# PROJECT MANUAL

**PROJECT NAME:**

## Newton Correctional Facility (NCF), Iowa Prison Industries (IPI), Homes For Iowa (HFI) – Phase II

**PROJECT ADDRESS:**
Newton Correctional Facility (NCF)
Iowa Prison Industries (IPI)
Homes For Iowa (HFI)
307 S. 60th Ave. W
Newton, IA, 50208

**PROJECT DATE:** July 18, 2025

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

**OWNER PROJECT NUMBER:** 9239.02 & 9239.03

**OWNER REQUEST FOR BID NUMBER:** RFB 923902-01

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**CONSTRUCTION MANAGER:**
The Samuels Group
2929 Westown Parkway
Suite 200
West Des Moines, IA
50266

**CONSTRUCTION MANAGER PROJECT NUMBER:** 7783

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Farnsworth Group
14225 University Ave.
Ste 110
Waukee, IA
50263

**ARCHITECT PROJECT NUMBER:** 02401959.001

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**DOCUMENT 00 01 05**

**CERTIFICATIONS**

**RFB #923902-01**


I hereby certify that the portion of this technical submission described below was prepared by me or under my direct personal supervision and responsible charge. I am a duly licensed architect under the laws of the state of Iowa.

Signature: _____
ROBERT C. RIDGWAY Date

License Expires: _____

Pages or sheets covered by this seal: _____


I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Signature: _____
SETH V. SUNDERMAN, P.E. Date

License Expires: _____

Pages or sheets covered by this seal: _____


I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Signature: _____
NATHAN T. KRESS, P.E. Date

License Expires: _____

Pages or sheets covered by this seal: _____


I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Signature: _____
NATHAN A. EMSICK, P.E. Date

License Expires: _____

Pages or sheets covered by this seal: _____


I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Signature: _____
CRAIG M. PHILLIPS, P.E. Date

License Expires: _____

Pages or sheets covered by this seal: _____

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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**

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**END OF SECTION**

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**SECTION 00 1113**

**NOTICE TO BIDDERS**

**RFB #923902-01**

The Iowa Department of Administrative Services will be receiving bids for exterior improvements, earthwork, utilities, HVAC, electrical, plumbing, and special construction for an engineered post frame structure at the Newton Correctional Facility (NCF), Iowa Prison Industries (IPI), Homes For Iowa (HFI) Facility Production Site, 307 S 60th Ave W, Newton, Iowa 50208.

The Iowa Department of Administrative Services anticipates construction to begin on September 22, 2025 and end on March 26, 2026.

Bids must be received no later than **2:00 pm, Wednesday, August 27, 2025**. 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://meet.google.com/hkj-uadi-jfh and teleconference number 321-465-5149 Pin: 975 781 147# at 3:00 pm on August 27, 2025.

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 2:00 pm, Friday, August 15, 2025, to the Issuing Officer.

Bidding documents may stipulate a specific product. Substitute product will be considered if a written request is received by 2:00 pm, Friday, August 15, 2025, 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 **Tuesday, August 12, 2025 at 10:00 am** at Newton Correctional Facility (NCF), Iowa Prison Industries (IPI), **Homes For Iowa (HFI) Facility Production Site**, 307 S 60th Ave W, Newton, Iowa 50208. This meeting is not mandatory but is highly recommended.

Bidding Documents, including drawing sheets bearing the project name Newton Correctional Facility, Iowa Prison Industries Phase II, Dated 07/18/25 and the Project Manual prepared by the Samuels Group and Farnsworth Group dated 07/18/25, may be obtained from Beeline & Blue by visiting www.beelineandblue.com or by calling (515) 244-1611 on Monday, August 04, 2025.

For further information regarding this project contact:
Katelyn Howells – Issuing Officer
Phone: (515) 515-721-7856
E-Mail: construction.procurement@iowa.gov

**END OF SECTION**

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**SECTION 00 2113**

**INSTRUCTIONS TO BIDDERS**

**RFB #923902-01**

## 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
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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
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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: The project includes exterior improvements, earthwork, utilities, HVAC, electrical, plumbing, and special construction for an engineered post frame structure at the Newton Correctional Facility (NCF), Iowa Prison Industries (IPI), Homes For Iowa (HFI) Facility Production Site, 307 S 60th Ave W, Newton, Iowa 50208.

### 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: Katelyn Howels – 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: 515-721-7856; email: construction.procurement@iowa.gov

B. OWNER REPRESENTATIVE: Brad Tonyan, State of Iowa, Department of Administrative Services, 109 SE 13th Street, Des Moines, IA 50319, Phone: 515-360-7718; email: brad.tonyan@iowa.gov

C. ON-SITE COORDINATOR (Homes For Iowa): Chad Squires, Supervisor, Iowa Prison Industries, 307 S. 60 Ave. W, Newton, IA 50208 Phone: 641-275-5982; email: chad.squires@iowa.gov

D. ON-SITE COORDINATOR (Newton Correctional Facility): Justin Thomas, POM, Newton Correctional Facility, 307 S. 60 Ave. W, Newton, IA 50208 Phone: 641-791-1684; email: justin.thomas@iowa.gov

E. CONSTRUCTION MANAGER CONTACT: Jerry Dehnke, The Samuels Group, 2929 Westown Parkway, Suite 200, West Des Moines, IA 50266, Phone: 515-661-7142; email: jdehnke@samuelsgroup.net

F. DESIGN PROFESSIONAL CONTACT: Architect, Leona Sears, Farnsworth Group Inc, 14225 University Ave, Suite 110, Waukee, IA 50263, Phone: 515-225-3469; email: lsears@f-w.com

G. DESIGN PROFESSIONAL CONTACT: Civil Engineer, Seth Sunderman, P.E., Bishop Engineering Company Inc, 3501 104th St, Des Moines, IA 50322, Phone: 515-276-0467; email: ssunderman@bishopengr.com

H. DESIGN PROFESSIONAL CONTACT: Structural Engineer, Nathan Kress, P.E., KPFF Consulting Engineers, 604 Locust Street, Suite 202, Des Moines, Iowa 50309, Phone: 515-279-3900; email: Nathan.Kress@kpff.com

I. DESIGN PROFESSIONAL CONTACT: Mechanical Engineer, Craig Phillips, P.E., Twin Rivers Engineering, 1000 Illinois Street, Suite A, Des Moines, IA 50314, Phone: 515-288-3679; email: cphillips@twinriverseng.com

J. DESIGN PROFESSIONAL CONTACT: Electrical Engineer, Nate Emsick, P.E., Twin Rivers Engineering, 1000 Illinois Street, Suite A, Des Moines, IA 50314, Phone: 515-288-3679; email: nemsick@twinriverseng.com

K.

# 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.

**END OF SECTION**

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**SECTION 00 2113.01**

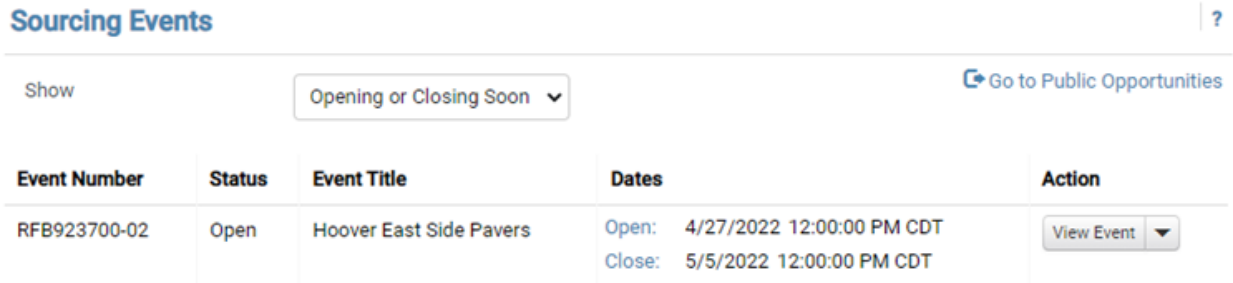
## IMPACS Public Construction Bidders User Guide

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

## 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<br>Agent's Name<br>Agent's Address | CONTACT NAME: Agent's Information<br>PHONE (A/C, No, Ext):<br>FAX (A/C, No):<br>E-MAIL ADDRESS:<br>INSURER(S) AFFORDING COVERAGE — NAIC # |
| INSURED<br>Trade Contractor's Name<br>Trade Contractor's Mailing Address | INSURER A: Company A (AM Best Rated A/VI or Better) — Admitted Carriers<br>INSURER B:<br>INSURER C:<br>INSURER D:<br>INSURER E:<br>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<br>CLAIMS-MADE [X] OCCUR<br>GEN'L AGGREGATE LIMIT APPLIES PER:<br>POLICY [X] PRO-JECT [ ] LOC<br>OTHER: | X | X | #TBD- CGL | 3/1/17 | 3/1/18 | EACH OCCURRENCE<br>DAMAGE TO RENTED PREMISES (Ea occurrence)<br>MED EXP (Any one person)<br>PERSONAL & ADV INJURY<br>GENERAL AGGREGATE<br>PRODUCTS - COMP/OP AGG | $ 1,000,000<br>$<br>$<br>$ 1,000,000<br>$ 2,000,000<br>$ 1,000,000 |
| B | AUTOMOBILE LIABILITY<br>[X] ANY AUTO<br>ALL OWNED AUTOS<br>SCHEDULED AUTOS<br>HIRED AUTOS<br>NON-OWNED AUTOS | X | X | #TBD-AL | 3/1/17 | 3/1/18 | COMBINED SINGLE LIMIT (Ea accident)<br>BODILY INJURY (Per person)<br>BODILY INJURY (Per accident)<br>PROPERTY DAMAGE (Per accident) | $ 1,000,000<br><br>amount varies based on paragraph 10.2.2 of the ConsensusDocs 802 contract |
| C | UMBRELLA LIAB [X] OCCUR<br>EXCESS LIAB [ ] CLAIMS-MADE<br>DED RETENTION $ | X | X | #TBD-UMB | 3/1/17 | 3/1/18 | EACH OCCURRENCE<br>AGGREGATE | $ 10,000,000<br>$ |
| D | WORKERS COMPENSATION AND EMPLOYERS' LIABILITY<br>ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y/N [ ]<br>(Mandatory in NH)<br>If yes, describe under DESCRIPTION OF OPERATIONS below | N/A | X | #TBD-WC | 3/1/17 | 3/1/18 | [X] PER STATUTE [ ] OTH-ER<br>E.L. EACH ACCIDENT<br>E.L. DISEASE - EA EMPLOYEE<br>E.L. DISEASE - POLICY LIMIT | $ 500,000<br>$ 500,000<br>$ 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)<br>109 SE 13th Street<br>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.<br>AUTHORIZED REPRESENTATIVE<br>Signature |



ACORD 25 (2014/01) — The ACORD name and logo are registered marks of ACORD

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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 – 08/28/25
B. Anticipated Date of Commencement – 09/12/25
C. Substantial Completion by –03/26/26 – Post Frame Structure
D. Substantial Completion by – 03/26/26 – Alternate 01 – Extend Overall Length of Building
E. Substantial Completion by – 11/25/25 – Alternate 02A – North Region
F. Substantial Completion by – 11/25/25 – Alternate 02B – North Region
G. Substantial Completion by – 11/25/25 – Alternate 03 – North Region

## PART 2 - PRODUCTS – NOT USED

## PART 3 - EXECUTION – NOT USED

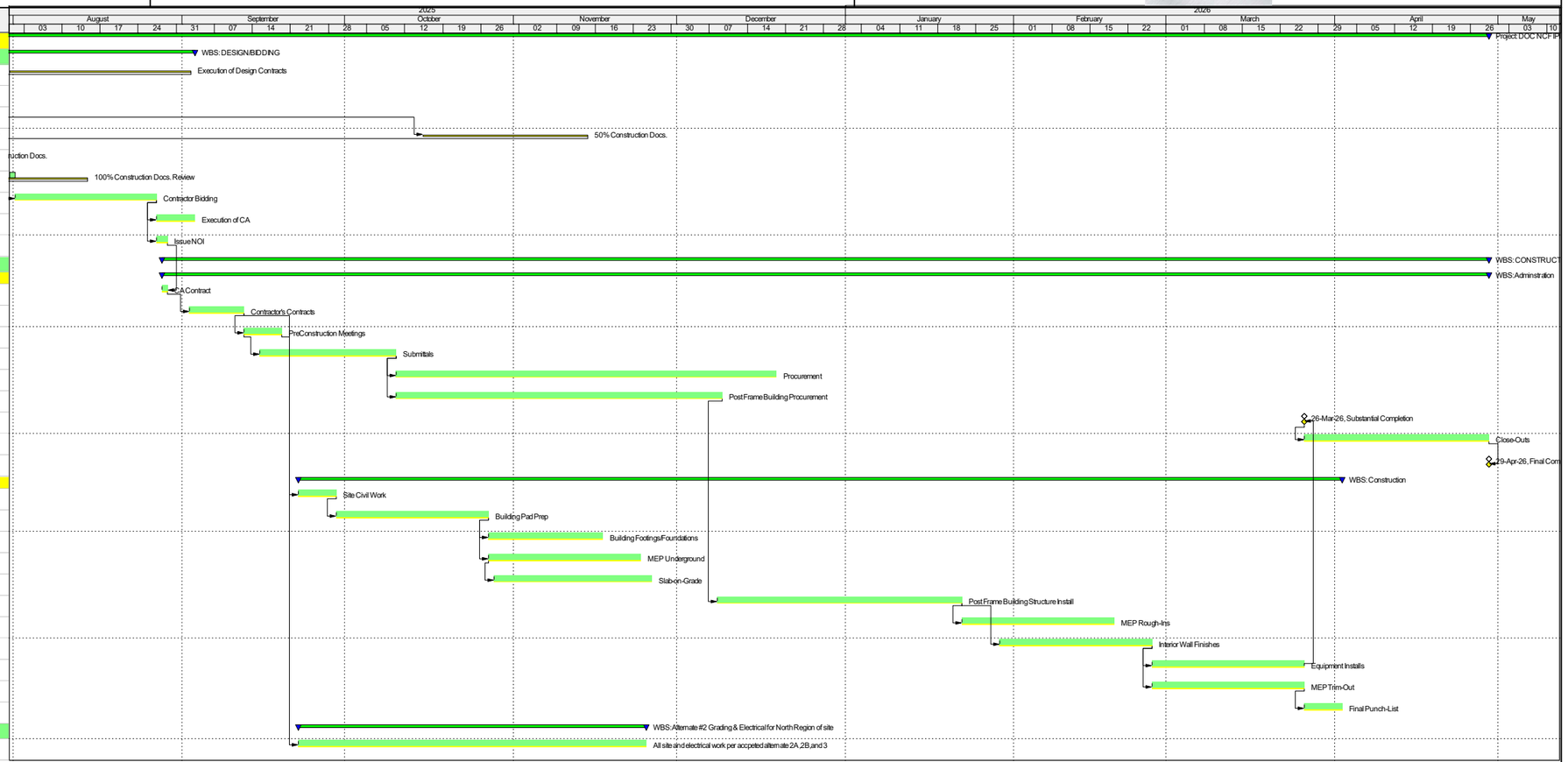
**END OF SECTION**

IOWA | Department of Administrative Services

# DOC NCF IPI Homes for Iowa Facility Project Phase II

Samuels Group

| # | Activity ID | Activity Name | Predecessors | DUR | Activity % Complete | Start | Finish |
|---|---|---|---|---|---|---|---|
| 1 | | **Project: DOC NCF IPI Homes for Iowa Facility Project Phase II** | | 258 | | 21-Jan-25 A | 29-Apr-26 |
| 2 | | *WBS: DESIGN/BIDDING* | | 147 | | 21-Jan-25 A | 03-Sep-25 |
| 3 | DBPC1010 | Execution of Design Contracts | | 23 | 100% | 21-Jan-25 A | 18-Feb-25 A |
| 4 | DBPC1020 | Project Scope Review | DBPC1010 | 1 | 100% | 18-Feb-25 A | 18-Feb-25 A |
| 5 | DBPC1030 | Design Devlopment Review/Budget Update | DBPC1020 | 1 | 100% | 21-Apr-25 A | 22-Apr-25 A |
| 6 | DBPC1100 | 50% Construction Docs. | DBPC1030 | 23 | 100% | 21-Apr-25 A | 27-May-25 A |
| 7 | DBPC1110 | 95% Construction Docs. | DBPC1100 | 21 | 100% | 27-May-25 A | 24-Jun-25 A |
| 8 | DBPC1120 | 100% Construction Docs. Review | DBPC1110 | 16 | 92.01% | 24-Jun-25 A | 01-Aug-25 |
| 9 | DBPC1130 | Contractor Bidding | DBPC1120 | 18 | 0% | 01-Aug-25 | 27-Aug-25 |
| 10 | DBPC1140 | Execution of CA | DBPC1130 | 4 | 0% | 27-Aug-25 | 03-Sep-25 |
| 11 | DBPC1150 | Issue NOI | DBPC1130 | 2 | 0% | 27-Aug-25 | 29-Aug-25 |
| 12 | | *WBS: CONSTRUCTION* | | 167 | | 28-Aug-25 | 29-Apr-26 |
| 13 | | **WBS: Adminstration** | | 167 | | 28-Aug-25 | 29-Apr-26 |
| 14 | CAA1000 | CA Contract | DBPC1150 | 1 | 0% | 28-Aug-25 | 29-Aug-25 |
| 15 | CAA1010 | Contractor's Contracts | CAA1000 | 8 | 0% | 02-Sep-25 | 12-Sep-25 |
| 16 | CAA1030 | PreConstruction Meetings | CAA1010 | 5 | 0% | 12-Sep-25 | 19-Sep-25 |
| 17 | CAA1020 | Submittals | CAA1030 | 19 | 0% | 15-Sep-25 | 10-Oct-25 |
| 18 | CAA1022 | Procurement | CAA1020 | 48 | 0% | 10-Oct-25 | 19-Dec-25 |
| 19 | CAA1032 | Post Frame Building Procurement | CAA1020 | 40 | 0% | 10-Oct-25 | 09-Dec-25 |
| 20 | CAA1040 | Substantial Completion | CAC1110 | 0 | 0% | | 26-Mar-26 |
| 21 | CAA1050 | Close-Outs | CAA1040 | 23 | 0% | 26-Mar-26 | 29-Apr-26 |
| 22 | CAA1060 | Final Completion | CAA1050 | 0 | 0% | | 29-Apr-26 |
| 23 | | **WBS: Construction** | | 133 | | 22-Sep-25 | 02-Apr-26 |
| 24 | CAC1000 | Site Civil Work | CAA1010 | 5 | 0% | 22-Sep-25 | 29-Sep-25 |
| 25 | CAC1002 | Building Pad Prep | CAC1000 | 20 | 0% | 29-Sep-25 | 27-Oct-25 |
| 26 | CAC1010 | Building Footings/Foundations | CAC1002 | 15 | 0% | 27-Oct-25 | 17-Nov-25 |
| 27 | CAC1004 | MEP Underground | CAC1002 | 20 | 0% | 27-Oct-25 | 24-Nov-25 |
| 28 | CAC1035 | Slab-on-Grade | CAC1004 | 21 | 0% | 28-Oct-25 | 26-Nov-25 |
| 29 | CAC1030 | Post Frame Building Structure Install | CAA1032 | 30 | 0% | 08-Dec-25 | 22-Jan-26 |
| 30 | CAC1070 | MEP Rough-Ins | CAC1030 | 20 | 0% | 22-Jan-26 | 19-Feb-26 |
| 31 | CAC1080 | Interior Wall Finishes | CAC1030 | 20 | 0% | 29-Jan-26 | 26-Feb-26 |
| 32 | CAC1110 | Equipment Installs | CAC1080 | 20 | 0% | 26-Feb-26 | 26-Mar-26 |
| 33 | CAC1120 | MEP Trim-Out | CAC1080 | 20 | 0% | 26-Feb-26 | 26-Mar-26 |
| 34 | CAC3000 | Final Punch-List | CAC1120 | 5 | 0% | 26-Mar-26 | 02-Apr-26 |
| 35 | | *WBS: Alternate #2 Grading & Electrical for North Region of site* | | 46 | | 22-Sep-25 | 25-Nov-25 |
| 36 | ALT1000 | All site and electrical work per accpeted alternate 2A ,2B,and 3 | CAA1030 | 46 | 0% | 22-Sep-25 | 25-Nov-25 |




| Date | Revision | Checked | Approved |
|---|---|---|---|
| 27-Aug-25 00:... | Project Bid Date | | |
| 26-Mar-26 00:00 | Substantial Completion Date | | |
| 31-Jul-25 00:00 | Data Date | | |

**DATA DATE 07.31.2025**

Primary Baseline
Actual Work
Remaining Work
Critical Remaining Work
Start Constraint
Finish Constraint
Baseline Milestone
Milestone
% Complete

**SECTION 00 3132**

**GEOTECHNICAL DATA**

## PART 1 - GENERAL

### 1.01 GEOTECHNICAL DATA

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. A geotechnical investigation report for Project, titled Geotechnical Exploration, NCF IPI Homes For Iowa Facility Project, PN 251210, prepared by Allender Butzke Engineers Inc., dated July 3, 2025, is available for viewing as appended to this Document.

## PART 2 - PRODUCTS – NOT USED

## PART 3 - EXECUTION – NOT USED

**END OF SECTION**

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# 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. Water Heater Permit and Inspections: Trade Contractor is responsible for permits and inspections.
D. Electrical 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 #923902-01

BID FORM for CONSTRUCTION CONTRACT
for
Newton Correctional Facility (NCF)
Iowa Prison Industries (IPI)
Homes For Iowa (HFI) – Phase II
307 S 60th Ave W, Newton, Iowa 50208
Project 9239.02 & 9239.03

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 July 18, 2025, 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

Description: General Construction

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

_____

_____ Dollars

($_____).

BP 02

Description: Civil

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

_____

_____ Dollars

($_____).

BP 03

Description: MEP

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

_____

_____ Dollars

($_____).

ALTERNATES:

ALT 01 - General Construction

Description: – General Construction: Extend Overall Length of Building

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

_____

_____ Dollars

($_____).

ALT 01 - Civil

Description: – Civil: Extend Overall Length of Building

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

_____

_____ Dollars

($_____).

ALT 01- MEP

Description: – MEP: Extend Overall Length of Building

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

_____

_____ Dollars

($_____).

ALT 02A - Civil

Description: Civil: All Grading and Earthwork for North Region of Site as Noted

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

_____

_____ Dollars

($_____).

ALT 02B - Civil

Description: – Civil: Respread Topsoil and Seed All Graded Areas as Noted

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

_____

_____ Dollars

($_____).

ALT 03 - Civil

Description: – Civil work for “Gravel Surface Add including Electrical Work as Noted”

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

_____

_____ Dollars

($_____).

ALT 03 - Electrical

Description: – Electrical work for “Gravel Surface Add including Electrical Work as Noted”

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

_____

_____ Dollars

($_____).

ALT 04 - Electrical

Description: – Electrical: Electrical Service and Distribution Re-work at the North end of the Site

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

_____

_____ Dollars

($_____).

UNIT PRICES:

UNIT 01

Description: Grading Berm Material

_____

_____ Dollars

($_____).

UNIT 02

Description: Over-Excavation & Replacement of Unsuitable Fill

_____

_____ Dollars

($_____).

UNIT 03

Description: Additional Crushed Rock Surface

_____

_____ 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**

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**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").

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)

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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**

# ConsensusDocs 802

## STANDARD FORM OF AGREEMENT BETWEEN OWNER AND TRADE CONTRACTOR

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


**TABLE OF ARTICLES**



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.

## 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

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

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

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

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

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

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

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

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

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

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

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)

☒ 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

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

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

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.

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

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.

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

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

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

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

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

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.

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

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.

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,

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

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,

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

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

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

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

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

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

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.

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

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

Trade Contractor: *Contractor Name*

By: _____

(Authorized Representative)

Name:

Title:

Date:

Owner: State of Iowa - DAS

By: _____

(Authorized Representative)

Name:

Title:

Date:

END OF DOCUMENT.

# 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,

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)


# 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,

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: _____

Print Title: _____

Witness: .....

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

# 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: Newton Correctional Facility (NCF), Iowa Prison Industries (IPI), Homes For Iowa (HFI) Production Site, 307 S 60th Ave W, Newton, Iowa 50208.
B. DAS Project #: 9239.02 & 9239.03
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: Brad Tonyan, Iowa Department of Administrative Services, 109 SE 13th Street, Des Moines, IA 50319
E. Construction Manager: Jerry Dehnke, The Samuels Group, 2929 Westown Parkway Suite 200, West Des Moines, IA 50266

### 1.03 PROJECT SUMMARY

A. The project includes exterior improvements, earthwork, utilities, HVAC, electrical, plumbing, and special construction for an engineered post frame structure at the Newton Correctional Facility (NCF), Iowa Prison Industries (IPI), Homes For Iowa (HFI) Facility Production Site, 307 S 60th Ave W, Newton, Iowa 50208.
B. Target date to provide substantial completion (See 00 3113 Preliminary Schedule for dates).

### 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. Dumpsters shall be provided by the owner and managed by the construction manager. Coordinate needs for dumpsters with the construction manager
9. Portable Toilets shall be provided by the owner and managed by the construction manager. Coordinate needs for temporary toilets with the construction manager

## 1.05 WORK HOUR RESTRICTIONS

A. **Iowa Prison Industries Site** standard Work hours are from 7:00 AM to 3:30 PM, Monday through Friday. Additional hours and weekend work will need to be approved by the State of Iowa IPI Facility and will need to be coordinated with the construction manager and the facility.

## 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.
D. All t**rade Contractors shall be responsible for the cleanup of their own work. Provide means and methods to ensure construction debris and materials are collected and removed to dumpsters on a daily basis. Dumpsters shall be provided by owner and managed by the construction manager.**

## 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.
D. Iowa Prison Industries, Homes For Iowa fabrication facility will be operational during the construction period of this project. Coordinate all construction activities with the construction manager and facility to accommodate facility operations.

## 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. All contractor personnel shall be required to take an online PREA training course (Approximately 30 minutes) and facility orientation (Approximately One Hour) on site prior to access to the facility.
D. PREA link: https://docs.google.com/presentation/d/1_8IcvvpMCYdqasseVuOxzY2ISqjS3RUi6Oups7t6-zA/pub?start=false&loop=false&delayms=3000&slide=id.p
E. Hot Work Permit Processes and Fire Watch, when necessary, will be adhered to for this project.
F. All State property is tobacco free. No smoking will be permitted or tolerated on campus unless in designated areas.
G. You are permitted access only to the work site and no other area of the institution.
H. No drugs, alcohol, or firearms are allowed on the work site.
I. Do not leave money, drugs, alcohol, or firearms in your personal vehicle.
J. Company and personal vehicles are to be parked and locked in designated or authorized area of the work.
K. Secure all tools at the end of the day.
L. Maintain control of all tools, supplies, and debris at all times during the work.
M. Never leave keys in any vehicle. If a security officer finds keys in a vehicle, they are under orders to turn them in to a security supervisor.
N. Do not give anything to residents or take anything from residents; if they offer, inform your supervisor.
O. **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.
P. 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.
Q. During an emergency, follow the instructions of the security staff.
R. Contractor shall wear clothing of a different color, pattern, fashion, etc. as to distinguish themselves from inmates.
S. **Contractors shall not wear orange or yellow T-shirts/sweatshirts. High visibility vests with reflective surface shall be allowed per OSHA standards**
T. Contractors shall not interact with inmates/offenders. Contractors shall immediately notify the facility if inmates/offenders pursue interaction with contractors
U. Contractors shall not wear sleeveless T-shirts or shorts. The minimum length of shirt sleeves shall be four inches and all pants shall be full length
V. Coordinate construction activities with all bid packages.

## 1.09 BID PACKAGE INSTRUCTIONS

A. **Bid Package #01** – General Construction: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
   1. General construction for the proposed engineered post frame building.
   2. Contractor's Work shall be performed in accordance with the Drawings, Specification Divisions 00 and 01, and applicable technical specification sections for the scope of work.
   3. Includes Division 3 (Section 03 3000)
   4. Includes Division 5 (Section 05 5000)
   5. Includes Division 6 (Section 06 1000)
   6. Includes Division 7 (Sections 07 6200, 07 7120, and 07 9200)

7. Includes Division 8 (Sections 08 1213, 08 1313, 08 3100, 08 3323, 08 3613, 08 7100, and 08 8000)
8. Includes Division 9 (Sections 09 2116, 09 6500, and 09 9100)
9. Includes Division 10 (Sections 10 2800 and 10 4400)
10. Includes Division 13 (13 3400)
11. Includes Division 31 (31 2000, 31 2005, 31 2200, 31 2316, 31 2323, and 31 2333) as applies to building footings/foundations/slab on grade for post frame structure. Note: Post Frame Building footing excavation/backfill, foundation walls excavation/backfill, and final grade are by Bid Package #1
12. Includes all survey and layout related to this bid package.

B. **Bid Package #02** – Civil: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
1. Civil, Earthwork, and Exterior Improvements.
2. Contractor's Work shall be performed in accordance with the Drawings, Specification Divisions 00 and 01, and applicable technical specification sections for the scope of work.
3. Includes specification: 02 4113
4. Includes Division 31 (Sections 31 1000, 31 2000, 31 2005, 31 2200, 31 2316, 31 2323, 31 2333, and 31 3500)
5. Includes Division 32 (Sections 32 1123, 32 9119, and 32 9219)
6. Division 32 Sections Not in Contract (Section 32 1313, 32 1373, 32 1723, 32 3113, and 32 3114) Provided for reference (future project).
7. Includes Division 33 (Sections 33 1000, 33 3100, 33 3101, 33 4000, and 33 4900).
8. Includes rough grading of proposed warehouse. Grade to within 1" +/- of rough grade. Note: Post Frame Building footing excavation/backfill, foundation walls excavation/backfill, and final grade are by Bid Package #1.
9. Includes placement and removal of temporary rock site entrance noted on C7.2 (20' wide temporary construction site access).
10. Includes all survey and layout related to this bid package.

C. **Bid Package #03** – MEP: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
1. Fire suppression, plumbing, HVAC, Electrical, Communications, and Electronic Safety & Security.
2. Contractor's Work shall be performed in accordance with the Drawings, Specification Divisions 00 and 01, and applicable technical specification sections for the scope of work.
3. Includes Division 21 (21 0500 and 21 1300)
4. Includes Division 22 (Sections 22 0519, 22 0553, 22 0719, 22 1005, 22 1006, 22 3000, and 22 4000)
5. Includes Division 23 (Sections 23 0519, 23 0593, 23 0713, 23 0913, 23 3100, 23 3300, 23 3423, 23 3700, 23 5533, and 23 7433)
6. Includes Division 26 (Sections 26 0519, 26 0526, 26 0529, 26 0533.13, 26 0533.16, 26 0533.23, 26 0553, 26 0583, 26 0923, 26 0950, 26 2100, 26 2413, 26 2416, 26 2701, 26 2726, 26 2813, 26 2816.16, 26 2913, 26 5100, and 26 5600)
7. Includes Division 27 (Section 27 1000)
8. Includes Division 28 (Section 28 3100)
9. Includes all survey and layout related to this bid package.
10. Include lump sum Allowance of $10,000.00 for temporary electrical service for the south post frame building site. Contractor to submit invoices, delivery slips, and/or time sheets to show actual quantities to be signed off by construction manager at time of execution/delivery

D. **Alternate #01 – General Construction:** Extend Overall Length of Building: Trade Contractor shall include all of the following, but not limited to, as part of the contract:

1. Base Bid Condition: Overall interior building dimensions shall be 100’-0” W x 150’-0” L x 24’-0” H.
2. Alternate Bid Condition: Overall interior building dimensions shall be 100’-0” W x 200’-0” L x 24’-0” H.
3. Perform all work as indicated on drawings and within specifications. Reference construction documents for full extent of architectural, structural, mechanical, electrical, and plumbing work included within this alternate.
4. Provide all General Construction elements to extend the post frame building an additional 50’ as noted in the documents.
5. Includes all divisions and sections noted in Bid Package #01 related to this additional section of building.
6. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
7. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
8. Execute accepted alternates under the same conditions as other work of the Contract.

E. **Alternate #01 – Civil:** Extend Overall Length of Building: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
1. Provide all Civil elements to extend the post frame building an additional 50’ as noted in the documents.
2. Includes all divisions and sections noted in Bid Package #02 related to this additional section of building.
3. Perform all work as indicated on drawings and within specifications. Reference Construction Documents for full extent of civil work included within this alternate.
4. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
5. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
6. Execute accepted alternates under the same conditions as other work of the Contract.

F. **Alternate #01 – MEP**: Extend Overall Length of Building: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
1. Provide all MEP elements to extend the post frame building an additional 50’ as noted in the documents.
2. Includes all divisions and sections noted in Bid Package #03 related to this additional section of building.
3. Perform all work as indicated on drawings and within specifications. Reference construction documents for full extent of mechanical, electrical, and plumbing work included within this alternate.
4. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
5. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
6. Execute accepted alternates under the same conditions as other work of the Contract.

G. **Alternate #02A** – **Civil:** All Grading and Earthwork for North Region of Site as Noted: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
1. Base Bid Condition: Perform all civil work as indicated in the Construction Documents for the south region of the site. No work is to be performed in the north region of the site unless otherwise noted in the Construction Documents

2. Alternate Bid Condition: Provide all civil grading work as noted in the Construction Documents for the north portion of the site.
3. Perform all work as indicated on drawings and within specifications. Reference Construction Documents for full extent of civil work included within this alternate.
4. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
5. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
6. Execute accepted alternates under the same conditions as other work of the Contract.

H. **Alternate #02B** – **Civil:** Respread Topsoil and Seed All Graded Areas as Noted: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
1. Base Bid Condition: Project shall include the respreading of topsoil and application of seeding as indicated in Construction Documents for the south region of the site.
2. Alternate Bid Condition: Project shall include the respreading of topsoil and the application of seeding as indicated in the Construction Documents for the north portion of the site.
3. Perform all work as indicated on drawings and within specifications. Reference construction documents for the full extent of civil work included within this alternate.
4. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
5. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
6. Execute accepted alternates under the same conditions as other work of the Contract.

I. **Alternate #03 – Civil:** Civil Work for the “Gravel Surface Add including Electrical Work as Noted”: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
1. Base Bid Condition: Project shall include only earthwork and grading as indicated in Construction Documents.
2. Alternate Bid Condition: Provide gravel surfacing for the north portion of the site as indicated in Construction Documents.
3. Coordinate with electrical contractor for installation of conduits, pedestals, and light pole bases prior to gravel surface installation.
4. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
5. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
6. Execute accepted alternates under the same conditions as other work of the Contract.

J. **Alternate #03 – Electrical:** Electrical Work for the “Gravel Surface Add including Electrical Work as Noted”: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
1. Production Lot Power Pedestals: Provide all electrical conduit and pedestals as indicated.
2. Production Lot Light Pole Bases: Provide all electrical conduit and concrete light pole bases.
3. Sallyport Power and Data: Provide handhold in location as indicated and provide power and data conduit to location for future work.
4. Coordinate with civil contractor for installation of conduits, pedestals, and light pole bases prior to gravel surface installation.
5. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

6. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
7. Execute accepted alternates under the same conditions as other work of the Contract.

K. **Alternate #04 – Electrical:** Electrical Service and Distribution Re-work at the North end of the Site: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
1. Provide new electrical service and distribution system as indicated in the Construction Documents. Work shall include reworking the existing system as well as providing a new electrical panel for future work.
2. Perform all work as indicated on drawings and within specifications. Reference construction documents for full extent of architectural, mechanical and plumbing work included within this alternate.
3. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
4. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
5. Execute accepted alternates under the same conditions as other work of the Contract.

L. **Unit Price #01** - Grading Berm Material: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
1. Contract Documents indicate, in the Base Bid, areas that shall be graded. Unit Prices will be utilized for unknown conditions not included in the base bid.
2. Work and materials for the inclusion of the drainage berm area on the north side of the site as indicated in the Construction Documents shall be provided by the contractor. Quantities will be calculated in accordance with this section. Architect to be notified immediately upon discovery before work is performed.
3. The unit Price quoted is to cover quantities of work and materials as indicated in the Contract Documents.
4. State the amount per cubic yard for work and materials as indicated. This same unit price shall also be used if less work and materials are required than indicated on the site plan.
5. Unit Price No. 1: Dollar - Per cubic yard
6. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.
7. 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.

M. **Unit Price #02** - Over-Excavation & Replacement of Unsuitable Fill: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
1. Contract Documents indicate, in the Base Bid, areas that shall be graded. Unit Prices will be utilized for unknown conditions not included in the base bid.
2. In the event inadequate soil or unexpected rubble is encountered during the excavation of soils additional removal and replacement of fill will be required by the contractor. Quantities will be calculated in accordance with this section. Architect to be notified immediately upon discovery before work is performed
3. The unit price quoted is to cover additional quantities of removal or replacement of unsuitable material beyond the base quantity required.
4. Unit Price shall include over-excavation of uncontaminated debris, soil, fill, foundations, rubble, concrete, etc. and placement of engineered fill beyond the scope of work indicated in the Contract Documents. Assume worst uncontaminated removal conditions and most stringent fill and compaction requirements.

5. If contaminated materials are to be removed, the incremental cost to cover the contamination shall be negotiated in accordance with the general conditions and added to the quoted unit price.
6. State the amount per cubic yard for additional removal and replacement of inadequate fill at the direction of the Structural Engineer and Contracting Officer. This same unit price shall also be used if less removal and replacement is required than indicated on the site plan.
7. Unit Price No. 2: Dollar - Per cubic yard
8. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.
9. 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.

N. **Unit Price #03** - Additional Crushed Rock Surface: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
1. Contract Documents indicate, in the Base Bid, areas that shall receive crushed rock. Unit Prices will be utilized for unknown conditions not included in the base bid.
2. In the event additional crushed rock is required due to unknown conditions or the Contracting Officers discretion, additional crushed rock shall be provided by the contractor. Quantities will be calculated in accordance with this section. Architect to be notified immediately upon discovery before work is performed.
3. The unit price quoted is to cover additional quantities of crushed rock beyond the base quantity required.
4. Unit Price shall include subbase compaction and grading, and placement of crushed rock beyond the scope of work indicated in the Contract Documents.
5. State the amount per cubic yard for additional crushed rock per the direction of the Contracting Officer. This same unit price shall also be used if less crushed rock is required than indicated on the site plan.
6. Unit Price No. 3: Dollar - Per cubic yard
7. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.
8. 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.

O. **Work Performed by Owner:** Iowa Prison Industries and Newton Correctional Facility will perform the following work items:
1. If Applicable - 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. Special Inspections

P. **Owner Furnished Products:** Iowa Prison Industries and Newton Correctional Facility will provide the following materials for installation by the contractor:
1. Roll off dumpster service.
2. Temporary Sanitary Facilities (Portable Toilets).

## PART 2 - PRODUCTS – NOT USED

**END OF SECTION**

**SECTION 01 22 00**

**UNIT PRICES**

**RFB #923902-01**

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Measurement and payment criteria applicable to the Work performed under a unit price payment method.

### 1.2 AUTHORITY

A. Measurement methods delineated in the individual specification sections complement the criteria of this section.
B. Take all measurements and compute quantities. The Architect/Engineer and/or the testing agency will verify measurements and quantities.
C. Assist by providing necessary equipment, workers, and survey personnel as required.

### 1.3 UNIT QUANTITIES SPECIFIED

A. Quantities and measurements supplied or placed in the work and verified by the Architect/Engineer and/or testing agency determine payment.
B. The Architect and/or Engineer may require more or fewer quantities than those quantities indicated.
C. Additional or fewer quantities will be compensated at the unit price quoted.

### 1.4 MEASUREMENT OF QUANTITIES

A. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

### 1.5 PAYMENT

A. Payment Includes: Full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.
B. Final payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities accepted by the Architect/Engineer multiplied by the unit sum/price for Work which is incorporated in or made necessary by the Work.

### 1.6 SCHEDULE OF UNIT PRICES

A. See 01 1200 Contract Summary for schedule of unit prices

END OF SECTION

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**SECTION 01 23 00**

**ALTERNATE BID ITEMS**

**RFB #923902-01**

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Submission procedures.
B. Documentation of changes to Contract Sum and Contract Time.

### 1.2 RELATED SECTIONS

A. Section 00 21 00 - Instructions to Bidders: Requirements for Additives.
B. Section 00 41 00 - Form of Bid: Incorporating Monetary Value of Additives.
C. Section 01 60 00 - Product Requirements.

### 1.3 REQUIREMENTS INCLUDED

A. This Section identifies each Alternate Bid Item and describes the **basic** changes to be incorporated into the Work, only if the alternate bid item has been made a part of the Contract per Section 00 21 00 – Instructions to Bidders: Article 1 – Definitions: 1.9.

### 1.4 RELATED REQUIREMENTS

A. Reference specifications and drawings for additional requirements, (including Civil, Structural, Mechanical, Electrical and Plumbing requirements), for products and methods to achieve the work stipulated under each Alternate Bid Item.
B. Coordinate pertinent related work and modify adjacent work as required to properly integrate the work under each Alternate Bid Item, and to provide the complete construction required by Contract Documents.
   1. Submit full description of the proposed Alternate and the effect on adjacent or related components.
C. Alternates quoted will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
D. Within each Alternate scheduled below, a time is indicated when the alternate must be accepted. If a time is provided, then alternate bid scope and amount proposed can be used as a change order item at Owner’s discretion at any time prior to the date indicated.

### 1.5 SELECTION AND AWARD OF ALTERNATES

A. Indicate variation of Bid Price for Alternates described below and list on Bid Form or any supplement to it which requests a 'difference' in Bid Price by adding to or deducting from the base bid price.
B. All requested Alternates, if any, shall be bid. The Owner reserves the right to accept Alternates in any order or combination, and to determine the low Bidder on the basis of the sum of the Base Bid and Alternate(s) accepted.

### 1.6 SCHEDULE OF ALTERNATES

A. See 01 1200 Contract Summary for schedule of Alternates

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# 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 5% of the value of the work performed. Upon substantial completion for the entire work, a sum sufficient to decrease the total retained to 5% 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

### 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 submittal 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 Sub Contractors.
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 bi-weekly (every two weeks) 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 #

**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.

**END OF SECTION**

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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 45 00

# SPECIAL INSPECTIONS AND TESTS

# RFB #923902-01

## 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.

### 1.2 SUMMARY

A. Section includes minimum 2015 International Building Code (IBC) required inspections and frequency of inspections.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
4. Specific test and inspection requirements are not specified in this Section.

### 1.3 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

### 1.4 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
11. Name and signature of laboratory inspector.
12. Recommendations on retesting and reinspecting.

## 1.5 SPECIAL INSPECTIONS AND TESTS

A. Special Tests and Inspections: Owner will engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in Statement of Special Inspections included in this Section, and as follows:

B. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

C. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
4. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Owner, Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Owner, Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.

5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
6. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION**

**3.1 TEST AND INSPECTION LOG**

A. Test and Inspection Log: Prepare a record of tests and inspections.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log.

**3.2 REPAIR AND PROTECTION**

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

B. Protect construction exposed by or for inspection activities.

**PART 4 - STATEMENT OF SPECIAL INSPECTIONS**

**4.1 Definitions:**

A. Frequency of special inspections and tests:
1. P (Perform): Perform these tasks for each welded joint, bolted connection, or each member. (AISC 360 & AISC 341)
2. O (Observe): Observe these items on a random basis. Operations need not be delayed pending these inspections. (AISC 360 & AISC 341)
3. P (Perform): Perform these tasks prior to final acceptance for each item or element. (SDI QA/QC)
4. O (Observe): Inspect these items of an intermittent basis. Operations need not be delayed pending these inspection. (SDI QA/QC)
5. D (Document): The inspector shall prepare reports indicating that the work has been performed in accordance with the contract documents. Only required for structures designed per AISC 341 – Seismic Provisions for Structural Steel Buildings. (AISC 341)
6. C (Continuous): Continuous special inspections is the constant monitoring of specific tasks by a special inspector. These inspections must be carried out continuously over the duration of the particular tasks. (2015 IBC)
7. P (Periodic): Periodic special inspection is inspections by the special inspector who is intermittently present where the work has been or is being performed. (2015 IBC)

## 4.2 Statement of Special Inspections and Test

| Statement of Special Inspections and Test |
|---|
| 2015 International Building Code |
| Project: DOC NCF IPI Homes for Iowa – Phase II |

| A. Concrete Construction (IBC: 1705.3) | | | | | |
|---|---|---|---|---|---|
| 1. Concrete Construction (IBC: Table 1705.3) | | | | | |
| Required | Verification and Inspection | Continuous | Periodic | Referenced Standard | IBC Reference |
| ☒ | a. Inspection of reinforcing steel and placement. | - | P | ACI 318: Ch. 20, 25.2, 25.3, 26.5.1-26.5.3 | 1908.4 |
| ☒ | b. Inspect anchors cast in concrete. | - | P | ACI 318: 17.8.2 | |
| ☒ | c. Inspect anchors post-installed in hardened concrete members: Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads. | C | - | ACI 318: 17.8.2.4 | |
| ☒ | d. Inspect anchors post-installed in hardened concrete members: Mechanical anchors and adhesive anchors not defined in A.1.c | - | P | ACI 318: 17.8.2 | |
| ☒ | e. Verify use of required design mix. | - | P | ACI 318: Ch. 19, 26.4.3, 26.4.4 | 1904.1, 1904.2, 1908.2, 1908.3 |
| ☒ | f. Fresh concrete tests: refer to section 03 30 00 for tests. | C | - | ASTM C172, ASTM C31, ACI 318: 26.4.5, 26.12 | 1908.1 |
| ☒ | g. Inspect concrete placement for proper application techniques. | C | - | ACI 318: 26.4.5 | 1908.6, 1908.7, 1908.8 |
| ☒ | h. Verify maintenance of specified curing temperature and techniques. | - | P | ACI 318: 26.4.7-26.4.9 | 1908.9 |
| ☒ | i. Inspect formwork for shape, location and dimensions of the concrete member being formed. | - | P | ACI 318: 26.10.1 (b) | |

| B. Soils (IBC: 1705.6) | | | | |
|---|---|---|---|---|
| 1. Soils (IBC: Table 1705.6) | | | | |
| Required | Verification and Inspection | Continuous | Periodic | Referenced Standard |
| ☒ | a. Verify materials below shallow foundation are adequate to achieve the design bearing capacity. | - | P | |
| ☒ | b. Verify excavations are extended to proper depth and have reached proper material. | - | P | |
| ☒ | c. Perform classification and testing of compacted fill materials. | - | P | |
| ☒ | d. Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill. | C | - | |

| | | | | |
|---|---|---|---|---|
| ☒ | e. Prior to placement of compacted fill, observe subgrade and verify that site has been prepared properly. | - | P | |

| C. Wood Construction (IBC: 1705.5) | | | | |
|---|---|---|---|---|
| | 1. Wood Construction (IBC: 1705.5.1, 1705.5.2) | | | |
| Required | Verification and Inspection | Continuous | Periodic | Referenced Standard |
| ☒ | a. Prefabricated wood structural elements. | - | P | IBC: 1705.5, 1704.2.5 |
| ☒ | c. Metal-plate-connected wood trusses spanning 60 feet (18,288 mm) or greater. | - | P | IBC: 1705.5.2 |

**END OF SECTION**

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# SECTION 01 5000

# TEMPORARY FACILITIES AND CONTROLS

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES

A. Temporary Utilities
B. Temporary Sanitary Facilities (Provided by Owner)
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. Water Supply, consisting of connection to existing facilities as available.
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.
C. Contractors will provide the following:
   1. Temporary Power.

### 1.03 TEMPORARY SANITARY FACILITIES (Provided by Owner)

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
B. Maintain daily in clean and sanitary condition.
C. Contractors to use project specific temporary sanitary facilities provided by owner. Temporary facilities for IPI Production site staff and offenders are off limits to construction personnel.

### 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 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. Provide temporary enclosure and fences as necessary to protect the public and secure the site.
B. Provide security and facilities to protect work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

### 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. Contractors shall provide means and methods to transport waste materials to the dumpster.
D. **Contractors shall provide clean-up on a daily basis**

E. Waste Disposal Facilities: Provide waste collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.
F. Dumpsters provided by owner.

**END OF SECTION**

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# 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**

## 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**

_____

_____

**Can 100% payment and retainage payment be released? ❑ Yes ❑ No**

# SECTION 02 4113

# SITE SELECTIVE DEMOLITION

# RFB #923902-01

## PART 1 – GENERAL

### 1.1 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
B. Section 01 2300 - Alternates: Descriptions of items, administrative requirements.
C. Section 01 3000 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.

### 1.2 PRICE AND PAYMENT PROCEDURES

A. Alternates: See Section 01 2300 - Alternates, for product alternatives affecting this section.

### 1.3 SUMMARY

A. Section includes:
   1. Demolition and removal of pavement as indicated in the plans.
   2. Cap and identify active utilities as indicated in the plans.
B. Related Sections:
   1. Section 01 11 00: Summary of Work.
   2. Section 31 20 00: Site Clearing
   3. Section 31 20 00: Earth Moving

### 1.4 DESCRIPTION OF WORK

A. Full depth sawcut, removal, and disposal of pavements.
B. Removing and disposing of existing concrete.
C. Tree protection.

### 1.5 SUBMITTALS

A. Demolition procedures and operational sequence for review and acceptance by Contracting Officer.
B. See Section 01 3000 - Administrative Requirements, for submittal procedures.

### 1.6 EXISTING CONDITIONS

A. Identify existing conditions and become familiar with the major demolition work.

### 1.7 PROTECTION

A. Do not interfere with use of adjacent buildings not in contract. Maintain free and safe passage to and from.
B. Prevent movement, settlement, or collapse of adjacent structure(s) and services. Provide and place bracing or shoring and be responsible for safety and support.
C. Cease operations and notify the Contracting Officer immediately if the safety of any structure appears to be endangered. Take precautions to properly support structure. Do not resume operations until safety is restored.

D. Provide, erect, and maintain barricades, lighting, and guard rails, as required, to protect occupants of building and workers.
E. Protect existing sidewalks, drives, curbs, utilities, and other features or facilities on or adjacent to the site from damage from the work of this Section where such items are to remain.
F. Locate all existing active utility lines traversing the work area and determine the requirements for their protection.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Except where noted otherwise, maintain possession of materials being demolished and immediately remove from site.
B. Carefully remove designated materials and equipment noted to be delivered to Owner. Deliver and store where directed by the Contracting Officer.
C. Carefully remove materials and equipment, to be re-used per Project requirements. Store and protect as required.

## PART 3 – EXECUTION

### 3.1 PREPARATION

A. Survey: Before any work is started, Contractor shall make a thorough survey, with the Construction Manager, of where alterations will occur and exterior areas which are anticipated routes of access, and submit a signed report to the Construction Manager. This report shall list by spaces and areas:
   1. Existence and conditions of items, such as equipment and other items required by Drawings to be either reused or relocated or both.
   2. Shall note any discrepancies between Drawings and existing conditions at site.
   3. Shall designate areas for working space, material storage and routes of access to areas where alterations occur, and which have been agreed upon by Contractor and the Construction Manager.
   4. Existing exterior conditions related to roadways, walkways and landscaped areas.
B. Resurvey: Before expected final inspection date, Contractor and Construction Manager together shall make a resurvey of the areas and grounds involved. Contractor shall submit a report on conditions, then existing, of surfaces as compared with conditions of same as noted in first condition survey report.
   1. Resurvey report shall list any damage caused by Contractor to surfaces despite protection measures; and will form the basis for determining extent of repair work required of Contractor to restore damage caused by Contractor's workmen in executing work of this Contract.

### 3.2 DEMOLITION

A. The term demolition, as used herein, includes the complete removal of all existing objects as noted on the Drawings.
B. Remove miscellaneous items, as indicated on the Drawings or as otherwise necessary, to execute the work of the Project.
C. Avoid interference with the use of, passage to and from streets adjacent to the Construction Site.
D. Demolish in an orderly and careful manner, as required, to accommodate new work.
E. Protect existing structures to remain. Repair damage.
F. Repair all demolition performed in excess of that required, at no cost to the Owner.

G. Remove all debris from the site and leave site in a neat and orderly condition. Burning of materials on site is not permitted.
H. Remove from the site contaminated, vermin infected, or dangerous material encountered and dispose of by safe means so as not to endanger health of workers and public.
I. Remove demolished materials, tools, and equipment from site upon completion of work. Leave site in a condition acceptable to the Contracting Officer.
J. Repair damaged areas to the grounds (wheel tracks, etc.) caused by vehicles used in performance of this Contract.

END OF SECTION

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**SECTION 03 30 00**

**CAST-IN-PLACE CONCRETE**

**RFB #923902-01**

## 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: cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1. Cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
2. Floors and slabs on grade.
3. Concrete footings and foundations.
4. Joint devices associated with concrete work.
5. Concrete curing and sealing.

B. Related Requirements:

1. Section 01 45 00 “Special Inspections and Tests” for required verifications and inspections.
2. Section 31 20 05 "Earth Moving for Building" for drainage fill under slabs-on-grade.

### 1.3 SUBMITTALS

A. Product Data: For each type of product.

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

1. Cementitious materials.

E. Material Test Reports: For the following, from a qualified testing agency:

1. Aggregates.

### 1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

### 1.5 DELIVERY, STORAGE, AND HANDLING

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

### 1.6 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 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.

B. Hot-Weather Placement: Comply with ACI 301 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.

## PART 2 - PRODUCTS

### 2.1 CONCRETE, GENERAL

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

1. ACI 301.
2. ACI 117.

### 2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that 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. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

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

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

1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.

### 2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

### 2.4 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.

## 2.5 CONCRETE MATERIALS

A. 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.

B. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I, gray.
2. Fly Ash: ASTM C 618, Class F or C.
3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.

C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size:
   a. Footings: 1-1/2 inches nominal.
   b. Walls and Slabs: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C 260/C 260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do 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 C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

F. Water: ASTM C 94/C 94M and potable.

## 2.6 VAPOR RETARDERS

A. Underslab Vapor Retarder: Multi-layer, fabric, cord, or aluminum reinforced polyethylene or equivalent, complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited. Include manufacturer’s recommended adhesive or pressure-sensitive tape.

1. Accessory Products: Vapor retarder manufacturer’s recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.
2. Products:
   a. Stego Industries, LLC; Stego Wrap Vapor Barrier 10-mil.
   b. W.R. Meadows, Inc.; PERMINATOR 10 mils.
   c. Substitutions: As approved by Engineer prior to bid.

## 2.7 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 C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear (non-yellowing), Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

## 2.8 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.

1. Material:

a. ASTM D 1751, asphalt-saturated sellulosic fiber.

b. Closed-cell, non-absorbent, compressible polyethylene or polymer foam.

B. Epoxy Adhesive for Reinforcing Bars: Install per manufacturer's instructions; bar size and embedment depth as indicated on Drawings.

1. Products:

a. HIT-HY200 Adhesive Anchoring System manufactured by Hilti, Inc.

b. PE1000+ Epoxy Injection Adhesive Anchoring System manufactured by Powers Fasteners.

c. SET-EP Epoxy Adhesive manufactured by Simpson Stong-Tie Company.

C. Below Areaway Slab Insulation: Thickness as indicated, square edge. Provide the following:

1. Extruded-Polystyrene (XPS Board Insulation: ASTM C 578, Type VII, R-5.0 def F x h x sq. ft./Btu x in. at 40 deg F. Allowable bearing capacity of 2,000 pounds per square feet per ASTM C578 compressive strength at 10 percent deformation.

## 2.9 REPAIR MATERIALS

A. Repair Materials: Repair materials and installation are subject to Design Professional and Owner approval. Repair of exposed concrete surfaces shall not begin without Design Professional's review and consent.

## 2.10 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.

B. Cementitious Materials: Use fly ash and/or slag cement as needed to reduce the total amount of portland cement, which would otherwise be used. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.

2. Slag Cement: 50 percent.

3. Combined Fly Ash and Slag Cement: 50 percent portland cement minimum, with fly ash not exceeding 25 percent.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing, or plasticizing 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, and concrete with a w/c ratio below 0.50.

## 2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Normal-weight concrete.

1. Minimum Compressive Strength: 3000 psi at 28 days.

2. Maximum W/C Ratio: 0.53.

3. Slump Limit: 4 inches, plus or minus 1 inch (25 mm).

4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery.

B. Foundation Walls: Normal-weight concrete.
   1. Minimum Compressive Strength: 4500 psi at 28 days.
   2. Maximum W/C Ratio: 0.50.
   3. Slump Limit: Up to 9 inches for concrete with verified slump of 2 to 4 inches before adding water-reducing admixture or plasticizing admixture.
   4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery.

C. Interior Slabs-on-Grade: Normal-weight concrete.
   1. Minimum Compressive Strength: 4000 psi at 28 days.
   2. Maximum W/C Ratio: 0.50.
   3. Slump Limit: Up to 6 inches for concrete with verified slump of 2 to 4 inches before adding water-reducing admixture or plasticizing admixture.
   4. Air Content for Interior Slabs: Not to extend 3 percent.

D. Exterior Slabs-on-Grade: Normal-weight concrete.
   1. Minimum Compressive Strength: 4500 psi at 28 days.
   2. Maximum W/C Ratio: 0.50.
   3. Slump Limit: Up to 6 inches for concrete with verified slump of 2 to 4 inches before adding water-reducing admixture or plasticizing admixture.
   4. Air Content for Exterior Slabs: 6 percent, plus or minus 1.5 percent at point of delivery.

**2.12 FABRICATING REINFORCEMENT**

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

**2.13 CONCRETE MIXING**

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, 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 INSTALLATION**

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 347 as abrupt or gradual, as follows:
   1. Class B, 1/4 inch for smooth-formed finished surfaces.
   2. Class C, 1/2 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.

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. Do not chamfer exterior corners and edges of permanently exposed concrete.

H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

**3.2 EMBEDDED ITEM INSTALLATION**

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 303.

**3.3 REMOVING AND REUSING FORMS**

A. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

**3.4 VAPOR-RETARDER INSTALLATION**

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

**3.5 STEEL REINFORCEMENT INSTALLATION**

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that 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.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

**3.6 JOINTS**

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated.

2. Locate horizontal joints in walls and columns at top of footings or floor slabs.

3. Space vertical joints in walls as indicated.

C. 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 are indicated.

3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

## 3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is 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 not to 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.

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 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.

## 3.8 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 and at concrete curb.

C. 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.

## 3.9 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. Restraighten, 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.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.

1. Apply a trowel finish to surfaces exposed to view.
2. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch at work bay slabs and 3/16 inch at non-work bay slabs.

D. Broom Finish: Apply a broom finish to all exterior concrete slabs.

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 before application.

## 3.10 MISCELLANEOUS CONCRETE ITEM INSTALLATION

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.

## 3.11 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Maintain concrete with minimum moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

1. Normal Concrete: Not less than 7 days.
2. High early strength concrete: Not less than 4 days.

C. Formed Surfaces: Cure formed concrete surfaces and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue moist curing, or apply curing compound, for remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Initial Curing: Initial curing refers to the cutting procedures implemented anytime between concrete placement and final finishing of the concrete surface to reduce moisture loss from the surface.
    a. Fogging: Fog spray the concrete surface with the spray directed above, not at, the concrete surface. Do not allow the water to pond on the surface and do not work accumulated water into the surface during the finishing process.
    b. Liquid-applied evaporation reducers: Apply using application rate and method recommended by the manufacturer.
2. Intermediate Curing: Intermediate curing refers to the curing procedures implemented when finishing is completed, but before the concrete has reached final set. During this period, surface evaporation may need to be reduced, but the concrete may not yet be able to tolerate the direct application of water or the mechanical damage resulting from the application of coverings.
    a. Fogging: Fog spray the concrete surface with the spray directed above, not at, the concrete surface.
    b. Liquid-Applied Evaporation Reducers: Apply using application rate recommended by the manufacturer.
    c. Curing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3. Final Curing: Final Curing refers to the curing procedures implemented after final finishing, and after the concrete has reached final set. Apply final curing method before surface is dry.
    a. Moisture-Retaining Sheet: Lap strips not less than 3 inches and seal with waterproof tape or adhesive; secure at edges.
    b. Saturated Burlap: Saturate burlap-polyethylene, and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.
    c. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for four (4) days.
    d. Straying: Spray water over floor slab areas, and maintain wet.
    e. Curing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

## 3.12 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

C. Repair materials and installation not specified above may be used, subject to Architect's approval.

## 3.13 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections: Refer to Section 01 45 00 “Special Inspections and Tests” for required verifications and inspections.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
    1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture for the first 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
    2. Slump: ASTM C 143/C 143M; 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 C 231/C 231M, 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 C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
    5. Compression Test Specimens: ASTM C 31/C 31M.
        a. Cast and laboratory cure four standard cylinder specimens for each composite sample.
    6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimens at 7 days, two specimens at 28 days, and one specimen retained in reserve for later testing if required.
        a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
    7. Test results shall be reported in writing to Architect, 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.

8. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
9. 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. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
10. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
11. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

**END OF SECTION**

**SECTION 05 50 00**

**METAL FABRICATIONS**

**RFB #923902-01**

## 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. Miscellaneous steel members and embeds.
2. Metal bollards.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing other items cast into concrete and concrete fill in metal bollards

### 1.3 COORDINATION

A. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete. Deliver such items to Project site in time for installation.

### 1.4 SUBMITTALS

A. Product Data:

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Miscellaneous steel members and embeds.
2. Metal bollards.

### 1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

### 1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, anchor bolts and other construction contiguous with metal fabrications by field measurements before fabrication.

## PART 2 - PRODUCTS

### 2.1 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

### 2.2 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

D. Provide for anchorage of type indicated; coordinate with supporting structure.

**2.3 MISCELLANEOUS FRAMING AND SUPPORTS**

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

C. Galvanize miscellaneous framing and supports where indicated.

**2.4 METAL BOLLARDS**

A. Fabricate metal bollards from steel shapes, as indicated.

B. Where bollards are located above building footings fabricate steel sleeves in the footings, as indicated. Grout solid void between bollard and sleeve.

C. Hot-dip galvanize bollards.

**2.5 FINISHES, GENERAL**

A. Finish metal fabrications after assembly.

**2.6 STEEL FINISHES**

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

**PART 3 - EXECUTION**

**3.1 INSTALLATION, GENERAL**

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

**3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS**

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

**3.3 INSTALLING METAL BOLLARDS**

A. Anchor bollards in concrete or with pipe sleeves preset and anchored into concrete. Fill annular space around bollard solidly with nonshrink grout; mixed and placed to comply with grout manufacturer's written instructions.

B. Fill bollards solidly with concrete, mounding top surface to shed water.

**3.4 FIELD QUALITY CONTROL**

A. Special Inspections: owner will engage a special inspector and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections: Refer to Section 01 45 00 “Special Inspections and Tests” for required verifications and inspections.

## 3.5 ADJUSTING AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

**END OF SECTION**

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**SECTION 06 10 00**

**ROUGH CARPENTRY**

**RFB #923902-01**

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. Rough Carpentry: Work shall include installation of all wood framing indicated on the drawings or required for a complete and operable facility.
B. Miscellaneous wood blocking for all trim, casework, accessories, etc.

### 1.2 RELATED SECTIONS

A. Section 08 12 13 Hollow Metal Frames.
B. Section 08 33 23 Overhead Coiling Doors.
C. Section 08 36 13 Sectional Doors.
D. Section 09 21 16 Gypsum Wallboard Assemblies.
E. Section 13 34 00 Engineered Post Frame Structures.

### 1.3 QUALITY ASSURANCE

A. Comply with the following grading rules:
   1. Southern Pine Inspection Bureau (SPIB).
   2. West Coast Lumber Inspection Bureau (WCLIB).
   3. Product Standard PS 51 for hardwood plywood.
   4. Product Standard PS 1 for softwood plywood.
B. Factory mark each piece of lumber and plywood with type, grade, mill, and of an ALSC Board of Review approved agency.

### 1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation.
B. Protect wood products from exposure to weather and contact with damp surfaces
   1. by covering them with waterproof sheeting, securely anchored.
C. Provide air circulation around stacks and under coverings.

## PART 2 - PRODUCTS

### 2.1 LUMBER

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.

2. All framing lumber shall be kiln-dried S4S, straight and free of warp which cannot be corrected by bridging or nailing and splits, large and loose knots.

B. Species:
1. Spruce Pine Fir.
2. Douglas fir-larch; WCLIB or WWPA.
3. Southern pine or mixed southern pine; SPIB.

C. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

D. Grade; No. 1 / No. 2 for beams, headers, joists, lintels, studs and rafters unless noted otherwise.

## 2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
3. Wood floor plates that are installed over concrete slabs-on-grade.

## 2.3 DIMENSION LUMBER FRAMING

A. Provide boards with 19% maximum moisture content (“S-Dry”).

B. Species: Southern Pine or mixed Southern Pine (SPIB) No. 2 boards or WWPA (any species) No. 3 boards.

C. Use of boards of maximum practical lengths. Boards less than 4’-0” in length are unacceptable.

## 2.4 SHEATHING

A. Communications and Electrical Room Mounting Boards: PS 1 A-C Fire-Retardant-Treated Plywood.
1. Fire-retardant treated in accordance with IBC 2015.
2. Nominal Thickness: 3/4 inch.
3. Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

## 2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
2. Nailers.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of the following species:
1. Mixed southern pine or southern pine; SPIB.
2. Douglas fir-larch; WCLIB or WWPA.
3. Spruce-pine-fir; NLGA.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

## 2.6 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
   1. Where rough carpentry is exposed to weather and interior locations subject to moisture, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
B. Nails, Brads, and Staples: ASTM F 1667.
C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.
   1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

## 2.7 METAL FRAMING ANCHORS

A. Allowable design loads, as published by manufacturer, shall meet or exceed those indicated or of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
C. Rafter Tie-Downs: Bent strap tie for fastening rafters or roof trusses to wall studs below. Tie fastens to side of rafter or truss and side of stud below.
D. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts.

## 2.8 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.
B. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chlorpyrifos as its active ingredient.

# PART 3 - EXECUTION

## 3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
B. Discard units of material with defects which might impair the quality of the work.
   1. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with the function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

C. Cut framing square on bearing surfaces, closely fitted, separately set and rigidly secured in place. Size members to give true line for finish surfaces. No shims permitted at bearing surfaces. Set joists and rafters with crown edge up.
D. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
E. Frame wood partitions with 2” x 4” and 2” x 6” studs as indicated on drawings. Triple studs at corners and double studs at door and window openings where single stud spacing is shown; triple stud as required on drawings. Frame for passage of pipes, ducts, and conduits.
   1. On all framing members to receive a finished wall or ceiling, align the finish sub-surface to vary not more than 1/8" from the plane of surfaces of adjacent and furring members.
F. Double framing members around openings at ceiling or roof and to form headers longer than 4’-0”. Do not cut, notch, or bore framing without permission of Architect. Plates: Single at bottom, double at top at bearing surfaces, with end joints staggered 4’-0” minimum. At corners, alternate lap top and bottom plate. Anchor bottom bearing wall plates with anchor bolts per details as indicated. Anchor bolts between 1'-0" to 2'-0" at each end of all plates. Anchor interior non-load bearing partitions with 1/2" diameter anchor bolts at 4’-0” o.c. and 4” embedment or 1/8” gun driven pins at 36” o.c. max., with 2 anchors min. per plate unless otherwise noted. Supports for plywood: 16” o.c. maximum, unless otherwise indicated. Provide blocking or suitable edge support between members to support sub-flooring or sheathing; cross blocking not required at normal sheathing joint perpendicular to trusses, for flooring.
G. Dress furring for size and to provide true and plumb line for finish materials. Provide 1” x 2” furring 16” o.c. max. where indicated. Furring: continuous at top and bottom of walls and around openings. Install vertically for gypsum board and horizontally for plywood. Secure furring 24” o.c. maximum.
H. Securely attach carpentry work to substrates. Use common wire nails except galvanized for exterior and interior locations subject to moisture. Use casing nails for securing interior frames and trim, and for exterior trim. Use threaded nails where specified. Install fasteners without splitting of wood.
I. Install shear wall panels to comply with manufacturer's written instructions.
J. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
K. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.
L. Do not splice structural members between supports unless otherwise indicated.
M. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
N. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
   2. ICC-ES evaluation report for fastener.
O. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

## 3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
C. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
   1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

2. Provide blocking as required to support piping and ductwork passing through walls.
3. Block behind all door knob striking locations.

D. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated.
E. Install all blocking as required to support all items of finish and to cut off all concealed draft openings, both vertical and horizontal, between ceiling and floor areas.

## 3.3 CONSTRUCTION PANLE INSTALLATION

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 in field of board.
   1. Where boards are indicated as full floor-to-ceiling height, install with long edge of board vertically.
   2. Install adjacent boards without gaps.
   3. Size and Location: As indicated on drawings.

## 3.4 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

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# SECTION 07 62 00

# SHEET METAL FLASHING AND TRIM

# RFB #923902-01

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. Shop fabricated flashing as detailed.
B. Miscellaneous sheet metal work connecting pieces and anchorages.

### 1.2 RELATED WORK

A. Section 06 10 00: Rough Carpentry; Installation of wood blocking, nailers, and grounds.
B. Section 07 92 00: Joint Sealants

### 1.3 REFERENCE STANDARDS

A. ASTM A526 - Steel sheet, Zinc Coated (Galvanized) by the Hot Dip Process, Commercial Quality.

### 1.4 PROTECTION

A. Exercise care when working on or about roof surfaces to avoid damaging or puncturing membrane or flexible flashings.
B. Place plywood panels on roof surfaces adjacent to work of this Section and on access routes. Keep in place until completion of work.

### 1.5 WARRANTY

A. Sheet metal not warranted by manufacturer shall be warranted by Contractor for a period of (1) one year from the Date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 SHEET METALS

A. Galvanized Steel: ASTM A526; with minimum 1.25 galvanized coating; 20-gage or as called for on Drawings.

### 2.2 ACCESSORY MATERIALS AND COMPONENTS

A. Nails and screws: Suited for the purpose shall be the same material or shall be compatible with the sheet metal. Nails no less than 10-gauge needle point, long enough to penetrate wood one inch. Screws shall be stainless steel with neoprene washers where detailed.
B. Fasteners: Concealed clip type; of same material as flashings; sized to suit application; as shown on drawings. Cleats shall be 22-gauge, galvanized steel, continuous. Provide continuous butyl tape between the edge of the roof membrane and the face of the wall behind continuous cleats.
C. Anchorage Devices: As detailed or type acceptable to Contracting Officer.
D. Solder and Flux: Type recommended for materials being used.
E. Plastic Cement: Cut back or cold process type compatible with adjoining materials.
F. Sealant: Silicone Construction 1200 Sealant by GE.

## 2.3 FABRICATION

A. Fabricate sheet metal work accurate to size, shape, profile, and according to details indicated on the Drawings. Work formed with brakes straight, true, and sharp. Plain surfaces free from waves or buckles. Profiles to match exactly at connections. Exposed edges beaded or returned for strength and appearance. Provide ribs, cleats, and reinforcement necessary to make the sections rigid and substantial. Allow for expansion and contraction. Finished width of lock seams and soldered lap seams not less than 1 inch and finished width of unsoldered lap seams shall be not less than 3 inches.
B. Sections shall be free from distortion and other defects detrimental to appearance or performance.
C. Hem exposed edges of flashings on underside 1/2 inch.
D. Flashing shall be formed as detailed. Form sections in 8 feet lengths. Space with approximately 3/16-inch opening between sections. Cover this opening with a 4-inch-wide cover plate formed to the profile of the stop. Cover plate to be embedded in mastic, nailed through the opening

between the sections and loose locked to the drip edge. Corners shall be continuous with joint covers minimum of 12 inches from each side of corner. Installation and materials utilized in the
E. installation of the coping and other sheet metal shall be compatible with the membrane roof system.
F. Form all other sheet metal seams with flat back seams.
G. Wipe and wash clean, soldered joints, to remove traces of flux immediately after soldering.
H. See Drawings for additional sheet metal requirements.

## PART 3 - EXECUTION

### 3.1 EXAMINATION OF SURFACES

A. Examine supporting materials and surfaces to receive sheet metal before commencing work. Do not proceed until conditions, which would result in a less than first class sheet metal installation, are satisfactorily corrected. Commencing work construed as acceptable of the surfaces by this contractor as satisfactory to receive the sheet metal.

### 3.2 INSTALLATION

A. Sheet metal work transported, stored at the site, and erected in a manner that would prevent damage or deformation. Exercise care to prevent scratching or abrading protective coatings. Store sheet metal work clear of the ground. Damaged material replaced.
B. The surfaces to receive sheet metal sound, and thoroughly clean and dry when sheet metal work is installed.
C. Coordinate work with window and other contractors, and properly schedule sheet metal work. Install metal flashings and other work required to be built into window openings.
D. Dissimilar metals shall not be placed in contact with surfaces given a coat of plastic cement or shall be separated with a non-absorptive tape or gasket.
E. Use exposed fasteners only in locations approved by Contracting Officer. When using exposed fasteners, they are to be of same finish as sheet metal.
F. Lock seams and end joints. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
G. After installation is complete, exposed sheet metal is to be thoroughly cleaned to remove flux, grease, dirt, and other foreign matter.

### 3.3 MISCELLANEOUS METAL WORK

A. Fabricate miscellaneous items of sheet metal work indicated on the drawings and not specified under other Sections. Fabricate as indicated on the drawings. Where specific details are not shown, fabricate according to Sheet Metal and Air Conditioning Contractors National Association "Architectural Sheet Metal Manual", 6th Edition.

END OF SECTION

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**SECTION 07 71 20**

**GUTTERS AND DOWNSPOUTS**

**RFB #923902-01**

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Steel gutters and downspouts.

### 1.2 REFERENCES

A. SMACNA - Architectural Sheet Metal Manual.

### 1.3 SUBMITTALS

A. Submit product data.
B. Provide product data on prefabricated components.
C. Manufacturer’s standard of prefinished items for Architect’s and Owner’s review and selection.

### 1.4 QUALITY ASSURANCE

A. Conform to SMACNA Manual Drawings for nominal sizing of components for rainfall intensity determined by a storm occurrence of 1 in 10 years.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to aid ventilation. Slope to drain.
B. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Shop bent steel sheet, pre-coated with PVDF coating; Color: As selected by the Architect.

### 2.2 COMPONENTS

A. Gutters: Architectural, Style A box profile, 24 gauge, prefinished; color: As selected by Architect.
   1. Upper Roof: Size = 7" x 7".
   2. Lower Roof: Size = 5” x 5”.
B. Downspouts: Rectangular open-face flat profile, 24" gauge, prefinished; color: As selected by Architect.
   1. Upper Roof: Size = 4" x 6".
   2. Lower Roof: Size = 3” x 5”.
C. End Caps, Downspout Outlets, Gutter Downspout Straps Support Brackets, and Joint Fasteners: Profiled to suit gutters and downspouts.

## 2.3 ACCESSORIES

A. Anchorage Devices: Type recommended by fabricator.
B. Gutter Supports: as recommended by manufacturer.
C. Downspout Supports: Straps.

## 2.4 FABRICATION

A. Form gutters and downspouts of profiles and size required.
B. Field measure site conditions prior to fabricating work.
C. Fabricate with required connection pieces.
D. Form sections square, true, and accurate in size, in maximum possible lengths and free of distortion or defects detrimental to appearance or performance.
E. Fabricate gutter and downspout accessories watertight.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

## 3.2 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.
B. Join lengths with seams sealed watertight. Flash and seal gutters to downspouts and accessories.
C. Slope gutters 1/16 inch per foot minimum.
D. Seal metal joints watertight.

END OF SECTION

# SECTION 07 92 00

# JOINT SEALANTS

# RFB #923902-01

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. Clean and prepare surfaces to receive sealant materials.
B. Install sealant and backing materials specified herein or indicated on Drawings and not specifically mentioned in other sections of this Specification.
   1. Nonsag gunnable joint sealants.
   2. Self-leveling pourable joint sealants.
   3. Joint backings and accessories.

### 1.2 SUBMITTALS

A. Product Data: manufacturers' descriptive literature, including surface preparation and installation instructions.
B. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

### 1.3 QUALITY ASSURANCE

A. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
   1. Adhesion Testing: In accordance with ASTM C794.
   2. Compatibility Testing: In accordance with ASTM C1087.
   3. Allow sufficient time for testing to avoid delaying the work.
   4. Deliver sufficient samples to manufacturer for testing.
   5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

### 1.4 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.
C. Extended Correction Period: Correct defective work within 5-year period commencing on Date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
   1. Retain subparagraph below if sealants are indicated for Use I. Revise if a liquid other than water is used in testing.
   2. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

## 2.2 MANUFACTURERS

A. Nonsag Sealants:
   1. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
   2. Bostik Inc: www.bostik-us.com.
   3. Dow Corning Corporation: www.dowcorning.com.
   4. Pecora Corporation: www.pecora.com.
   5. Sika Corporation: www.usa-sika.com.
   6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com.
   7. Substitutions: See Section 016000 - Product Requirements.
B. Self-Leveling Sealants:
   1. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
   2. Bostik Inc: www.bostik-us.com.
   3. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
   4. Pecora Corporation: www.pecora.com.
   5. Sika Corporation: www.usa-sika.com/#sle.
   6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
   7. Substitutions: See Section 016000 - Product Requirements.

## 2.3 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. Gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
         1) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated.
      c. Other joints indicated below.
   2. Do Not Seal:
      a. Intentional weep holes in masonry.
      b. Joints indicated to be covered with expansion joint cover assemblies.
      c. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.
      d. Joints where sealant installation is specified in other sections.
      e. Joints between suspended ceilings and walls.
B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
   1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
   2. Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.
C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
   1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
   2. Floor Joints in Wet Areas: Non-sag polyurethane "non-traffic-grade" sealant suitable for continuous liquid immersion.

3. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
4. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.

D. Interior Wet Areas: Bathrooms and restrooms; fixtures in wet areas include plumbing fixtures, countertops, cabinets, and other similar items.

## 2.4 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.
   2. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   3. Color: Match adjacent finished surfaces.
   4. Cure Type: Single-component, neutral moisture curing.
   5. Service Temperature Range: Minus 20 to 180 degrees F.

B. Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Color: Match adjacent finished surfaces.
   2. Cure Type: Mildew-resistant acetoxy-curing.
   3. Service Temperature Range: Minus 65 to 180 degrees F.

C. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: Clear.

D. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; multi-component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Color: Match adjacent finished surfaces.
   3. Service Temperature Range: Minus 40 to 180 degrees F.

E. Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface .
   1. Movement Capability: Plus and minus 35 percent, minimum.
   2. Color: Match adjacent finished surfaces.
   3. Service Temperature Range: Minus 40 to 180 degrees F.

F. Non-Sag "Traffic-Grade" Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Color: Match adjacent finished surfaces.

G. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
   1. Color: To be selected by Architect from manufacturer's standard range.
   2. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).

H. Non-Curing Butyl Sealant: Solvent-based; ASTM C1311; single component, non-sag, non-skinning, non-hardening, non-bleeding.
   1. Products:
      a. Basis of Design: Tremco; TremPro JS-773.
      b. Substitutions: See Section 016000 - Product Requirements.

## 2.5 SELF-LEVELING JOINT SEALANTS

A. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.

3. Color: To be selected by Architect from manufacturer's standard range.
4. Service Temperature Range: Minus 40 to 180 degrees F.

## 2.6 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
   1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
   2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
   3. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
B. Preformed Extruded Silicone Joint Seal: Pre-cured low-modulus silicone extrusion, in sizes to fit applications indicated on drawings, combined with a neutral-curing liquid silicone sealant for bonding joint seal to substrates.
   1. Size: 1 inch wide, in rolls 100 feet long.
   2. Thickness: 0.78 inch, with ridges along outside bottom edges for bonding area.
   3. Color: As selected by Architect.
C. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
D. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
E. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.
F. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

# PART 3 - EXECUTION

## 3.1 PREPARATION / INSTALLATION

A. Maintain workmanship of the highest quality in accordance with best trade practice.
B. Clean and prepare joints in accordance with manufacturer's recommendations. Remove any loose materials and other foreign matter which might impair adhesion of sealant.
C. Ensure that joint forming materials are compatible with sealant.
D. Examine joint dimensions and size materials to achieve required width/depth ratios. Use joint filler to achieve required joint depths to allow sealants to perform properly. Use bond breaker(s) where required.
E. Install sealant in accordance with manufacturer's recommendations.
F. Apply sealant within recommended temperature ranges. Consult manufacturer when sealant cannot be applied within recommended temperature ranges.
G. Prime surfaces to be caulked with sealant according to manufacturer's recommendations. Care to be taken to prevent excess primer from being applied outside of joints.
H. Provide bond breaker as required by sealant manufacturers.
I. Apply sealants according to manufacturer's instructions.
   1. Applied with material gun, using a nozzle of sufficient size, to fill the joint completely. Tool joints immediately after application of material. Finish bead flush with adjoining surfaces, unless otherwise indicated.
J. Apply sealants at interior control joints after walls are painted, to avoid cracking paint.
K. Mask joints as required; remove masking, excess materials, and smears, as the work progresses, and leave adjacent surfaces clean and free of sealant.
L. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

## 3.2 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.
B. Remove and replace failed portions of sealants using the same materials and procedures as indicated for original installation.

END OF SECTION

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**SECTION 08 12 13**

**HOLLOW METAL FRAMES**

**RFB #923902-01**

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. Standard pressed steel hollow metal door frames.

### 1.2 RELATED WORK

A. Section 08 13 13: Hollow Metal Doors.
B. Section 08 71 00: Finish Hardware for Doors.
C. Section 09 91 00: Painting.

### 1.3 REFERENCE STANDARDS

A. Underwriter's Laboratories, Inc. (UL) and Factory Mutual (FM), as applicable to fire rated hollow metal door frames.
B. ASTM A525 - Steel Sheet, Zinc Coated (Galvanized) by the Hot Dip Process, General Requirements.
C. ASTM A366 - Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.

### 1.4 SHOP DRAWINGS AND PRODUCT DATA

A. Submit Shop Drawings and Product Data indicating general construction, configurations, jointing methods, reinforcements, anchorage methods, hardware locations, and installation details.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

A. Curries; www.curries.com
B. Ceco Door; www.cecodoor.com
C. Pioneer Industries; www.pioneerindustries.com
D. Steelcraft; www.steelcraft.com
E. Republic; www.republicdoor.com
F. Other manufacturers: submit per Section 01 60 00.

### 2.2 HOLLOW METAL FRAMES

A. Interior hollow metal frames shall be constructed of 0.053 inch (nom. 16 gage) thick, zinc coated steel. Exterior frames shall be 0.067 inch (nom.14 gage) thick, zinc coated steel. All frames shall have a coating of not less than .6 oz. per sq. ft. of zinc, in accordance with ASTM A525.
B. All frames shall be one piece, full-profile welded; welds shall be ground, fill, dressed and made smooth, flush and invisible. Knock-down frames are not acceptable.
C. Contractor shall review face dimensions of frame heads to insure they align with masonry coursing prior to submitting shop drawings.

D. Breaks accurately formed, true, and sharp. Corners square and in alignment. Corners, including stops, fully mitered, ground to hairline accuracy, and continuously arc welded on backside to produce rigid hairline joints. Where flange prohibits a continuous weld on backside face weld flange and face of frame casing to complete continuous weld. Continuously face weld joint and stops where mullions join or intersect. Joints shall be invisible. Grind exposed welds smooth. Finish work smooth and free from warps and buckles.
E. Mortise, reinforce, drill, and tap for hardware. Cover mortises with pressed steel mortar boxes tightly fitted, firmly attached to back of frame.
F. At all exterior hinges, and where heavy weight hinges are specified, use "high frequency hinge preparation" (8 gage) for all hinge locations. Exterior door frames shall have two pair of hinges per leaf.
G. Provide stiffeners and reinforcing as necessary to insure a rigid and secure installation.
H. Frames extend to sub-floor where finished flooring occur over concrete slabs.
I. Provide 12 gage floor clips for all door frames. Provide types of anchors, as detailed or required, for wall construction. Frames shall be securely anchored to the structural portion of the structure and not the brick veneer. Furnish temporary spreader bars and bracing.
J. All frames shall be thoroughly cleaned and given one (1) coat of rust inhibitive primer, per specification section 09 91 00 - Painting.
K. All frames over 48 inches wide shall have 12 gage formed continuous channel at head.
L. Provide manufacturer's standard resilient type door bumpers, removable for replacement. Place minimum of three (3) single bumpers on single door frames. Space equally along strike jambs. Place minimum of two (2) single bumpers on double door frames. Place on frame heads.
M. Fill surface depressions, including countersunk anchors, of hollow metal frames with metallic paste filer and grind to smooth finish.
N. Provide frames to accommodate 180-degree door swing where indicated in construction documents.
O. Countersink anchors, fill and make smooth, flush and invisible on exposed faces.
P. Cut ends of material (i.e. glazing stops) must be factory primed and field painted.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Coat inside of exterior hollow metal frames with a corrosion-inhibiting bituminous material.
B. All frames in non-masonry walls shall filled with fiberglass batt insulation.

### 3.2 INSTALLATION

A. Install hollow metal frames plumb and square, in locations indicated on Drawings and with a maximum diagonal distortion of 1/16 inch. Ensure frames are securely and rigidly anchored to adjacent construction, (not to brick veneer). Refer to details for type of anchors required to securely anchor jamb frames to wall materials.
B. After installation, touch up scratched or damaged surfaces. Use type of primer recommended for galvanized surfaces.
C. Perimeter sealants and related backup materials furnished and installed under Section 07 92 00.

END OF SECTION

# SECTION 08 13 13

# HOLLOW METAL DOORS

# RFB #923902-01

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. Standard pressed steel hollow metal doors with flush faces.
B. Insulated hollow metal doors at exterior locations.

### 1.2 RELATED WORK

A. Section 08 13 12: Hollow Metal Frames.
B. Section 08 71 00: Door Hardware.
C. Section 08 80 00: Glazing.
D. Section 09 91 00: Painting.

### 1.3 SCOPE

A. Provide all labor, materials, tools and equipment necessary for the furnishing and installation, complete, of all hollow metal doors as shown on the drawings or specified, in accordance with the provisions of the Contract Documents and completely coordinated with that of all other trades.
B. Although such work is not specifically shown or specified, furnish and install all supplementary and miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation.

### 1.4 REFERENCE STANDARDS

A. ASTM A525 - Steel Sheet, Zinc coated, (Galvanized) by the Hot Dip Process, General Requirements.
B. ASTM A366 - Steel, Carbon, Cold-Rolled Sheet; Commercial Quality.
C. ASTM E330 -Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

### 1.5 QUALITY ASSURANCE

A. Doors shall comply with the Steel Door Institute “Recommended Specifications: Standard Steel Doors and Frames” (SDI-100) and as herein specified.

### 1.6 SHOP DRAWINGS AND PRODUCT DATA

A. Submit Shop Drawings and Product Data indicating general construction, configurations, jointing methods, and reinforcements.
B. Provide schedule of doors and frames using same reference numbers for details and openings as those on the Drawings.

### 1.7 DELIVERY, STORAGE AND HANDLING

A. Delivery and Storage. Doors shall be shipped individually packed. Frames shall be shipped with angle spreaders at door opening bottoms. Doors and frames shall be stored on the building site, in an upright position, under cover, on wood sills or floors, in a manner that will prevent rust or damage. Ventilate canvas or plastic covers to prevent moisture traps.

B. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided items are equal in all respects to new work and acceptable to the Contracting Officer. Rejected work shall be replaced with new items.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Galvanized Steel Sheets shall be zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526, ASTM A 642, hot dipped galvanized in accordance with ASTM A 525 with ASO or G60 coating designation, mill phosphatized.
B. Inserts, Bolts and Fasteners shall be the manufacturer's standard units, except hot-dip galvanized items shall be built into exterior walls, complying with ASTM A 153, Class C or D as applicable.
C. Shop Applied Primer for all exterior doors and related accessories shall be rust-inhibitive enamel or paint, either air-dried or baked, suitable as a base for specified finish paints listed in Section 09 9100.
D. Exposed Fasteners. Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.

### 2.2 ACCEPTABLE MANUFACTURERS

A. Curries; www. assaabloydss.com
B. Ceco: www. assaabloydss.com
C. Eggers Industries; www.eggersindustries.com
D. Steelcraft; www.steelcraft.com
E. Republic; www.republicdoor.com
F. Other manufacturers: submit per Section 01 60 00.

### 2.3 HOLLOW METAL DOORS

A. Doors:
   1. Interior: SDI Level 2, Heavy Duty, Model 2, seamless design; shall be fabricated of 0.042 inch (nom. 18 gage) thick zinc coated steel. "Seamless design' means all seams on the vertical edges are continuously welded the full height of the door, filled, and finished smooth for no visible seams.
   2. Exterior: SDI Level 3, Extra Heavy Duty, Model 2, seamless design; shall be fabricated of 0.053 inch (nom. 16 gage) thick zinc coated steel. "Seamless design' means all seams on the vertical edges are continuously welded the full height of the door, filled, and finished smooth for no visible seams.
B. Doors shall have 1/8-inch bevel in 2 inches on hinge and lock edges.
C. Doors shall have vertical mechanical interlocking seams on hinge and lock edges.
   1. Edge seams shall be continuously welded full height of edges with welds and seams filled and ground smooth.
D. All exterior doors shall be closed flush at the top and bottom edges. Install minimum 20-gauge channels (legs down at top of door, legs up at bottom of door) even with the top and bottom edges of door face sheets (no recesses). Seam wire weld continuous or spot weld around entire perimeter of channel. Fill all welds and seams and finish smooth for no visible seams. Provide openings in the bottom closure channel to permit the escape of entrapped moisture.
E. Provide openings for glass lites as indicated on the drawings. Provide one fixed stop integrally formed with glazing and one removable stop. Fabricate stops from not less than 18 gage steel. Stops not otherwise detailed 3/4-inch square. Fit and install stops in the factory. Allow for proper thickness of glass and specified method of glazing. Install stops using screws spaced not over 16 inches on center with at least two screws per piece.

F. Doors shall be phosphatized and receive one (1) coat of baked-on prime paint, per specification section 09 91 00 – Painting.
G. All cut ends of material (i.e. glazing stops) shall be primed and painted.
H. Astragals: provide manufacturer's steel astragal at meeting edge, (inactive leaf), of all pairs of exterior doors.
I. Non-handed doors are not acceptable.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install hollow metal doors plumb and square, and with maximum diagonal distortion of 1/16 inch.
B. Adjust door in frame to provide uniform clearance of 1/8" between door and frame.

### 3.2 ADJUSTMENT AND CLEANING

A. Remove dirt from exposed surfaces.
B. Touch up marred or abraded surfaces to match original finish.
C. Adjust moving parts for smooth operation.
D. Remove debris from project site at regular intervals.

END OF SECTION

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**SECTION 08 31 00**

**ACCESS DOORS AND PANELS**

**RFB #923902-01**

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Ceiling access door and frame units.

### 1.2 REFERENCES

A. UL (FRD) – Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

### 1.3 SUBMITTALS

A. Product Data: Manufacturer’s technical data for each type of access door and panel assembly, including setting drawings, templates, fire-resistive characteristics, finish requirements, and details of anchorage devices.
   1. Include complete schedule, types, locations, construction details, finishes, latching or locking provisions, and other pertinent data.
B. Shop Drawings:
   1. Door and panel units: Show types, elevations, thickness of metals, full size profiles of door members.
   2. Hardware: Show materials, finishes, locations of fasteners, types of fasteners, locations and types of operating hardware, and details of installation.
   3. General: Show connections of units and hardware to other Work. Include schedules showing location of each type and size of door and panel unit.
C. Manufacturer’s Installation Instructions: Indicate installation requirements and rough-in dimensions.
D. Verification Samples: For each finish product specified, two samples, minimum size 6 inch square, representing actual product and color.

### 1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing Work of this section in the fabrication and installation of access doors and panels for this Project..
B. Installer Qualifications: Engage installer who is an authorized representative of the access door manufacturer for both installation and maintenance of units required for this Project.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.
B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.
C. Store materials in a dry, warm, ventilated weather tight location out of direct sunlight.

### 1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

### 1.7 COORDINATION

A. Provide inserts and anchoring devices that will be built into other Work for installation of access door assemblies.
B. Coordinate Work with other operations and installation of adjacent finish materials to avoid damage to installed materials.

## PART 2 – PRODUCTS

### 2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Nystrom Building Products; www.nystrom.com.
      a. MWPX Cold Rolled Steel 12ga, White Powder Coat Finish 24” x 30” Interior Access Door
   2. Babcock-Davis; www.babcockdavis.com.
      a. BMWPX Cold Rolled Steel 12ga, White Powder Coat Finish 24” x 30” Interior Access Door
   3. Acudor; www.acudor.com
      a. MS-7000 Steel 12ga, Baked White Primer Coat 24” x 36” Interior Access Door
   4. Substitutions: Subject to compliance with specifications. Submit Document 00 43 25 Supplement F – Proposed Substitution Form (Bidding Phase).

### 2.2 DESIGN REQUIREMENTS

A. Obtain specific locations and sizes for required access doors and frames from trades, including mechanical and electrical, indicated on submittal schedule.

### 2.3 MATERIALS

A. Commercial quality, cold steel sheet with gray baked on powder coat finish.
B. 6063-T5 Extruded Aluminum, Mill Finish.
C. Type: No. 304 stainless steel with No. 04 satin polish finish.

### 2.4 ACCESS PANELS

A. Interior Access Panel; Basis of Design: Nystrom NTM series
   1. Door: Fabricate from 12-gauge cold rolled sheet steel, with multiple mounting configurations.
   2. Frame: Fabricate from 12-gauge cold rolled sheet steel. Provide 1/4 inch mounting holes and easy install tabs.
   3. Hinge: Concealed Continuous Piano Hinge
   4. Latching/Locking Devices: Pinned Allen Head Cam Latches

### 2.5 FABRICATION

A. Manufacture each access panel assembly as an integral unit ready for installation.
B. Welded construction: Furnish with a sufficient quantity of 1/4 inch mounting holes to secure access panels to types of supports indicated.
C. Furnish number of latches required to hold door in flush, smooth plane when closed.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verify that rough openings for door and frame are correctly sized and located.
B. Verify mechanical and electrical requirements for ceiling or wall access panels.

### 3.2 INSTALLATION

A. Install access door and frame units per manufacturer's written instructions.
B. Install frames plumb and level in opening. Secure rigidly in place.
C. Position units to provide convenient access to concealed Work requiring access.

### 3.3 ADJUSTING AND CLEANING

A. Adjust panel after installation for proper operation.
B. Remove and replace panels or frames that are warped, bowed, or damaged.
C. Clean all components using non-abrasive materials and methods recommended by manufacturer.
D. Remove labels and visible markings.
E. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

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**SECTION 08 33 23**

**OVERHEAD COILING DOORS**

**RFB #923902-01**

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Insulated Overhead Coiling Service Doors, power operated; Non-Fire-Rated.
B. Non-Insulated Overhead Coiling Service Doors, manually operated; Non-Fire-Rated.

### 1.2 RELATED WORK

A. Section 13 34 00 Engineered Post Frame Structures.
B. Divisions 26: Power to unit.

### 1.3 REFERENCES

A. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
B. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
C. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
E. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
F. NEMA MG 1 - Motors and Generators.

### 1.4 DEFINITIONS

A. Operation Cycle: One complete cycle of a door begins with the door in the closed position. The door is then moved to the open position and back to the closed position.

### 1.5 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide overhead coiling doors capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:
   1. Operation-Cycle Requirements: Design overhead coiling door components and operator to operate for not less than 10,000 cycles.

### 1.6 SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes. Provide roughing-in diagrams, operating instructions, and maintenance information. Include the following:
   1. Setting drawings, templates, and installation instructions for built-in or embedded anchor devices.
B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's data sheets.

## 1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing Work of this section in the fabrication and installation of security closures for this Project.
B. Installer Qualifications: Engage an installer who is an authorized representative of the overhead coiling door manufacturer for both installation and maintenance of units required for this Project.
C. Source Limitations: Non-fire rated overhead coiling doors shall be obtained through one source from a single manufacturer.

## 1.8 WARRANTY

A. The door and its component parts shall be warranted for one (1) year from the date of substantial completion against defects in material and workmanship.
B. The electrical operator and its component parts shall be warranted for two (2) years from the date of substantial completion against defects in material and workmanship.
C. The powder coat finish shall be warranted against cracking or peeling for three (3) years from the date of substantial completion.

## 1.9 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.
B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.
C. Store materials in a dry, warm, ventilated weather tight location.

## 1.10 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

## 1.11 COORDINATION

A. Coordinate Work with other operations and installation of adjacent finish materials to avoid damage to installed materials.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. Insulated Rolling Service Door, Motorized Operation.
    1. Door Basis of Design: DuraCoil insulated rolling service door as manufactured by Raynor Manufacturing Company.
    2. Electric Operator Basis of Design: ControlHoist Optima as manufactured by Raynor Manufacturing Company.
    3. Other acceptable manufacturers and types:
        a. Doors:
            1) Stormtite Model 625 insulated heavy duty rolling service door as manufactured by Overhead Door Corporation.
            2) Advanced Rolling Door System Model 800C ADV insulated heavy duty rolling service door manufactured by Wayne Dalton.
        b. Electric Operator:
            1) RHX Series Operator as manufactured by Overhead Door Corporation.
            2) Direct Drive Operator manufactured by Wayne Dalton.

c. Substitutions: (subject to compliance with specifications). Submit Document 00 43 25 Supplement F – Proposed Substitution Form (Bidding Phase).

B. Rolling Service Door, Manual Operation.
1. Basis of Design: DuraCoil insulated rolling service door as manufactured by Raynor Manufacturing Company.
2. Other acceptable manufacturers and types:
a. Stormtite Model 625 insulated heavy duty rolling service door as manufactured by Overhead Door.
b. Rolling Service Door Model 624 as manufactured by CHI.
c. Substitutions: (subject to compliance with specifications). Submit Document 00 43 25 Supplement F – Proposed Substitution Form (Bidding Phase).

## 2.2 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtain: Fabricate overhead coiling door curtain of interlocking slats, designed to withstand loading(s) indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of material thickness recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
1. Slat Types:
a. Insulated Door Steel Curtain Slats: Insulated flat slats with 24 gauge backer.
1) Provide manufacturer's standard insulated flat-profile slats, 20 gauge, 1¼” high x minimum 3/8” deep.
2) Insulation: Polyisocyanurate.
3) Material: Commercial quality hot-dipped galvanized (G-90) steel in accordance with ASTM A-653.
4) Color and Finish: Powdercoat finish. Color to be selected by Architect from Manufacturer’s standard color options.
b. Non-Insulated Door Steel Curtain Slats: Standard flat slats.
1) Provide manufacturer's standard flat-profile slats, 20 gauge, 1¼” high x minimum 3/8” deep.
2) Material: Stainless steel in accordance with ASTM A-240, type 304.
3) Color and Finish: Stainless steel #4 finish.
2. End locks: Manufacturer's standard end lock on not less than alternate slats to maintain curtain alignment and resistance against lateral movement.

B. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, either stainless-steel or aluminum extrusions to suit type of curtain slats.
1. Astragal: Provide a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene, between angles or fitted to shape, as a cushion bumper for interior door.

C. Vision Panels: None.

D. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch per foot of span. Counterbalance is adjustable by means of an adjusting tension wheel.

E. Wall Mounting Condition: Face of wall mounting.

F. Curtain Jamb Guides: Fabricate curtain jamb guides of angles, or channels and angles of material and finish to match curtain slats, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Provide continuous integral wear strips to prevent metal-to-metal contact and minimize noise of travel and removable stops on guides to prevent over travel of curtain.

G. Curtain Jamb Guide Weatherseal: Seals to inhibit air infiltration between the guide and the curtain.
1. EDPM rubber with an aluminum retainer

## 2.3 HOODS AND ACCESSORIES

A. Hood: Provide round type for all doors.

1. Insulated Doors:
   a. 24 gauge steel (0.022 inch minimum thickness) commercial quality hot-dipped galvanized steel in accordance with ASTM A-653.
   b. Provide brackets as required to prevent sagging.
   c. Hood Baffle: Provide hood baffle with a rubber seal to inhibit air infiltration through hood cavity.
2. Non-Insulated Doors:
   a. 24 gauge stainless steel (0.024 inch minimum thickness) in accordance with ASTM A-240, type 304.
   b. Provide brackets as required to prevent sagging.

B. Header Seal: Provide a “Z” shape aluminum retainer with EDPM rubber to inhibit air infiltration between the header and the curtain.
C. Manual Operation: Non-Insulated Rolling Service Door.
D. Accessories – Electric Operation (Insulated Non-Fire-Rated Doors):
   1. Power requirement: 208 volt.
   2. Pushbutton: Provide momentary contact for “OPEN” and “STOP”. Provide constant contact for “CLOSE” (no automatic reversing controls).

## 2.4 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of adjustable-tension steel helical torsion spring, mounted around a steel shaft and contained in a spring barrel connected to door curtain with required barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
B. Counterbalance Barrel: Fabricate spring barrel of hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in/ft. of span under full load.
C. Provide spring balance of one or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Provide cast-steel barrel plugs to secure ends of springs to barrel and shaft.
D. Fabricate torsion rod for counterbalance shaft of cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
E. Brackets: Provide mounting brackets of manufacturer's standard design, either cast-iron or cold-rolled steel plate with bell-mouth guide groove for curtain.

## 2.5 ELECTRIC OPERATORS

A. Provide doors designed for electric motor and hand chain operation.
   1. Provide with floor operated disconnect for use with chain hoist and electric operator combination. Electric operator, Jackshaft type, mounted at position #1 on the adjacent wall.
      a. Insulated Rolling Service Doors:
         1) Motor: continuous duty capacitor start NEMA "C" faced flanged 3 HP motor; 208V three phase. Motor shall be separate from reduction mechanism for ease of maintenance.
         2) Reduction: heavy duty worm gear drive running in oil with additional reduction by chain and sprockets.
         3) Roller Chain Drive: Door shaft shall be driven by roller chain to provide door travel of 6" to 12" per second.
         4) Starter-Reversing Contactor Type: heavy duty across the line reversing type with mechanical interlock. Automatic reversing controls are not to be used.
         5) Adjustable Friction Clutch: shall be provided to protect door and operator if door movement is obstructed.
         6) Limit Switches: positive chain drive screw type limit switch, enclosed in electrical control box, accessible for precision setting. Limit switches will remain in time when emergency chain hoist is used and door is operated manually.

7) Control Wiring: Control voltage shall be 24 volts. Control wiring shall be RC: Three button momentary contact on OPEN and STOP, constant pressure on CLOSE.
8) Overload Protection: provide manual reset for overload protection.
9) Electrical Enclosure: all electrical components shall be in NEMA 1 enclosure.
10) Emergency Operation: supply a chain hoist, which may be engaged from the floor for mechanical operation. An electrical interlock disconnects power when chain hoist is engaged.
11) Magnetic Brake: furnish magnetic solenoid brake for positive stop.

## 2.6 FINISHES, GENERAL

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.7 STAINLESS-STEEL FINISHES

A. General: Remove or blend tool and die marks and stretch lines into finish.
   1. Grind and polish surfaces to produce uniform, directional textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
B. Bright, Directional Polish: No. 4 finish.
C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared. Verify that site conditions are acceptable for installation of doors, operators, controls, and accessories. Ensure that openings are square, flush, and plumb.

## 3.2 INSTALLATION

A. General: Install doors and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports according to Shop Drawings, manufacturer's written instructions, and as specified.

## 3.3 ADJUSTING

A. Lubricate bearings and sliding parts; adjust doors to operate easily, free from warp, twist, or distortion and evenly fit at entire perimeter.
B. Adjust hardware and operating assemblies for smooth and noiseless operation.

## 3.4 DEMONSTRATION

A. Startup Services: Engage a factory-authorized service representative to perform startup services and to train Contracting Officer's maintenance personnel as specified below:
   1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
      a. Test door closing when activated by detector or alarm connected fire-release system. Reset door-closing mechanism after successful test.

2. Train Contracting Officer's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance, and procedures for testing and resetting release devices.
3. Review data in the operations and maintenance manual.
4. Schedule training with Contracting Officer with at least 7 days' advance notice.

## 3.5 CLEANING

A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.
B. Remove labels and visible markings.
C. Touch-up, repair or replace damaged products before Substantial Completion.

## 3.6 PROTECTION

A. Protect installed products until completion of project.

## 3.7 SCHEDULE

A. Insulated Overhead Rolling Service Door:
   1. Non-fire rated; power operated; powder-coated galvanized steel finish.
   2. Doors 100-6, 100-7, 100-8 and 100-9.
B. Non-Insulated Overhead Rolling Service Door:
   1. Non-fire rated; manually operated; stainless steel finish.
   2. Door 101-1.
C. Reference Drawings for details.

END OF SECTION

**SECTION 08 36 13**

**SECTIONAL DOORS**

**RFB #923902-01**

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. Section Includes: Electrically operated sectional doors, operators, controls and accessories.
B. Electrical wiring from panel to electric operator and control station.

### 1.2 RELATED WORK

A. Section 08 71 00: Door Hardware
B. Section 09 91 00: Painting.
C. Division 26: Electrical Requirements

### 1.3 REFERENCE STANDARDS

A. ASTM A526 - Steel Sheet, Zinc Coated (Galvanized) by the Hot Dip Process, Commercial Quality.
B. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

### 1.4 PERFORMANCE REQUIREMENTS

A. Spring Cycle Requirements: 100,000 cycles.

### 1.5 QUALITY ASSURANCE

A. Installer Qualifications: Utilize an installer trained and authorized by the door dealer as required to maintain manufacturer’s warranty.

### 1.6 SHOP DRAWINGS AND PRODUCT DATA

A. Submit shop drawings and product data indicating pertinent dimensioning, general construction, component connections and details, anchorage methods, hardware locations and installation details.
B. Field verify lift type and existing conditions.

### 1.7 WARRANTY

A. Submit manufacturer's one-year written warranty.

### 1.8 DELIVERY OF MATERIALS

A. Comply with manufacturer’s ordering instructions and lead time requirements to avoid construction delays.
B. Delivery: Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact. Deliver door in manufacturer's packaging complete with installation instructions.
C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

A. Manufacturer and Type:
   1. Basis of design: SteelForm Series, Model S-20 insulated steel door manufactured by Raynor Manufacturing Company.
   2. Manufacturer: Overhead Door Model: 418
   3. Manufacturer: Clopay, Energy Series Model: 3220
   4. Other manufacturers: submit per Section 01 60 00.

### 2.2 DOOR OPERATORS

A. Provide doors designed for electric motor and hand chain operation.
   1. Provide with floor operated disconnect for use with chain hoist and electric operator combination. Electric operator, Jackshaft type, Model: Liftmaster, 1/2 HP, mounted at position #1 on exterior wall.
      a. Motor: continuous duty capacitor start NEMA "C" faced flanged motor; 115V single phase. Motor shall be separate from reduction mechanism for ease of maintenance.
      b. Reduction: heavy duty worm gear drive running in oil with additional reduction by chain and sprockets.
      c. Roller Chain Drive: Door shaft shall be driven by roller chain to provide door travel of 6" to 12" per second.
      d. Starter-Reversing Contactor Type: heavy duty across the line reversing type with mechanical interlock. Automatic reversing controls are not to be used.
      e. Adjustable Friction Clutch: shall be provided to protect door and operator if door movement is obstructed.
      f. Limit Switches: positive chain drive screw type limit switch, enclosed in electrical control box, accessible for precision setting. Limit switches will remain in time when emergency chain hoist is used and door is operated manually.
      g. Control Wiring: Control voltage shall be 24 volts. Control wiring shall be RC: Three button momentary contact on OPEN and STOP, constant pressure on CLOSE.
      h. Overload Protection: provide manual reset for overload protection.
      i. Electrical Enclosure: all electrical components shall be in NEMA 1 enclosure.
      j. Emergency Operation: supply a chain hoist, which may be engaged from the floor for mechanical operation. An electrical interlock disconnects power when chain hoist is engaged.
      k. Magnetic Brake: furnish magnetic solenoid brake for positive stop.

### 2.3 DOOR SECTIONS

A. Door Standards: Sections shall be 2" thick, roll formed from commercial quality hot dip 20 gage galvanized steel (G90) per ASTM A-653. Each door section to have two deep ribs, four pencil grooves, and roll-formed tongue-and-groove joints. End stiles and center stiles to be riveted to outside face with stainless steel rivets and resistance welded to interior rail. End stiles and center stiles to be minimum 16-gauge thickness.
B. Insulation: Doors shall be Polystyrene with 20-gauge Steel Covers: non-CFC expanded polystyrene with minimum R-value of 7, with 20 gauge hot-dipped galvanized steel covers, painted gray.
C. Glazing: Provide thermal glazing in size and configurations shown on drawings, complete with 3/16" insulating glass and one-piece EPDM vulcanized rubber frame.
D. Finish: Exterior and interior door skins pre-coated prior to roll forming with a two-coat process of baked on polyester white enamel finish over epoxy primer. Finish painting by Section 09 91 00 - Painting.
E. Wind Load: Door designed to withstand 20 lbs. per sq. ft. Deflection of door in horizontal position to be maximum 1/120th of door width.

## 2.4 TRACK

A. 2 inch, Hot-dipped galvanized steel (ASTM A-653) track, fully adjustable for adequate sealing of door to jamb or weather seal; vertical lift design. Tracks to have Graduated seal for weather tight closing. Tracks to be bracket mounted or with continuous angle sized not less than 5-5/8 inches x 5 inches x 1/8 inch.

## 2.5 COUNTERBALANCE SYSTEM

A. Heavy duty oil tempered wire torsion springs on continuous ball bearing cross header shaft. Galvanized aircraft type lifting cables with minimum safety factor of 5 to 1.
B. Provide a spring-loaded steel or bronze cam mounted to the bottom door roller assembly, on each side, designed to stop the door automatically if either or both cables break.

## 2.6 HARDWARE

A. All hinges and brackets made from galvanized steel. Track rollers shall have 1/4-inch diameter hardened steel ball bearing.
B. Track Rollers: 3-inch diameter consistent with track size, with hardened steel ball bearings.
C. Pusher Springs: Provide as required by manufacturer.
D. Perimeter Seal: Door to be furnished with complete weatherstripping system to reduce air infiltration. Top of door provided with neoprene rubber sealing strip. Bottom of door to have flexible U-shaped vinyl seal encased in extruded aluminum retainer to conform to irregularities in floor. Jam seal to be neoprene seal, mounted between the jamb and mounting angle. Maximum air leakage per foot of door perimeter (floor, jamb, and header) shall not exceed .81 CFM @ 25 MPH. No air leakage shall be detected between section joints when tested in accordance with ASTM E-283.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Site Verification of Conditions: Verify through direct observation and field measurement that site conditions are acceptable for installation of doors and accessories. Ensure that openings are square, flush and plumb.
B. Do not proceed with installation of doors and accessories until unacceptable conditions are corrected.

## 3.2 INSTALLATION

A. Install overhead sectional door in accordance with manufacturer's recommendations.
B. Fit, align, and adjust complete door assembly level and plumb, and to provide smooth operation.
C. Securely brace overhead door tracks suspended from structure. Secure tracks to structural members only.

## 3.3 ADJUSTING

A. General: Lubricate bearings and sliding parts, assure weathertight fit around door perimeter and adjust doors for proper operation, balance, clearance and similar requirements.

## 3.4 CLEANING

A. Remove temporary coverings and protection of adjacent work areas. Repair or replace installed products damaged prior to or during installation.

B. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove and legally dispose of construction debris from project site.

## 3.5 SCHEDULE

A. Production Building – (1) Sectional Door + (1) controller.
   1. Door 100-2.
      a. Door is labeled the same in both the Base Bid and Alternate No. 1.
B. Reference Drawings to verify sizes and quantities.

END OF SECTION

# SECTION 08 71 00

# DOOR HARDWARE

## PART 1 – GENERAL

### 1.1 SUMMARY

A. Furnish all labor, finish hardware, templates, accessories, equipment, and transportation, necessary to install all finish hardware required by the drawings, schedules and specifications.
B. Refer to drawings and other specification sections for items requiring specific hardware not included in this Section
C. The intent is to provide finish hardware for the proper operation and control of all doors in the Project. Notify the Contracting Officer of any omissions or discrepancies prior to bidding, if any door does not have hardware meeting this intent. Clarification will be made by Addendum, otherwise provide such items in the type and quantity for the appropriate service intended.

### 1.2 WORK INCLUDED

A. Hardware for interior and exterior hollow metal doors.

### 1.3 RELATED WORK

A. Section 07 92 00: Joint Sealants.
B. Section 08 12 13: Hollow Metal Frames.
C. Section 08 13 13: Hollow Metal Doors.

### 1.4 REFERENCE STANDARDS

A. ANSI A115.2 - Door and Frame Preparation for Mortise Locks.
B. ANSI A156.1 - Butts and Hinges.
C. ANSI A156.2 - Locks and Lock Trim.
D. ANSI A156.4 - Door Controls (Closers).
E. ANSI A156.5 – Cylinder Cores
F. ANSI A156.7 - Template Hinges.
G. ANSI A156.8 - Door Controls (Overhead Holders).

### 1.5 SHOP DRAWINGS AND PRODUCT DATA

A. Product data: Submit manufacturer’s technical product data and parts list for each hardware item. Include information necessary to show compliance with requirements and include instructions for installation and for maintenance of operating parts and finishes.
B. Hardware schedule: Submit a hardware schedule in a vertical format, (horizontal format not acceptable). Designations for door numbers and hardware sets in the schedule shall match those used in the Construction Documents. Submittals with hardware distributor developed hardware group numbers will be rejected and returned for re-submittal. Include the following information.
    1. Hardware schedule shall be coordinated with doors, frames, and related work to ensure proper size, thickness, hand function, and finish of door hardware. Provide index at end of submittal listing door and-specified hardware. In addition, indicate page on submittal where door is found.
    2. Catalog cuts of each type of exposed hardware unit, highlighted in color to indicate compliance with the Hardware Schedule.
        a. Type, style, function, size send finish of each hardware item.
        b. Name and manufacturer of each item.
        c. Fastenings and other pertinent information.

d. Explanation of all abbreviations, symbols, codes, etc., contained in schedule.
e. Mounting locations for hardware.
f. Door and frame sizes and materials.
g. Deviations from specifications shall be noted in cover letter.

3. Submittal sequence: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g. hollow metal frames), which is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule.

C. Keying schedule: Submit separate detailed schedule indicating keying for all locks. Keying schedule must be approved by Contracting Officer before ordering any locks.
D. Templates: Furnish hardware templates to each fabricator of doors, frames and other work. To be factory-prepared for the installation of hardware: Upon request check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

## 1.6 QUALITY ASSURANCE

A. Hardware Supplier Qualifications: A recognized hardware supplier with warehousing facilities. Supplier shall be or employ an Architectural Hardware Consultant (AHC) qualified person to assist in work with this section. The Architectural hardware Consultant shall be available, at reasonable times during the course of the work, for consultation about Project's hardware requirements, to Contracting Officer and Contractor.
B. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80, No. 101 and local building code requirements. Provide only hardware, which has been tested and listed, by UL, FM or Warnock Hersey for types and sizes of doors required and complies with requirements of door and frame labels.
   1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL or FM labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL or FM label on exit devices indicating "Fire Exit Hardware".
C. Underwriter's Laboratories Requirements: Provide sufficient hardware of proper type to qualify every opening so indicated to meet Underwriter's Laboratories label requirements.
D. Referenced manufacturers' standards are minimum acceptable as to all pertinent factors.

## 1.7 COORDINATION

A. Coordinate work of this Section with other directly affected sections involving manufacturer(s) of any internal reinforcement for door hardware.

## 1.8 FIELD QUALITY CONTROL

A. Hardware Supplier’s Architectural Hardware Consultant (AHC) shall field inspect and certify hardware and installation has been furnished and installed in accordance with manufacturer’s instructions and as specified.

## 1.9 DELIVERIES, STORAGE AND HANDLING:

A. Package each hardware item in separate containers with all screws, wrenches, installation instructions and installation templates. Mark each box with hardware heading and door number according to approved hardware schedule.
B. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation: Provide a complete packing list showing items, door numbers and hardware headings with each shipment.

C. Store hardware in shipping cartons above ground and under cover to prevent damage. Provide secure lockup for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.
D. Overhead Sectional Hardware: Deliver hardware for overhead sectional and coiling doors as directed by the overhead door supplier. Coordinate with Section 08 36 13 – Sectional Doors.

## 1.10 WARRANTY

A. Door hardware items shall be warranted against defects in material and workmanship as set forth in Division 1 - General Requirements.
B. Door hardware shall be warranted by the manufacturers to be free from defects in materials and workmanship for a period of two (2) years from date of substantial completion of the project.
   1. Exceptions:
      a. Mechanical closers shall be warranted for ten (10) years from date of substantial completion.
      b. Exit devices shall be warranted for five (5) years from date of substantial completion.
C. Repair, replace, or otherwise correct deficient materials and workmanship without additional cost to the Owner.

# PART 2 - PRODUCTS

## 2.1 HARDWARE – GENERAL

A. Provide the materials or products indicated by trade names, manufacturer's name, or catalog number. Substitutions will not be permitted except as described in Section 01 60 00 – Product Requirements.
B. Provide manufacturer's standard products meeting the design intent of this Specification, free of imperfections affecting appearance or serviceability.
   1. Provide hardware complete with all fasteners, anchors, instructions, layout templates, and specialized tools as required for satisfactory installation and adjustment per the manufacturer’s written instructions.
   2. Hand of door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
   3. Finish screws exposed under any condition to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as possible. Use machine screws for metal connections and wood screws for connections to wood. Use manufacturer's screws to secure hardware.
   4. Provide concealed fasteners for hardware units which are exposed when door is closed, except to extent no standard units of type specified are available with concealed fasteners.
   5. Furnish self-tapping screws for attachment of sweeps and stop applied weatherstripping. Fasteners exposed to weather shall be non-ferrous or stainless steel.
   6. Do not use thru-bolts for installation where bolt, head or nut on opposite face is exposed in other work, except where indicated otherwise or where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each thru-bolt or use sex screw fasteners.
   7. Special Tools: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of finish hardware.
   8. Coordinate required hardware reinforcements for doors and frames.

## 2.2 MATERIALS

A. Hinges:
   1. Furnish hinges with sufficient width to accommodate trim and allow for 180-degree swing.

B. Standard Locksets and Latchsets:
   1. All locksets and latches shall be Heavy Commercial duty; Grade 1; mortise type, unless otherwise called out in hardware schedule.
   2. Locksets and latchsets shall accept specified interchangeable cores and cylinders.
C. Security Locksets:
   1. All locksets with deadbolts shall be BHMA A 156.13, Series 1000, Operational Grade 1, Security Grade 2, mortise locks with “anti-panic” operation, (inside lever simultaneously retracts deadbolt and latchbolt).
   2. Refer to hardware schedule for doors to receive security locksets.
   3. Acceptable Manufacturers:
      a. Falcon
      b. Schlage
      c. Sargent
      d. Yale
      e. No Substitutions
D. Lock Cylinders and Keying
   1. ANSI A 156.5, Grade 1, 7-pin type, A2 System, Small Format Interchangeable Core (SFIC).
   2. Acceptable Manufacturers:
      a. Falcon
      b. No Substitutions.
   3. Metals: Construct lock cylinder parts from brass/bronze, stainless steel or nickel silver.
   4. Key System: Assign building with new locking system and control number.
      a. Keyway “Q”; verify control number with Owner.
   5. Keying Requirements:
      a. Supply "Bitting list w/set-up chart" to Owner at Project Closeout.
      b. Deliver keys to Contracting Officer.
         In addition, provide:
         1) Temporary construction cores for all key removable core cylinders.
         2) Keyed to Owner’s requirements. All keying and coordination shall be by hardware supplier. Coordinate Owner’s keying requirements during course of Work. Upon return of reviewed finish hardware schedule, arrange a meeting between Owner, hardware supplier, Interchangeable Core Manufacturer’s Representative (if required) and other involved parties to establish a keying schedule based on Owner’s project requirements.
      c. Provide removable cores for all locksets, interior and exterior; locksets shall accept pre-approved cores.
E. Deadbolt Locks:
   1. All deadbolt locks shall be BHMA A156.13, Series 1000, Operational Grade 1, Security Grade mortise locks with “anti-panic” operation, (Inside lever simultaneously retracts deadbolt and latchbolt).
   2. ANSI F13 locking function.
F. Closers:
   1. Comply with manufacturer's recommendations for unit size based on door size, weather exposure and usage.
   2. Through-bolt all closer units, using sex bolt fasteners.
   3. All closers UL Certified shall be in compliance with UBC 7.2 and UL 10C.
   4. Closer body shall be cast iron.
   5. Approved Manufacturers: Sargent, Corbin Russwin, LCN
G. Exit Devices:
   1. All exit devices shall be through-bolted, using sex bolt fasteners.
   2. All exit devices shall have dead-locking latchbolts.
   3. All touch-pads shall be satin stainless-steel finish.
   4. All exit devices shall be able to be dogged down.
   5. Approved Manufacturers: Sargent, Corbin Russwin, Von Duprin

H. Flush Bolts and Dust Proof Strikes:
   1. Furnish 12" rods for manual flushbolts for door 7'-6" or less, 24" top rods for doors over 7'-6" and up to 8'-6" wide.
   2. Furnish flushbolts with non-locking dust proof strikes.
   3. Approved Manufacturers: Rockwood, Trimco, Ives

I. Kickplates:
   1. Provide 10” high x 2” less door width, or 1” less door width of pairs. Metal protective plates shall be 0.050” thick satin stainless steel and shall be beveled four (4) sides and counter sunk.
   2. Provide kick plates on the push-side of all doors. Verify any exceptions with Owner.
   3. Approved Manufacturers: Rockwood, Trimco, Ives

## 2.3 FINISH

A. Provide matching finishes for hardware units at each door to the greatest extent possible, unless otherwise indicated. In general, match items to the finish for the latch, lock or push pull unit for color and texture. Reference Hardware Schedule at the end of this specification section.
   1. US26D (BHMA 626) – Satin Chromium / Brass or Bronze
   2. US32D (BHMA 630) - Satin Stainless Steel / Stainless Steel

## 2.4 MANUFACTURERS

A. The numbers listed in the following Hardware Schedule are taken from the following manufacturers and are designated as follows:

| | |
|---|---|
| (BO) | Bommer |
| (FAL) | Falcon |
| (GJ) | Glynn-Johnson Corp. (Ives & Builders Brass approved equal) |
| (I) | Ives |
| (LCN) | LCN Closer, Inc. |
| (MK) | McKinney |
| (N) | National Guard Products |
| (PE) | Pemko |
| (R) | Reese |
| (RF) | Rixson |
| (RO) | Rockwood |
| (SA) | Sargent |
| (SCH) | Schlage |
| (S) | Stanley Hardware (McKinney and Hager approved equal) |
| (SU) | Securitron |
| (T) | Trimco |
| (V) | Von Duprin |
| (Y) | Yale |

B. Manufacturers of finish hardware items not listed: submit per Section 01 60 00 – Product Requirements.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Refer to Section 08 12 13 - Hollow Metal Frames and 08 13 13 - Hollow Metal Doors for additional installation requirements.
D. Prior to hardware installation, the Contractor shall setup a meeting with the hardware supplier and the hardware installer to ensure the installer has and understands the manufacturer's installation requirements for all hardware items.
   1. The supplier shall observe the installation of the first lockset, closer, and exit device.

## 3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's written instructions, using proper templates.
   1. Set units' level, plumb, and true to line and location.
   2. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
   3. Drill and countersink units that are not factory prepared for anchorage fasteners, space fasteners and anchors according to industry standards.
B. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of trim units with finishing work specified in Section 09 91 00 - Painting. Do not install surface-mounted items until finishes have been completed on substrates involved.
C. Set thresholds for exterior doors in full bed of sealant complying with requirements specified in Section 07 92 00 – Joint Sealants.

## 3.3 ADJUSTMENT

A. Make initial adjustment, as follows:
   1. Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit.
   2. Replace units that cannot be adjusted to operate as intended.
   3. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with reference accessibility requirements.
   4. Adjust door closer sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move from a point 3 inches from the latch, measured to the leading edge of the door.

## 3.4 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.
B. Clean operating items as necessary to restore proper function and finish.
C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at the time of Substantial Completion.

## 3.5 HARDWARE SCHEDULE

A. Following is a schedule of type of hardware required for the various openings and is intended to cover the principal items but may not include each and every item required. Furnish all items which are standard for a complete installation, including devices on pairs of doors, (astragals, latch protectors, etc.) as required to maintain security and prevent tampering with latching hardware. Modify, where necessary, for opening operation and to meet U.L. requirements (verify with Contracting Officer). Include any drop plates, brackets, or shoes and rod lengths, as may be required, for installing door closers (verify with Contracting Officer). Fasten all jamb brackets and door closers to wood doors with sex bolts.
B. All rated doors shall receive 1 Set Smoke Seals.
C. All Doors: 1 ¾" HM Doors and HM Frame – reference Article 2.2E.5 within this specification section for keying requirements.

**SEE HARDWARE SCHEDULE ON NEXT PAGE**

## HARDWARE SCHEDULE

**Set: 1.0**

Door: 100-1, 100-3, 100-4 and 100-5 (Exterior Personnel Doors)
Description: Single Secure Exterior Doors

| | | | | | |
|---|---|---|---|---|---|
| 4 | EA | HINGE | TA2314 NRP 4-1/2" x 4-1/2" | US32D | MK |
| 1 | EA | EXIT DEVICE | 72 737P 8913 ET | US32D | SA |
| 1 | EA | SFIC CORE | CYLINDER | 626 | |
| 1 | EA | SURFACE CLOSER | 281 CPSH | EN | SA |
| 1 | EA | ARMOR PLATE | K1050 34" x 34" BEV CSK | US32D | RO |
| 1 | EA | THRESHOLD (1/4” RISE) | 270A | AL | PE |
| 1 | EA | THRESHOLD STOP | 1842APK | AL | PE |
| 1 | EA | GASKETING | 294PWV | | PE |
| 1 | EA | RAIN GUARD | 346C | | PE |
| 1 | EA | SWEEP | 3452CNB | | PE |

**Set: 2.0**

Door: 102-1 (Offender Restroom – Mult-User)
Description: Single Interior Doors

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGE, FULL MORTISE | TA2714 4-1/2" X 4-1/2" | US26D | MK |
| 1 | EA | STOREROOM LOCK | 72 737P 8204 LNL | US26D | SA |
| 1 | EA | KICK PLATE | K1050 10" x 2" LDW 4BE CSK | US32D | RO |
| 3 | EA | SILENCER | 608-RKW | | RO |

**Set: 3.0**

Door: 105-1 (Mechanical Room)
Description: Pair Secure Interior Storage Doors

| | | | | | |
|---|---|---|---|---|---|
| 6 | EA | HINGE, FULL MORTISE, HVY WT | T4A3786 4-1/2" X 4-1/2" | US26D | MK |
| 1 | EA | AUTO FLUSH BOLT | 2842 | US26D | RO |
| 1 | EA | DUST PROOF STRIKE | 570 | US26D | RO |
| 1 | EA | STOREROOM LOCK | 72 737P 8204 LNL | US26D | SA |
| 2 | EA | ARMOR PLATE | K1050 34" x 34" BEV CSK | US32D | RO |
| 2 | EA | DOOR STOP & HOLDER | 494S | US26D | RO |
| 2 | EA | ASTRAGAL | 18041CNB TKSP | | PE |

**Set: 4.0**

Door: 103-1, 105A-1 (Janitor, Electrical)
Description: Single Secure Interior Storage Doors

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGE, FULL MORTISE | TA2714 4-1/2" X 4-1/2" | US26D | MK |
| 1 | EA | STOREROOM LOCK | 72 737P 8204 LNL | US26D | SA |
| 1 | EA | ARMOR PLATE | K1050 34" x 34" BEV CSK | US32D | RO |
| 3 | EA | SILENCER | 608-RKW | | RO |

**Set: 5.0**

Door: 104-1 (Employee Restroom – Single User)
Description: Single Secure Interior Privacy Doors

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGE, FULL MORTISE | TA2714 4-1/2" X 4-1/2" | US26D | MK |
| 1 | EA | INDUSTRIAL PRIVACY w/ INDICATOR | V21 EMB 8258 LNL | US26D | SA |
| 1 | EA | KICK PLATE | K1050 10" X 2" LDW CSK BEV | US32D | RO |
| 1 | EA | WALL STOP | 400 | US26D | RO |
| 3 | EA | SILENCER | 608-RKW | | RO |

**Set: 6.0**

1 EA KEYS

Provide (3) cut keys per cylinder plus an additional (3) blank keys per cylinder, to be cut as directed by Owner.

**Set: 7.0**

1 EA COMBINATION CORES

Contactor shall provide an additional (10%) ten percent combination cores for Owner’s future use.

END OF SECTION

**SECTION 08 80 00**

**GLAZING**

**RFB #923902-01**

## PART 1 – GENERAL

### 1.1 WORK INCLUDED

A. Glass and glazing for hollow metal doors.

### 1.2 RELATED WORK

A. Section 08 13 13: Hollow Metal Doors.

### 1.3 REFERENCE STANDARDS

A. FS DD-D-451C - Glass, Plate, Sheet, Figured (Flat for Glazing, Mirrors, and Other Uses).

### 1.4 GUARANTEE

A. Insulated Glass: Ten (10) year warranty against failure of insulating glass seal.
B. Guarantee provided by the manufacturer of each listed type of glass.
C. Submit three (3) copies of each required warranty.

### 1.5 SUBMITTALS

A. Product Data: Fire-rated Glass: submit manufacturer’s technical data for installation and maintenance.
B. Certification: provide a signed letter from the manufacturer indicating compliance with the specified performance requirements.

### 1.6 PERFORMANCE REQUIREMENTS

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   3. Glass thicknesses listed are minimum.
B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
   1. In conjunction with weather barrier related materials described in other sections, as follows:
C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

## 1.7 QUALITY ASSURANCE

A. Fire-rated Glass: each unit shall bear, (in an inconspicuous location), a permanent, non-removable UL label, certifying it for use in tested and rated fire protective assemblies.

## 1.8 DELIVERY, STORAGE, AND PROTECTION

A. Deliver, store and protect products in accordance with Section 01 60 00 – Product Requirements.

# PART 2 – PRODUCTS

## 2.1 GLASS

A. Acceptable Manufacturers:
   1. PPG Industries, Inc; www.ppgideascapes.com
   2. Pilkington / Libbey-Owens-Ford; www.pilkington.com
   3. Viracon, Inc; www.viracon.com
   4. Cardinal Glass Industries; www.cardinalcorp.com
   5. Other manufacturers per Section 01 60 00 – Product Requirements.

B. Glass factory shall be labeled on each pane. Labels shall be left on glass until final cleaning.

C. Glass as follows:
   1. Insulating Glass:
      a. For Exterior Hollow Metal Doors, Sidelights, Transoms: 1 inch thick with sealed edges, consisting of 1/4 inch clear glass, 1/2 inch air space and 1/4 inch clear polished plate. Glass shall be of plate or float quality; interior lite of unit shall be laminated glass where applicable.
      b. Minimum Performance Characteristics:
         1) U-factor COG: 0.29
         2) U-factor Unit: 0.42
         3) SHGC: 0.38
         4) Visual Transmission: 0.70
   2. Tempered Glass: 1/4 inch thick, tempered, of plate or float quality, clear. Exposed tong marks (exposed to view) will not be allowed.
   3. Laminated Glass: 1/4 inch thick, consisting of two (2) nominal 3-mm (1/8 inch) glass panes bonded together with a minimum of .75-mm (30 mil) polyvinyl-buteryl (PVB) interlayer.

A. Manufacturers:
   1. Glass: Any of the manufacturers specified for float glass.

B. Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Metal Edge Spacers: Aluminum, bent and soldered corners.
   4. Spacer Color: Black.
   5. Edge Seal:
      a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
   6. Color: Black.
   7. Purge interpane space with dry air, hermetically sealed.

C. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
   1. Applications: Exterior glazing unless otherwise indicated.
   2. Space between lites filled with air.
   3. Outboard Lite: Fully tempered float glass, 3/16 inch thick, minimum.

a. Tint: Clear.
b. Coating: Low-E (passive type), on #2 surface.

4. Inboard Lite: Fully tempered float glass, 3/16 inch thick, minimum.
   a. Tint: Clear.
5. Total Thickness: 1 inch.
6. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.30, nominal.
7. Visible Light Transmittance (VLT): 72 percent, nominal.
8. Solar Heat Gain Coefficient (SHGC): 0.40, nominal.

D. Type G-1 - Monolithic Interior Vision Glazing:
   1. Applications: Interior glazing unless otherwise indicated.
   2. Glass Type: Fully tempered float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch, nominal.

## 2.2 GLAZING MATERIALS

A. Glazing Materials: Sealants, glazing compounds, tapes and backup materials to be the products of one manufacturer insofar as possible. All materials used together compatible with each other. Materials to be used together with a sealant approved for such use by the sealant manufacturer. Materials delivered to the job in their original sealed containers.
   1. Thiokol Sealant: non-sag, two component Thiokol polysulfide liquid polymer, conform to ANSI A116.1.
   2. Glazing Materials for Fire-rated Glass: per requirements of glass manufacturer.

B. Glazing Tape: Non-shrinking, synthetic rubber, reinforced tape of ribbon with self-adhesive surfaces.
   1. Manufactured by Tremco, Norton, or PTI
   2. Black-bronze color.

C. Setting Blocks: Neoprene; 70-90 durometer hardness; 4" long x 3/8" thick x 1/4" high.

D. Miscellaneous Glazing Accessories: As recommended by manufacturer for the various glazing requirements.

# PART 3 - EXECUTION

## 3.1 INSPECTION

A. Verify surfaces of glazing channels or recesses are clean, free of obstructions, and ready for work of this Section.

B. Beginning the installation means acceptance of substrate.

## 3.2 WORKMANSHIP

A. Before commencing work, inspect frames to be glazed to determine frames are set true and straight with proper clearances. Do not proceed until conditions are satisfactorily corrected.

B. Sash rabbets and stops clean and dry at time of glazing. Before glazing metal sash, remove oil, lacquer or other materials to which the compound will not readily adhere, or which will tend to delaminate from the metal.

C. Cut glass to fit openings while maintaining clearances.

D. Set glass using setting blocks and spacers to insure proper edge clearances. Clearances shall conform to the glazing materials manufacturer's recommendations. Center glass in glazing rabbets. Cut and set Sheet glass so that wave or distortion runs horizontally. Prime materials as required by the glazing material manufacturer.

E. Remove and replace glazing inserts carefully to avoid marking or defacing the frames, stops or fastenings. In general, glass set with continuous glazing insert or sealant.

## 3.3 GLAZING AT DOORS AND FRAMES

A. Glaze hollow metal doors, stops provided by Section 08 13 13.
B. Firmly glaze in place with gaps sealed, free of rattles.

## 3.4 PROTECTION AND CLEANING

A. Protect glass from contact with contaminating substances resulting from construction operations.
   1. Clean glass surfaces in strict accordance with manufacturer’s printed instructions.
B. After installation, mark glass with "X" by using tape or removable paste.
C. Immediately remove traces of glazing material from finished surfaces.
D. Remove labels after work is complete.

END OF SECTION

**SECTION 09 2116**

**GYPSUM BOARD ASSEMBLIES**

**RFB #923902-01**

## PART 1 – GENERAL

### 1.1 SECTION INCLUDES

A. Gypsum board.
B. Taped and sanded joint treatment.
C. Textured gypsum board ceilings.
D. Gypsum board accessories.

### 1.2 REFERENCES

A. ASTM C475 - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017.
B. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2018b.
C. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.
D. ASTM C1396 - Standard Specification for Gypsum Board; 2017.
E. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior
F. Coatings in an Environmental Chamber; 2016.
G. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.

### 1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Fire-, Moisture- and Mold-Resistant Gypsum Board:
   1. CertainTeed Corp; www.certainteed.com.
   2. National Gypsum Company: www.nationalgypsum.com.
   3. United States Gypsum Company; www.usg.com.
   4. G-P Gypsum Corp; www.gp.com.
   5. Substitutions: See Section 01 60 00 – Product Requirements

### 2.2 GYPSUM BOARD MATERIALS

B. Fire-, Moisture- and Mold-Resistant Gypsum Wallboard: ASTM D3273; Type X, UL rated. Basis of Design: Mold Tough Firecode X Drywall as manufactured by USG (United States Gypsum Company).
   1. Size to minimize joints in place.
   2. Ends shall be square cut.
   3. Thickness: 5/8 inch unless otherwise indicated on Drawings.
   4. Edges: Tapered.

## 2.3 ACCESSORIES

A. Sound Insulation: Mineral Fiber Sound Batts. 3” thick ASTM C665 Type I – unfaced.
B. Nails: Annular ring GWB type meeting ASTM C514 and conforming with gypsum Association Recommended Performance Standards for nails for gypsum wallboard.
C. Screws: Drywall Type S, Phillips bugle head, self-drilling, self-tapping for use with power tool. Use coated nails where required by STC or fire rated assembly.
D. Joint Compound: ASTM C475, ready-mixed, separate bedding and topping compound especially made for gypsum drywall, recommended by gypsum board manufacturer.
E. Joint Tape: ASTM C475, perforated and reinforced fibered paper with feathered edges, recommended by gypsum board manufacturer.
F. Metal Outside Corner: Heavy gauge, hot-dip galvanized steel similar to SHEETROCK brand paper faced metal 3/4" bullnose outside corner, tape on bead (SLOC). Bottom of Corner shall be square for installation of base trim.
G. Edge Trim: Metal electro-galvanized steel, similar to U. S. Gypsum No. 200-A.
H. Control Joint: Metal roll-formed zinc with tape protected openings, similar to U. S. Gypsum No. 093.

## 2.4 TEXTURING

A. Walls: Provide “Light Orange Peel” texture finish for all walls.
B. Ceiling: Textured ceiling spray shall include paint mixture products for single application of ceiling texture as noted in room finish schedule.
    1. Provide “Knock-down” or “Executive” texture on horizontal surfaces.

# PART 3 - EXECUTION

## 3.1 INSPECTION

A. Verify that site conditions are ready to receive work.
B. Beginning of installation means acceptance of surfaces.

## 3.2 STUD INSTALLATION

A. Check wood framing for proper spacing and alignment. Verify that wood framing does not exceed spacing allowable for wallboard to be used. Verify that door frames are set for thickness of wallboard to be used. Defective Framing: Corrected before start of work. Maintain temperature of 50° F to 70° F during installation. Provide ventilation during and following adhesive and joint treatment applications.
B. Trusses shall be laterally supported at panel points.

## 3.3 ACOUSTICAL ACCESSORIES INSTALLATION

A. Place acoustical insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.
B. Install acoustical sealant at acoustical walls gypsum board perimeter.
    1. Caulk all penetrations of partitions by conduit, pipe, ductwork, rough-in boxes, and other penetrations.

## 3.4 GYPSUM BOARD INSTALLATION

A. Install materials in accordance with manufacturer’s directions and as required for specified sound and fire ratings. Install wallboard with minimum of end joints. Stagger end joints and locate as far as possible from center of wall or ceiling. Neatly fit ends and edges and support

on framing or furring. Cut wallboard on face side. At double layer construction stagger end and edge joints. In cold or damp weather follow Gypsum Association recommendations.

B. Use fire-, mold-, and moisture-resistant Type X board for all partitions.
C. For single layer construction apply gypsum board staggered on opposite sides of partition and secure to framing. At double layer construction offset joints of finished layer. Joints of base layer at double layer construction do not need to be finished.
D. Extend partitions to underside of roof or floor deck where indicated on drawings. Seal voids at top of partition and deck with sealant.
E. Treat cut edges and holes in moisture resistant gypsum board with sealant.
F. Place control joints consistent with lines of building spaces; max. 40’ o.c.
G. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.

## 3.5 FINISHING

A. Maintain minimum temperature of 55° F for 24 hours before and during drywall finishing, and until compounds are dry.
B. Install metal trim where gypsum board abuts dissimilar surface.
C. Joints and ceiling and wall inside corner angles shall be reinforced with joint tape bedded in bedding compound and finished with two additional coats of topping compound.
D. Corner Beads: Install at external corners, using longest practical lengths. Use appropriate materials to maintain rated assemblies.
E. Screw heads or dimples shall receive three (3) coats of topping compound.
F. Allow each coat of compound to dry, then sand, if necessary. All wallboard shall be left smooth and ready for painting.
G. Caulk perimeter space between board and electrical boxes, piping or other wall penetrations in sound rated partitions.
H. Install control joints where indicated on drawings and as recommended by manufacturer. Install control joints at head of corridor doors at both jamb edges on both sides of corridor wall.
I. Repair nail pops driving new nail approximately 1-1/2” from nail pop and reset nail. Where face paper is punctured, install new fastener adjacent to defective fastener and remove defective fastener.

## 3.6 TEXTURING

A. Subcontractor shall be wholly responsible for the finish appearance of his work and shall not commence any part of it until surface is in proper condition. Notify Contractor of any unsuitable surface and ascertain that corrections have been made.
B. Texture all exposed gypsum board ceilings.
C. Gypsum board walls to be Light Orange Peel texture.
D. Mix and apply texture products according to manufacturer’s instructions to achieve the specified textures for each type of surface.
E. Remove ceiling texture droppings from walls.
F. Apply sample area for Architect’s approval at start of work.
G. Protect finished drywall work from damage during the remainder of the construction period.

## 3.7 ANCHORAGE

A. Gypsum Board: Direct attachment to framing members.
   1. Walls:
      Single Nail: 1-7/8” coated nail maximum 7” o.c.
      Double Nail: 1-7/8” coated nail; 12” o.c. field of board; 7” o.c. perimeter.
      Screws: 1-1/4” Type S screws at 16” o.c.
   2. Ceilings:
      Single Nail: 1-7/8” coated nails, maximum 7” o.c.
      Double Nail: 1-7/8” coated nails, 12” o.c. field of board; 7” o.c. perimeter.
      Screws: 1-1/4” Type S screws at 12” o.c.

B. Gypsum Board: Double layer application, direct attachment to framing members.
   1. Base layer (parallel to framing)
      Walls and Ceiling:
         Single Nail: 1-7/8” coated nails at 16” o.c.
         Screws: 1-1/4” Type S screws at 24” o.c.
   2. Face Layer (perpendicular to framing)
      Walls:
         Single Nail: 2-1/2” coated nails at 7” o.c.
         Screws: 2” Type S at 16” o.c.
      Ceilings:
         Single Nail: 2-1/2” coated nails at 7” o.c.
         Screws: 2” Type S screws at 12” o.c.

C. Gypsum Board: Direct attachment of single layer gypsum board to resilient channels, wall or ceiling.
   1. 1” Type S screws at 12” o.c. along channels.

D. Gypsum Sheathing: Install sheets vertically.
   1. Nails: 1-3/4” long, 7/16” head, 11 ga. galvanized roofing nails. Space nails 8” o.c. along each stud and perimeter.
   2. Staples: 16 ga. galvanized divergent point, 1/2” wide, 1-1/2” long. Space staples 8” o.c. perimeter and along each stud. Staples parallel to long dimension of framing members; staple heads to be flush without breaking paper.

E. Gypsum board shall be installed to comply with UL assemblies in lieu of the above anchorage where applicable.

## 3.8 JOINT TREATMENT

A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
B. Feather coat onto adjoining surfaces so that camber is maximum 1/16 inch.

## 3.9 TOLERANCES

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

**END OF SECTION**

**SECTION 09 65 00**

**RESILIENT FLOORING**

**RFB #923902-01**

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. Preparation of substrate surfaces.
B. Resilient Base.
C. Cleaning of all surfaces and areas of work.

### 1.2 RELATED SECTIONS

A. Section 09 29 00 Gypsum Wallboard Systems. Substrate for resilient wall base.

### 1.3 REFERENCES

A. ASTM E 648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 1997.
B. ASTM E 662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials; 1995.
C. ASTM F 1861 - Standard Specification for Resilient Wall Base

### 1.4 PERFORMANCE REQUIREMENTS

A. Conform to applicable code for fire performance ratings as follows:
   1. Critical radiant flux (CRF): Minimum 0.45 CRF, per ASTM E 648.
   2. Flame spread: Maximum 75, per ASTM E 648; Class 1>0.45 CRF
   3. Smoke density: Maximum 450, per ASTM E 662.

### 1.5 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
B. Verification Samples: Submit one sample illustrating color and pattern for each resilient and rubber product specified.
C. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning and finishing.

### 1.6 DELIVERY, STORAGE, AND PROTECTION

A. Protect roll materials from damage by storing on end.

### 1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain minimum 65 degrees F air temperature at installation area for minimum two days prior to, during, and for minimum 24 hours after installation.
B. Store flooring materials in area of application; allow two days for material to reach same temperature as area and maintain for minimum 24 hours after completion of installation. The ambient relative humidity shall be between 40% and 60%.

### 1.8 WARRANTY

A. Warranty: Resilient materials shall be free from defects in workmanship and materials, and to withstand exceptional use and conditions, for a period of two (2) years from the Date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 FLOOR COVERING MATERIALS

A. Resilient Base: 4-inch-high, cove base, 1/8-inch-thick, with molded top set cove, ribbed back as manufactured by Tarkett Commercial or equal; www.commercial.tarkett.com.
   1. Other approved manufactures:
      a. Mannington Commercial; www.manningtoncommercial.com.
      b. Roppe Corporation; www.roppe.com.
      c. VPI Flooring; www.vpicorp.com.
      d. Substitutions: Submit per Section 01 60 00 – Product Requirements.
B. Color(s): Provide up to (2) two colors from manufacturer's full line. Colors as selected by Architect.

### 2.2 ACCESSORIES / ADHESIVE / SEALERS

A. Sub-Floor Filler: Hydraulic/Portland cement-based material designed for providing thin solid surface for leveling and for minor ramping of subsurface to adjacent floor finishes. Use material capable of being applied and feathered out to adjacent floor without spalling.
B. Primers and Adhesives: Water and alkali resistant, zero regulated VOC types as recommended by flooring manufacturer for specific application.
   1. Vinyl composition tile adhesive shall contain less than 1% asbestos containing material.

## PART 3 – EXECUTION

### 3.1 SITE AND SUBSTRATE CONDITIONS

A. All surfaces to receive base shall be examined and work shall not be started until surfaces meet the minimum requirements established by the product manufacturer and herein specified.

### 3.2 INSTALLATION – BASE & ACCESSORIES

A. Resilient base and accessories shall be firmly cemented to surfaces with adhesive; scribe and fit to door frames and other obstructions.
B. Fit joints tight and square. Maintain minimum measurement of 18 inches between joints.
C. Miter internal corners.
D. Install on solid backing. Fill all depressions, cracks, and other surface irregularities with a good quality patching compound appropriate for this purpose.
E. Install straight and level to variation of plus or minus 1/8 inch over 10 feet.
F. Reference manufacturer's recommendations for all material installations.

### 3.3 CLEAN-UP

A. Remove excess adhesive from base, accessories and wall surfaces without causing damage to surfaces due to cleaning operations and repair damage to adjacent materials caused by resilient tile installation recommended by adjacent materials manufacturer.
   1. When materials have been given sufficient time to cure, the floors shall be thoroughly cleaned.

## 3.4 PROTECTION

A. Protect resilient flooring products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

## 3.5 EXTRA MATERIALS

A. Resilient Wall Base: Provide to Owner 10 linear feet for each 500 linear feet, or fraction thereof, of each type, color and size specified.

END OF SECTION

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**SECTION 09 91 00**

**PAINTING**

**RFB #923902-01**

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. Prepare surfaces that are to receive finish.
B. Finish surfaces as indicated in schedule at end of this Section.
C. Prepare existing surfaces that are to be refinished.

### 1.2 RELATED WORK

A. Section 05 50 00: Metal Fabrications
B. Section 08 12 13: Hollow Metal Frames
C. Section 08 13 13: Hollow Metal Doors

### 1.3 FLAME SPREAD REQUIREMENTS

A. It is intended that all paint materials for interior use conform to the requirements of the NFPA "Life Safety Code" 101, 6-5.3 Use of Interior Finishes.
B. Prior to ordering of material, the Painting Contractor shall obtain from the paint manufacturer written evidence indicating the Flame Spread classification for each of the materials specified. Submit to Contracting Officer.
C. In case any of the materials specified do not meet with requirements noted above, the Contracting Officer shall be notified during the bidding period.

### 1.4 SAMPLES

A. Prepare 12" X 12" sample(s) of actual wall & frame finishes. When possible, apply finishes on identical type material to which they will be applied on job.
B. Identify each sample as to finish, formula, color name and number, sheen name, and gloss units.
C. Colors: as selected by Contracting Officer.

### 1.5 MAINTENANCE MATERIALS

A. Containers to be tightly sealed and clearly labeled for identification.

### 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint materials in sealed original, labeled containers, bearing manufacturer's name, type of paint, brand name, color designation, and instructions for mixing and/or reducing.
B. Provide adequate storage facilities. Store paint materials at minimum ambient temperature of 45 degrees F. in well-ventilated area.
C. Take precautionary measures to prevent fire hazards and spontaneous combustion.

### 1.7 ENVIRONMENTAL CONDITIONS

A. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture contents of surfaces are below following maximums:
   1. Gypsum Wallboard: 12%
   2. Concrete and Concrete Block: 12%

3. Interior Located Wood: 15%

B. Ensure surface temperatures or the surrounding air temperature is above 40 degrees F. before applying finishes. Minimum application temperatures for latex paints for interior work is 45 degrees F. and 50 degrees F. for exterior work. Minimum application temperature for varnish and stained finishes is 65 degrees F.
C. Provide adequate continuous ventilation and sufficient heating facilities to maintain temperatures above 45 degrees F. for 24 hours before and during, and 48 hours after application of finishes.
D. Provide minimum 25 foot-candles of lighting on surfaces to be finished.

## 1.8 PROTECTION

A. Adequately protect other surfaces from paint and damage. Repair damage as a result of inadequate or unsuitable protection.
B. Furnish sufficient drop cloths, shields, and protective equipment to prevent spray or droppings from fouling surfaces not being painted.
C. Place cotton, waste clothes and materials that may constitute a fire hazard in closed metal containers and remove daily from site.
D. Remove electrical plates, surface hardware, fittings, and fastenings prior to painting operations. These items are to be carefully stored, cleaned, and replaced on completion of work in each area. Do not use solvent to clean hardware that may remove permanent lacquer finish.
E. Protect new and existing data cabling from paint overspray. All data cabling (including concealed or above ceilings) shall be protected from paint overspray or installed after painting is completed. Paint on data cabling voids the cable manufacturer’s warranty. Any data cabling with paint on them shall be replaced by the contractor at no additional cost to the Owner.
F. Provide “Wet Paint” or other warning indicator(s) as required to protect newly painted finishes.

## 1.9 FIELD QUALITY CONTROL

A. Request review of first finished room, space, or items of color scheme(s) required by Contracting Officer for color, texture, and workmanship.
B. Use first acceptable room, space or items as project standard for each color scheme.
C. For spray application, paint surface not smaller than 100 square feet.
D. Cut paint around fixed items neatly and with uniform edge at existing and new construction. Uneven lines will not be accepted and will require repainting.

## 1.10 EXTRA MATERIALS

A. Provide Owner with one full gallon of each color, type and surface texture. Label each container with color, type, texture and room locations in addition to manufacturer’s label. Provide inventory list of extra materials provided.

# PART 2 - PRODUCTS

## 2.1 ACCEPTABLE MANUFACTURERS

A. Refer to "Painting and Finishing Schedule" at the end of this section. For the products are listed, equal products, as determined by the Contracting Officer, as manufactured by ICI, Diamond Vogel, Pittsburgh Paints, Benjamin-Moore Co., P&L, Iowa Paint, Tnemec, or Sherwin-Williams, can be offered as a substitute, provided that the following information is submitted and approved by the Contracting Officer within thirty (30) days from the date the Contractor receives the Contracting Officer’s approval of painting Subcontractor:
   1. A revised Schedule of Painting to follow the outline under 3.7 and 3.8 of this section to indicate the following:
      a. Proprietary product name as it appears in the Schedule of Painting or addenda.

b. Proposed product name as it will appear on the label.
c. Proposed product catalog number.
d. Manufacturer's printed information indicating:
1) Chemical description of product.
2) Spreading rate per gallon for each type of surface or use.
3) Dry mil. thickness developed at the above rate.
4) Thinning recommendations to achieve items (2). & (3), above.
5) Dust free time and re-coat time.

2. Samples of each finish for sheen evaluation, abrasive resistance testing, and washability, if required by Contracting Officer.
3. The information and samples prepared and submitted in duplicate.

B. Contractor shall verify in writing within the 30-day time period that he either intends to apply the proprietary products listed in the Schedule of Painting or shall submit for approval the information required under Paragraph 2.1.A for another listed approved manufacturer.

## 2.2 MATERIALS

A. Paint, Enamel, & Fillers: Type and brand listed herein.
B. Paint Accessory Materials Linseed oil, shellac, turpentine, and other materials not specifically indicated herein, but required to achieve the finishes specified of high quality and approved manufacturer.
C. Paints: Ready-mixed, except filed catalyzed coating. Pigments, fully ground and maintaining a soft paste consistency, capable of readily and uniformly dispersed to a complete homogeneous mixture.
D. Paints to have good flowing and brushing properties and be capable of dry or curing free of streaks or sags.

# PART 3 - EXECUTION

## 3.1 INSPECTION

A. Thoroughly examine surfaces scheduled to be painted prior to commencement of work. Report in writing to Contracting Officer any conditions that may potentially affect proper application. Do not commence until such defects have been corrected.
B. Correct defects and deficiencies in surfaces that may adversely affect work of this section.

## 3.2 PREPARATION OF SURFACES

A. Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry completely.
B. Remove contamination from gypsum wallboard surfaces and prime to show defects, if any. Paint after defects have been remedied.
C. Remove surface contamination and oils from galvanized surfaces and wash with solvent. Apply coat of etching type primer.
D. Remove surface contamination and oils from zinc coated surfaces and prepare for priming in accordance with metal manufacturer's recommendations.
E. Remove dirt, loose mortar, scale, powder, and other foreign matter from concrete and concrete block surfaces that are to be painted or to receive a clear seal. Remove oil and grease with a solution of trisodium phosphate, rinse well, and allow to thoroughly dry.
F. Remove stains from concrete and concrete block surfaces caused by weathering or corroding metals with a solution of sodium metasilicate after being thoroughly wetted with water. Allow to thoroughly dry.
G. Remove grease, rust, scale, dirt and dust from steel and iron surfaces. Where heavy coating of scale is evident, remove by wire brushing, sandblasting, or any other necessary method. Ensure steel surfaces are satisfactory before paint finishing.

H. Clean unprimed steel surfaces by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime surfaces to indicate defects, if any. Paint after defects have been remedied.
I. Sand and scrape shop primed steel surfaces and existing hollow metal doors and frames to remove loose primer, paint, and rust. Feather out edges to make touch up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
J. Remove dust, grit and other contaminants from miscellaneous wood items prior to staining or painting. Spot coat knots, pitch streaks and sappy sections with sealer. Fill nail holes and cracks after primer has dried and sand between coats. Back prime interior woodwork.
K. At existing surfaces, previously painted, be sure surface is free of all dirt, dust, oil, wax, grease, loose paint, soap residue and all other contaminants.
L. All existing misc. anchoring components (nails, screws, expansion anchors, hangers, etc.), shall be removed by Contractor from existing exposed surfaces. All existing or new holes, voids, cracks or otherwise damaged wall surfaces shall be patched and repaired to match existing surfaces prior to application of new finishes.

## 3.3 APPLICATIONS

A. Apply each coat at proper consistency.
B. Each coat of paint is to be slightly darker than preceding coat unless otherwise approved by Contracting Officer.
C. Sand lightly between coats to achieve required finish.
D. Do not apply finishes on surfaces that are not sufficiently dry.
E. Allow each coat of finish to dry before following coat is applied, unless directed otherwise by manufacturer.
F. Apply each paint system to completely cover and provide uniform color and sheen and be free from brush and lap marks.
G. Refinish entire wall or surface where portion of finish has been damaged or is otherwise unacceptable by work of this section.
H. Prime top and bottom edges of metal doors with enamel undercoat when they are to be painted.
I. Prime and paint cut ends of metal glazing stops.
J. Back prime interior woodwork which is to receive paint or enamel finish, with enamel under coater.

## 3.4 MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to mechanical and electrical sections with respect to color coding, identification banding of equipment, ducting, piping and conduit.
B. Remove grilles, covers and access panels for mechanical and electrical systems from location and paint separately.
C. Finish paint primed equipment to color selected.
D. Replace identification markings on mechanical or electrical equipment when painted over or spattered.
E. Painting contractor shall paint new and existing exposed conduit and electrical equipment, ductwork, gas piping, etc., occurring in (new and existing) finished areas. Unless specified otherwise, color and sheen shall match adjacent surfaces.
F. Painting contractor shall paint existing wall, ceiling and exposed structural surfaces, where gaps or color-changes in the existing paint system result from the removal of exposed conduit and electrical devices & equipment, thermostats, gas piping, etc. Color and sheen to match adjacent surfaces.
G. Painting contractor shall paint both sides and edges of plywood backboards for electrical equipment before installing backboards and mounting equipment on them.
H. Painting contractor shall prime and paint insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars and supports, except where items are placed or covered with a pre-finished coating.

I. Painting contractor shall paint interior surfaces of air ducts, convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line. Paint dampers exposed immediately behind louvers, grilles, convector and baseboard cabinets to match face panels.
J. Mechanical and electrical sub-contractors shall color code equipment, piping, conduit and exposed ductwork in accordance with requirements indicated in Divisions 22, 23, 26 & 27. Color banding and identification (flow arrows, naming, numbering, etc.).

## 3.5 CLEANING

A. As work proceeds and upon completion, promptly remove paint where spilled, splashed, or spattered.
B. During progress of work, keep premises free from any unnecessary accumulation of tools, equipment, surplus materials, and debris.
C. Upon completion of work, leave premises neat and clean to the satisfaction of Contracting Officer.
D. Painting equipment is to be cleaned in Contractor furnished receptacles with waste being properly disposed. The waste is not to be poured down the sanitary sewer, storm sewer or poured out on the ground. Any costs incurred by the Owner for cleanup will be charged to the Contractor.

## 3.6 PAINTING AND FINISHING SCHEDULE (GENERAL)

A. New and existing walls indicated for paint shall be painted from finish floor to minimum 6” above finished ceiling. Where room is exposed to structure, paint to top of wall or underside of roof deck.
B. Prime coats, specified below, may be omitted where factory-applied shop coats are specified in other sections.
C. Prime coats, specified below, may be omitted from existing surfaces to be recoated provided the existing coating is sound.
    1. **SURFACES NOT TO BE COATED:**
        a. Cast-In-Place & Precast Concrete,
        (unless specifically called out to be painted).
        b. Nonferrous metal.
        c. Rubber.
        d. Elastomeric sealants.
        e. Face brick.
        f. Pre-finished sheet metal.
        g. Acoustical tile.
        h. Items having complete factory finish,
        (unless specifically called out to be painted).
        i. New and existing data cables.

## 3.7 PAINTING AND FINISHING SCHEDULE (EXTERIOR)

A. Ferrous Metals, Hollow Metal Doors & Frames, Sectional Doors, Lintels, Bollards, Grease Trap Lids, Signage, Ladders, Exposed Structural Items, Miscellaneous Metals, Steel Plates at Sidewalks, Handrails and Railings, all architectural and Miscellaneous Steel:
    1. Spot prime damaged areas with 10-99 primer, as manufactured by Tnemec Company, Inc.
    2. Galvanized items shall be thoroughly wiped with solvent-dampened rags.
    3. Galvanized Metal Only: One coat Tnemec 66-1211 Epoxoline Primer, 4.0 dry mils/coat.
    4. Two coats Tnemec Series 73 Endura-Shield III, 2.0 dry mils/coat.

## 3.8 PAINTING AND FINISHING SCHEDULE (INTERIOR)

A. Hollow Doors and Frames, convector enclosures (not factory finished or if called out to be painted), Lintels, Structural Steel, Miscellaneous Metals:
   1. Spot prime damaged areas with compatible primer.
   2. Two coats ICI Ultra-Hide Alkyd Semi-Gloss #1516.
B. New and Existing Gypsum Board - Paint:
   1. One Coat Latex Primer/Sealer ICI Bloxfil #4000.
   2. Two coats ICI Ultra-Hide Semi-Gloss Latex #1416.
   3. Each coat shall be sprayed and then back-rolled.
C. New and Existing Gypsum Board – Epoxy Paint:
   4. One Coat Latex Primer/Sealer PrepRite 200 Latex Primer.
   5. Two coats ICI Tru-Glaze (Semi-Gloss Waterborne) Epoxy #4406.
   6. Each coat shall be sprayed and then back-rolled.
D. Wood (called out to be painted):
   1. One coat ICI Ultra-Hide Oil/Alkyd Interior Wood Undercoater #1120.
   2. Two coats ICI Ultra-Hide Alkyd Semi-Gloss #1516.
E. Other Surface Called for on Drawings:
   1. Provide one coat of appropriate primer-undercoat followed by two coats of finish.

## 3.9 HIGH PERFORMANCE PAINT

A. Minimum 71% solids by weight.
B. Locations:
   1. Exterior lintels and exposed structural items.
   2. Steel plates at exterior site features.
   3. All architectural or miscellaneous exterior steel.
   4. Exterior steel doors and frames.

END OF SECTION

# SECTION 10 28 00

# TOILET BATH AND OFFICE ACCESSORIES

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. Toilet and office accessories.
B. Attachment hardware.

### 1.2 SUBMITTALS

A. Submit manufacturer's product data to illustrate each accessory at large scale and show installation method.

### 1.3 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver accessories to site until rooms that they are to be installed are ready to receive them.
B. Pack accessories individually in a manner to protect accessory and its finish.

### 1.4 PROTECTION

A. Protect adjacent or adjoining finished surfaces and work from damage during installation of work of this Section.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Unless noted otherwise, accessories identified below are manufactured by Bobrick Washroom Equipment, Inc.; www.bobrick.com similar accessories by the following manufacturers are approved:
   1. American Specialties, Inc.; www.americanspecialties.com
   2. Bobrick Washroom Equipment, Inc.; www.bobrick.com.
   3. Bradley Corporation; www.bradleycorp.com
   4. Glarco Products Inc.; www.glarco-products.com
   5. Alternate manufacturers of accessories: Submit per Section 01 60 00 - Product Requirements.
B. Schedule of Accessories:
   1. T1 Mirrors: No. B-165-2436, ¾" x ¾" one-piece rolled formed frame, type 304 stainless steel angle with satin finish. Installed on concealed wall hanger with theft-proof mounting.
      a. Employee Restroom 104: Qty. (1).
   2. T2 Soap Dispensers: Bobrick No. 818615, Heavy-Duty Manual Liquid Soap Dispenser, 40-fl oz. Satin Finish.
      a. Employee Restroom 104: Qty. (1).
      b. Offender Restroom 102: Qty. (2).
   3. T3 Recessed Combination Paper Towel Dispenser and Waste Receptacle: Stainless Steel Satin Finish Bobrick No. B-4369,or approved equal.
      a. Employee Restroom 104: Qty. (1).
   4. T4 Semi-Recessed Combination Paper Towel Dispenser and Waste Receptacle: Stainless Steel Satin Finish Bobrick No. B-43944,or approved equal.
      a. Offender Restroom 102: Qty. (2).

5. T5 Semi-Recessed Toilet Tissue Dispensers: Stainless Steel Satin Finish Bobrick No. B-4388, or approved equal. Two (2) rolls. Keyed locking device. Controlled delivery not allowed.
   a. Employee Restroom 104: Qty. (1).
   b. Offender Restroom 102: Qty. (3).
6. T6 Stainless-steel Privacy Panel: KryptoMax Model KM-SCRN-48 Privacy Panel, or approved equal.
   a. Offender Restroom 102: Qty. (3).
7. Grab Bars – HC Restroom: 1¼ inch diameter, peened grip. Provide appropriate anchor for fastening to wood stud framed wall. Reference drawings for size and mounting heights.
   a. T-7: Employee Restroom 104: Qty. (1).
   b. T-8: Employee Restroom 104: Qty. (1).
   c. T-9: Employee Restroom 104: Qty. (1).
8. T10 Mop Holder: Bobrick No. B-223 x 36, wall mounted (Provide appropriate anchors for fastening to wood stud framed wall).
   a. Janitor 103: Qty. (1).

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates and rough-in measurements as required.
B. Before starting work notify Architect in writing of any conflicts detrimental to installation or operation of units.
C. Verify with Architect exact location of accessories not listed or provided for in the drawings.

### 3.2 INSTALLATION

A. Install fixtures, accessories, and items in accordance with manufacturer's printed instructions.
   1. Where mounting heights and/or locations are not shown on the drawings, verify with Architect.
B. Install fixtures true, plumb, and level. Anchor to substrate in a secure and rigid manner.
C. Use tamper-proof fasteners.

END OF SECTION

# SECTION 10 44 13

# FIRE PROTECTION SPECIALITIES

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. Fire Extinguishers: 10-pound
B. Fire Extinguisher Bracket
C. Accessories

### 1.2 REFERENCES

A. NFPA1 0 – Portable Fire Extinguishers

### 1.3 SHOP DRAWINGS

A. Submit Shop Drawings indicating sizes, dimensions, finishes, and anchors.

## PART 2 – PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

A. Where indicated on drawings, provide fire extinguisher cabinets, brackets and accessories as manufactured by one of the following approved manufacturers:
   1. J.L. Industries, Inc.; www.jlindustries.com, Model: Ambassador Series
   2. Larsen’s Manufacturing Company; www.larsensmfg.com, Model: Architectural Series
   3. Strike First Corporation; www.strikefirstusa.com, Model: Elite Series
   4. Substitutions: See Section 01 60 00 Product Requirements

### 2.2 MATERIALS AND COMPONENTS

A. Wall Bracket:
   1. Noted “FE” on drawings.
   2. Type as required to mount fire extinguishers listed below.
B. Fire extinguishers:
   1. Extinguishers as manufactured by Amerex; Model B456.
   2. No substitutions.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install brackets and cabinets in locations and mounting heights indicated. Comply with applicable regulations of governing authorities.
   1. Installation Height:
      a. Brackets: 52" from floor to top of fire extinguisher.
B. Securely fasten mounting brackets to structure, square and plumb, to comply with manufacturer’s instructions. Beginning of installation means acceptance of existing conditions.
   1. Provide appropriate anchor for fastening to wood stud framed wall.

## 3.2 CLEANING

A. Clean all surfaces in accordance with manufacturer's instructions
B. Remove debris from work site.

## 3.3 SCHEDULE

A. Brackets: Reference drawings for quantity and locations.

END OF SECTION

**SECTION 13 34 00**

**ENGINEERED POST FRAME STRUCTURES**

**RFB #923902-01**

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Engineered wood-framed structures consisting of the following components:
      a. Factory-engineered wall columns.
      b. Factory-engineered roof truss.
      c. Factory-engineered metal roof and wall panels.
      d. Prefinished metal trim items.
      e. Prefinished ridge vents and soffits.
      f. Prefinished metal gutters and downspouts.
      g. Roof and wall insulation.

### 1.2 REFERENCES

A. Reference Standards:
   1. Preservative Treated Lumber:
      a. American Wood Preservers Association (AWPA).
   2. Lumber grading rules and wood species:
      a. National Design Specifications for Wood Construction, current edition.
      b. Northeastern Lumber Manufacturer's Association, Inc. (NELMA).
      c. Southern Pine Inspection Bureau (SPIB): Southern Pine.
      d. West Coast Lumber Inspection Bureau (WCLIB): Douglas Fir.
      e. Western Wood Products Association (WWPA): Douglas Fir and Ponderosa Pine.
   3. MSR Lumber Producers Council (MSR) for machine stress rated lumber.
   4. National Design Specifications for Wood Construction.
   5. National Design Standard for Metal Plate Connected Wood Truss Construction (TPI).

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-engineered product. Indicate component materials, dimensions, profiles, and construction and installation details.
   1. Include information for specialty accessory products specified for this Project.
   2. Include data for wood-preservative treatment from chemical treatment manufacturers and certification by treating plants that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   3. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to truss fabricator.
   4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Sizes, stress grades, and species of lumber.
   2. Anchor-bolt layout.
   3. Structural Framing Drawings: Show complete fabrication of primary and secondary framing. Include provisions for openings and the following information:
      a. Slope or depth, span, and spacing of truss.
      b. Heel bearing height.
      c. Design loading to include:
         1) Top chord live load.

2) Top chord dead load.
3) Bottom chord dead load.
4) Concentrated loads and their points.

d. Adjustments to lumber and plate design values for conditions of use.
e. Plate type, thickness of gauge, and size.
f. Lumber size, species and grade for each member.
g. Truss framing bracing layout and connections.

4. Metal Roof and Wall Panel Layout Drawings: Show layouts of metal panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, and special details. Indicate the following components:
   a. Roof mounted items.
   b. Wall mounted items.
5. Submit Shop Drawings that have been engineered and certified by professional engineer licensed in the State in which Project is located. Include seal and signature of professional engineer on Shop Drawings.

C. Design Data: Truss and support framing engineering calculations for loading and stresses, bearing seal and signature of professional engineer licensed in the State in which Project is located. Include the following calculations:
   1. Minimum design shall meet design standards of the latest edition of the International Building Code unless other, more stringent requirements are in force in Project location.
   2. Bending moments and axial forces for each member.
   3. Basic plate design values.
   4. Design analysis for each joint indicating that proper plates have been used.
   5. Provide design calculations for exterior walls, canopies, soffit systems, and lateral bracing walls. Design wind loads and lateral bracing loads are indicated on structural Drawings.
   6. Submit design calculations that have been engineered and certified by professional engineer licensed in the State in which Project is located. Include seal and signature of professional engineer on calculations
D. Samples for Initial Selection: For each finish product specified, provide complete sets of color chips representing manufacturer's full range of available colors and patterns.

## 1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:
   1. Wood-preservative-treated wood.
   2. Engineered wood products.
B. Quality Control Submittals:
   1. Test Reports: Certified test reports showing compliance with specified performance characteristics.
   2. Certification: Manufacturer’s certification that Products furnished meet specified design and performance criteria.
C. Submit written proof of third party inspection program in force for truss manufacturers used on Project.
D. Certifications: Certify that specified roof and wind load requirements are met.

## 1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer that participates in recognized quality-assurance program that complies with quality-control procedures and that involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.
   1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
   2. The manufacturer shall have engineering department.

3. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by qualified professional engineer.

B. Erector Qualifications: An erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

C. Source Limitations: Obtain engineered post frame building components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Handle and store materials per manufacturer's requirements.

B. Handle and store trusses to comply with recommendations in TPI BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."
   1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
   2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
   3. Provide air circulation around stacks and under coverings.
   4. Store trusses to avoid contact with other materials that could create staining or discoloration.

C. Inspect trusses upon deliver to Project site and notify manufacturer immediately if members have damage from handling or show discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

## 1.7 WARRANTY

A. Manufacturer's Special Warranty – Treated Material: Manufacturer agrees to repair, restore, or replace columns that fail in materials within specified warranty period.
   1. Warranty Period: 50 years from date of Substantial Completion.
   2. Manufacturer shall repair treated structural columns that fail because of insect damage or because of decay that occurs under normal conditions and proper use. If manufacturer is not able to repair structural posts to satisfaction of Architect and Owner, manufacturer shall replace damaged treated structural columns.

B. Special Warranty on Metal Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes the following:
      a. Color fading more than 5 Hunter units when tested per ASTM D2244.
      b. Chalking in excess of a No. 8 rating when tested per ASTM D4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: From date of Substantial Completion, 40 years on chalk; 30 years on color change:
   3. Warranty Exclusions: Manufacturer will not warrant metal panel finishes damaged due to exposure to atmospheric pollutants including animal waste or other corrosive conditions. Manufacturer will not warrant labor by others.
   4. Manufacturer shall repair painted steel roofing or siding panels if the paint peels, cracks, checks, flakes or blisters to an extent that is apparent by ordinary outdoor visual observation when exposed to normal weather and atmospheric conditions. If manufacturer is not able to repair steel panels to satisfaction of Architect and Owner, manufacturer shall replace damaged steel panels.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

A. Structural Frame Design:
   1. Design shall be based on the building framing and enclosure as noted.
      a. Type: Clear span roof truss or rafter style roof framing with interior column lines.
      b. Maximum Width: 124 feet.
      c. Maximum Clear Height: 30 feet.
      d. Columns: Bolted to foundation.
      e. Purlins: Recessed between trusses in galvanized steel joist hangers Or on-edge above truss, factory drilled and fastened with 3/16 inch x 6 inches screw.

B. Dimensions:
   1. Interior post spacing shall be on center, except for end bays which shall be from center of first interior bay post to the outside of endwall framing.
   2. Width: 100 feet, outside to outside of primary or secondary wall framing.
   3. Length: Outside to outside of primary or secondary wall framing.
      a. Base Bid Length: 150 feet.
      b. Alternate No.1: 200 feet.
   4. Height: 24 feet, clearance from top of floor to underside of truss or rafter.
   5. Roof Slope: 4:12 (units of rise per 12 units of run).
   6. Ceiling Slope: None.

### 2.1 PERFORMANCE CRITERIA

A. Design Requirements:
   1. Design wood members per formulas published in National Design Specifications (NDS) for Wood Construction.
   2. Design light meta-toothed connector plates and joint design in compliance with Truss Plate Institute's (TPI) National Design Standard for Metal Plate Connected Wood Truss Construction.
   3. Include unbalanced roof loads required by ASCE-7, current edition.

### 2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC3b for exterior construction not in contact with ground and Use Category UC4a for items in contact with ground.
   1. Preservative Chemicals:Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
   2. For exposed items indicated to receive stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Maximum moisture content of 19 percent or per appropriate grading rules. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of inspection agency approved by ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:
   1. Laminated columns.
   2. Baseboards.
   3. Hold down blocks.

### 2.3 MATERIALS – WOOD

A. Laminated Columns: Factory-fabricated from minimum 3 ply 2x6 #1 or better Southern yellow pine.

1. Columns over 20 Feet Lengths: Spliced laminated plies per approved Shop Drawings and manufacturer's design. Bases of design is laminated 2x8 columns.
2. Preservative-Treatment: Treat portions of columns designed to be in contact with ground to net retention of 0.60 pounds per cubic foot of CCA per AWPA U1 requirements.

B. Wood Trusses: Factory-fabricated of surfaced lumber.
1. Lumber:
a. Top and Bottoms Chords: No. 1 or better Southern yellow pine or comparable Spruce-pine-fir.
b. Webs: No. 2 or better Southern yellow pine or SPF.
2. Metal Connector Plates: Fabricated from ASTM A653; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A); G60 hot-dip galvanizing coating designation.
a. Plate Thicknesses: 0.036 inch and 0.0556 inch thick.

C. Baseboards: 2x8 No. 2 or better Southern yellow pine, tongue-and-groove.
1. Preservative-Treatment: Treat baseboards for ground contact conditions per AWPA U1 requirements. Preservative shall penetrate 100 percent of sapwood.

D. Wall Girts: 2x6 girts, No. 1 or better Southern yellow pine.

E. Purlins and Truss Ties: 2x4 laid on edge, MSR SPF 1650.
1. Purlins may be installed over top chord of truss, flat, or in purlin hangers. Where purlins and truss ties are set in hangers, provide 2x6 laid on edge, MSR SPF 1650 or No. 1 or better Southern yellow pine.

F. Overhang Framing: Fabricated rafter frames.
1. Provide factory beveled fascia boards, 2x6 Spruce-pine-fir, No. 2.

G. Wind Bracing:
1. 2x6, No. 2 or better Spruce-pine-fir from end wall column to first truss back.
2. 2x4 diagonal in roofline bracing as required by design.

H. Framing Around Openings:
1. Provide 2x6 / 2x4 No. 2 around door, window, and overhead sectional door openings.

I. Headers:
a. Option 1: Provide built-up No. 1 or better Southern yellow pine headers as required to meet loading designs.
b. Option 2: Structural steel header and jamb columns as required to meet loading designs.

J. Incidental Framing: No.2 or better 2x4.

## 2.4 MATERIALS – PREFINISHED MATERIALS

A. General: Factory-formed metal panels, roll-formed in manufacturer's facility, designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.

B. Metal Panels: Exposed-fastener metal roof and wall panels, formed with raised ribs and recesses.
1. Material: Zinc-coated (galvanized) steel sheet, 0.0125 inch nominal thickness.
a. Exterior Finish: Siliconized polyester.
b. Color:
1) Roof Panels: Regal Blue / Gallery Blue.
2) Wall Panels: Slate Gray / Pewter Gray.
2. Rib Spacing: 2 major ribs at 9 inches on center. 2 minor ribs at 3 inches on center between major ribs.
3. Panel Coverage: 36 inches.
4. Panel Height: 7/8 inch.

C. Metal Trim: Match material and color of metal panels. Provide trim for corners, ridge lines, rakes, eaves, and panel bases.
1. Lengths: Minimum 10 feet.
2. Trim, overhang fascias, track covers, and slide door jambs available in building panel covers.

3. Overhead Sectional Door and Slide Door Jamb Trim: Fabricated from 1 piece up to 10 feet in length.

D. Soffits: Aluminum or steel, vented as required. Colors shall match roof panel color.
E. Gutters and Downspouts: Provide manufacturer's standard gutters and downspouts as shown in Drawings. Colors shall match roof panel color.
F. Ridge Vent: Manufacturer’s standard pre-engineered ridge cap or ridgelite, flashings, and eave and gable trim. Field-fabricate minor flashings as indicated on approved Shop Drawings.
   1. Provide manufacturer’s standard ridge vents.
      a. Continuous Vented Ridge: 12 square inches per lineal foot.

## 2.5 RELATED MATERIALS

A. Closure Strips: Closed cell, 2 psf density polyethylene foam, pre-molded to match configuration of panels.

## 2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
   1. Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153.
   2. Exposed Fastener Heads: Match color of steel panel.
   3. Where steel panels or trims are attached to preservative-treated lumber, provide fasteners of unpainted Type 304 stainless steel.
B. Nails, Brads, and Staples: ASTM F1667.
   1. Framing Lumber: 10d, 16d and 60d ring shank nails.
   2. Machine Bolts: Minimum grade 1, A307.
   3. Metal Panels: Minimum 1-1/2 inch No. 10 screw fasteners with EPDM sealing washers bearing on weather side of metal panels.
      a. Match color of metal panels.

## 2.7 INSULATION

A. Blanket Insulation: ASTM C 665, Type I, Class A, Unfaced Fiberglass Blanket.
   1. Thermal Resistance: R-20.
   2. Flame Spread, ASTM E 84: Less than 25.
   3. Smoke Developed, ASTM E 84: Less than 50.
B. Blanket Insulation: ASTM C 665, Type II, Class C, Kraft Faced Fiberglass Blanket.
   1. Thermal Resistance: R-20.
   2. Water Vapor Transmission, ASTM E 96, 1.00 Perm (57.45 ng/(Pa*s*m^2) or less.
C. Blanket Insulation: ASTM C 991, Type II, Preformed Poly-Scrim-Kraft-Faced Fiberglass Blanket, located between framing and exterior sheathing:
   1. Thermal Resistance: R-6 (R-1.06).
   2. Facing: 0.0015 inch white polypropylene film, fiberglass scrim reinforcement, and 12 lb. craft paper. 3 mil cross laminated high density polyethylene.
   3. Physical Properties:
      a. Flame Spread, ASTM E 84: Less than 25
      b. Smoke Developed, ASTM E 84: Less than 50
      c. Water Vapor Transmission, ASTM E 96: 0.02 Perms (1.15 ng/(Pa*s*m^2).
      d. Light Reflectivity, ASTM C 523, illuminant D-6500: 87 percent.
D. Mineral Wool (Owens Corning Thermafiber Fire & Sound Guard Plus).
   1. Thermal Resistance: R-21.
   2. Water Vapor Sorption, ASTM C 1104, Sorption less than 1% by volume.
E. Continuous High Compression Mineral Wool (Owens Corning Thermafiber Rainbarrier CI HC (80)) located between framing and exterior sheathing:

1. Thermal Resistance: R-4.2 per inch minimum.
2. Water Vapor Sorption, ASTM C 1104, Sorption less than 0.1% by volume.
3. Installed between exterior wall cladding and wall girt framing. Provides continuous insulation (ci).

F. If application exposes insulation to heated building space, install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.

### 2.7 FABRICATION

A. Shop-fabricate wood trusses in TPI inspected plant.
B. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
C. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
D. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
   1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
E. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
B. Before erection proceeds, survey elevations and locations of concrete-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.
   1. Engage land surveyor to perform surveying.
C. Verify that mechanical and electrical utilities are in correct position.
D. Proceed with erection only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent framing, connections, and bracing are in place unless indicated otherwise.

### 3.3 ERECTION OF FRAMING

A. General: Do not use materials that are unsound, warped, improperly finished, or with defective surfaces, sizes, or patterns.
   1. Comply with frame manufacturer's approved Shop Drawings for details and building erection.
   2. Comply with NFBA document “Accepted Practices for Post-frame Construction Framing Tolerances.”
B. Columns:
   1. Coordinate installation of cast-in-concrete column anchors and/or brackets with foundation wall installer.
   2. Install column anchorage brackets per approved Shop Drawings and manufacture’s recommendations.

3. Install the column into anchorage brackets per approved Shop Drawings and manufacture's recommendations.

C. Baseboards: Install 1 run of 2-inch by 8-inch tongue-and-groove plank, at grade, using manufacturer recommended fasteners.
D. Wall Girts: Install at centers indicated on Drawings.
   1. If required, install overhang framing at top of wall girts.
E. Trusses:
   1. Set trusses in place in center of column using lifting methods as approved by manufacturer.
   2. When trusses are properly positioned, install 1/2-inch machine bolt and manufacturer recommended 20d ring shank nails through 2 of column laminates and truss heel, or as indicated in approved Shop Drawings.
   3. Brace trusses per WTCA guidelines and BCSI Manual
F. Purlins: Install purlins with fasteners and at spacings per approved Shop Drawings.
G. Truss Ties: Install truss ties at locations recommended by structure manufacture and per approved Shop Drawings
   1. Run truss ties from end wall to end wall.
H. Incidental Framing: Install 2x4 or 2x6 blocking as required per structure manufacturer's recommendations.

## 3.4 METAL PANEL INSTALLATION, GENERAL

A. Install metal panels per manufacturer's established construction procedures.
B. Install metal panels and components plumb, square, straight, and true to lines, and to assure freedom from rattles.
C. Take care when cutting prefinished materials to ensure cuttings do not remain on finished surface.
D. Properly install fasteners taking care to not under- or overdrive.

## 3.5 METAL PANEL INSTALLATION

A. Roofing Panels: Install panels perpendicular to supports aligned straight with end fascias and fasten to purlins. Anchor with fasteners at spacings recommended by manufacturer and design loads.
B. Wall Panels: Install metal panels perpendicular to wall girt and purlin supports, aligned level and plumb. Anchor with fasteners at spacings recommended by manufacturer and design loads.
C. Vented Ridges: Fasten vented ridges to structure as indicated on Drawings, maintaining manufacturer's minimum clear throat opening.
D. Soffits: Install soffits to interlock with trim items at top of steel siding and at fascias.
   1. Solid or optional vented soffit shall be used at end overhang.
   2. A combination of solid and perforated soffits shall be provided for balanced ventilation at side overhangs.
E. Trim Items: Install trim items at base, wainscot transitions, corners, top of steel siding, fascia, gables, and ridges using no less than 1 inch screw fasteners.
   1. Trim items shall be installed at the base, at any wainscot transition, corners, top of steel siding, fascias, gables and ridge using appropriate 1" screw fasteners.
F. Closure Strips: Provide closure strips at top and bottom of roofing panels.

## 3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
B. Inspections: Refer to Section 01 45 00 "Special Inspections and Tests" for required verifications and inspections.

END OF SECTION

**SECTION 21 05 00**

**COMMON WORK RESULTS FOR FIRE SUPPRESSION**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Pipe, fittings, sleeves, escutcheons, seals, and connections for sprinkler systems.

### 1.02 REFERENCE STANDARDS

A. ASME A112.18.1 - Plumbing Supply Fittings; 2012.

B. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.

C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2010.

D. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.

E. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2011.

F. ASME B16.9 - Factory-Made Wrought Buttwelding Fittings; 2012.

G. ASME B16.25 - Buttwelding Ends; 2012.

H. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999 (Reapproved 2014).

I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

J. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2009 (Reapproved 2014).

K. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015.

L. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).

M. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2013.

N. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2013.

O. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.

P. AWWA C606 - Grooved and Shouldered Joints; 2011.

Q. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.

R. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

S. UL 262 - Gate Valves for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

T. UL 312 - Check Valves for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

### 1.03 SUBMITTALS

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

B. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.

C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

D. Project Record Documents: Record actual locations of components and tag numbering.

E. Operation and Maintenance Data: Include installation instructions and spare parts lists.

**1.04 QUALITY ASSURANCE**

A. Manufacturer Qualifications: Company specializing in manufacturing the Products in this section must posses documented acceptable industry experience of the type specified.

B. Installer Qualifications: Company specializing in performing the work of this section must possess minimum acceptable industry experience installing fire suppression systems of the specified type and provide contract maintenance serves as a regular part of their business.

C. Conform to UL and FM requirements.

D. Valves: Bear UL and FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.

E. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

F. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

**1.05 DELIVERY, STORAGE, AND HANDLING**

A. Deliver and store valves in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

**PART 2 PRODUCTS**

**2.01 GENERAL REQUIREMENTS**

A. Sprinkler-based System :
   1. Comply with NFPA 13.
   2. See Section 21 1300.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

C. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

**2.02 BURIED PIPING**

A. Steel Pipe: ASTM A53/A53M Schedule 40, ASTM A135/A135M Schedule 10, ASTM A795/A795M Standard Weight, or ASME B36.10M Schedule 40, black, with AWWA C105/A21.5 polyethylene jacket, or double layer, half-lapped polyethylene tape.
   1. Steel Fittings: ASME B16.9, wrought steel, buttwelded, ASME B16.25, buttweld ends, ASTM A234/A234M, wrought carbon steel or alloy steel, ASME B16.5, steel flanges and fittings, or ASME B16.11, forged steel socket welded and threaded; with double layer, half-lapped polyethylene tape.
   2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings.
   3. Joints: Welded in accordance with AWS D1.1/D1.1M.

**2.03 ABOVE GROUND PIPING**

A. Steel Pipe: ASTM A795 Schedule 10, ASTM A53 Schedule 40, or ASTM A135/A135M Schedule 10, black.
   1. Steel Fittings: ASME B16.5, steel flanges and fittings.
   2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
   3. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.
   4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

5. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

**2.04 PIPE SLEEVES**

A. Vertical Piping:
   1. Sleeve Length: 1 inch above finished floor.
   2. Provide sealant for watertight joint.
   3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.
   4. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.

B. Plastic, Sheet Metal, or Moisture-Resistant Fiber: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

C. Clearances:
   1. Rated Openings: Caulked tight with firestopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

**2.05 ESCUTCHEONS**

A. Manufacturers:
   1. Fire Protection Products, Inc: www.fppi.com.com.
   2. Tyco Fire Protection Products: www.tyco-fire.com.
   3. Viking Group Inc: www.vikinggroupinc.com.
   4. Engineer approved equivalent.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Material:
   1. Grade TP304, seamless tube, ASTM A269/A269M stainless steel.
   2. Metals and Finish: Comply with ASME A112.18.1.

C. Construction:
   1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
   2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

**2.06 PIPE HANGERS AND SUPPORTS**

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.

E. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.

F. Vertical Support: Steel riser clamp.

G. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

**2.07 MECHANICAL COUPLINGS**

A. Manufacturers:
   1. Victaulic Company; FireLock Style 009H: www.victaulic.com/#sle.
   2. Engineer approved equivalent.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Rigid Mechanical Couplings for Grooved Joints:
   1. Dimensions and Testing: Comply with AWWA C606.
   2. Minimum Working Pressure: 300 psig.
   3. Housing Material: Fabricate of ductile iron complying with ASTM A536.

4. Housing Coating: Factory applied orange enamel.
5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.
6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.
7. Provide stops for direct stab installation without field assembly.

**2.08 GATE VALVES**

A. Up to and including 2 inches:
   1. Bronze body, bronze trim, rising stem, handwheel, solid wedge or disc, threaded ends.

B. Over 2 inches:
   1. Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, solid rubber covered bronze or cast iron wedge, flanged ends.

C. Over 4 inches:
   1. Iron body, bronze trim, non-rising stem with bolted bonnet, solid bronze wedge, flanged ends, iron body indicator post assembly.

**2.09 GLOBE OR ANGLE VALVES**

A. Up to and including 2 inches:
   1. Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable rubber disc, threaded ends, with backseating capacity repackable under pressure.

B. Over 2 inches:
   1. Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.

**2.10 BALL VALVES**

A. Up to and including 2 inches:
   1. Bronze two piece body, brass, chrome plated bronze, or stainless steel ball, teflon seats and stuffing box ring, lever handle and balancing stops, threaded ends with union.

B. Over 2 inches:
   1. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle or gear drive handwheel for sizes 10 inches and over, flanged.

**2.11 CHECK VALVES**

A. Up to and including 2 inches:
   1. Bronze body and swing disc, rubber seat, threaded ends.

B. Over 2 inches:
   1. Iron body, bronze trim, swing check with rubber disc, renewable disc and seat, flanged ends with automatic ball check.

C. 4 inches and Over:
   1. Iron body, bronze disc, stainless steel spring, resilient seal, threaded, wafer, or flanged ends.

**2.12 DRAIN VALVES**

A. Compression Stop:
   1. Bronze with hose thread nipple and cap.

B. Ball Valve:
   1. Brass with cap and chain, 3/4 inch hose thread.

**PART 3 EXECUTION**

**3.01 PREPARATION**

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

**3.02 INSTALLATION**

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space, to not interfere with use of space and other work.

D. Group piping whenever practical at common elevations.

E. Sleeve pipes passing through partitions, walls, and floors.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Pipe Hangers and Supports:
   1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   2. Place hangers within 12 inches of each horizontal elbow.
   3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
   5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   6. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

H. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

I. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.

J. Do not penetrate building structural members unless indicated.

K. Provide sleeves when penetrating footings, floors, walls, and partitions and seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.
   1. Aboveground Piping:
      a. Pack solid using mineral fiber complying with ASTM C592.
      b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
   2. All Rated Openings: Caulk tight with firestopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.
   3. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

L. Escutcheons:
   1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
   2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
   3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.

M. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

N. Die-cut threaded joints with full-cut, standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

O. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.

P. Provide gate valves for shut-off or isolating service.

Q. Provide drain valves at main shut-off valves, low points of piping and apparatus.

**3.03 CLEANING**

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

**END OF SECTION**

# SECTION 21 13 00

# FIRE-SUPPRESSION SPRINKLER SYSTEMS

# RFB #923902-01

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

C. Fire department connections.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 07 8400 - Firestopping.

D. Section 28 4600 - Fire Detection and Alarm.

E. Section 21 0500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION: Pipe and fittings.

F. Section 22 0553 - Identification for Plumbing Piping and Equipment.

G. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

H. Section 28 4600 - Fire Detection and Alarm.

### 1.03 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; current edition.

B. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.

C. NFPA 1963 - Standard for Fire Hose Connections; 2014.

D. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

### 1.05 SUBMITTALS

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

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Shop Drawings:
   1. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
   2. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Engineer.

D. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

E. Designer's qualification statement.

F. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements for additional provisions.

2. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
3. Sprinkler Wrenches: For each sprinkler type.

H. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

**1.06 QUALITY ASSURANCE**

A. Maintain one copy of referenced design and installation standard on site.

B. Comply with FM (AG) requirements.

C. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in Iowa.

D. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with industry acceptable documented experience.

E. Installer Qualifications: Company specializing in performing the work of this section must possess documented industry experience approved by manufacturer.

F. Equipment and Components: Provide products that bear FM (AG) label or marking.

G. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

**1.07 DELIVERY, STORAGE, AND HANDLING**

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

**1.08 EXTRA MATERIALS**

A. See Section 01 6000 - Product Requirements, for additional provisions.

B. Provide extra sprinklers of type and size matching those installed, in quantity required by referenced NFPA design and installation standard.

C. Provide suitable wrenches for each sprinkler type.

D. Provide metal storage cabinet located adjacent to alarm valve.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

A. Sprinklers, Valves, and Equipment:
1. Tyco Fire Protection Products, a Tyco Business: www.tyco-fire.com.
2. Viking Corporation: www.vikinggroupinc.com.
3. Reliable: www.reliablesprinkler.com.
4. Engineer approved equivalent
5. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 SPRINKLER SYSTEM**

A. Sprinkler System: Provide coverage for entire building.

B. Occupancy: Light hazard; comply with NFPA 13.

C. Water Supply: Determine volume and pressure from water flow test data.
1. Static pressure of 84 psi. Residual pressure of 76 psi at 1300 gpm at the CRC facility entrance Southwest of the primary Newton Correctional Facility located at 307 S 60th Ave. W., Newton, IA 50208.
2. Revise design when test data available prior to submittals.

D. Provide fire department connections where indicated.

E. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

**2.03 SPRINKLERS**

A. Suspended Ceiling Type: Concealed pendant type with matching push on cover plate.
1. Response Type: Quick.

2. Coverage Type: Standard.
3. Finish: Brass.
4. Cover Plate Finish: Enamel, color as selected.
5. Fusible Link: Glass bulb type temperature rated for specific area hazard.

B. Exposed Area Type: Pendant type with guard.
1. Response Type: Quick.
2. Coverage Type: Standard.
3. Finish: Brass.
4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

C. Sidewall Type: Recessed horizontal sidewall type with matching push on escutcheon plate.
1. Response Type: Quick.
2. Coverage Type: Standard.
3. Finish: Brass.
4. Escutcheon Plate Finish: Brass.
5. Fusible Link: Glass bulb type temperature rated for specific area hazard.

D. Storage Sprinklers: Pendant type with guard.
1. Response Type: Quick..
2. Coverage Type: Standard.
3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

E. Guards: Finish to match sprinkler finish.

## 2.04 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
1. Activate electric alarm.
2. Test and drain valve.
3. Replaceable internal components without removing valve from installed position.

B. Backflow Preventer: Double check valve assembly backflow preventer with drain and OS & Y gate valve on each end.

C. Test Connections:
1. Backflow Preventer Test Connection:
a. Provide downstream of the backflow prevention assembly, listed hose valves with 2.5 inch National Standard male hose threads with cap and chain.
b. Furnish one valve for each 250 gpm of system demand or fraction thereof.
c. Provide permanent sign reading "Test Valve" in accordance with Section 21 0553.

D. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy chrome plated gong and motor housing, nylon bearings, and inlet strainer.

E. Electric Alarm: Electrically operated chrome plated gong with pressure alarm switch.

F. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

## 2.05 FIRE DEPARTMENT CONNECTION

A. Fire Department Connections:
1. Type: Flush, wall mount made of corrosion resistant metal complying with UL 405.
2. Inlets: Two way, 2-1/2 inch swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.
3. Configuration: Horizontal.
4. Outlet: With pipe threads, 4 NPS.
5. Location: Back.
6. Rated Working Pressure: 175 psi.
7. Finish: Chrome.

8. Signage: Raised or engraved lettering 1 inch minimum indicating system type.

## PART 3 EXECUTION

### 3.01 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Install buried shut-off valves in valve box. Provide post indicator.

D. Provide approved double check valve assembly at sprinkler system water source connection.

E. Place pipe runs to minimize obstruction to other work.

F. Place piping in concealed spaces above finished ceilings.

G. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.

H. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

I. Flush entire piping system of foreign matter.

J. Install guards on sprinklers where indicated.

K. Hydrostatically test entire system.

L. Require test be witnessed by Fire Marshal.

### 3.02 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

### 3.03 SCHEDULES

A. System Hazard Areas:
   1. Equipment Wash Area (101), Offender Restroom (102), Janitor (103), Employee Restroom (104), Mech (105), Mech (105A): Light Hazard.
   2. Construction Bays (100): Ordinary Hazard, Group 2.

**END OF SECTION**

# SECTION 22 05 19

# METERS AND GAUGES FOR PLUMBING PIPING

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Pressure gauges.

B. Thermometers and thermometer wells.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

### 1.03 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.

B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.

C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014.

### 1.04 SUBMITTALS

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

B. Product Data: Provide red-marked product data sheets for each furnished item with associated components and accessories.

C. Project Record Documents: Record actual locations of components and instrumentation.

### 1.05 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

## PART 2 PRODUCTS

### 2.01 PRESSURE GAUGES

A. Manufacturers:
   1. Weksler Corp.; Model 45F: www.wekslerglass.com.
   2. Weiss Instruments: www.weissinstruments.com.
   3. Dwyer Instruments, Inc: www.dwyer-inst.com/#sle.
   4. Omega Engineering a subsidiary of Spectris, Plc; www.omega.com/#sle.
   5. Engineer approved equivalent.
   6. Substitutions: See Section 01 6000 - Product Requirements.

### 2.02 PRESSURE GAUGE TAPPINGS

A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi.

B. Needle Valve: Brass, 1/4 inch NPT for minimum 150 psi.

C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections.

D. Syphon: Steel, Schedule 40, 1/4 inch angle or straight pattern.

### 2.03 STEM TYPE THERMOMETERS

A. Manufacturers:
   1. Weksler Glass Thermometer Corp; Model #AA5H-7: www.wekslerglass.com.
   2. Weiss Instruments: www.weissinstruments.com.
   3. Dwyer Instruments, Inc: www.dwyer-inst.com.
   4. Omega Engineering, Inc: www.omega.com.
   5. Engineer approved equivalent.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
   1. Size: 7 inch scale.
   2. Window: Clear glass.
   3. Stem: 3/4 inch NPT brass.
   4. Accuracy: 2 percent, per ASTM E77.
   5. Calibration: Degrees F.

**2.04 THERMOMETER SUPPORTS**

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

A. Install metering products in accordance with manufacturer's instructions for intended fluid type and service.

B. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

C. Provide instruments with scale ranges selected according to service with largest appropriate scale.

D. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

E. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

**3.02 SCHEDULES**

A. Pressure Gauges, Location and Scale Range:
   1. Sprinkler system, 0 to 100 psi.
   2. Backflow preventers, 0 to 100 psi.

B. Stem Type Thermometers, Location and Scale Range:
   1. Domestic hot water supply and recirculation, 30 to 240 degrees F.

**END OF SECTION**

# SECTION 22 05 53

# IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 09 9123 - Interior Painting: Identification painting.

### 1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007 (ANSI/ASME A13.1).

### 1.04 SUBMITTALS

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

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Schedules:
   1. Submit plumbing component identification schedule listing equipment, piping, and valves.
   2. Detail proposed component identification data in terms of of wording, symbols, letter size, and color coding to be applied to corresponding product.
   3. Valve Data Format: Include id-number, location, function, and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

F. Project Record Documents: Record actual locations of tagged valves.

## PART 2 PRODUCTS

### 2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

A. Pipe Markers: 3/4 inch diameter and higher.

### 2.02 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Champion America, Inc: www.Champion-America.com.

C. Seton Identification Products: www.seton.com/aec.

D. Brimar Industries: www.brimar.com

E. Engineer approved equivalent.

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

### 2.03 NAMEPLATES

A. Description: Laminated piece with up to three lines of text.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch.
   3. Background Color: Black.

**2.04 TAGS**

A. Flexible: Vinyl with engraved black letters on light contrasting background color with up to three lines of text. Minimum tag size 1-1/2 inch in diameter.

B. Metal: Brass, 19 gauge 1-1/2 inch in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.

C. Valve Tag Chart: Typewritten 12-point letter size list in anodized aluminum frame.

**2.05 PIPE MARKERS**

A. Comply with ASME A13.1.

B. Flexible Tape Marker: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

C. Identification Scheme, ASME A13.1:
   1. Primary: External Pipe Diameter, Uninsulated or Insulated.
   2. Secondary: Color scheme per fluid service.
      a. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.

D. Color code as follows:
   1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.
   2. Fire Quenching Fluids: Red with white letters.
   3. Flammable Fluids: Yellow with black letters.
   4. Compressed Air: Blue with white letters.

**PART 3 EXECUTION**

**3.01 PREPARATION**

A. Degrease and clean surfaces to receive identification products.

**3.02 INSTALLATION**

A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags in clear view and align with axis of piping

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.

E. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

F. Identify control panels and major control components outside panels with plastic nameplates.

G. Identify valves in main and branch piping with tags.

H. Tag automatic controls, instruments, and relays. Key to control schematic.

I. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

J. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

**END OF SECTION**

# SECTION 22 07 19

# PLUMBING PIPING INSULATION

# RFB #923902-01

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Piping insulation.

B. Glass fiber insulation.

C. Jacketing and accessories.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 07 8400 - Firestopping.

D. Section 09 9123 - Interior Painting: Painting insulation jacket.

E. Section 22 1005 - Plumbing Piping: Placement of hangers and hanger inserts.

F. Section 23 2113 - Hydronic Piping: Placement of hangers and hanger inserts.

G. Section 23 2300 - Refrigerant Piping: Placement of inserts.

### 1.03 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.

B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013).

C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2015.

D. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

G. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

### 1.04 SUBMITTALS

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

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

### 1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with documented industry experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with documented industry experience.

### 1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

### 1.07 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

## PART 2 PRODUCTS

### 2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

### 2.02 GLASS FIBER INSULATION

A. Manufacturers:
   1. Johns Manville Corporation; "Micro-Lok": www.jm.com.
   2. Knauf Insulation: www.knaufusa.com.
   3. Owens Corning Corp: www.owenscorning.com.
   4. CertainTeed Corporation: www.certainteed.com.
   5. Engineer approved equivalent.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. K Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 850 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm.

D. Vapor Barrier Lap Adhesive: Compatible with insulation.
   1. Compatible with insulation.

E. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
   1. ASTM C195; hydraulic setting on mineral wool.

### 2.03 JACKETING AND ACCESSORIES

A. PVC Plastic Jacket:
   1. Manufacturers:
      a. Johns Manville Corporation; "Zeston": www.jm.com.
      b. Knauf; "Proto": www.knauffiberglass.com
      c. Engineer approved equivalent
      d. Substitutions: See Section 01 6000 - Product Requirements.
   2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.
      c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil, 0.010 inch.
      e. Connections: Brush on welding adhesive.
   3. Covering Adhesive Mastic: Compatible with insulation.
      a. Compatible with insulation.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

## 3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

G. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

H. Inserts and Shields:
   1. Application: Piping 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert Location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 8400.

J. Pipe Exposed in Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

K. Pipe exposed in wash bay: Finish with PVC jacket and fitting covers.

## 3.03 SCHEDULES

A. Plumbing Systems:
   1. Domestic Hot Water Supply:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: Up to 1-1/4 inch.
         2) Thickness: 1 inch.
         3) Pipe Size Range: 1-1/2 inch and above
         4) Thickness: 1-1/2 inch
   2. Domestic Hot Water Recirculation:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: All sizes.
         2) Thickness: 1 inch.
   3. Domestic Cold Water:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: All sizes.
         2) Thickness: 1 inch.

4. Plumbing Vents Within 10 Feet of the Exterior:
   a. Glass Fiber Insulation:
      1) Pipe Size Range: All sizes.
      2) Thickness: 1 inch.

**END OF SECTION**

**SECTION 22 10 05**

**PLUMBING PIPING**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Sanitary waste piping, buried within 5 feet of building.

B. Sanitary waste piping, above grade.

C. Domestic water piping, buried within 5 feet of building.

D. Domestic water piping, above grade.

E. Natural gas piping, above grade.

### 1.02 RELATED REQUIREMENTS

A. Division 0 - Introductory Information, Bidding, and Contracting Requirements

B. Division 1 - General Requirements

C. Section 07 8400 - Firestopping.

D. Section 09 9123 - Interior Painting.

E. Section 22 0553 - Identification for Plumbing Piping and Equipment.

F. Section 22 0719 - Plumbing Piping Insulation.

G. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

### 1.03 REFERENCE STANDARDS

A. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2010.

B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.

E. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; 2011.

F. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; 2012.

G. ASME B31.1 - Power Piping; 2014.

H. ASME B31.2 - Fuel Gas Piping; The American Society of Mechanical Engineers; 1968.

I. ASME B31.9 - Building Services Piping; 2014.

J. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.

K. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

L. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2015.

M. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2015.

N. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

O. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.

P. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.

Q. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2013.

R. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2010.

S. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2002 (Reapproved 2010).

T. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2014.

U. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.

V. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.

W. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).

X. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2015.

Y. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

Z. AWWA C651 - Disinfecting Water Mains; 2005.

AA. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; 2009.

AB. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2011.

AC. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

AD. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; 2011.

AE. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.

AF. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2012.

AG. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

AH. NSF 372 - Drinking Water System Components - Lead Content; 2011.

AI. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

## 1.04 SUBMITTALS

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

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

D. Project Record Documents: Record actual locations of valves.

## 1.05 QUALITY ASSURANCE

A. Perform Work in accordance with State of Iowa, standards.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.

E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

## 1.06 REGULATORY REQUIREMENTS

A. Perform Work in accordance with State of Iowa plumbing code.

B. Conform to applicable code for installation of backflow prevention devices.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

**1.07 DELIVERY, STORAGE, AND HANDLING**

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

**1.08 FIELD CONDITIONS**

A. Do not install underground piping when bedding is wet or frozen.

**PART 2 PRODUCTS**

**2.01 GENERAL REQUIREMENTS**

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

**2.02 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET OF BUILDING**

A. Cast Iron Pipe: ASTM A74 service weight.
   1. Fittings: Cast iron.
   2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.
   3. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and listed by NSF International.

B. Cast Iron Pipe: CISPI 301, hubless.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.
   3. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and listed by NSF International.

C. PVC Pipe: ASTM D 2665.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

**2.03 SANITARY WASTE PIPING, ABOVE GRADE**

A. Cast Iron Pipe: ASTM A74, service weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.
   3. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and listed by NSF International.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
   3. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and listed by NSF International.

C. Copper Tube: ASTM B 306, DWV.
   1. Fittings: ASME B16.29, wrought copper, or ASME B16.23, sovent.
   2. Joints: ASTM B32, alloy Sn50 solder.

D. PVC Pipe: ASTM D 2665. **(Not allowed above ceilings)**
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

**2.04 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING**

A. Copper Pipe: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.

**2.05 DOMESTIC WATER PIPING, ABOVE GRADE**

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.
   3. Press-fit with grooves designed to accept grooved end couplings of the same manufacturer. Fittings shall be wrought copper, conforming to ASTM B-75, ASTM B-152 or ASTM B-584-87. Flaring of tube and fitting ends to IPS dimensions is not allowed. Fittings shall have coupling gaskets of synthetic rubber conforming to the copper tube size outside diameter and coupling housing of elastomers having properties as designated in ASTM D-2000.

**2.06 NATURAL GAS PIPING, ABOVE GRADE**

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
   2. Joints: Threaded or welded to ASME B31.1.

**2.07 PIPE FLANGES, UNIONS, AND COUPLINGS**

A. Unions for Pipe Sizes 3 inch and Under:
   1. Ferrous Pipe: Class 150 malleable iron threaded unions.
   2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Sizes Over 1 inch:
   1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
   2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

**2.08 PIPE HANGERS AND SUPPORTS**

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.
   4. Vertical Pipe Support: Steel riser clamp.

B. Plumbing Piping - Drain, Waste, and Vent:
   1. Conform to ASME B31.9.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
   3. Hangers for Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
   4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   5. Vertical Support: Steel riser clamp.
   6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Plumbing Piping - Water:
   1. Conform to ASME B31.9.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
   3. Hangers for Cold Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
   4. Hangers for Hot Pipe Sizes 2 to 4 inch: Carbon steel, adjustable, clevis.
   5. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
   6. Vertical Support: Steel riser clamp.

7. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

## 2.09 GATE VALVES

A. Manufacturers:
   1. Nibco, Inc; Model S-111-LF: www.nibco.com
   2. Milwaukee Valve Company: www.milwaukeevalve.com.
   3. Hammond: www.hammondvalve.com.
   4. Stockham: www.stockham.com.
   5. Engineer approved equivalent
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Up To and Including 3 Inches:
   1. MSS SP-129, NSF/ANSI 61 and NSF/ANSI 372, Class 125, silicon performance bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder ends.

## 2.10 BALL VALVES

A. Manufacturers:
   1. Nibco, Inc; Model T-585-66-LF: www.nibco.com.
   2. Milwaukee Valve Company: www.milwaukeevalve.com.
   3. Hammond: www.hammondvalve.com
   4. Engineer approved equivalent
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Construction, 4 Inches and Smaller: MSS SP-110, NSF/ANSI 61 and NSF/ANSI 372, 400 psi CWP, forged DZR copper alloy, two-piece body, 304 stainless steel ball, full port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder, threaded, or grooved ends with union.

## 2.11 PLUG VALVES

A. Manufacturers:
   1. Conbraco Industries: www.conbraco.com.
   2. Nibco, Inc: www.nibco.com.
   3. Milwaukee Valve Company: www.milwaukeevalve.com.
   4. Engineer approved equal
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Construction 2-1/2 Inches and Smaller: ANSI Z21.15, CGA 9.2, 400 psi CWP, brass body and chrome plated brass plug, pressure lubricated, teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

## 2.12 FLOW CONTROLS

A. Manufacturers:
   1. ITT Bell & Gossett "Circuit Setter": www.bellgossett.com.
   2. Griswold Controls: www.griswoldcontrols.com.
   3. Taco, Inc: www.taco-hvac.com.
   4. Engineer approved equal
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain. Lead free and ANSI/NSF 61 compliant.

C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum pressure 3.5 psi.

## 2.13 SWING CHECK VALVES

A. Manufacturers:
   1. Nibco, Inc; Model S-413-Y-LF: www.nibco.com.
   2. Hammond Valve: www.hammondvalve.com.
   3. Milwaukee Valve Company: www.milwaukeevalve.com.

4. Stockham: www.stockham.com
5. Engineer approved equal
6. Substitutions: See Section 01 6000 - Product Requirements.

B. Up to 2 Inches:
1. MSS SP-139, NSF/ANSI 61 and NSF/ANSI 372, Class 125, silicon perfromance bronze alloy body and cap, silicon bronze swing disc with rubber seat, solder ends.

**2.14 SPRING LOADED CHECK VALVES**

A. Manufacturers:
1. Nibco, Inc.; Model S-480-Y-LF: www.nibco.com.
2. Hammond Valve: www.hammondvalve.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.
4. Stockham: www.stockham.com
5. Engineer approved equivalent.
6. Substitutions: See Section 01 6000 - Product Requirements.

B. MSS SP-139, NSF/ANSI 61 and NSF/ANSI 372, Class 125, silicon performance bronze alloy body, silicone bronze trim, stainless steel springs, PTFE disc, Buna N seals, wafer style ends.

**2.15 STRAINERS**

A. Manufacturers:
1. Watts; Model LF777SI: www.watts.com
2. Hammond: www.hammond.com
3. Armstrong International, Inc: www.armstronginternational.com.
4. WEAMCO: www.weamco.com.
5. Engineer approved equivalent
6. Substitutions: See Section 01 6000 - Product Requirements.

B. Size 2 inch and Under:
1. Class 125, NSF Certified, wye-pattern, lead free cast copper silicon alloy body and cap, soldered connections with #20 mesh stainless steel perforated screen.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify that excavations are to required grade, dry, and not over-excavated.

**3.02 PREPARATION**

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

**3.03 INSTALLATION**

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed.

I. Establish elevations of buried piping outside the building to ensure not less than 5 ft of cover.

J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly; coordinate with General Contractor and architectural specifications.

K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.

L. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.

M. Install bell and spigot pipe with bell end upstream.

N. Install valves with stems upright or horizontal, not inverted. See Section 22 0523.

O. Install water piping to ASME B31.9.

P. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

Q. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

R. Sleeve pipes passing through partitions, walls, and floors.

S. All exterior gas piping shall be painted with two coats of rust inhibitive paint.

T. Inserts:
1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

U. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9.
2. Support horizontal piping as indicated.
3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping.
9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
10. Support cast iron drainage piping at every joint.

**3.04 TRENCHING**

A. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove large stones and other hard matter which could damage piping or impede consistent backfilling or compaction.

G. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.

H. Remove excavated material that is unsuitable for re-use from site.

I. Stockpile excavated material to be re-used in area designated on site.

J. Remove excess excavated material from site.

K. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

L. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

M. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

**3.05 BACKFILL**

A. Pipe shall be laid on a smoothly graded, prepared subgrade soil foundation true to alignment and grade. The bottom of the pipe shall be in continuous contact with the surface of the prepared subgrade material. When joined in the trench, the pipe invert shall form a true and straight line.

B. Approved backfill material shall be placed in the trench along the side of the pipe and compacted by hand up to the top of the pipe. Approved backfill material shall be placed and compacted a minimum of 12 inches above the pipe.

C. Backfill to contours and elevations indicated using unfrozen materials.

D. Employ a placement method that does not disturb or damage other work.

E. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

F. Maintain optimum moisture content of fill materials to attain required compaction density.

G. Correct areas that are over-excavated.

H. Use general fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density.

**3.06 APPLICATION**

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

C. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Install globe valves for throttling, bypass, or manual flow control services.

E. Provide spring-loaded check valves on discharge of water pumps.

F. Provide plug valves in natural gas systems for shut-off service.

G. Provide flow controls in water recirculating systems where indicated.

**3.07 TOLERANCES**

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/8 inch per foot slope.

B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

**3.08 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM**

A. Prior to starting work, verify system is complete, flushed, and clean.

B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

I. Document testing data and procedures. Submit report prior to substantial completion.

**3.09 TESTING OF SYSTEMS**

A. Plumbing and piping systems shall be pressure tested in accordance with the Uniform Plumbing Code.
   1. Sanitary and Storm Sewer:10 foot hydrostatic pressure for 1 hour
   2. Domestic Water:1.5 times working pressure, 100 psi minimum for 4 hours
   3. Natural Gas (up to 5 psi):60 psi air or inert gas test for 24 hours

**3.10 SERVICE CONNECTIONS**

A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer. Obtain water meter from the Iowa Reginal Utilities Association (IRUA).
   1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.

C. Provide new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 14 inch wg. Verify gas pressure with equipment to be served. Provide and install regulators as required based on service pressure and operating pressures of gas-fired equipment.

D. Utility company cost for extending service and meter shall be billed directly to the Owner.

**3.11 SCHEDULES**

A. Pipe Hanger Spacing:
   1. Metal Piping:
      a. Pipe Size: 1/2 inch to 1-1/4 inch:
         1) Maximum Hanger Spacing: 6.5 ft.
         2) Hanger Rod Diameter: 3/8 inches.
      b. Pipe Size: 1-1/2 inch to 2 inch:
         1) Maximum Hanger Spacing: 10 ft.
         2) Hanger Rod Diameter: 3/8 inch.
      c. Pipe Size: 2-1/2 inch to 3 inch:
         1) Maximum Hanger Spacing: 10 ft.
         2) Hanger Rod Diameter: 1/2 inch.
      d. Pipe Size: 4 inch to 6 inch:
         1) Maximum Hanger Spacing: 10 ft.
         2) Hanger Rod Diameter: 5/8 inch.
   2. Plastic Piping:
      a. All Sizes:
         1) Maximum Hanger Spacing: 6 ft.
         2) Hanger Rod Diameter: 3/8 inch.

**END OF SECTION**

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**SECTION 22 10 06**

**PLUMBING PIPING SPECIALTIES**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Floor drains.
B. Cleanouts.
C. Backflow preventers.
D. Water hammer arrestors.
E. Sediment interceptors.
F. Interceptors.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements
B. Division 01 - General Requirements
C. Section 01 1000 - Summary: Product requirements for Owner furnished kitchen equipment.
D. Section 01 6000 - Product Requirements: Procedures for Owner supplied products.
E. Section 22 1005 - Plumbing Piping.
F. Section 22 4000 - Plumbing Fixtures.
G. Section 22 3000 - Plumbing Equipment.
H. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

### 1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; current edition; (ADA Standards for Accessible Design).
B. ASME A112.6.3 - Floor and Trench Drains; 2001 (R2007).
C. ASSE 1011 - Hose Connection Vacuum Breakers; 2004.
D. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent; 2009.
E. ASSE 1013 - Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers; 2011.
F. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2011.
G. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).
H. NSF 372 - Drinking Water System Components - Lead Content; 2011.
I. PDI-WH 201 - Water Hammer Arresters; 2010.

### 1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
D. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
E. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors.
F. Operation Data: Indicate frequency of treatment required for interceptors.

G. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements for additional provisions.
   2. Extra Loose Keys for Outside Hose Bibbs: One.
   3. Extra Hose End Vacuum Breakers for Hose Bibbs: One.

**1.05 QUALITY ASSURANCE**

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with documented acceptable industry experience.

**1.06 DELIVERY, STORAGE, AND HANDLING**

A. Accept specialties on site in original factory packaging. Inspect for damage.

**PART 2 PRODUCTS**

**2.01 GENERAL REQUIREMENTS**

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

**2.02 FLOOR DRAIN (FD-1)**

A. Manufacturers:
   1. Watts; Model FD-100-A: www.watts.com.
   2. Josam Company: www.josam.com.
   3. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
   4. Zurn Industries, Inc: www.zurn.com.
   5. Engineer approved equivalent.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Floor Drain:
   1. ASME A112.21.1; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable 7-inch diameter nickel-bronze strainer.

**2.03 FLOOR DRAIN (FD-2)**

A. Manufacturers:
   1. Watts; Model FD-100-ER: www.watts.com.
   2. Josam Company: www.josam.com.
   3. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
   4. Zurn Industries, Inc: www.zurn.com.
   5. Mifab: www.mifab.com
   6. Engineer approved equivalent.
   7. Substitutions: See Section 01 6000 - Product Requirements.

B. Floor Drain:
   1. ASME A112.21.1; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable 7-inch diameter nickel-bronze extended rim strainer.

**2.04 CLEANOUTS**

A. Manufacturers:
   1. Watts: www.watts.com
   2. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
   3. Josam Company: www.josam.com.
   4. Zurn Industries, LLC: www.zurn.com.
   5. Engineer approved equal.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Cleanouts at Exterior Surfaced Areas:
   1. Round cast nickel bronze access frame and non-skid cover.

C. Cleanouts at Exterior Unsurfaced Areas:
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.

D. Cleanouts at Interior Finished Floor Areas:
   1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

E. Cleanouts at Interior Finished Wall Areas:
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

F. Cleanouts at Interior Unfinished Accessible Areas:
   1. Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

## 2.05 BACKFLOW PREVENTERS

A. Manufacturers:
   1. Watts Regulator Company; Model LF009: www.wattsregulator.com.
   2. Conbraco Industries, Inc: www.apollovalves.com.
   3. Zurn Industries, LLC: www.zurn.com.
   4. Engineer approved equivalent.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Reduced Pressure Backflow Preventer Assembly:
   1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks. Provide an air gap to receive the backflow relief and extend discharge of air gap to exterior.
   2. Size: 2 inch assembly with threaded gate valves.

## 2.06 WATER HAMMER ARRESTORS

A. Manufacturers:
   1. Souix Chief; "Hydra-Rester": www.souixchief.com
   2. Jay R. Smith Manufacturing Company; "Hydrotrol": www.jayrsmith.com.
   3. Watts Regulator Company, a part of Watts Water Technologies; Model SS: www.wattsregulator.com.
   4. Zurn Industries, Inc; "Shoktrol": www.zurn.com.
   5. Engineer approved equivalent.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Water Hammer Arrestors:
   1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F and maximum 250 psi working pressure.

## 2.07 SANITARY WASTE INTERCEPTORS

A. Manufacturers:
   1. Zurn Industries, LLC; Z1181: www.zurn.com/#sle.
   2. Jay R. Smith Manufacturing Company: www.jrsmith.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Sand/Sediment Interceptors:
   1. Acid resistant coated interceptor and exterior fabricated steel solids interceptor for flush with floor installation. Furnish with a removale acid resistant coated fabricated steel bucket having removable primary and secondary flow diffusing/intercepting screens, and complete with a top access gasketed secured cover. Furnished with a low inlet and a high outlet.

## PART 3 EXECUTION

### 3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Provide and install cleanouts in sanitary and storm sewer piping in horizontal and vertical runs as required by the Uniform Plumbing Code.

F. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

G. Pipe relief from backflow preventer to nearest drain.

H. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories, sinks, and water closets. See drawings for locations and sizes.

**END OF SECTION**

**SECTION 22 30 00**

**PLUMBING EQUIPMENT**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Commercial electric water heaters.

B. Diaphragm-type compression tanks.

C. In-line circulator pumps.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

### 1.03 REFERENCE STANDARDS

A. ANSI Z21.10.3 - Gas-Fired Water Heaters - Volume III - Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous; 2014.

B. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; 2015.

C. CSA P.3 - Testing Method for Measuring Energy Consumption and Determining Efficiencies of Gas-Fired Storage Water Heaters; 2004 (Reaffirmed 2015).

D. ICC (IPC) - International Plumbing Code; 2012.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Current Edition, Including All Revisions.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

### 1.05 SUBMITTALS

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

B. Product Data:
   1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Indicate pump type, capacity, power requirements.
   3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
   4. Provide electrical characteristics and connection requirements.

C. Shop Drawings:
   1. Indicate heat exchanger dimensions, size of tappings, and performance data.
   2. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

D. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

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

F. Project Record Documents: Record actual locations of components.

### 1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum [five] years of documented experience.

B. Certifications:
   1. Water Heaters: NSF approved.
   2. Electric Water Heaters: UL listed and labeled to UL 174.
   3. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

C. ASME Compliance: Condensing water heaters must be constructed in accordance with ASME Water heater and Pressure Vessel Code, Section IV (HLW) Potable Water Heaters.

D. ETL Compliance. Condensing water heaters must be tested for compliance with ETL, "Commercial-Industrial Gas Heating Equipment." Condensing water heaters shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

### 1.07 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

### 1.08 WARRANTY

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

B. Provide five year manufacturer warranty for domestic water heaters.

## PART 2 PRODUCTS

### 2.01 COMMERCIAL ELECTRIC WATER HEATERS (EWH-1)

A. Manufacturers:
   1. A.O. Smith Water Products Co; Model DEN-30: www.hotwater.com.
   2. Rheem Manufacturing Company: www.rheem.com.
   3. Engineer approved equivalent.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Type: Factory-assembled and wired, electric, vertical storage.

C. Performance:
   1. Storage capacity: 33 gal.
   2. Maximum working pressure: 150 psig.
   3. See drawings for schedule

D. Electrical Characteristics:
   1. 208 volts, single phase, 60 Hz.

E. Tank: Glass lined welded steel; 4 inch diameter inspection port, thermally insulated with minimum 2 inches glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.

F. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F, flanged or screw-in nichrome elements, high temperature limit thermostat.

G. Accessories: Provide:
   1. Water connections: Brass.
   2. Dip tube.
   3. Anode: Magnesium.

H. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 Watts per square inch.

### 2.02 DIAPHRAGM-TYPE COMPRESSION TANKS

A. Manufacturers:

1. Amtrol Inc; Model ST-12C: www.amtrol.com.
2. Bell & Gossett, a xylem brand: www.bellgossett.com.
3. Taco, Inc: www.taco-hvac.com.
4. Engineer approved equivalent.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Construction: Welded steel, tested and stamped in accordance with ASME (BPV VIII, 1); supplied with National Board Form U-1, rated for working pressure of 150 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles. Working pressure of compression tank shall match water heater working pressure.

C. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 12 psig.

D. Size: 12 inches diameter, 14 inches overall length, 6.4 gal capacity.

E. Tank working pressure shall match water heater rated working pressure.

**2.03 DOMESTIC HOT WATER CIRCULATING PUMP (DHWCP-1)**

A. Manufacturers:
1. Bell & Gossett; Model NBF-25: www.bellgossett.com
2. Taco, Inc.:www.taco-hvac.com
3. Engineer approved equivalent.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.

C. Impeller: Noryl.

D. Shaft: Ceramic with integral thrust collar and two oil lubricated bronze sleeve bearings.

E. Seal: Carbon rotating against a stationary ceramic seat.

F. Drive: Flexible coupling.

G. Timer & Aqustat: 24 hour time clock and aquastat to thermostatically switch pump on/off based on loop temperature.

H. Performance:
1. Flow: 1 gpm, at 10 feet head.
2. Electrical Characteristics:
a. 92 watts.
b. 120 volts, single phase, 60 Hz.

**2.04 ELECTRICAL WORK**

A. Provide electrical motor driven equipment specified complete with motors, motor starters, controls, and wiring.

B. Electrical characteristics to be as specified or indicated.

C. Furnish motor starters complete with thermal overload protection and other appurtenances necessary for the motor control specified.

D. Supply manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for controls and devices not shown.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions required for applicable certifications.

B. Coordinate system, equipment, and piping work with applicable electrical, fuel, gas, vent, drain, and waste support interconnections as included or provided by other trades.

C. Examination
1. Before water heater installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations. Examine piping and electrical connections to verify actual

locations, sizes and other conditions affecting water heater performance, maintenance and operations.
   a. Final water heater locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.
2. Examine mechanical spaces for suitable conditions where water heaters will be installed.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Water Heater Installation
1. Install water heaters an appropriately rated and installed stand or on level concrete bases.
2. Assemble and install water heater trim.
3. Install electrical devices furnished with water heater but not specified to be factory mounted.
4. Install control wiring to field-mounted electrical devices.

E. Connections
1. Piping installation requirements are specified in other Division 22 sections. Drawings indicate general arrangement of piping, fittings and specialties.
2. Install piping adjacent to water heater to permit service and maintenance.
3. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.
4. Connect gas piping to water heater gas valve with unions. Piping shall be at least full size of gas train connection. Provide a reducer if required.
5. Connect hot-water piping to supply and return water heater tappings with shutoff valve and union or flange at each connection.
6. Multiple heaters shall be piped such that all cold water entering the system will go through the heat exchanger first. A series of approved piping installation examples are shown in the installation and maintenance manuals provided with the unit. Each water heater shall have individual isolation valves for servicing and a hot water hose connection for start-up and field testing.
7. Install piping from safety relief valves to nearest floor drain.
8. Water heater Venting
   a. Install flue venting kit and combustion-air intake.
   b. Connect venting full size to water heater connections.
9. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
10. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

F. Pumps:
1. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.
2. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches and over.
3. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
4. Adjust aquastat to maintain a minimum of 105 degrees F (adjustable) return water temperature.

**END OF SECTION**

# SECTION 22 40 00

# PLUMBING FIXTURES

# RFB #923902-01

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Flush valve water closets.

B. Lavatories.

C. Sinks.

D. Under-lavatory pipe supply covers.

E. Electric water coolers.

F. Wash fountains.

### 1.02 RELATED REQUIREMENTS

A. Division 0 - Introductory Information, Bidding, and Contracting Requirements

B. Division 1 - General Requirements

C. Section 07 9005 - Joint Sealers: Seal fixtures to walls and floors.

D. Section 22 1005 - Plumbing Piping.

E. Section 22 1006 - Plumbing Piping Specialties.

F. Section 22 3000 - Plumbing Equipment.

G. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

### 1.03 REFERENCE STANDARDS

A. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2002).

B. ASME A112.18.1 - Plumbing Supply Fittings; 2012.

C. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2013.

D. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2011.

E. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

F. NSF 372 - Drinking Water System Components - Lead Content; 2011.

### 1.04 SUBMITTALS

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

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Manufacturer's Instructions: Indicate installation methods and procedures.

D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

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

### 1.05 QUALITY ASSURANCE

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

### 1.06 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

### 1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on-site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

### 1.08 WARRANTY

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

## PART 2 PRODUCTS

### 2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

### 2.02 WALL MOUNTED, FLUSH VALVE WATER CLOSETS (WC-1)

A. Bowl:
   1. Manufacturers:
      a. Kohler; "Kingston" (K-4325): www.kohlerco.com
      b. American Standard Inc.; "Afwall" : www.americanstandard.com.
      c. Zurn Industries, Inc.: www.zurn.com.
      d. Engineer approved equivalent
      e. Substitutions: See Section 01 6000 - Product Requirements.
   2. ASME A112.19.2M; wall hung, siphon jet vitreous china closet bowl, with elongated rim, 1-1/2 inch top spud, china bolt caps. High efficiency bowl for 1.28 gpf with 10-1/2"x9" water area and 2-1/8" passageway.

B. Flush Valve Manufacturers:
   1. Sloan Valve Company; Model Royal #111-1.28/Optima EL-700-A: www.sloanvalve.com.
   2. Zurn Industries, Inc: www.zurn.com.
   3. Engineer approved equivalent
   4. Substitutions: See Section 01 6000 - Product Requirements.

C. Sensor Operated Flush Valve:
   1. ASME A112.18.1; exposed chrome plated, diaphragm type with low voltage operated solenoid operator, infrared sensor and over-ride button in chrome plated plate, wheel handle stop and vacuum breaker; maximum 1.6 gallon flush volume.

D. Seat:
   1. Manufacturers:
      a. Church Seat Company; Model #9500C: www.churchseats.com.
      b. Olsonite; Model #95: www.olsonite.com.
      c. Engineer approved equivalent
      d. Substitutions: See Section 01 6000 - Product Requirements.
   2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.

E. Water Closet Carrier:
   1. Manufacturers:
      a. JOSAM Company: www.josam.com.
      b. Zurn Industries, Inc: www.zurn.com.
   2. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers. See drawings for horizontal or vertical discharge.

### 2.03 WALL MOUNTED, FLUSH VALVE WATER CLOSETS, ADA (WC-2)

A. Same as WC-1, mounted at ADA height. Coordinate flush valve mounting with grab bars.

### 2.04 LAVATORIES (L-1)

A. Manufacturers:

1. Kohler Company "Kingston": www.kohlerco.com.
2. American Standard: www.americanstandard.com.
3. Zurn: www.zurn.com
4. Engineer approved equivalent
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Vitreous China Counter Top Basin:
1. ASME A112.19.2; vitreous china wall-mount lavatory, 18 x 17 inches with single hole drilling, front overflow, soap depression, seal of putty, calking, or concealed vinyl gasket.

C. Supply Faucet Manufacturers:
1. Delta; Model 590-PALGHDF-HW
2. Zurn industries, Inc: www.zurn.com.
3. Engineer approved equivalent
4. Substitutions: See Section 01 6000 - Product Requirements.

D. Supply Faucet:
1. ASME A112.18.1; chrome plated combination supply fitting with open grid strainer, water economy aerator with maximum 0.5 gpm flow, single lever handle.

E. Accessories:
1. Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.
2. Offset waste with perforated open strainer.
3. Wheel handle stops.
4. Flexible supplies.
5. Install insulation on ADA location supplies and waste to comply with ADA.
6. Carrier:
   a. Manufacturers:
      1) JOSAM Company: www.josam.com.
      2) Zurn Industries, Inc: www.zurn.com.
      3) Engineer approved equal
      4) Substitutions: See Section 01 6000 - Product Requirements.
   b. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.

**2.05 WASH FOUNTAINS (WF-1)**

A. Manufacturers:
1. Bradley Corporation; Model MF2933: www.bradleycorp.com.
2. Acorn Engineering Company: www.acorneng.com.
3. Engineer approved equivalent
4. Substitutions: See Section 00400 - Pre-Bid Product Substitutions

B. Wall mounted, semi-circular densified resin washfountain with 304 stainless steel pedestal frame, semi-circular bowl, pedestal and access panels. The unit shall have three independently controlled sprayheads. Each spray nozzle shall be controlled by a separate infrared activated solenoid valve. Shut-off shall be automatic after hands are removed from the detection area. Infrared controls shall include solenoid valves and 24V transformer.

C. Mounting height shall be in accordance with ADA guidelines on reach, clearances and operation.

D. Bowl:
1. Three station, trapezoidal, 26" length, 36" width resistant resin.

E. Accessories: Spray head, thermostatic mixing valve, backsplash, supporting tube, spud and strainer, operating mechanism, combination stop, strainer and check valves.

**2.06 SINK (S-1)**

A. Manufacturers:
1. Elkay; Model 2C24X24-2-24X: www.elkay.com.
2. Just: www.just-mfg.com

3. Engineer approved equivalent.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Double Compartment Bowl:
1. ASME A112.19.3; 24 x 24 x 12 inch outside dimensions, ADA compliant, 16 gauge thick, Type 304 stainless steel, self rimming and undercoated, with ledge back drilled for trim.

C. Supply Faucet Manufacturers:
1. Delta; Model #55C1583-S7: www.deltafaucet.com
2. Zurn: www.zurn.com
3. Engineer approved equivalent.
4. Substitutions: See Section 01 6000 - Product Requirements.

D. Trim: ASME A112.18.1; ADA compliant, two handle wall mount pre-rinse kitchen faucet with hooded level handles, spray outlet, spring loaded stainless steel hose with auto shut-off and tubular swing out spout.

E. Accessories: Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon, wheel handle stop, rigid supplies.

**2.07 ELECTRIC WATER COOLERS (EWC-1)**

A. Electric Water Cooler Manufacturers:
1. Elkay Manufacturing Company; Model LZSTL8WSLK: www.elkay.com.
2. Tri Palm International/Oasis: www.tripalmint.com.
3. Haws Corporation: www.hawsco.com.
4. Oasis International: www.oasiscoolers.com/#sle.
5. Acorn Aqua: www.acornaqua.com
6. Engineer approved equivalent
7. Substitutions: See Section 01 6000 - Product Requirements.

B. Fountain:
1. ARI 1010; surface mounted, single ADA refrigerated and filtered water cooler with bottle filling station with stainless steel top, vinyl on steel body, safety bubbler, and electronic bottle filler sensor with front and side pushbar activation.
2. Bottle filling unit shall have auto 20-second shut-off timer, 1.1 gpm fill rate.
3. 3000-gallon capacity filtration system.
4. Electrical: 115 V, 60 Hertz compressor, 6 foot cord and plug for connection to electric wiring system including grounding connector.
a. Capacity: 8.0 gpm of 50 degree F water with inlet at 80 degree F and room temperature of 90 degree F, when tested in accordance with ASHRAE Std 18.
b. Electrical: Maximum 370 watt compressor, 6 foot cord and plug for connection to electric wiring system including grounding connector.

**2.08 SERVICE SINKS (JS-1)**

A. Manufacturers:
1. Fiat "MSB 2424"
2. Mustee
3. Engineer approved equivalent
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Bowl:
1. 24 x 24 x 10 inch high white molded stone, floor mounted, with one inch wide shoulders, vinyl bumper guard, stainless steel strainer.

C. Trim:
1. Delta #28T9
2. ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.

D. Accessories:

1. 5 feet of 3/4 inch diameter plain end reinforced rubber hose.
2. Hose clamp hanger.
3. Mop hanger.
4. Stainless steel wall guard.

### 2.09 PIPING SAFETY COVERS

A. Manufacturers:
   1. Truebro, Inc; "LavGuard"; www.truebro.com.
   2. Engineer approved equivalent
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Piping Insulation Accessories:
   1. Provide products that comply with the following:
      a. Americans With Disabilities Act (ADA), Article 4.19.4.
   2. Piping Safety Covers: Truebro Lav-Guard.
      a. Characteristics: Three-piece molded assembly, minimum 1/8 inch wall thickness, with internal ribs to provide air space between piping and piping insulation jacket, molded to receive manufacturer's snap-clip fasteners.
      b. Vinyl Material: Impact-resistant and stain-resistant molded closed-cell anti-microbial vinyl compound, UV-stable, non-fading, non yellowing; having the following performance characteristics:
         1) Burning Characteristics: 0 seconds Average Time of Burning (ATB), 0 mm Area of Burning (AEB), when tested in accordance with ASTM D 635.
         2) Thermal Conductivity: K-value 1.17, when tested in accordance with ASTM C 177.
         3) Indentation Hardness: 60, minimum, when tested in accordance with ASTM D 2240, using Type A durometer.
      c. Trap Assembly Cover: Three-piece assembly, with removable clean-out nut enclosure.
      d. Angle Stop Covers: Formed with hinged cap for access to valve without requiring cover removal.
      e. Configurations: In accordance with manufacturer's product data for project piping configurations indicated on drawings.
      f. Color: China White, gloss finish; paintable.
      g. Fasteners: Manufacturer's standard re-usable snap-clip fasteners; wire-tie fasteners not permitted.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

### 3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

### 3.03 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome-plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

E. Seal fixtures to wall and floor surfaces with sealant as, color to match fixture.

F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended to hold fixture in place.

**3.04 INTERFACE WITH WORK OF OTHER SECTIONS**

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

**3.05 ADJUSTING**

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

**3.06 CLEANING**

A. Clean plumbing fixtures and equipment.

**3.07 PROTECTION**

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

C. Repair or replace damaged products before Date of Substantial Completion.

**END OF SECTION**

**SECTION 23 05 19**

**METERS AND GAGES FOR HVAC**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Thermometers and thermometer wells.

B. Static pressure gauges.

### 1.02 RELATED REQUIREMENTS

A. Section 23 0923 - Direct-Digital Control System for HVAC.

B. Section 23 0993 - Sequence of Operations for HVAC Controls.

C. Division 00 - Procurement and Contracting Requirements

D. Division 01 - General Requirements

E. Section 23 2113 - Hydronic Piping.

F. Section 23 0923 - Direct-Digital Control System for HVAC.

G. Section 23 0993 - Sequence of Operations for HVAC Controls.

### 1.03 REFERENCE STANDARDS

A. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.

### 1.04 SUBMITTALS

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

B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

C. Project Record Documents: Record actual locations of components and instrumentation.

### 1.05 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

### 1.06 EXTRA MATERIALS

A. See Section 01 6000 - Product Requirements. for additional provisions.

## PART 2 PRODUCTS

### 2.01 DIAL THERMOMETERS

A. Manufacturers:
   1. Weksler Glass Thermometer Corp.; Model #5AA: www.wekslerglass.com.
   2. Weiss Instruments: www.weissinstruments.com.
   3. Dwyer Instruments, Inc: www.dwyer-inst.com.
   4. Omega Engineering, Inc: www.omega.com.
   5. Engineer approved equivalent.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Thermometer: ASTM E1, stainless steel case, adjustable angle with front recalibration, bimetallic helix actuated with silicone fluid damping, white with black markings and black pointer hermetically sealed lens, stainless steel stem.
   1. Size: 3 inch diameter dial.
   2. Lens: Clear glass.
   3. Accuracy: 1 percent.
   4. Calibration: Degrees F.

### 2.02 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

### 2.03 TEST PLUGS

A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F.

### 2.04 STATIC PRESSURE GAUGES

A. Manufacturers:
   1. Weiss Instruments: www.weissinstruments.com.
   2. Dwyer Instruments, Inc: www.dwyer-inst.com.
   3. Omega Engineering, Inc: www.omega.com.
   4. Weksler Glass Thermometer Corp: www.wekslerglass.com.
   5. Engineer approved equivalent.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Inclined manometer, red liquid on white background with black figures, front recalibration adjustment, 3 percent of full scale accuracy.

C. Accessories: Static pressure tips with compression fittings for bulkhead mounting, 1/4 inch diameter tubing.

## PART 3 EXECUTION

### 3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install thermometers in air duct systems on flanges.

C. Install thermometer sockets adjacent to controls system thermostat, transmitter, or sensor sockets. Refer to Section 23 0943. Where thermometers are provided on local panels, duct or pipe mounted thermometers are not required.

D. Locate duct mounted thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence.

E. Coil and conceal excess capillary on remote element instruments.

F. Provide instruments with scale ranges selected according to service with largest appropriate scale.

G. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

H. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

I. Locate test plugs adjacent thermometers and thermometer sockets.

### 3.02 SCHEDULE

A. Dial Thermometers, Location and Scale Range:
   1. Each supply air zone, (MAU), 30 to 130 degrees F.

B. Static Pressure and Filter Gauges, Location and Scale Range:
   1. MAU-1, 0 to 2 inches W.C..

**END OF SECTION**

**SECTION 23 05 93**

**TESTING, ADJUSTING, AND BALANCING FOR HVAC**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

### 1.02 RELATED REQUIREMENTS

A. Division 0 - Introductory Information, Bidding, and Contracting Requirements

B. Division 1 - General Requirements

C. Section 01 9113 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.

### 1.03 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. AABC MN-1 - AABC National Standards for Total System Balance; 2002.

C. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.

D. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems; 2015, Eighth Edition.

E. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

### 1.04 SUBMITTALS

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

B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

C. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

D. Progress Reports.

E. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

1. Submit to the the Commissioning Authority within two weeks after completion of testing, adjusting, and balancing.
2. Revise TAB plan to reflect actual procedures and submit as part of final report.
3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Engineer and for inclusion in operating and maintenance manuals.
4. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
5. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
6. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
7. Units of Measure: Report data in I-P (inch-pound) units only.
8. Include the following on the title page of each report:

a. Name of Testing, Adjusting, and Balancing Agency.
b. Address of Testing, Adjusting, and Balancing Agency.
c. Telephone number of Testing, Adjusting, and Balancing Agency.
d. Project name.
e. Project location.
f. Project Architect.
g. Project Engineer.
h. Project Contractor.
i. Report date.

F. Project Record Documents: Record actual locations of balancing valves and rough setting.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 GENERAL REQUIREMENTS**

A. Perform total system balance in accordance with one of the following:
1. AABC (NSTSB), AABC National Standards for Total System Balance.
2. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
3. SMACNA (TAB).

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project. Coordinate TAB work required after substantial completion and occupancy with the Owner.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:
1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
2. Having documented industry experience and providing contract maintenance service as a regular part of their business.
3. Certified by one of the following:
a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

E. TAB Supervisor Qualifications: Certified by same organization as TAB agency.

F. Pre-Qualified TAB Agencies:
1. Systems Management & Balancing, Inc., Waukee, Iowa.
2. Precision Test & Balance, Clive, Iowa.
3. Engineer approved TAB Agency.
4. Substitutions: See Section 01 6000 - Product Requirements.

**3.02 EXAMINATION**

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.

7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

**3.03 PREPARATION**

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Engineer to facilitate spot checks during testing.

C. Mechanical contractor shall provide additional balancing devices as required.

**3.04 ADJUSTMENT TOLERANCES**

A. Air Handling Systems: Adjust to within plus or minus 10 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

**3.05 RECORDING AND ADJUSTING**

A. Field Logs: Maintain written logs including:
1. Running log of events and issues.
2. Discrepancies, deficient or uncompleted work by others.
3. Contract interpretation requests.
4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

H. Check and adjust systems approximately six months after final acceptance and submit report.

**3.06 AIR SYSTEM PROCEDURE**

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

**3.07 SCOPE**

A. Test, adjust, and balance the following:
1. Electric Water Coolers.
2. Direct Fired Make Up Air Units
3. Fans.
4. Air Inlets and Outlets
5. Unit Heaters
6. Exhaust Fans

**3.08 MINIMUM DATA TO BE REPORTED**

A. 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.

B. V-Belt Drives:
1. Identification/location.
2. Required driven RPM.
3. Driven sheave, diameter and RPM.
4. Belt, size and quantity.
5. Motor sheave diameter and RPM.
6. Center to center distance, maximum, minimum, and actual.

C. Air Moving Equipment:
1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Arrangement/Class/Discharge.

6. Air flow, specified and actual.
7. Return air flow, specified and actual.
8. Outside air flow, specified and actual.
9. Total static pressure (total external), specified and actual.
10. Inlet pressure.
11. Discharge pressure.
12. Sheave Make/Size/Bore.
13. Number of Belts/Make/Size.
14. Fan RPM.

D. Exhaust Fans:
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.

E. Duct Traverses:
1. System zone/branch.
2. Duct size.
3. Area.
4. Design velocity.
5. Design air flow.
6. Test velocity.
7. Test air flow.
8. Duct static pressure.
9. Air temperature.
10. Air correction factor.

F. Air Distribution Tests:
1. Air terminal number.
2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Area factor.
6. Design velocity.
7. Design air flow.
8. Test (final) velocity.
9. Test (final) air flow.
10. Percent of design air flow.

**END OF SECTION**

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**SECTION 23 07 13**

**DUCT INSULATION**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Duct insulation.

B. Weather barrier coatings.

C. Jacketing and accessories.

### 1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Division 0 - Introductory Information, Bidding, and Contracting Requirements

C. Division 1 - General Requirements

D. Section 09 9123 - Interior Painting: Painting insulation jackets.

E. Section 23 3100 - HVAC Ducts and Casings

### 1.03 REFERENCE STANDARDS

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

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.

D. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

E. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.

F. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

I. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

J. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

### 1.04 SUBMITTALS

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

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

### 1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with acceptable documented industry experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with documented industry experience and approved by manufacturer.

### 1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

### 1.07 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

## PART 2 PRODUCTS

### 2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

### 2.02 GLASS FIBER, FLEXIBLE

A. Manufacturer:
   1. Johns Manville Corporation "Microlite": www.jm.com.
   2. Knauf Insulation: www.knaufinsulation.com.
   3. Owens Corning Corporation: www.ocbuildingspec.com.
   4. CertainTeed Corporation: www.certainteed.com/#sle.
   5. Engineer approved equal
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. K value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 450 degrees F.
   3. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
   3. Secure with pressure-sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

### 2.03 GLASS FIBER, RIGID

A. Manufacturer:
   1. Johns Manville Corporation "Spin-Glas": www.jm.com.
   2. Knauf Insulation: www.knaufinsulation.com.
   3. Owens Corning Corp: www.owenscorning.com.
   4. CertainTeed Corporation: www.certainteed.com.
   5. Engineer approved equal
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. K Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 450 degrees F.
   3. Maximum Water Vapor Absorption: 5.0 percent.
   4. Maximum Density: 8.0 pcf.

C. Vapor Barrier Jacket:

1. ASJ Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
3. Secure with pressure-sensitive tape.

D. Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive. All Purpose facing shall be comprised of white kraft bonded to aluminum foil, reinforced with fiber glass yarn and laminated with fire-resistant adhesive to kraft paper.

## 2.04 WEATHER BARRIER COATINGS

A. Weather-Resistive Barrier Coating: Fire-resistive, UV resistant, water-based mastic for use over closed cell polyethylene and polyurethane foam insulation; applied with glass fiber or synthetic reinforcing mesh.
1. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A, when tested in accordance with ASTM E84.
2. Water Vapor Permeance: Greater than 1.0 perm in accordance with ASTM E96/E96M.

## 2.05 OUTDOOR DUCT INSULATION

A. Closed Cell Flexible Elastomeric Insulation; that has a service temperature range from -60 degrees F to 180 degrees F. This outdoor duct insulation meets ASTM C 177 or C 518 and shall have minimum 'k' value of 0.27 Btu-in. / hr-ft2- degrees F at minimum density measurement of 3 lb/cu ft. The insulation and outside surface must be protected with a white Thermo Plastic Rubber Membrane formulated to:
1. Be resistant to UV, and ozone, acid rain, and physical elements produced from outdoor weather per ASTM E 96 Procedure A.
2. Have aflame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with the test method for surface burning in ASTM E 84.
3. Show no evidence of continued erosion, delaminating, cracking, flaking, or peeling when tested in accordance with the test method for erosion resistance in UL181. Be resistant to mold growth resistance, ASTM G 21/C 1338 resistant to fungi, and resistant to bacteria growth per ASTM G 22.

## 2.06 JACKETING AND ACCESSORIES

A. Aluminum Jacket:
1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
2. Thickness: 0.016 inch sheet.
3. Finish: Smooth.
4. Joining: Longitudinal slip joints and 2 inch laps.
5. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

# PART 3 EXECUTION

## 3.01 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

## 3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated Ducts Conveying Air Below Ambient Temperature:
1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.

4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated Ducts Conveying Air Above Ambient Temperature:
   1. Provide with or without standard vapor barrier jacket.
   2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

E. External Duct Insulation Application:
   1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
   2. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
   3. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
   4. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

F. Duct and Plenum Liner Application:
   1. Adhere insulation with adhesive for 90 percent coverage.
   2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
   3. Seal and smooth joints. Seal and coat transverse joints.
   4. Seal liner surface penetrations with adhesive.
   5. Duct dimensions indicated are net outside dimensions required for air flow. Do not increase duct size to allow for insulation thickness.

**3.03 SCHEDULES**

A. Exhaust Ducts Within 10 ft of Exterior Openings:
   1. Glass Fiber Duct Insulation: 1-1/2 inches thick.

B. Supply Ducts (Exposed MUA-1):
   1. Rigid Glass Fiber Duct Insulation: 1-1/2 inches thick.
   2. Round spiral supply duct downstream of make up air unit, shall be double wall insulated from manufacture. No exterior insulation at these locations.

C. Ducts Exposed to Outdoors (MAU-1 Supply):
   1. Closed Cell Flexible Elastomeric Insulation: 2 inches thick.
   2. Aluminum jacketing

**END OF SECTION**

**SECTION 23 09 13**

**INSTRUMENTATION AND CONTROL DEVICES FOR HVAC**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Damper Operators:
   1. Electric operators.

B. Wall-, Surface-, and Duct-Mounted Sensors:
   1. Nitrogen dioxide sensors.
   2. Carbon monoxide sensors.

C. Thermostats:
   1. Electric thermostats.

D. Miscellaneous accessories.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 23 0519 - Meters and Gages for HVAC: Thermometer sockets and gauge taps.

D. Section 23 0993 - Sequence of Operations for HVAC Controls.

E. Section 23 3300 - Air Duct Accessories.

F. Section 25 3513 - Integrated Automation Actuators and Operators.

G. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

H. Section 26 2726 - Wiring Devices: Elevation of exposed components.

### 1.03 REFERENCE STANDARDS

A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2012.

B. NEMA DC 3 - Residential Controls - Electrical Wall-Mounted Room Thermostats; 2013.

C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

### 1.04 ADMINISTRATIVE REQUIREMENTS

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

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

### 1.05 SUBMITTALS

A. See Section 01 3000 - Submittal Procedures, for submittal procedures.

B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

D. Design Data: Provide design data for sizing and selection of compressor.

E. Manufacturer's Instructions: Provide for all manufactured components.

F. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
   1. Revise shop drawings to reflect actual installation and operating sequences.

G. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

H. Project Record Documents: Record actual location of control components, including panels, thermostats, and sensors.
   1. Revise shop drawings to reflect actual installation and operating sequences.

I. For variable frequency drives, compliance to IEEE 519 - harmonic analysis for particular jobsite including total harmonic voltage distortion and total harmonic current distortion (TDD).
   1. The VFD manufacturer shall provide calculations; specific to this installation, showing total harmonic voltage distortion is less than 5%. Input line filters shall be sized and provided as required by the AFD manufacturer to ensure compliance with IEEE standard 519. All VFD's shall include a minimum of 5% impedance reactors, no exceptions.

J. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

### 1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with documented industry experience.

B. Installer Qualifications: Company specializing in performing the work of this section with documented industry experience approved by manufacturer.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

### 1.07 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this section.

### 1.08 WARRANTY

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

B. Correct defective work within a five year period after Substantial Completion.

## PART 2 PRODUCTS

### 2.01 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

### 2.02 DAMPERS

A. Performance: Test in accordance with AMCA 500-D.

B. Frames: Galvanized steel, welded or riveted with corner reinforcement, minimum 12 gauge, 0.1046 inch.

C. Blades: Galvanized steel, maximum blade size 8 inches wide, 48 inches long, minimum 22 gauge, 0.0299 inch, attached to minimum 1/2 inch shafts with set screws.

D. Blade Seals: Synthetic elastomeric, inflatable, mechanically attached, field replaceable.

E. Jamb Seals: Spring stainless steel.

F. Shaft Bearings: Oil impregnated sintered bronze.

G. Linkage Bearings: Oil impregnated sintered bronze.

H. Leakage: Less than one percent based on approach velocity of 2000 ft per min and 4 inches wg.

I. Maximum Pressure Differential: 6 inches wg.

J. Temperature Limits: Minus 40 to 200 degrees F.

K. Control Dampers serving the CO/CO Battery/Workspace must comply with UL 5555.

L. Product:
1. Ruskin
2. Substitutions: See Section 01 6000 - Product Requirements.

**2.03 DAMPER OPERATORS**

A. General:
1. Provide actuators with torque capacity sized for minimum of 20 percent greater than maximum design stream velocity and hold tight seal against maximum system pressures.
2. Provide spring return for two position control and for fail safe operation.
3. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
4. Provide one operator for maximum 36 sq ft damper section.
5. See Section 25 3513 for field-mount damper actuators and operators.

B. Electric Operators:
1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.
2. Product:
a. Belimo
b. Johnson Controls
c. Siemens
d. Substitutions: See Section 01 6000 - Product Requirements.

**2.04 WALL-, SURFACE-, AND DUCT-MOUNT SENSORS**

A. Carbon Monoxide Controller and Detectors:
1. Controller Manufacturers:
a. Toxalert; "Toxcontrol": www.toxalert.com
b. Engineer approved equivalent.
c. Substitutions: See Section 01 6000 - Product Requirements.
2. Provide a controller to monitor the carbon monoxide sensors and shall start the exhaust fan(s) per the table on the drawings. When a sensor indicates a gas concentration of 50 PPM or higher the associated exhaust fan(s) shall start and an LED on the face of the controller shall indicate "Warning level" (exhaust fan on) operation. If the gas concentration reaches 100 PPM or higher a red alarm LED on the face of the controller shall light and the audible alarm shall sound and an alarm set of contacts shall close. The audible alarm shall be a minimum of 68dB and have a momentary push button silence switch.
3. Provide one each labeled, two color LED (light emitting diode) or two different colored lights for each sensor input. The LED or lights shall light green to indicate "Warning level" and light red for "Alarm level."
4. Provide "Sensor failure" indication for each sensor. The sensor shall be designed such that the controller can detect when a sensor has failed. Provide a light or LED on the face of the controller panel for each sensor input to indicate sensor failure. The detection of a failed sensor shall sound the audible alarm.
5. The gas monitor and control system shall utilize non-volatile memory and/or shall maintain all programs for a minimum of 72 hours during power loss.
6. Controller shall have manual override for exhaust fan control. If override switch is not integral with controller, the controller shall be provided with an override switch and wiring diagram for field installation. Additional costs for the electrical contractor to wire the switch in the field shall be the responsiility of the supplier.
7. Carbon Monoxide Sensor Manufacturers:
a. Toxalert; "Tox-CO/ANA": www.toxalert.com
b. Engineer approved equivalent.

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

8. Install carbon monoxide (CO) sensor where indicated on the drawings and as specified herein. The CO sensors shall have a linear analog output signal proportional to the CO gas levels detected, and shall have normal operation over the environmental range of -20ºF to 122ºF and 0 to 95% R.H. non-condensing. The sensors shall have a maximum range of 0 to 400 PPM (parts per million) and an accuracy of ±3% of range. The CO sensors shall be microprocessor based and shall periodically recalibrate itself. The sensor cabinet shall be a NEMA 1 and be key locked to prevent tampering. The sensor shall have indicating lamp(s) to indicate; POWER ON, sensor operating normally, and sensor failure. The CO sensor shall be designed to indicate "sensor failure" to its controller(s) when the sensor is malfunctioning. The sensor output signal resolution shall be minimum of 12 bits so that controller can sense .1 PPM signal change.
9. The CO sensor(s) shall be powered by low voltage so they can be wired using class 2 wiring. The CO sensors shall be designed to work with DC Controllers, PLC's (programmable logic controllers), automation system, analog input controllers, etc.
10. The unit shall be designed for mounting on a single gang electrical box with all wiring entering the unit from the back of the unit. Unit wiring shall not be exposed. The unit shall also be designed for surface mounting on a flat surface (drywall) with two fasteners. Wiring shall enter unit from the back so that wiring is not exposed.
11. Nitrogen Dioxide Sensor Manufacturers:
    a. Toxalert; "Tox-NO2/ANA": www.toxalert.com
    b. Engineer approved equivalent.
    c. Substitutions: See Section 01 6000 - Product Requirements.
12. Nitrogen Dioxide (NO2) sensors shall have a range of 0 to 10 ppm (parts per million) and an analog output of 4 to 20mA over its range. The sensor shall be housed in an impact-resistant, non-flammable, IP66 rated housing. The sensing element shall be electrochemical and have a life of one to three years. The sensor response time shall reach 90% of level being sensed in 30 seconds. The sensor shall be powered by low voltage and have a self check capability and an LED to indicate sensor "okay". If the sensor fails its output shall drop to zero to signal the controller of the failed condition.

### 2.05 THERMOSTATS

A. Electric Thermostats:
   1. Type: NEMA DC 3, 24 volts, with setback/setup temperature control.
   2. Service: cooling and heating.
   3. Covers: Locking with set point adjustment, with thermometer.
   4. Mounting height: Centerline at 48 inches above finished floor. Align with light switches.

B. Line Voltage Thermostats:
   1. Integral manual On/Off/Auto selector switch, single or two pole as required.
   2. Dead Band: Maximum 2 degrees F.
   3. Cover: Locking with set point adjustment, with thermometer.
   4. Rating: Motor load.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that systems are ready to receive work.

C. Beginning of installation means installer accepts existing conditions.

D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

F. Ensure installation of components is complementary to installation of similar components.

G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

**3.02 INSTALLATION**

A. Install in accordance with manufacturer's instructions.

B. Check and verify location of thermostats with plans and room details before installation. Locate 48 inches above floor. Align with lighting switches and humidistats. Refer to Section 26 2726.

C. Mount freeze protection thermostats using flanges and element holders.

D. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

E. Provide separable sockets for liquids and flanges for air bulb elements.

F. Provide guards on thermostats in entrances, public areas, and where indicated.

G. Provide valves with position indicators and with pilot positioners where sequenced with other controls.

H. Provide mixing dampers of opposed blade construction arranged to mix streams. Provide pilot positioners on mixed air damper motors.

I. Provide isolation (two-position) dampers of parallel blade construction.

J. Provide pilot positioners on pneumatic damper operators sequenced with other controls.

K. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.

L. Mount control panels adjacent to associated equipment on vibration free walls or free-standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

M. Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.

N. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

**3.03 WIRING**

A. Control and interlock wiring and installation shall comply with national and local electrical codes, Division 26, and manufacturer's recommendations. Where the requirements of Section 23 0913 differ from Division 26, Section 23 0913 shall take precedence.

B. NEC Class 1 (line voltage) wiring shall be UL listed in approved raceway as specified by NEC and Division 26.

C. Low-voltage wiring shall meet NEC Class 2 requirements. Subfuse low-voltage power circuits as required to meet Class 2 current limit.

D. NEC Class 2 (current-limited) wires not in raceway but in concealed and accessible locations such as return air plenums shall be UL listed for the intended application.

E. Install wiring in raceway in mechanical, electrical, service rooms and inaccessible locations.

F. Install Class 1 and Class 2 wiring in separate raceways. Boxes and panels containing high-voltage wiring and equipment shall not be used for low-voltage wiring except for the purpose of interfacing the two through relays and transformers.

G. Do not install wiring in raceway containing tubing.

H. Run exposed Class 2 wiring parallel to a surface or perpendicular to it and tie neatly at 10 ft intervals using wiring management D-rings.

I. Use structural members to support or anchor plenum cables without raceway. Do not use ductwork, electrical raceways, piping, or ceiling suspension systems to support or anchor cables.

J. Secure raceways with raceway clamps fastened to structure and spaced according to code requirements. Raceways and pull boxes shall not be hung on or attached to ductwork, electrical raceways, piping, or ceiling suspension systems.

K. Size raceway and select wire size and type in accordance with manufacturer's recommendations and NEC requirements.

L. Include one pull string in each raceway 1 in. or larger.

M. Use color-coded conductors throughout.

N. Locate control and status relays in designated enclosures only. Do not install control and status relays in packaged equipment control panel enclosures containing Class 1 starters.

O. Conceal raceways except within mechanical, electrical, or service rooms. Maintain minimum clearance of 6 in. between raceway and high-temperature equipment such as steam pipes or flues.

P. Adhere to requirements in Division 16 where raceway crosses building expansion joints.

Q. Install insulated bushings on raceway ends and enclosure openings. Seal top ends of vertical raceways.

R. Terminate control and interlock wiring related to the work of this section. Maintain at the job site updated (as-built) wiring diagrams that identify terminations.

S. Flexible metal raceways and liquid-tight flexible metal raceways shall not exceed 3 ft in length and shall be supported at each end. Do not use flexible metal raceway less than ½ in. electrical trade size. Use liquid-tight flexible metal raceways in areas exposed to moisture including chiller and boiler rooms.

T. Terminate control and interlock wiring related to the work of this section. Maintain at the job site updated (as-built) wiring diagrams that identify terminations. Clearly and permanently label all controllers, control devices, cabinets, actuators, valves, sensors, and any other components related to the controls. Sensors shall be labeled to match BAS naming conventions. Label all control cabeling at each end of termination. Labeling shall match the building automation system control drawings.

U. Install raceway rigidly, support adequately, ream at both ends, and leave clean and free of obstructions. Join raceway sections with couplings and according to code. Make terminations in boxes with fittings. Make terminations not in boxes with bushings.

## 3.04 CONTROL SYSTEM CHECKOUT AND TESTING

A. Startup Testing. Complete startup testing to verify operational control system before notifying Owner of system demonstration. Provide Owner with schedule for startup testing. Owner may have representative present during any or all startup testing.
   1. Calibrate and prepare for service each instrument, control, and accessory equipment furnished under Section 23 0913.
   2. Verify that control wiring is properly connected and free of shorts and ground faults. Verify that terminations are tight.
   3. Enable control systems and verify each input device's calibration. Calibrate each device according to manufacturer's recommendations.
   4. Verify that binary output devices such as relays, solenoid valves, two-position actuators and control valves, and magnetic starters, operate properly and that normal positions are correct.
   5. Verify that analog output devices such as I/Ps and actuators are functional, that start and span are correct, and that direction and normal positions are correct. Check control valves and automatic dampers to ensure proper action and closure. Make necessary adjustments to valve stem and damper blade travel.
   6. Prepare a log documenting startup testing of each input and output device, with technician's initials certifying each device has been tested and calibrated.

7. Verify that system operates according to sequences of operation. Simulate and observe each operational mode by overriding and varying inputs and schedules. Tune PID loops and each control routine that requires tuning.
8. Alarms and Interlocks.
   a. Check each alarm with an appropriate signal at a value that will trip the alarm.
   b. Trip interlocks using field contacts to check logic and to ensure that actuators fail in the proper direction.
   c. Test interlock actions by simulating alarm conditions to check initiating value of variable and interlock action.

**END OF SECTION**

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**SECTION 23 31 00**

**HVAC DUCTS AND CASINGS**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Metal ducts.

B. Metal ductwork.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

D. Section 23 0713 - Duct Insulation: External insulation and duct liner.

E. Section 23 3300 - Air Duct Accessories.

F. Section 23 3319 - Duct Silencers.

G. Section 23 3700 - Air Outlets and Inlets: Fabric air distribution devices.

### 1.03 REFERENCE STANDARDS

A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2013.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

G. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; 2012, 2nd Edition.

### 1.04 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

### 1.05 SUBMITTALS

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

B. Product Data: Provide data for duct materials.

C. Shop Drawings: Indicate duct fittings, particulars such as gauges, sizes, welds, and configuration prior to start of work for 4-inch pressure class and higher systems.

D. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate per appropriate seal class, following SMACNA (LEAK).

E. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

### 1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with documented industry experience, and approved by manufacturer.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with documented industry experience.

### 1.07 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A standards.

### 1.08 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

## PART 2 PRODUCTS

### 2.01 GENERAL REQUIREMENTS

A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.

B. Provide metal duct unless otherwise indicated. Fibrous glass duct can be substituted at the Contractor's option.

C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 23 3319.

D. Duct Shape and Material in accordance with Allowed Static Pressure Range:

E. Duct Sealing and Leakage in accordance with Static Pressure Class:

F. Duct Fabrication Requirements:
   1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
   2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
   3. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.
   4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
   5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
   6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
   7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

G. Regulatory Requirements: Construct ductwork to comply with 1 standards.

### 2.02 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
   1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
   2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
   3. For Use with Flexible Ducts: UL labeled.
   4. Manufacturers:
      a. Carlisle HVAC Products; Hardcast Versa-Grip 181 Water Based Fiber Reinforced Duct Sealant: www.carlislehvac.com/#sle.
      b. Design Polymerics; DP 1010 Water Based Smooth Duct Sealant, Zero VOC, Premium Quality: www.designpoly.com/#sle.

c. Ductmate Industries, Inc, a DMI Company: www.ductmate.com/#sle.
d. Engineer approved equivalent.
e. Substitutions: See Section 01 6000 - Product Requirements.

C. Gasket Tape: Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle rings connections.
1. Manufacturers:
a. Design Polymerics; DP 1040 100 Percent Solids, Zero VOC, High Pressure/High-Velocity Butyl Gasket Tape: www.designpoly.com/#sle.
b. Engineer approved equivalent.
c. Substitutions: See Section 01 6000 - Product Requirements.

D. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

E. Insulated Flexible Ducts:
1. Manufacturers:
a. Thermaflex Model #M-KE.
b. ATCO: www.atcoflex.com
c. Engineer approved equivalent.
d. Substitutions: See Section 01 6000 - Product Requirements.
2. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.
a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
b. Maximum Velocity: 5000 fpm.
c. Temperature Range: -20 degrees F to 210 degrees F.

F. Ducts: Galvanized steel, unless otherwise indicated.

G. Hanger Rod: ASTM A 36/A 36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

**2.03 DUCTWORK FABRICATION**

A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.

B. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE (FUND) Handbook - Fundamentals.

C. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

D. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.

E. T's, bends, and elbows: Construct according to SMACNA (DCS).

F. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

G. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

H. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

I. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

J. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

### 2.04 DUCT MANUFACTURERS

A. SEMCO Incorporated: www.semcoinc.com.

B. United McGill Corporation: www.unitedmcgill.com.

C. Sheet Metal Connectors: www.smcduct.com

D. Lindab: www.lindab.com

E. Engineer approved equivalent.

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

### 2.05 METAL DUCTS

A. Material Requirements:
   1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages,reinforcing, and sealing for operating pressures indicated.

C. Flat Oval and Round Ducts: Machine made from round spiral lockseam duct with light reinforcing corrugations; fittings manufactured of at least two gages heavier metal than duct.
   1. Manufacture in accordance with SMACNA (DCS).
   2. Fittings: Manufacture at least two gauges heavier metal than duct.
   3. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

D. Spiral Ducts: Round spiral lockseam duct with galvanized steel outer wall.
   1. Manufacture in accordance with SMACNA (DCS).

E. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
   1. Manufacturers:
      a. Carlisle HVAC Products; Nexus Flange Connectors with Sealant Pocket: www.carlislehvac.com/#sle.
      b. Ductmate Industries, Inc, a DMI Company: www.ductmate.com/#sle.
      c. Engineer approved equivalent.
      d. Substitutions: See Section 01 6000 - Product Requirements.

## PART 3 EXECUTION

### 3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install products following the manufacturer's instructions.

C. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.

D. Flexible Ducts: Connect to metal ducts with adhesive.

E. Install flexible ductwork elbow supports at each diffuser, grille, or register, and elsewhere as indicated.

F. Duct sizes indicated are inside clear dimensions. For lined ducts, duct liner thickness have been accounted for in the final duct size.

G. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

H. Provide openings in ductwork as indicated to accommodate thermometers and controllers. Provide pilot tube openings as indicated for testing of systems, complete with metal can with spring device or screw to insure against air leakage. For openings, insulate ductwork and install insulation material inside a metal ring.

I. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

J. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with a crimp in the direction of airflow.

K. Use double nuts and lock washers on threaded rod supports.

L. Connect terminal units to supply ducts directly or with one foot maximum length of flexible duct. Do not use flexible duct to change direction.

M. Connect diffusers or light troffer boots to low-pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.

N. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

O. At exterior wall louvers and caps, seal duct to louver or wall cap frame and install blank-out panels where required.

**3.02 SCHEDULES**

A. Ductwork Material:
   1. Low and Medium Pressure Supply: Galvanized Steel.
   2. General Exhaust: Galvanized Steel.

B. Ductwork Pressure Class:
   1. Low Pressure Supply: 2 inch
   2. General Exhaust: 2 inch.

**END OF SECTION**

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**SECTION 23 33 00**

**AIR DUCT ACCESSORIES**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Backdraft dampers.

B. Duct access doors.

C. Duct test holes.

D. Flexible duct connectors.

E. Volume control dampers.

F. Miscellaneous Products:
   1. Internal strut end plugs.
   2. Duct opening closure film.

### 1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Division 00 - Procurement and Contracting Requirements

C. Division 01 - General Requirements

D. Section 23 3100 - HVAC Ducts and Casings.

E. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

### 1.03 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

### 1.04 SUBMITTALS

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

B. Product Data: Provide for shop-fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.

C. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.

D. Project Record Drawings: Record actual locations of access doors and test holes.

### 1.05 PROJECT RECORD DOCUMENTS

A. Record actual locations of access doors and test holes.

### 1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with documented industry experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

### 1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

### 1.08 EXTRA MATERIALS

A. See Section 01 6000 - Product Requirements, for additional provisions.

## PART 2 PRODUCTS

### 2.01 BACKDRAFT DAMPERS

A. Manufacturers:
   1. Louvers & Dampers, Inc, a brand of Mestek, Inc: www.louvers-dampers.com/#sle.
   2. Nailor Industries, Inc: www.nailor.com/#sle.
   3. Ruskin Company: www.ruskin.com/#sle.
   4. Engineer approved equivalent.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

### 2.02 DUCT ACCESS DOORS

A. Manufacturers:
   1. Acudor Products Inc, a Division of Nelson Industrial Inc: www.acudor.com/#sle.
   2. Ductmate Industries, Inc, a DMI Company: www.ductmate.com/#sle.
   3. Nailor Industries Inc: www.nailor.com.
   4. Ruskin Company: www.ruskin.com.
   5. SEMCO Incorporated: www.semcohvac.com.
   6. Engineer approved equivalent.
   7. Substitutions: See Section 01 6000 - Product Requirements.

B. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick-fastening locking devices. For insulated ducts, install minimum 1-inch thick insulation with sheet metal cover.
   1. Less Than 12 inches Square: Secure with sash locks.
   2. Up to 18 inches Square: Provide two hinges and two sash locks.
   3. Up to 24 by 48 inches: Three hinges and two compression latches with outside and inside handles.
   4. Larger Sizes: Provide an additional hinge.

C. Access doors with sheet metal screw fasteners are not acceptable.

### 2.03 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

### 2.04 FLEXIBLE DUCT CONNECTORS

A. Manufacturers:
   1. Carlisle HVAC Products; Dynair Connector Plus G90 Steel Offset Seam Neoprene Fabric: www.carlislehvac.com/#sle.
   2. Ductmate Industries, Inc, a DMI Company: www.ductmate.com/#sle.
   3. Engineer approved equivalent.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Flexible Duct Connections: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz/sq yd.
      a. Net Fabric Width: Approximately 2 inches wide.
   2. Metal: 3 inches wide, 24 gauge, 0.0239 inch thick galvanized steel.

D. Maximum Installed Length: 14 inch.

## 2.05 VOLUME CONTROL DAMPERS

A. Manufacturers:
   1. Louvers & Dampers, Inc: www.louvers-dampers.com.
   2. Nailor Industries Inc: www.nailor.com.
   3. Ruskin Company: www.ruskin.com.
   4. Engineer approved equivalent.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Single Blade Dampers:
   1. Fabricate for duct sizes up to 6 by 30 inch.
   2. Blade: 24 gauge, 0.0239 inch, minimum.

D. Multi-Blade Damper: Fabricate consisting of opposed blades with maximum blade sizes 8 by 72 inches. Assemble center- and edge-crimped blades in prime-coated or galvanized-channel frame with suitable hardware.
   1. Blade: 18 gauge, 0.0478 inch, minimum.

E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

F. Quadrants:
   1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
   2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
   3. Where rod lengths exceed 30 inches provide regulator at both ends.

## 2.06 MISCELLANEOUS PRODUCTS

A. Internal Strut End Plugs: Combination end-mounting and sealing plugs for metal conduit used as internal reinforcement struts for metal ducts; plug crimped inside conduit with outside gasketed washer seal.
   1. Manufacturers:
      a. Carlisle HVAC Products; Dynair Internal Duct Reinforcement - Conduplugs: www.carlislehvac.com/#sle.

B. Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.
   1. Thickness: 2 mils.
   2. High tack water based adhesive.
   3. UV stable light blue color.
   4. Elongation Before Break: 325 percent, minimum.
   5. Manufacturers:
      a. Carlisle HVAC Products; Dynair Duct Protection Film: www.carlislehvac.com/#sle.

C. For dampers above non-removable ceilings and without ceiling access panels provide Ventloc #667 or equivalent damper regulator with paintable cover plate and interconnecting hardware.

D. Balancing damper above non-removable ceilings shall have volume control dampers, casing and wire, cable, locking gear cable controller and control wrench all as an integrated system. Control dampers shall be opposed blade rectangular or round as required for the specific branch ducts. Cable, casing and wire shall be routed concealed within duct or above ceiling. Wrench operated controller shall be mounted concealed in duct drop on hard ducted diffusers and inside plenum on plenum slot diffusers. Wrench operated controller shall be mounted to frame or back cone of lay-in ceiling diffusers. Provide and install mouting brackets as required for operator mounting. Provide stand-off mounting brackets on insulated ductwork and plenums. Controller may also be mounted in accessible mechanical or storage room.

## PART 3 EXECUTION

### 3.01 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 23 3100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 by 8 inch size for hand access,  size for shoulder access, and as indicated.  Provide 4 by 4 inch for balancing dampers only.  Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

F. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

G. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum two duct widths from duct take-off.

H. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

**END OF SECTION**

# SECTION 23 34 23

# HVAC POWER VENTILATORS

# RFB #923902-01

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Wall exhausters.

B. Destratification fans.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 23 3300 - Air Duct Accessories: Backdraft dampers.

D. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

### 1.03 REFERENCE STANDARDS

A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; http://www.amca.org/certified/search/company.aspx.

B. AMCA 99 - Standards Handbook; 2010.

C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2005.

D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2007.

E. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; Air Movement and Control Association International, Inc.; http://www.amca.org/certified/search/company.aspx.

F. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.

G. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2014.

H. NEMA MG 1 - Motors and Generators; 2014.

I. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

### 1.04 SUBMITTALS

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

B. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.

C. Manufacturer's Instructions: Indicate installation instructions.

D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

### 1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with documented industry experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

### 1.06 FIELD CONDITIONS

A. Request Owner permission to use permanent ventilator(s) for ventilation during construction.

## PART 2 PRODUCTS

### 2.01 POWER VENTILATORS - GENERAL

A. Static and Dynamically Balanced: Comply with AMCA 204.

B. Performance Ratings: Comply with AMCA 210, bearing certified rating seal.

C. Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.

D. Fabrication: Comply with AMCA 99.

E. UL Compliance: UL 705, listed, labeled, designed, manufactured, and tested.

F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

### 2.02 WALL EXHAUSTERS (EF-1, EF-2)

A. Manufacturers:
1. Loren Cook Company: www.lorencook.com.
2. Greenheck Fan Corporation: www.greenheck.com/#sle.
3. PennBarry, Division of Air System Components: www.pennbarry.com/#sle.
4. Twin City Fan & Blower: www.tcf.com/#sle.
5. Engineer approved equivalent.
6. Substitutions: See Section 01 6000 - Product Requirements.

B. Fan Unit: V-belt or direct driven with spun aluminum housing; resiliently mounted motor; 1/2 inch mesh, 0.062 inch thick aluminum wire bird screen.

C. Disconnect Switch: Cord and plug in housing for thermal overload protected motor and fan mounted, adjustable speed control.

D. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

E. Sheaves: For V-belt drives, provide cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm can be reached with sheaves set at mid-position; fan shaft with self-aligning prelubricated ball bearings.

### 2.03 DESTRATIFICATION FANS (DF-A)

A. Manufacturers:
1. ZOO Fans; Model H-25 AC: www.zoofans.com
2. Engineer approved equivalent.
3. Substitutions: See Section 01 6000 - Product Requirements.

B. Description
1. Complete Unit Certification: The combined fan, hanging accessories, and controller shall be ETL certified as a comprehensive package for UL Standard 507 and CSA Standard 22.2
2. The fan shall incorporate a direct drive system with axial blades that are completely enclosed in a plastic housing. Blades shall not be exposed like paddle fans.
3. All models shall include intake safety grill
4. Axial blades: The fan shall be equipped with seven (7) dynamically balanced blades constructed of PA6 glass-fiber reinforced plastic. The blades shall be high performance owlet style blades comprised of winglets top and bottom and serrated trailing edges for enhanced efficiency and performance of the fan.
5. Motor: The fan motor shall be direct drive externally wound high efficiency PSC motor. The motor shall be 120V, 1ph.
6. Mounting System: The fan mounting system shall be designed for quick installation. The mounting system shall include a 200lb safe working load cable with quick adjustment and

attachment hardware. The mounting system shall also include a 100 lb safe working load stabilization tether and attachment hardware.

7. Performance:
   a. Air Volume: 588 cfm
   b. Electrical Characteristics: 120V/1 ph/0.48A
   c. Sound Level: 36.4 dBA @ 25 ft.
   d. Color: White in Constuction Bays

C. Accessories
   1. Advanced Variable Speed Controller: Microprocessor controller for stand alone system operation, 115V, automatically detected. Wiring for Control Signal must be in separate conduit.
   2. Three Prong Plug: Optional 3-prong plug and 6’ cord factory installed.
   3. Exhaust Safety Grill: Optional Exhaust Safety Grill to protect the exhaust from large objects.

## PART 3 EXECUTION

### 3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide sheaves required for final air balance.

C. Install motorized backdraft dampers on outside air intake to energy recovery unit.

D. Install gravity backdraft damper on exhaust from energy recovery unit.

E. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

**END OF SECTION**

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# SECTION 23 37 00

# AIR OUTLETS AND INLETS

# RFB #923902-01

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Diffusers:

B. Registers/grilles:

C. Louvers:

### 1.02 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2012.

B. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets; 2006 (R2011).

C. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

### 1.03 SUBMITTALS

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

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

C. Project Record Documents: Record actual locations of air outlets and inlets.

### 1.04 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Test and rate louver performance in accordance with AMCA 500-L.

### 1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with documented industry experience.

## PART 2 PRODUCTS

### 2.01 GRILLES, REGISTERS AND DIFFUSERS

A. Manufacturer:
   1. Price Industries: www.price-hvac.com.
   2. Titus: www.titus-hvac.com.
   3. Carnes, a division of Carnes Company Inc.: www.carnes.com.
   4. Krueger: www.krueger-hvac.com.
   5. Engineer approvel equivalent.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Grilles, Registers and Diffusers:
   1. See schedule on drawings for air inlet and outlet types and performance.

### 2.02 LOUVERS

A. Manufacturers:
   1. Ruskin; Model ELF6375DX: www.ruskin.com
   2. Greenheck: www.greenheck.com
   3. Louvers and Dampers: www.louvers-dampers.com
   4. Pottorff: www.pottorff.com
   5. United Enertech: www.unitedenertech.com
   6. Engineer approved equivalent.
   7. Substitutions: See Section 01 6000 - Product Requirements.

B. Type: 6 inch deep with blades on 37.5 degree slope with center baffle and return bend, heavy channel frame, 1/2 inch square mesh screen over exhaust and 1/2 inch square mesh screen over intake.

C. Fabrication: 0.081 inch thick extruded aluminum, welded assembly, with factory Kynar finish color to be selected.

D. Gutters: Drain gutter in head frame and each blade.

E. Downspouts: Downspouts in jambs to drain water from louver for minimum water cascade from blade to blade.

F. Vertical Supports: Hidden vertical supports to allow continuous line appearance up to 120 inches.

G. Sill: Steeply angled integral sill eliminating areas of standing or trapped moisture.

H. Mounting: Furnish with masonry strap anchors for installation at the boiler room.

I. Mounting: Furnish with exterior flat flange for installation at the existing metal wall panels.

J. Performance: See schedule on drawings.

K. Finish: As selected by Architect.

## PART 3 EXECUTION

### 3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.

C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

D. Install diffusers to ductwork with air tight connection.

E. Provide balancing dampers on duct take-off to diffusers and grilles and registers, despite whether dampers are specified as part of diffuser, or grille and register assembly.

F. Paint ductwork visible behind air outlets and inlets matte black, see Section 09 9123.

**END OF SECTION**

# SECTION 23 55 33

# FUEL-FIRED UNIT HEATERS

# RFB #923902-01

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Infrared heaters.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 23 3100 - HVAC Ducts and Casings.

D. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

### 1.03 REFERENCE STANDARDS

A. NFPA 54 - National Fuel Gas Code; 2015.

B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

C. NFPA 211 - Guide for Smoke and Heat Venting; 2013, Including All Amendments.

### 1.04 SUBMITTALS

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

B. Product Data: Provide manufacturer's literature and data indicating rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

C. Shop Drawings: Indicate assembly, required clearances, and locations and sizes of field connections.

D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating 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.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 6000 - Product Requirements - Project Requirements, for additional provisions.

### 1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with documented industry experience.

### 1.06 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

### 1.07 WARRANTY

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

B. Provide written warranty, by manufacturer, agreeing to replace/repair, within warranty period, components of gas fired infrared systems furnished by manufacturer, which are defective in either material or workmanship, provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty periods follows:

1. Three (3) year warranty on the burner system and on the tubing from date of final acceptance of the infrared heaters.
2. Three (3) from date of final acceptance of all other components including electrical.

## PART 2 PRODUCTS

### 2.01 LOW-INTENSITY, INFRARED RADIANT HEATERS, POSITIVE PRESSURE

A. Manufacturers:
   1. Detroit Radiant; "HL3": www.reverberray.com
   2. Roberts Gordon: "CTH3": www.robertsgordon.com
   3. Engineer approved equivalent.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Natural Gas model, burner box design with silicone gasketed doors, internally mounted blower (permanently lubricated), nickel plated burner cup, hot surface ignition, interlock safety switch, spot welded construction, mica flame observation window. Burner assembly shall be epoxy polyester powder painted for corrosion resistance.

C. Burner and Emitter Type: Gravity-vented power burner, with the following features:
   1. Gas control: Operation shall include a defined input differential. Heater must be CSA Design Certified to operate at an input differential of at least 30% between the low and nominal rated input modes.
   2. Burner/Ignition: Power gas burner with hot surface ignition electronic flame safety. The ignition sequence shall have a prepurge and timed trial for ignition with multiple ignition trial before lockout occurs. The heater shall be capable of a minimum of (4) trials for ignition to provide maximum reliability.
   3. Fail Safe Controls: Safety contorls shall include an air proving safety switch pressure switch to verify blower operation before gas valve opens. Blower air pressure shall be continuously monitored by a pressure sensor. A sensed reduction in pressure shall result in corresponding reduction in gas input for maximum safety and combustion quality.
   4. Combustion Tubing:
      a. IRH-1, IRH-2: Radiant heater tube assembly shall be constructed of 4" O.D. 16 gauge heat treated aluminized steel.
   5. Tubing Connections: Stainless-steel couplings with slide bar/coupling lock.

D. Reflector: Provide aluminum reflector installed to provide continuous coverage of heat exchanger. To maximize radiant output and minimize convection losses, reflectors are to extend below the bottom of the heat exchanger pipe. Reflector shall be .025 polished aluminum with a multi-faceted design which includes reflector end caps. Reflector shall have a polished bright finish with clear visual reflection ability. Reflectors shall be rotatable from 0 to 45 degrees when required. The heater's reflector hanging system shall be designed to permit expansion while minimizing noise and/or rattles.
   1. Reflector Extension Shields: Same material as reflectors, arranged for fixed connection to lower reflector lip and rigid support to provide 100 percent cutoff of heat exchanger.

E. Burner Safety Controls:
   1. Heater controls shall include a safety differential pressure switch to monitor combustion air flow, as to provide complete burner shutdown due to insufficient combustion air or flue blockage.
   2. The heater shall incorporate a self-diagnostic ignition module, and recycle the heater after an inadvertent shutdown.
   3. The heater's control system shall be designed to shut off the gas flow to the main burner in the event either a gas supply or power supply interruption occurs.
   4. The heater's blower motor shall be thermally protected and the motor's impeller shall be balanced.
   5. Heater control assembly shall include three indicator lights that define the units operating input ranges. One indicator shall validate air flow. Two indicator lights shall indicate low and high stages.
   6. The heater's air flow control system shall provide a 45 second pre-purge prior to initiating burner operation and a 90 second post-purge upon completion, effectively removing all products of combustion from heat exchanger and/or radiant tubes.

7. No condensation shall form as a result of combustion in the combustion chamber or radiant tubes while at operating temperatures.
8. Thermostat control shall be two-stage (or modulating) operating on 24 volts.

F. Venting
1. Provide and install single wall venting from radiant heating sections to exterior. Double wall, Type B vent shall be used at penetrations through combustible construction.
2. Sidewall venting shall be Tjernlund VH1 or equivalent weather-proof end cap.
3. Roof venting shall be through weather-proof cap.

G. Temperature Control:
1. Provide low voltage type heat demand control device for each 'central' radiant heater. Zone temperature sensor shall include 40-75° F setpoint adjustability and low voltage ON/OFF switch as available from radiant heater manufacturer. Temperature sensor shall be wired only to one heater per zone. Separate ON/OFF switch for 'satellite' heaters. All control wiring and conduit shall be the responsibility of the mechanical contractor.
2. Provide a wet environment themostat in the wash bay near the hotsy.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that space is ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available.

C. Verify that proper fuel supply is available for connection.

### 3.02 INSTALLATION

A. Install in accordance with NFPA 90A.

B. Install gas fired units in accordance with NFPA 54 and applicable codes.

C. Provide vent connections in accordance with NFPA 211. Refer to Section 23 5100.

D. Provide connection to electrical power systems; refer to Section 26 0583.

E. Install gas fired radiant systems as indicated, in accordance with manufacturer's most current 'Installation and Operation Manual' instructions, and in compliance with applicable codes and requirements of authorities having jurisdiction.

F. Suspend heat exchangers, burners, gas piping, conduit, and reflectors from building substrate as indicated, or if not indicated, in manner to provide durable and safe installation; and in accordance with manufacturer's installation instructions.

G. Do not exceed clearance to combustibles outlined and printed on burner nameplate, and in manufacturer's product data. Measure clearance distance from surface of heat exchangers or as indicated by manufacture 'Installation and Operation Manual'.

H. Install gas piping as indicated, and in accordance with manufacturer's installation instructions. Provide gas at maximum of 14 inches W.C. to each burner. Gas shutoff cock, as supplied with unit must not be subjected to more than 14 inches W.C. pressure.

I. Provide dirt legs at all gas risers.

J. Adjust gas fired radiant heaters in accordance with manufacturer's start-up instructions. Check and calibrate controls, adjust burners if applicable according to manufacturer's instructions for maximum efficiency.

### 3.03 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gas-fired radiant heaters.

**END OF SECTION**

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**SECTION 23 74 33**

**DEDICATED OUTDOOR AIR UNITS**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Direct fired make-up air heater.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 22 1005 - Plumbing Piping: Natural gas connections.

D. Section 23 3300 - Air Duct Accessories: Flexible duct connections.

E. Section 23 0913 - Instrumentation and Control Devices for HVAC: Control components, time clocks.

F. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

### 1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008.

B. ASHRAE Std 23.1 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units; 2010.

C. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2013, Including All Amendments and Errata.

D. NFPA 54 - National Fuel Gas Code; 2015.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

G. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

### 1.04 SUBMITTALS

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

B. Product Data: Provide data with dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.

C. Shop Drawings: Indicate dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.

D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

E. Project Record Documents: Record actual locations of components.

F. Operation And Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

G. Warranty: Submit manufacturer’s warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

### 1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with documented industry experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section with documented industry experience and approved by manufacturer.

### 1.06 REGULATORY REQUIREMENTS

A. Conform to NFPA 70.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

### 1.07 WARRANTY

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

B. Provide five year manufacturer's warranty for compressor/condenser unit.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Weather-Rite; XT Series: www.weather-rite.com

B. Trane: www.trane.com

C. Greenheck: www.greenheck.com.

D. Engineer approved equivalent.

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

### 2.02 MANUFACTURED UNITS

A. Provide self-contained, packaged direct fired, dynamically pressure modulated, industrial air handler including casing, insulation, modulating burner, manifold, forward curve DWDI fan, motor, mixing chamber, positive position modulating return/fresh air dampers specifically designed and temperature control and system monitoring, and all other component parts reasonably incidental to providing a complete pressurized heating system.

B. Unit: Outdoor Constant Volume unit.

C. Construction and Ratings: In accordance with AHRI 210/240 and UL 207. Testing: ASHRAE Std 23.1.
   1. Performance Ratings: Energy Efficiency Rating (EER)/Coefficient of Performance (COP) not less than requirements of 1.
   2. Heating Capacity:
      a. Temperature Rise: [90] degrees F
      b. Air Flow: 4000 cfm.
      c. External Static Pressure: 0.5 inches wg.

### 2.03 FABRICATION

A. Casing and Components: Heavy gauge galvanized steel panels, minimum 18 gauge. Hinged access door to burner, fan, controls and motor.

B. Fan Support: The fan and bearings shall be supported by a reinforced structural steel framework independent of the cabinet.

C. Access Doors: Neoprene-gasketed, hinged doors shall be provided to allow easy service of all critical components, controls and fan.

D. Lifting Points: Internal members shall be properly sized to allow easy service of all critical components, controls and fan.

E. Observation Port: On burner section for observing main and pilot flames.

F. Outdoor Installation: Weatherproofed casing, with intake louver or hood.

### 2.04 FILTERS

A. Filter: Removable 2 inches thick high velocity permanent filters in metal frames.

### 2.05 BURNERS

A. Burner: Line burner designed to burn natural or propane gas at or below the non-contaminating levels required by ANSI and OSHA. The burner shall have a cast aluminum manifold and heat resistant Type 430 stainless steel burner plates. The burner shall have a nominal 30:1 turndown ratio and be designed for 100% combustion efficiency for the life of the equipment.

B. Burner Profile: The correct outdoor air velocity across the burner shall be maintained by fixed burner profile plates (burner velocity on 100% OA variable volume (VAV) units shall be regulated via a modulating damper controlled by a differential pressure control). The design of the unit profile plates shall maintain manufacturer's specified air velocity at all times over the burner during operation. No air from the occupied space shall be allowed to recirculate across the burner at any time.

C. Burner Assembly - Gas Train: The burner assembly and fuel piping arrangement shall include automatic ignition controls, flame rod monitoring / supervision flame failure system, pressure regulator, fully modulating gas control valve, primary and secondary automatic shutoff valves and manual shutoff valve. Pilot gas controls shall include a pilot regulator, normally-closed solenoid shutoff valves and manual shutoff valve. Gas train shall be sized to provide full unit capacity at specified inlet pressure to the gas train. Installing contractor shall provide and install a supplementary high pressure regulator as necessary to maintain unit inlet pressure at less than 5 PSI.

D. Pilot: Electrically ignited by spark rod through high voltage ignition transformer.

E. Damper: Motorized with end switch to prove position before burner will fire.

**2.06 FAN**

A. Fan: Statically and dynamically balanced centrifugal fan mounted on solid steel shaft with heavy duty self-aligning pre-lubricated ball bearings and V-belt drive with matching motor sheaves and belts.

B. Fan Bearings: Self-aligning, pillow block or flange type and shall have (for external static pressure less that 1" w.c.) an ABMA L10 rated life of 30,000 hours.

C. Electrical Characteristics:
   1. See schedule on drawings.

**2.07 CONTROLS**

A. Controls: Pre-wire unit for connection of power supply. Field wiring from unit to remote control panel makes unit operative.

B. Factory testing: The complete control system, all burner and gas manifold functions shall be factory tested for proper operation and to simplify field commissioning.

C. Control Enclosure: The unit control encloser shall be constructed to NEMA 3R specifications with a hinged door. The control enclosure shall contain the gas train and all principal electrical components, such as motor, motor starter, fused disconnect switch, 120V and 24V transformers, control circuit fuses, control relay(s), flame relay and full number-coded terminal strip.

D. Flame Relay: The air handler control panel shall have a burner flame relay to lock out the flame during abnormal operating conditions.

E. Safety Controls
   1. Air Flow: The air flow switch measure air pressure differential across the burner to assure proper air flow during burner operation and prior to ignition. It shall be factory set and the point as dictated by the equipment's' ETL Certification report.
   2. High Temperature Limit: A manual reset high temperature switch shall turn the burner off when the air is discharged above the set point. The High Temperature Limit Switch shall be factor set at 160F.

F. Remote Control Panel: On-off-auto switch, Heat/Off, indicating lights for supply fan, pilot operation, burner operation, lockout indication, and clogged filter indication.

G. Fan Discharge Thermostat: Controls modulating gas valve to maintain supply air temperature.

H. Safety Controls: Sense correct air flow before energizing pilot and sense pilot ignition before activating main gas valve.

I. Manual Reset Low and High Limit Controls: Maintain supply air temperature between set points and shut fan down if temperatures are exceeded.

## PART 3 EXECUTION

### 3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide unit- or duct-mounted smoke detectors and other NFPA 90A provisions.

C. Install to 1. Provide connection to fuel gas system; refer to Section 22 1005.

D. Provide flexible duct connections on inlet and outlet from unit; see Section 23 3300.

E. Connect drain pan outlet to nearest building drain system piping.

F. Adjusting: Use plenum static pressure readings against manufacturer calibration chart to adjust primary airflow as other measuring methods will not work.

**END OF SECTION**

**SECTION 26 05 19**

**LOW-VOLTAGE POWER CONDUCTORS AND CABLES (600 V AND LESS)**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Single conductor building wire.
B. Metal-clad cable.
C. Wire and cable for 600 volts and less.
D. Wiring connectors.
E. Electrical tape.
F. Heat shrink tubing.
G. Wire pulling lubricant.
H. Cable ties.
I. Firestop sleeves.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements
B. Division 01 - General Requirements
C. Section 07 8400 - Firestopping.
D. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
F. Section 26 2100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conductors.
G. Section 28 3100 - Fire Detection and Alarm: Fire alarm system conductors and cables.
H. Section 31 2316 - Excavation.
I. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.
J. Section 31 2323 - Fill: Bedding and backfilling.

### 1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.
B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.
C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).
D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).
E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2010.
F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2013.
G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
H. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.

I. NEMA WC 70 - Nonshielded Power Cable 2000 V or Less for the Distribution of Electrical Energy; 2009.

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 267 - Outline of Investigation for Wire-Pulling Compounds; Most Recent Edition, Including All Revisions.

N. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

O. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

P. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

Q. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

R. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

A. Coordination:
1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
3. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.05 SUBMITTALS**

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

B. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing of conduits 2" and larger for all systems.

**1.06 QUALITY ASSURANCE**

A. Comply with requirements of NFPA 70.

**1.07 DELIVERY, STORAGE, AND HANDLING**

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

**PART 2 PRODUCTS**

**2.01 CONDUCTOR AND CABLE APPLICATIONS**

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Nonmetallic-sheathed cable is not permitted.

D. Underground feeder and branch-circuit cable is not permitted.

E. Service entrance cable is not permitted.

F. Armored cable is not permitted.

G. Metal-clad cable is permitted only as follows:
1. Where not otherwise restricted, may be used:
a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.

1) Maximum Length: 6 feet.

2. In addition to other applicable restrictions, may not be used:
   a. Where not approved for use by the authority having jurisdiction.
   b. Where exposed to view.
   c. Where exposed to damage.
   d. For damp, wet, or corrosive locations.

**2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS**

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductors for Grounding and Bonding: Also comply with Section 26 0526.

H. Conductor Material:
   1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   3. Tinned Copper Conductors: Comply with ASTM B33.

I. Minimum Conductor Size:
   1. Branch Circuits: 12 AWG.
      a. Exceptions:
         1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
         2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
   2. Control Circuits: 14 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. 208Y/120 V, 3 Phase, 4 Wire System:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
         4) Neutral/Grounded: White.
      b. Equipment Ground, All Systems: Green.
      c. Travelers for 3-Way and 4-Way Switching: Purple.
      d. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
      e. For control circuits, comply with manufacturer's recommended color code.

## 2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor Stranding:
   1. Feeders and Branch Circuits:
      a. Size 10 AWG and Smaller: Solid.
      b. Size 8 AWG and Larger: Stranded.
   2. Control Circuits: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:
   1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
      a. Size 4 AWG and Larger: Type XHHW-2.
      b. Installed Underground: Type XHHW-2.
      c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

## 2.04 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. Provide dedicated neutral conductor for each phase conductor.

F. Grounding: Full-size integral equipment grounding conductor.

G. Armor: Steel, interlocked tape.

## 2.05 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. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
   5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
   6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.

7. Conductors for Control Circuits: Use crimped terminals for all connections.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F 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.

H. Mechanical Connectors: Provide bolted type or set-screw type.

I. Compression Connectors: Provide circumferential type or hex type crimp configuration.

J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

**2.06 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.
3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
5. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil; suitable for continuous temperature environment up to 221 degrees F.
6. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Wire Pulling Lubricant:
1. Listed and labeled as complying with UL 267.
2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
3. Suitable for use at installation temperature.

D. Cable Ties: Material and tensile strength rating suitable for application.

E. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.

F. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that raceway installation is complete and supported.

E. Verify that field measurements are as indicated.

F. Verify that conditions are satisfactory for installation prior to starting work.

**3.02 PREPARATION**

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

**3.03 INSTALLATION**

A. Circuiting Requirements:
   1. Unless dimensioned, circuit routing indicated is diagrammatic.
   2. When circuit destination is indicated without specific routing, determine exact routing required.
   3. Arrange circuiting to minimize splices.
   4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
   5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
   6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
   7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are shown as separate, combining them together in a single raceway is permitted, under the following conditions:
      a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
      b. Increase size of conductors as required to account for ampacity derating.
      c. Size raceways, boxes, etc. to accommodate conductors.
   8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among 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.
   2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.

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. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

K. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

L. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

M. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
   3. Do not remove conductor strands to facilitate insertion into connector.
   4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
   5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

N. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
   1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
      b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
   2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
      b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
   3. Wet Locations: Use heat shrink tubing.

O. Insulate ends of spare conductors using vinyl insulating electrical tape.

P. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

Q. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

R. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

S. Support cables above accessible ceiling and in attic, using spring metal clips, D-rings or metal cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.

**3.04 FIELD QUALITY CONTROL**

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

B. Perform inspection, testing, and adjusting in accordance with Section 01 4000.

C. Correct deficiencies and replace damaged or defective conductors and cables.

**END OF SECTION**

# SECTION 26 05 26

# GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 26 0519 - Low-Voltage Power Conductors and Cables (600 V and Less): Additional requirements for conductors for grounding and bonding, including conductor color coding.

D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 5600 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

### 1.03 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2007.

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.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify exact locations of underground metal water service pipe entrances to building.
   2. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install ground rod electrodes until final backfill and compaction is complete.

### 1.05 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 25 ohms.

### 1.06 SUBMITTALS

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

B. Field quality control test reports.

C. Project Record Documents: Record actual locations of grounding electrode system components and connections.

### 1.07 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

### 1.08 DELIVERY, STORAGE, AND HANDLING

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

## PART 2 PRODUCTS

### 2.01 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Engineer. Precipitation within the previous 48 hours does not constitute normally dry conditions.
   2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

E. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.
      b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
   2. Metal Underground Water Pipe(s):
      a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
      b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
      c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
   3. Metal In-Ground Support Structure:
      a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
   4. Ground Rod Electrode(s):
      a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
      b. Space electrodes not less than 10 feet from each other and any other ground electrode.
   5. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

F. Bonding and Equipment Grounding:
   1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.

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

G. Pole-Mounted Luminaires: Also comply with Section 26 5600.

## 2.02 GROUNDING AND BONDING COMPONENTS

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

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:
   1. Use insulated copper conductors unless otherwise indicated.

C. Connectors for Grounding and Bonding:
   1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
   2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
   3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
      a. Exceptions:
         1) Use exothermic welded connections for connections to metal building frame.

D. Ground Rod Electrodes:
   1. Comply with NEMA GR 1.
   2. Material: Copper-bonded (copper-clad) steel.
   3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.

# PART 3 EXECUTION

## 3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify existing conditions prior to beginning work.

## 3.02 INSTALLATION

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

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
   1. Outdoor Installations: Unless otherwise indicated, install with top of rod 2 feet below finished grade.
   2. Indoor Installations: Unless otherwise indicated, install with 4 inches of top of rod exposed.
   3. Verify that final backfill and compaction has been completed before driving rod electrodes.

D. Make grounding and bonding connections using specified connectors.
   1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
   2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
   3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
   4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 26 0553.

F. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

**3.03 FIELD QUALITY CONTROL**

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

B. Perform inspection in accordance with Section 01 4000.

C. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

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

**END OF SECTION**

# SECTION 26 05 29

# HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

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

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

D. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

E. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

F. Section 26 5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

G. Section 26 5600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

### 1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2013.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

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.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
   2. Coordinate work to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
   4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
   5. Notify Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 03 3000.

### 1.05 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

### 1.06 DELIVERY, STORAGE, AND HANDLING

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

## PART 2 PRODUCTS

### 2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with the following. Where requirements differ, comply with most stringent.
      a. NFPA 70.
      b. Requirements of authorities having jurisdiction.
   2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
   3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
   4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
   5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   6. Do not use perforated pipe strap or wood for permanent supports unless specifically indicated or permitted.
   7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
      a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
      c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel.
   2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

D. Metal Channel/Strut Framing Systems:
   1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
   2. Comply with MFMA-4.
   3. Channel Material:
      a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
   4. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
   5. Minimum Channel Dimensions: 1-5/8 inch wide by 13/16 inch high.

E. 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. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch diameter.
      c. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch diameter.

d. Trapeze Support for Multiple Conduits: 3/8-inch diameter.
e. Outlet Boxes: 1/4-inch diameter.
f. Luminaires: 1/4-inch diameter.

F. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
1. Description: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring attachment to roof structure and not penetrating roofing assembly, with support fixtures as specified.
2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
4. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

G. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. 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. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
b. Comply with MFMA-4.
c. Channel Material: Use galvanized steel.
11. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 INSTALLATION

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

B. Install hangers and supports in accordance with NECA 1.

C. 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. Unless specifically indicated or approved by Engineer, do not provide support from suspended ceiling support system or ceiling grid.

F. Unless specifically indicated or approved by Engineer, do not provide support from roof deck.

G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

H. Equipment Support and Attachment:

1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Unless otherwise indicated, mount floor-mounted equipment on properly sized concrete pad 3 inches in height; see Section 03 3000.
5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Conduit Support and Attachment: See Section 26 0533.13 for additional requirements.

J. Cable Tray Support and Attachment: See Section 26 0536 for additional requirements.

K. Box Support and Attachment: See Section 26 0533.16 for additional requirements.

L. Interior Luminaire Support and Attachment: See Section 26 5100 for additional requirements.

M. Exterior Luminaire Support and Attachment: See Section 26 5600 for additional requirements.

N. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

O. Secure fasteners in accordance with manufacturer's recommended torque settings.

P. Remove temporary supports.

**3.03 FIELD QUALITY CONTROL**

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

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

**END OF SECTION**

**SECTION 26 05 33.13**

**CONDUIT FOR ELECTRICAL SYSTEMS**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Galvanized steel intermediate metal conduit (IMC).

C. PVC-coated galvanized steel rigid metal conduit (RMC).

D. Flexible metal conduit (FMC).

E. Liquidtight flexible metal conduit (LFMC).

F. Galvanized steel electrical metallic tubing (EMT).

G. Rigid polyvinyl chloride (PVC) conduit.

H. Conduit fittings.

I. Accessories.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 03 3000 - Cast-in-Place Concrete: Concrete encasement of conduits.

D. Section 07 8400 - Firestopping.

E. Section 26 0526 - Grounding and Bonding for Electrical Systems.
   1. Includes additional requirements for fittings for grounding and bonding.

F. Section 26 0529 - Hangers and Supports for Electrical Systems.

G. Section 26 0533.16 - Boxes for Electrical Systems.

H. Section 26 0533.23 - Surface Raceways for Electrical Systems.

I. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

J. Section 26 2100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

K. Section 27 0533.13 - Conduit for Communications Systems.

L. Section 31 2316 - Excavation.

M. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

N. Section 31 2323 - Fill: Bedding and backfilling.

### 1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.

B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.

C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.

F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2003.

G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.

H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; 2005.

I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.

J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.

K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

M. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

N. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.

O. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

P. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

Q. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

R. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

S. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

T. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

U. UL 2420 - Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Underwriters Laboratories Inc; Current Edition, Including All Revisions.

## 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
   4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
   5. Notify Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

## 1.05 SUBMITTALS

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

B. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2-inch (53 mm) trade size and larger.

## 1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

## 1.07 DELIVERY, STORAGE, AND HANDLING

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

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

## PART 2 PRODUCTS

### 2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
   1. Under Slab on Grade: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
   2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, galvanized steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
   3. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or schedule 80 rigid PVC conduit where emerging from underground.
   4. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel intermediate metal conduit (IMC) elbows, PVC-coated galvanized steel rigid metal conduit (RMC) elbows, or concrete-encased PVC elbows for bends.
   5. Where steel conduit is installed in direct contact with earth or concrete, use corrosion protection tape to provide supplementary corrosion protection 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: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC). Embed within structural slabs only where approved by Structural Engineer.
   3. Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
   4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT) where emerging from concrete.
   5. Where galvanized steel rigid metallic conduit RGC, galvanized steel intermediate metal conduit (IMC) or galvanized steel electrical metallic tubing (EMT) is in contact with concrete or soil, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection for minimum of 4 inches on either side of where conduit is in contact with concrete or soil.

E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use galvanized steel intermediate metal conduit (IMC) or galvanized steel electrical metallic tubing (EMT).

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC) or galvanized steel 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. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

L. Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC).

M. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

N. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).
   1. Maximum Length: 6 feet.

O. Flexible Connections to Vibrating Equipment:
   1. Dry Locations: Use flexible metal conduit (FMC).
   2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).
   3. Maximum Length: 6 feet unless otherwise indicated.
   4. Vibrating equipment includes, but is not limited to:
      a. Motors.
      b. Mechanical Equipment.

## 2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Communications Systems Conduits: Also comply with Section 27 1000.

C. Fittings for Grounding and Bonding: See Section 26 0526 for additional requirements.

D. Provide conduit, fittings, supports, and accessories required for complete raceway system.

E. Provide products listed, classified, and labeled as suitable for purpose intended.

F. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Branch Circuits: 3/4-inch trade size.
   2. Branch Circuit Homeruns: 3/4-inch trade size.
   3. Control Circuits: 1/2-inch trade size.
   4. Flexible Connections to Luminaires: 3/8-inch trade size.
   5. Underground, Interior: 3/4-inch trade size.
   6. Underground, Exterior: 1-inch trade size.

G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

### 2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
   1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
   2. Material: Use steel or malleable iron.
      a. Do not use die cast zinc fittings.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

### 2.04 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
   1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
   2. Material: Use steel or malleable iron.
      a. Do not use die cast zinc fittings.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

### 2.05 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch.

C. PVC-Coated Boxes and Fittings:
   1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
   2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.
   3. Material: Use steel or malleable iron.
   4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch.

D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch.

### 2.06 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
      a. Do not use die cast zinc fittings.

### 2.07 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.
      a. Do not use die cast zinc fittings.

### 2.08 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
      a. Do not use die cast zinc fittings.
   3. Connectors and Couplings: Use compression/gland or set-screw type.
      a. Do not use indenter type connectors and couplings.

### 2.09 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.

### 2.10 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch.

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.

E. Sealing Compound for Hazardous/Classified Location Sealing Fittings: Listed for use with particular fittings to be installed.

F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.

G. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

H. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify routing and termination locations of conduit prior to rough-in.

E. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

### 3.02 INSTALLATION

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

B. Install conduit in accordance with NECA 1.

C. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.

D. Intermediate Metal Conduit (IMC): Install in accordance with NECA 101.

E. PVC-Coated Galvanized Steel Rigid Metal Conduit (RMC): Install using only tools approved by manufacturer.

F. Rigid Polyvinyl Chloride (PVC) Conduit: Install in accordance with NECA 111.

G. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated without specific routing, determine exact routing required.
   3. Conceal conduits unless specifically indicated to be exposed.
   4. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Mechanical equipment rooms.
      c. Within joists in areas with no ceiling.
      d. Warehouse style construction bays - above liner panel, but within wall assembly.
   5. Unless otherwise approved, do not route exposed conduits:
      a. Across floors.
      b. Across roofs.
      c. Across top of parapet walls.
      d. Across building exterior surfaces.
   6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route 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 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 same area on common rack.

H. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 0529.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
   4. Use conduit strap to support single surface-mounted conduit.
      a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
   5. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
   6. Use conduit clamp to support single conduit from beam clamp or threaded rod.

7. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.
8. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.
9. Use of spring steel conduit clips for support of conduits is not permitted.
10. Use of wire for support of conduits is not permitted.

I. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
7. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
8. Secure joints and connections to provide mechanical strength and electrical continuity.

J. 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. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
8. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 8400.

K. Underground Installation:
1. Provide trenching and backfilling; see Section 31 2316 and Section 31 2323.
2. Minimum Cover, Unless Otherwise Indicated or Required:
   a. Underground, Exterior: 18 inches.
   b. Under Slab on Grade: 12 inches to bottom of slab.
3. Provide underground warning tape along entire conduit length for service entrance where not concrete-encased; see Section 26 0553.

L. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide minimum concrete cover of 3 inches on all sides unless otherwise indicated; see Section 03 3000.

M. 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.

N. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
a. Where conduits enter building from outside.
b. Where service conduits enter building from underground distribution system.
c. Where conduits enter building from underground.
d. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
a. Where conduits pass from outdoors into conditioned interior spaces.
b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

O. 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.

P. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

Q. Provide grounding and bonding; see Section 26 0526.

R. Identify conduits; see Section 26 0553.

**3.03 FIELD QUALITY CONTROL**

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

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

D. Correct deficiencies and replace damaged or defective conduits.

**3.04 CLEANING**

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

**3.05 PROTECTION**

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

B. Use rigid steel elbows to transition underground/underfloor conduits to above grade.

C. Route conduit through roof openings for piping and ductwork wherever possible. Where separate roofing penetration is required, coordinate location and installation method with roofing installation.

**END OF SECTION**

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**SECTION 26 05 33.16**

**BOXES FOR ELECTRICAL SYSTEMS**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 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.

C. Accessories.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 07 8400 - Firestopping.

D. Section 26 0529 - Hangers and Supports for Electrical Systems.

E. Section 26 0533.13 - Conduit for Electrical Systems:
   1. Conduit bodies and other fittings.
   2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

F. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

G. Section 26 2726 - Wiring Devices:

H. Section 27 1000 - Structured Cabling for Voice and Data: Additional requirements for communications systems outlet boxes.

### 1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.05 SUBMITTALS**

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures and underground boxes/enclosures.

B. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Keys for Lockable Enclosures: Two of each different key.

**1.06 QUALITY ASSURANCE**

A. Comply with requirements of NFPA 70.

**1.07 DELIVERY, STORAGE, AND HANDLING**

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

**PART 2 PRODUCTS**

**2.01 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. Minimum Box Size, Unless Otherwise Indicated:
    a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
    b. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
    c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
13. 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 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    a. Indoor Clean, Dry Locations: Type 1, painted steel.
    b. Outdoor Locations: Type 3R, painted steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches:
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
    b. Boxes 6 square feet and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
    b. Back Panels: Painted steel, removable.
    c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
    d. Enclosure for Fire Alarm Panel and Fiber Optic IDF Terminal Equipment.
        1) Refer to details on drawings for minimum size, configuration, etc.
        2) Enclosre shall include an internally mounted strip style heater with internally mounted thermostatic controller to reduce/eliminate condensation and maintain minimum internal cabinet temperature above 32 degrees F (0 deg. C).
5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.

## 2.02 ACCESSORIES

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.

## 2.03 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
1. Material: Galvanized cast iron.
2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

# PART 3 EXECUTION

## 3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify locations of floor boxes with Owner prior to rough-in.

**3.02 INSTALLATION**

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

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

E. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

F. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

G. Box Locations:
   1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 3100 as required where approved by the Architect.
   2. Unless dimensioned, box locations indicated are approximate. Adjust box locations up to 10 feet if required to accommodate intended purpose.
   3. Locate boxes as required for devices installed under other sections or by others.
      a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 2726.
      b. Communications Systems Outlets: Comply with Section 27 1000.
   4. Locate boxes so that wall plates do not span different building finishes.
   5. Locate boxes so that wall plates do not cross masonry joints.
   6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
   7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
   8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
   9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
      a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches 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.
   10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 0533.13.
   11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
      a. Concealed above accessible suspended ceilings.
      b. Within joists in areas with no ceiling.
      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.
4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.

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.

R. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.

S. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.

T. Set wall mounted boxes at elevations to accommodate mounting heights indicated.

U. Orient boxes to accommodate wiring devices oriented as specified in Section 26 2726.

V. Maintain headroom and present neat mechanical appearance.

W. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

X. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

Y. Use stamped steel bridges to fasten flush mounting outlet box between studs.

Z. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

AA. Use gang box with plaster ring for single device outlets.

AB. Use cast outlet box in exterior locations exposed to the weather and wet locations.

AC. Identify boxes in accordance with Section 26 0553.

**3.03 ADJUSTING**

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closures in unused box openings.

**3.04 CLEANING**

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

### 3.05 PROTECTION

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

**END OF SECTION**

# SECTION 26 05 33.23

# SURFACE RACEWAYS FOR ELECTRICAL SYSTEMS

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Wireways.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 26 0526 - Grounding and Bonding for Electrical Systems.

D. Section 26 0529 - Hangers and Supports for Electrical Systems.

E. Section 26 0533.13 - Conduit for Electrical Systems.

F. Section 26 0533.16 - Boxes for Electrical Systems.

G. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

H. Section 27 1000 - Structured Cabling for Voice and Data: Voice and data jacks.

### 1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

D. UL 870 - Wireways, Auxiliary Gutters, and Associated Fittings; Current Edition, Including All Revisions.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify minimum sizes of raceways with the actual conductors and components to be installed.
   2. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of raceways is complete between outlet, junction and splicing points.

### 1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

## PART 2 PRODUCTS

### 2.01 RACEWAY REQUIREMENTS

A. Provide all components, fittings, supports, and accessories required for a complete raceway system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

### 2.02 WIREWAYS

A. Manufacturers:

1. Eaton Corporation; _____: www.eaton.com/#sle.
2. nVent HOFFMAN; _____: www.nvent.com/#sle.
3. Schneider Electric; _____: www.se.com/#sle.

B. Description: Lay-in wireways and wiring troughs with removable covers; listed and labeled as complying with UL 870.

C. Wireway Type, Unless Otherwise Indicated:
1. Indoor Clean, Dry Locations: NEMA 250, Type 1, painted steel with screw-cover.
2. Outdoor Locations: NEMA 250, Type 3R, painted steel with screw-cover; include provision for padlocking.

D. Finish for Painted Steel Wireways: Manufacturer's standard grey unless otherwise indicated.

E. Minimum Wireway Size: 4 by 4 inches unless otherwise indicated.

F. Where wireway size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 INSTALLATION

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

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install raceways plumb and level.

D. Arrange wireways and associated raceway connections to comply with NFPA 70, including but not limited to requirements for deflected conductors and wireways used as pullboxes. Increase size of wireway where necessary.

E. Secure and support raceways in accordance with Section 26 0529 at intervals complying with NFPA 70 and manufacturer's requirements.

F. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

G. Close unused raceway openings.

H. Provide grounding and bonding in accordance with Section 26 0526.

I. Identify raceways in accordance with Section 26 0553.

J. Use and routing of surface raceway in finished areas shall be approved by the Architect prior to installation.

### 3.03 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

### 3.04 PROTECTION

A. Protect installed raceways from subsequent construction operations.

**END OF SECTION**

# SECTION 26 05 53

# IDENTIFICATION FOR ELECTRICAL SYSTEMS

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Underground warning tape.

F. Floor marking tape.

G. Warning signs and labels.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 09 9113 - Exterior Painting.

D. Section 09 9123 - Interior Painting.

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

F. Section 26 2726 - Wiring Devices.

G. Section 27 1000 - Structured Cabling for Voice and Data: Identification for communications cabling and devices.

### 1.03 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; 2015.

E. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
2. Do not install identification products until final surface finishes and painting are complete.

### 1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

## PART 2 PRODUCTS

### 2.01 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. Switchgear:
      1) Identify power source and circuit number. Include location when not within sight of equipment.
      2) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
   b. Panelboards:
      1) Identify ampere rating.
      2) Identify voltage and phase.
      3) Identify power source and circuit number. Include location when not within sight of equipment.
      4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
      5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
      6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.
   c. Enclosed switches and circuit breakers:
      1) Identify voltage and phase.
      2) Identify power source and circuit number. Include location when not within sight of equipment.
      3) Identify load(s) served. Include location when not within sight of equipment.
   d. Time Switches:
      1) Identify load(s) served and associated circuits controlled. Include location.
   e. Enclosed Contactors:
      1) Identify ampere rating.
      2) Identify voltage and phase.
      3) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).
      4) Identify coil voltage.
      5) Identify load(s) and associated circuits controlled. Include location.
2. Service Equipment:
   a. Use identification nameplate to identify each service disconnecting means.
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. Use identification label on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
6. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
7. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
   a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches wide, painted in accordance with Section 09 9123 and 09 9113.
8. 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.

9. 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.
    a. Minimum Size: 3.5 by 5 inches.
    b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent."
10. 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.

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.

C. Identification for Raceways:
1. Use voltage markers, color-coded bands, or factory-painted conduits to identify systems other than normal power system for accessible conduits.
    a. Maximum Intervals: 20 feet.
    b. 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) Field-Painting: Comply with Section 09 9123 and 09 9113.
        3) Vinyl Color Coding Electrical Tape: Comply with Section 26 0519.
    c. Color Code:

D. Identification for Boxes:
1. Use voltage markers or color coded boxes to identify systems other than normal power system.
    a. Color-Coded Boxes: Field-painted in accordance with Section 09 9123 and 09 9113 per the same color code used for raceways.
        1) Fire Alarm System: Red.
    b. For exposed boxes in public areas, do not color code.
2. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
    a. For exposed boxes in public areas, use only identification labels.

E. Identification for Devices:
1. Identification for Communications Devices: Comply with Section 27 1000.
2. Wiring Device and Wallplate Finishes: Comply with Section 26 2726.
3. Use identification label to identify 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.

## 2.02 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.
   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.
      a. Use only for indoor locations.
   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. System designation where applicable:
         1) Fire Alarm System: Identify with text "FIRE ALARM".
      b. Equipment designation or other approved description.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height:
      a. System Designation: 1 inch.
      b. Equipment Designation: 1/2 inch.
   5. Color:
      a. Normal Power System: White text on black background.
      b. Fire Alarm System: White text on red background.

D. 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.

E. Format for Control Device Identification:
   1. Minimum Size: 3/8 inch by 1.5 inches.
   2. Legend: Load controlled or other designation indicated.
   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.

**2.03 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.

E. Minimum Text Height: 1/8 inch.

F. Color: Black text on white background unless otherwise indicated.

**2.04 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. Color: Black text on white background unless otherwise indicated.

**2.05 UNDERGROUND WARNING TAPE**

A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Non-detectable Type Tape: 3 inches wide, with minimum thickness of 4 mil.

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. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

**2.06 FLOOR MARKING TAPE**

A. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminate, 3 inches wide, with alternating black and white stripes.

**2.07 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.
   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.
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

### 3.01 PREPARATION

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

B. Degrease and clean surfaces to receive nameplates and labels.

### 3.02 INSTALLATION

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

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
1. Surface-Mounted Equipment: Enclosure front.
2. Flush-Mounted Equipment: 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.

### 3.03 FIELD QUALITY CONTROL

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

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

**END OF SECTION**

# SECTION 26 05 83

# WIRING CONNECTIONS

# RFB #923902-01

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Electrical connections to equipment.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 26 0519 - Low-Voltage Power Conductors and Cables (600 V and Less).

D. Section 26 0533.13 - Conduit for Electrical Systems.

E. Section 26 0533.16 - Boxes for Electrical Systems.

F. Section 26 2726 - Wiring Devices.

G. Section 26 2816.16 - Enclosed Switches.

### 1.03 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2012.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
   2. Determine connection locations and requirements.

B. Sequencing:
   1. Install rough-in of electrical connections before installation of equipment is required.
   2. Make electrical connections before required start-up of equipment.

### 1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

## PART 2 PRODUCTS

### 2.01 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Comply with NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Disconnect Switches: As specified in Section 26 2816.16 and in individual equipment sections.

C. Wiring Devices: As specified in Section 26 2726.

D. Flexible Conduit: As specified in Section 26 0533.13.

E. Wire and Cable: As specified in Section 26 0519.

F. Boxes: As specified in Section 26 0533.16.

**2.02 EQUIPMENT CONNECTIONS**

A. Make connections to equipment as shown on the drawings:

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify that equipment is ready for electrical connection, wiring, and energization.

B. Coordinate electrical power and rough-in requirements for equipment provided by others.

**3.02 ELECTRICAL CONNECTIONS**

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

**END OF SECTION**

**SECTION 26 09 23**

**LIGHTING CONTROL DEVICES**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Occupancy sensors.

B. Outdoor photo controls.

C. Lighting contactors.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 26 0519 - Low-Voltage Power Conductors and Cables (600 V and Less).

D. Section 26 0526 - Grounding and Bonding for Electrical Systems.

E. Section 26 0529 - Hangers and Supports for Electrical Systems.

F. Section 26 0533.16 - Boxes for Electrical Systems.

G. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

H. Section 26 0573 - Power System Studies.

I. Section 26 2726 - Wiring Devices: Devices for manual control of lighting, including wall switches.

J. Section 26 5100 - Interior Lighting.

K. Section 26 5600 - Exterior Lighting.

### 1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000 (R2005), with errata, 2008.

E. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (R2011).

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.

H. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

I. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.

J. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contractors and Motor-starters - Electromechanical Contractors and Motor-starters; Current Edition, Including All Revisions.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of lighting control devices with millwork, furniture, equipment and other potential conflicts.

2. Coordinate placement of wall switch occupancy sensors with installed door swings.
3. Coordinate placement of occupancy sensors with millwork, furniture, equipment and other potential obstructions to motion detection coverage.
4. Coordinate lighting control device product selections with luminaire characteristics; see Section 26 5100 and lighting fixture schedule.
5. Notify Engineer of conflicts or deviations from 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.

## 1.05 SUBMITTALS

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

B. Product Data: Include ratings, operating modes or sequence of functions, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

C. Shop Drawings:
1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.

D. Field quality control reports.

E. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Operation and Maintenance Data: Include detailed information on device programming and setup.

G. Project Record Documents: Record actual installed locations and settings for lighting control devices.

## 1.06 QUALITY ASSURANCE

A. Comply with NFPA 70.

## 1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store products in clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

## 1.08 WARRANTY

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

B. Provide five year manufacturer warranty for occupancy sensors.

C. Provide five year manufacturer warranty for digital load controllers.

# PART 2 PRODUCTS

## 2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for purpose intended.

B. Unless specifically indicated as excluded, provide components necessary for complete operating system including, but not limited to, conduit, wiring, connectors, hardware, and accessories.

## 2.02 OCCUPANCY SENSORS

A. Manufacturers:
1. Hubbell Building Automation, Inc; : www.hubbellautomation.com
2. Lutron Electronics Company, Inc: www.lutron.com/sle.
3. Sensor Switch Inc; : www.sensorswitch.com/#sle.
4. WattStopper; : www.wattstopper.com/#sle.
5. nLight Controls; www.nlight.acuitybrands.com

6. Crestron Electronics, Inc.; www.crestron.com
7. Substitutions: See Section 01 6000 - Product Requirements.
8. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

B. General Requirements:
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. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
   c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using 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 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. Sensitivity: Field adjustable.
9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
10. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
11. Load Rating for Line Voltage Occupancy Sensors: As required to control load indicated on drawings.

C. Wall Switch Occupancy Sensors:
1. General Requirements:
   a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
   b. Unless otherwise indicated or required to control load indicated on drawings, provide line voltage units with self-contained relay.
   c. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/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 delayed-off time interval.
   e. Finish: Match finishes specified for wiring devices in Section 26 2726, unless otherwise indicated.
   f. Finish: Grey unless otherwise indicated.
2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within area of 900 square feet.

3. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within area of 900 square feet.

D. Ceiling Mounted Occupancy Sensors:
   1. General Requirements:
      a. Description: Low profile occupancy sensors designed for ceiling installation.
      b. Unless otherwise indicated or required to control load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
      c. Provide field selectable setting for disabling LED motion detector visual indicator.
      d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
      e. Finish: White unless otherwise indicated.
   2. Ultrasonic Ceiling Mounted Occupancy Sensors:
      a. Extended Range Sensors: Capable of detecting motion within area of 2,000 square feet at mounting height of 9 feet.
   3. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
      a. Extended Range Sensors: Capable of detecting motion within area of 1,200 square feet at mounting height of 9 feet, with field of view of 360 degrees.

E. Directional Occupancy Sensors:
   1. General Requirements:
      a. Description: Occupancy sensors designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.
      b. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
      c. Finish: White unless otherwise indicated.
   2. Passive Infrared (PIR) Directional Occupancy Sensors:
      a. Long Range Sensors: Capable of detecting motion within distance of 80 feet at mounting height of 10 feet.
   3. Passive Infrared/Ultrasonic Dual Technology Directional Occupancy Sensors: Capable of detecting motion within distance of 40 feet at mounting height of 10 feet.

F. 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 associated wiring and accessories as required to control load indicated on drawings.
   3. Input Supply Voltage: Dual rated for 120/277 V ac.
   4. Load Rating: As required to control load indicated on drawings.

## 2.03 OUTDOOR PHOTO CONTROLS

A. Manufacturers:
   1. Intermatic, Inc: www.intermatic.com/#sle.
   2. Paragon, a brand of Invensys Controls; : www.invensyscontrols.com.
   3. NSI Industries LLC: www.nsiindustries.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.
   5. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

B. Stem-Mounted Outdoor Photo Controls:
   1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
   2. Housing: Weatherproof, impact resistant polycarbonate.
   3. Photo Sensor: Cadmium sulfide.
   4. Provide external sliding shield for field adjustment of light level activation.
   5. Light Level Activation: 1 to 5 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.

6. Voltage: As required to control load indicated on drawings.
7. Failure Mode: Fails to the on position.
8. Load Rating: As required to control load indicated on drawings.
9. Provide accessory wall-mounting bracket where indicated or as required to complete installation.

### 2.04 LIGHTING CONTACTORS

A. Manufacturers:
   1. ABB/GE: www.electrification.us.abb.com/#sle.
   2. Eaton Corporation: www.eaton.com/#sle.
   3. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
   4. Siemens Industry, Inc: www.usa.siemens.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: Magnetic lighting contactors complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; noncombination type unless otherwise indicated; ratings, configurations and features as indicated on drawings.

C. Short Circuit Current Rating:
   1. Provide contactors with listed short circuit current rating not less than available fault current at installed location as determined by short circuit study performed in accordance with Section 26 0573.

D. Enclosures:
   1. Comply with NEMA ICS 6.
   2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   3. Finish: Manufacturer's standard unless otherwise indicated.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that 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 service voltage and ratings of lighting control devices are appropriate for service voltage and load requirements at location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### 3.03 INSTALLATION

A. 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 as required for installation of lighting control devices; see Section 26 0533.16.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switch Occupancy Sensors: 48 inches above finished floor.

2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Engineer to obtain direction prior to proceeding with work.

C. Maintain separation of remote-control, signaling, and power-limited circuits.
1. See manufacturer instructions and Section 26 0519 for control wiring conductors, wiring methods, and identification requirements.

D. Install lighting control devices in accordance with manufacturer's instructions.

E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

F. Install lighting control devices plumb and level, and held securely in place.

G. Where required and not furnished with lighting control device, provide wall plate; see Section 26 2726.

H. Provide required supports; see Section 26 0529.

I. 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.

J. Install identification label for wall switch occupancy sensors in accordance with Section 26 0526 indicating load served where indicated, when controlling loads that are not visible from the control location, or when multiple control devices are installed at one location.

K. Occupancy Sensor Locations:
1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

L. Outdoor Photo Control Locations:
1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by photo control itself.

M. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into photo control.

N. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near sensor location.

O. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

P. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

## 3.04 FIELD QUALITY CONTROL

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

B. Inspect each lighting control device for damage and defects.

C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

D. Test outdoor photo controls to verify proper operation, including time delays where applicable.

E. Correct wiring deficiencies and replace damaged or defective conductors, cables, and lighting control devices.

**3.05 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 Engineer.

C. Adjust position of directional occupancy sensors to achieve optimal coverage as required.

D. 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.

E. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Engineer. Record settings in written report to be included with submittals.

F. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Engineer.

**3.06 CLEANING**

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

**3.07 COMMISSIONING**

A. See Section 01 9113 - General Commissioning Requirements for commissioning requirements.

**3.08 CLOSEOUT ACTIVITIES**

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

B. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of installed lighting control devices.
   3. Location: At project site.

**END OF SECTION**

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# SECTION 26 09 50

# ELECTRIC HEATING

# RFB #923902-01

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Baseboard radiation.

B. Electric wall/ceiling heaters

### 1.02 RELATED SECTIONS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 26 2717 - Equipment Wiring: Electrical characteristics and wiring connections. Installation of room thermostats. Electrical supply to units.

### 1.03 SUBMITTALS

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

B. Product Data: Provide typical catalog of information including arrangements.

C. Shop Drawings:
   1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
   2. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.
   3. Indicate mechanical and electrical service locations and requirements.,

D. Manufacturer's Instructions: Indicate installation instructions and recommendations.

E. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access or valving.

F. Operation and Maintenance Data: Include manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

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

### 1.04 QUALITY ASSURANCE

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

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

### 1.05 WARRANTY

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

B. Provide five year manufacturer’s warranty for all Heaters.

## PART 2 PRODUCTS

### 2.01 ELECTRIC BASEBOARD HEATERS

A. Manufacturers:
   1. INDEECO (Industrial Engineering and Equipment Company): www.indeeco.com.
   2. Marley Engineered Products: www.marleymep.com.
   3. Berko, division of Marley Engineered Products, www.marleymep.com
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Assembly: UL listed and labeled with terminal box and cover, and built-in controls.

C. Heating Elements: Enclosed copper tube, aluminum finned element of coiled nickel-chrome resistance wire centered in tubes and embedded in refractory material.

D. Enclosure: Minimum 0.030 inch steel with 7 inch high back and top of one piece; front panel, end panel, end caps, corners, and joiner pieces to snap together, and front panel easily removable.

E. Control: Built-in tamperproof thermostat, factory wired.

F. Disconnect: Built-in disconnect switch.

G. Electrical Characteristics:
   1. Refer to schedule on drawings.

**2.02 ELECTRIC UNIT HEATERS - WALL AND CEILING MOUNTED**

A. Manufacturers:
   1. INDEECO (Industrial Engineering and Equipment Company): www.indeeco.com.
   2. Marley Engineered Products: www.marleymeh.com.
   3. Berko, division of Marley Engineered Products, www.marleymep.com
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Assembly: UL listed and labeled assembly with terminal box and cover, and built-in controls.

C. Heating Elements: Stainless steel tubular elements with aluminum fins.

D. Cabinet: 20-gauge galvanized steel with easily removed front panel with integral air outlet and inlet grilles. White epoxy polyester powder paint finish.

E. Motor: Direct drive motor. Permanently lubricated, ball bearings.

F. Control: Separate fan speed switch and thermostat heat selector switch, factory wired, with switches built-in behind cover. Provide thermal overload.

G. Disconnect: Built-in disconnect.

H. Electrical Characteristics:
   1. Refer to schedule on drawings.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

A. Install in accordance with manufacturer's instructions.

B. Install equipment exposed to finished areas after walls and ceiling are finished and painted. Do not damage equipment or finishes.

C. Protection: Provide finished cabinet units with protective covers during balance of construction.

D. Install electric heating equipment including devices furnished by manufacturer but not factory-mounted. Furnish copy of manufacturer's wiring diagram submittal. Install electrical wiring in accordance with manufacturer's submittals and Section 26 2717.

**3.02 CLEANING**

A. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

B. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

**END OF SECTION**

# SECTION 26 21 00

# LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

# RFB #923902-01

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Electrical service requirements.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 03 3000 - Cast-in-Place Concrete: Materials and installation requirements for cast-in-place concrete equipment pads.

D. Section 26 0519 - Low-Voltage Power Conductors and Cables (600 V and Less).

E. Section 26 0526 - Grounding and Bonding for Electrical Systems.

F. Section 26 0529 - Hangers and Supports for Electrical Systems.

G. Section 26 0533.13 - Conduit for Electrical Systems.

H. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

I. Section 26 2413 - Switchboards: Service entrance equipment.

J. Section 26 2416 - Panelboards: Service entrance equipment.

K. Section 31 2316 - Excavation.

L. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

M. Section 31 2323 - Fill: Bedding and backfilling.

### 1.03 DEFINITIONS

A. Service Point: The point of connection between the facilities of the serving utility and the premises wiring as defined in NFPA 70, and as designated by the Utility Company.

### 1.04 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

### 1.05 ADMINISTRATIVE REQUIREMENTS

A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.

B. Coordination:
   1. Verify the following with Utility Company representative:
      a. Utility Company requirements, including division of responsibility.
      b. Exact location and details of utility point of connection.
      c. Utility easement requirements.
      d. Utility Company charges associated with providing service.
   2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
   3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.

D. Utility Company charges associated with providing permanent service to be paid by the Owner directly to the Utility Company.

E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.

F. Scheduling:
1. Where work of this section involves interruption of existing electrical service, arrange service interruption with Owner.
2. Arrange for inspections necessary to obtain Utility Company approval of installation.

## 1.06 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product. Include ratings, configurations, standard wiring diagrams, outline and support point dimensions, finishes, weights, service condition requirements, and installed features.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations and arrangement of Utility Company and service entrance equipment, metering provisions, required clearances, and proposed service routing.
1. Obtain Utility company approval of shop drawings prior to submittal.

D. Project Record Documents: Record actual locations of equipment and installed service routing.

## 1.07 QUALITY ASSURANCE

A. Comply with the following:
1. IEEE C2 (National Electrical Safety Code).
2. NFPA 70 (National Electrical Code).
3. The requirements of the Utility Company.

## 1.08 DELIVERY, STORAGE, AND HANDLING

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

B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

# PART 2 PRODUCTS

## 2.01 ELECTRICAL SERVICE REQUIREMENTS

A. Provide New and Replacement of existing electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.

B. Electrical Service Characteristics: As indicated on drawings.

C. Electrical Service Characteristics:
1. Service Type: Underground.
2. Service Voltage: 208Y/120 V, 3 phase, 60 Hz.

D. Utility Company: Alliant Energy.
1. Point of Contact: Dillon Wright.
2. Phone: 641-269-2907.
3. Email: DillonWright@alliantenergy.com.

E. Division of Responsibility:
   1. Pad-Mounted Utility Transformers:
      a. Transformers: Furnished and installed by Utility Company.
      b. Transformer Grounding Provisions: Furnished and installed by Contractor per Utility Company requirements.
      c. Primary:
         1) Trenching and Backfilling: Provided by Utility Company.
         2) Conduits: Furnished and installed by Utility Company.
         3) Conductors: Furnished and installed by Utility Company.
      d. Secondary:
         1) Trenching and Backfilling: Provided by Contractor.
         2) Conduits: Furnished and installed by Contractor.
         3) Conductors - Transformer to Meter: Furnished and installed by Utility Company (Service Point at transformer).
         4) Conductors - Meter to Service Entrance Panel: Furnished and installed by Contractor (Service Point at meter).
   2. Terminations at Service Point: Provided by Utility Company.
   3. Metering Provisions:
      a. Meter Bases: Furnished and installed by Contractor per Utility Company requirements.
      b. Metering Transformer Cabinets: Furnished and installed by Contractor per Utility Company requirements.
      c. Conduits Between Metering Transformers and Meters: Furnished and installed by Contractor per Utility Company requirements.
      d. Wiring Between Metering Transformers and Meters: Furnished and installed by Utility Company.

F. Products Furnished by Contractor: Comply with Utility Company requirements.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.

C. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 PREPARATION

A. Verify and mark locations of existing underground utilities.

### 3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions and Utility Company requirements.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required trenching and backfilling in accordance with Section 31 2316 and Section 31 2323.

E. Construct cast-in-place concrete vaults with pads for utility equipment in accordance with Utility Company requirements and Section 03 3000.

F. Provide required support and attachment components in accordance with Section 26 0529.

G. Provide grounding and bonding for service entrance equipment in accordance with Section 26 0526.

H. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 26 0553.

**3.04 PROTECTION**

A. Protect installed equipment from subsequent construction operations.

**END OF SECTION**

# SECTION 26 24 13

# SWITCHBOARDS

# RFB #923902-01

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Low-voltage (600 V and less) switchboards and associated accessories for service and distribution applications.

B. Overcurrent protective devices for switchboards.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

D. Section 26 0526 - Grounding and Bonding for Electrical Systems.

E. Section 26 0529 - Hangers and Supports for Electrical Systems.

F. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

G. Section 26 2100 - Low-Voltage Electrical Service Entrance.
   1. Includes Utility Company contact information.

### 1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision E, 2013.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NECA 400 - Standard for Installing and Maintaining Switchboards; 2007.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

E. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.

F. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less; 2013.

G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

J. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

K. UL 891 - Switchboards; Current Edition, Including All Revisions.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances 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. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.
5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Service Entrance Switchboards:
1. Coordinate with Utility Company to provide switchboards with suitable provisions for electrical service and utility metering, where applicable.
2. Coordinate with Owner to arrange for Utility Company required access to equipment for installation and maintenance.
3. See Section 26 2100 for Utility Company contact information and additional requirements.
4. Preinstallation Meeting: Convene one week prior to commencing work of this section to review requirements with Utility Company representative.
5. Arrange for inspections necessary to obtain Utility Company approval of installation.

## 1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, and other installed components and accessories.

C. Shop Drawings: Indicate dimensions, voltage, bus ampacities, 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 switchboards and adjacent equipment with all required clearances indicated.
2. Include wiring diagrams showing all factory and field connections.
3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.

D. Field Quality Control Test Reports.

E. Project Record Documents: Record actual installed locations of switchboards and final equipment settings.

## 1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

## 1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store switchboards in accordance with manufacturer's instructions, NECA 400, and NEMA PB 2.1.

B. Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchboards, which are not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.

C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

D. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

## 1.08 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

# PART 2 PRODUCTS

## 2.01 MANUFACTURERS

A. Switchboards - Basis of Design: Square D, Schneider Electric.

B. Switchboards:
1. ABB/GE: www.geindustrial.com/#sle.
2. Eaton Corporation: www.eaton.com/#sle.

3. Schneider Electric; Square D Products: www.schneider-electric.us.

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

D. Source Limitations: Furnish switchboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

**2.02 SWITCHBOARDS**

A. Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.

D. Front-Connected Switchboards:
1. Main Device(s): Individually-mounted.
2. Feeder Devices: Panel/group-mounted.
3. Arrangement: Front accessible only (not rear accessible), rear aligned.

E. Service Entrance Switchboards:
1. Listed and labeled as suitable for use as service equipment according to UL 869A.
2. For solidly-grounded wye systems, provide factory-installed main bonding jumper between neutral and ground busses, and removable neutral disconnecting link for testing purposes.
3. Comply with Utility Company requirements for electrical service.
4. See Section 26 2100 for additional requirements.

F. Service Conditions:
1. Provide switchboards and associated components suitable for operation under the following service conditions without derating:
   a. Altitude: Less than 6,600 feet.
   b. Ambient Temperature:
      1) Switchboards Containing Molded Case or Insulated Case Circuit Breakers: Between 23 degrees F and 104 degrees F.
2. Provide switchboards and associated components suitable for operation at indicated ratings under the service conditions at the installed location.

G. Short Circuit Current Rating:
1. Provide switchboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
2. Minimum Rating: 65,000 rms symmetrical amperes.
3. Label equipment utilizing series ratings as required by NFPA 70.

H. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.

I. Bussing: Sized in accordance with UL 891 temperature rise requirements.
1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.
2. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
3. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
4. Phase and Neutral Bus Material: Copper.
5. Ground Bus Material: Copper.

J. Conductor Terminations: Suitable for use with the conductors to be installed.
1. Line Conductor Terminations:

a. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
b. Main and Neutral Lug Type: Mechanical.

2. Load Conductor Terminations:
a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
b. Lug Type:
1) Provide mechanical lugs unless otherwise indicated.

K. Enclosures:
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
a. Outdoor Locations: Type 4.
2. Finish: Manufacturer's standard unless otherwise indicated.
3. Enclosure Space Heaters:
a. Provide in each switchboard section installed outdoors.
b. Size according to manufacturer's recommendations for worst case ambient temperature to prevent condensation.
c. Heater Control: Thermostat.
d. Heater Power Source: Provide connection to transformer factory-installed in switchboard.
e. Heater shall be sized and controlled to prevent condensation within enclosure and to maintain minimum circuit breaker operating conditions listed herein.
4. Outdoor Enclosures:
a. Enclosure Type: Non-walk-in type unless otherwise indicated.
b. Color: Manufacturer's standard.
c. Access Doors: Lockable, with all locks keyed alike.
d. Enclosure shall have outer door to cover switchgear and shall include:
1) NEMA 4 enclosure with dust protection.
2) Continuous door seal around enclosure door to prevent moisture and dust from entering enclosure.
3) Provide rodent barrier guards around perimeter of enclosure.
4) Ventilation openings into switchgear shall have dust filter rack integral to enclosure with re-useable filter. Ventilation openings shall have snow block deflector on outside of enclosure to prevent wind blown snow, etc. from entering switchgear.

L. Future Provisions:
1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
2. Equip distribution sections with full height vertical bussing to accommodate maximum utilization of space for devices.
3. Arrange and equip through bus and ground bus to accommodate future installation of additional switchboard sections.

M. Ratings:
1. Voltage: 120/208 volts.
2. Configuration: Three phase, four wire, grounded.

N. Main Section Devices: Panel mounted.

O. Distribution Section Devices: Panel mounted.

P. Bus Material: Copper with tin plating, standard size.

Q. Bus Connections: Bolted, accessible from front for maintenance.

R. Ground Bus: Extend length of switchboard.

S. Line and Load Terminations: Accessible from the front only of the switchboard, suitable for the conductor materials and sizes indicated.

T. Future Provisions: Fully equip spaces for future devices with bussing and bus connections, suitably insulated and braced for short circuit currents. Provide continuous current rating as indicated.

U. Enclosure: Type 4, outdoor rated for rain, sleet, snow & dust.
1. Align sections at front and rear.
2. Switchboard Height: 90 inches, excluding floor sills, lifting members and pull boxes.
3. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.

## 2.03 OVERCURRENT PROTECTIVE DEVICES

A. Circuit Breakers:
1. Interrupting Capacity:
a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
2. Molded Case Circuit Breakers:
a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
1) Provide thermal magnetic circuit breakers for circuit breaker frame sizes less than 400 amperes.
2) Provide electronic trip circuit breakers for circuit breaker frame sizes 400 amperes and above.
b. Minimum Interrupting Capacity:
1) 65,000 rms symmetrical amperes at 240 VAC or 208 VAC.
c. 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.
d. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
1) Provide the following field-adjustable trip response settings:
(a) Long time pickup, adjustable by setting dial.
(b) Long time delay.
(c) Short time pickup and delay.
(d) Instantaneous pickup.

## 2.04 SOURCE QUALITY CONTROL

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

B. Shop inspect and test switchboard according to NEMA PB 2.

# PART 3 EXECUTION

## 3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the switchboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive switchboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

## 3.02 PREPARATION

A. Provide concrete housekeeping pad under the provisions of Section 03 3000.

B. Verify that field measurements are as indicated on shop drawings.

C. Coordinate switchgear assembly to utilize existing transformer pad with concrete pad extension where noted on drawings.

**3.03 INSTALLATION**

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

B. Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.

C. Provide required support and attachment in accordance with Section 26 0529.

D. Install switchboards plumb and level.

E. Unless otherwise indicated, mount switchboards on properly sized 4 inch high concrete pad constructed in accordance with Section 03 3000.

F. Provide grounding and bonding in accordance with Section 26 0526.

G. Install all field-installed devices, components, and accessories.

H. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

I. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 26 0573.

J. Provide filler plates to cover unused spaces in switchboards.

K. Identify switchboards in accordance with Section 26 0553.

**3.04 FIELD QUALITY CONTROL**

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

B. Before energizing switchboard, perform insulation resistance testing in accordance with NECA 400 and NEMA PB 2.1.

C. Inspect and test in accordance with NETA ATS, except Section 4.

D. Perform inspections and tests listed in NETA ATS, Section 7.1.

E. Molded Case and Insulated Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.

F. Correct deficiencies and replace damaged or defective switchboards or associated components.

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

**3.05 ADJUSTING**

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of switchboard covers and doors.

**3.06 CLEANING**

A. Clean dirt and debris from switchboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred surfaces to match original factory finish.

**3.07 CLOSEOUT ACTIVITIES**

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

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

C. Training: Train Owner's personnel on operation, adjustment, and maintenance of switchboard and associated devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

**3.08 PROTECTION**

A. Protect installed switchboards from subsequent construction operations.

**END OF SECTION**

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**SECTION 26 24 16**

**PANELBOARDS**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 26 0526 - Grounding and Bonding for Electrical Systems.

D. Section 26 0529 - Hangers and Supports for Electrical Systems.

E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

### 1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision E, 2013.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2009.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

E. NEMA PB 1 - Panelboards; 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K. UL 67 - Panelboards; Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

M. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

### 1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
1. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.

D. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. Panelboard Keys: Two of each different key.

### 1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

### 1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

### 1.08 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:
1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. ABB/GE: www.geindustrial.com/#sle.

B. Eaton Corporation: www.eaton.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Source Limitations: Provide panelboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from a single supplier.

### 2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
1. Altitude: Less than 6,600 feet.
2. 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.
2. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70.
3. Label equipment utilizing series ratings as required by NFPA 70.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
a. Indoor Clean, Dry Locations: Type 1.
b. Outdoor Locations: Type 4, suitable for snow, sleet, rain & dust environment.
2. Boxes: Galvanized steel unless otherwise indicated.
a. Provide wiring gutters sized to accommodate the conductors to be installed.
b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
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.

## 2.03 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
1. Phase and Neutral Bus Material: Copper.

2. Ground Bus Material: Copper.

D. Circuit Breakers:
1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.
2. Provide thermal magnetic circuit breakers unless otherwise indicated.

E. Enclosures:
1. Provide surface-mounted or flush-mounted enclosures unless otherwise indicated.
2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

## 2.04 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 on the drawings.

B. Conductor Terminations:
1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
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: Copper.
3. Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

F. Cabinet Front: Surface cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

## 2.05 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) 22,000 rms symmetrical amperes at 240 VAC or 208 VAC.
b. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
3. Conductor Terminations:
a. Provide mechanical lugs unless otherwise indicated.
b. Provide compression lugs where indicated.
c. Lug Material: Copper, suitable for terminating copper conductors only.
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 the following circuit breaker types where indicated:

a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.

7. Do not use tandem circuit breakers.
8. Do not use handle ties in lieu of multi-pole circuit breakers.
9. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
10. Provide the following features and accessories where indicated or where required to complete installation:
    a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
    b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

**2.06 SOURCE QUALITY CONTROL**

A. Factory test panelboards according to NEMA PB 1.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

**3.02 INSTALLATION**

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 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.
    1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.

K. Install all field-installed branch devices, components, and accessories.

L. Provide filler plates to cover unused spaces in panelboards.

M. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
    1. Fire detection and alarm circuits.

N. Identify panelboards in accordance with Section 26 0553.

O. Provide computer-generated circuit directory for each lighting and appliance panelboard and each power distribution panelboard provided with a door, clearly and specifically indicating the loads served. Identify spares and spaces.

P. Provide identification nameplate for each panelboard in accordance with Section 26 0553.

Q. Provide arc flash warning labels in accordance with NFPA 70.

R. Ground and bond panelboard enclosure according to Section 26 0526.

**3.03 FIELD QUALITY CONTROL**

A. Perform inspection, testing, and adjusting in accordance with Section 01 4000.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Test GFCI circuit breakers to verify proper operation.

D. Test shunt trips to verify proper operation.

E. Correct deficiencies and replace damaged or defective panelboards or associated components.

**3.04 ADJUSTING**

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

**3.05 CLEANING**

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

# SECTION 26 27 01

# ELECTRICAL UTILITY SERVICES

# RFB #923902-01

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Metering transformer cabinets.

B. Meter bases.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 26 2416 - Panelboards

D. Section 26 2413 - Switchboards: Metering transformer compartment.

### 1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

### 1.04 SYSTEM DESCRIPTION

A. System Characteristics: 208Y/120 volts, three phase, four-wire, 60 Hertz.

B. Service Entrance:

### 1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section. Review service entrance requirements and details with Utility Company representative.

### 1.06 SUBMITTALS

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

B. Product Data: Provide ratings and dimensions of transformer cabinets and meter bases.

### 1.07 QUALITY ASSURANCE

A. Perform work in accordance with utility company written requirements and NFPA 70.

B. Review service entrance requirements and details with Utility Company representative prior to beginning the work.

## PART 2 PRODUCTS

### 2.01 COMPONENTS

A. Metering Transformer Cabinets: Sheet metal cabinet with hinged door, conforming to utility company requirements, with provisions for locking and sealing.

B. Utility Transformer Vault/Pad: By Electrical Contractor

C. Conduits: Primary and secondary conduits as scheduled on the drawings.

D. Meter Base: Coordinate requirements with Utility Company.

E. Other Components: As required by utility company.

## PART 3 EXECUTION

### 3.01 PREPARATION

A. Arrange with utility company to obtain permanent electric service to the Project.

**3.02 INSTALLATION**

A. Install securely, in a neat and workmanlike manner, as specified in NECA 1.

**END OF SECTION**

**SECTION 26 27 26**

**WIRING DEVICES**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Wall plates and covers.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 26 0519 - Low-Voltage Power Conductors and Cables (600 V and Less): Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.

D. Section 26 0526 - Grounding and Bonding for Electrical Systems.

E. Section 26 0533.16 - Boxes for Electrical Systems.

F. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

G. Section 26 0583 - Wiring Connections: Cords and plugs for equipment.

H. Section 26 0923 - Lighting Control Devices26 0923: Devices for automatic control of lighting, including occupancy sensors and lighting contactors.

### 1.03 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Federal Specification; Revision G, 2001.

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F, 1999.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2012.

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.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.

3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Notify Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

**1.05 SUBMITTALS**

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

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Operation and Maintenance Data:
1. Wall Dimmers: Include information on operation and setting of presets.
2. GFCI Receptacles: Include information on status indicators.

D. Project Record Documents: Record actual installed locations of wiring devices.

**1.06 QUALITY ASSURANCE**

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

**1.07 DELIVERY, STORAGE, AND PROTECTION**

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

**PART 2 PRODUCTS**

**2.01 WIRING DEVICES - GENERAL REQUIREMENTS**

A. Provide wiring devices suitable for intended use with ratings adequate for load served.

**2.02 MANUFACTURERS**

A. Hubbell Incorporated: www.hubbell-wiring.com.

B. Leviton Manufacturing Company, Inc: www.leviton.com.

C. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us

D. Cooper Wiring Devices: www.cooperwiringdevices.com.

E. GE Industrial: www.geindustrial.com.

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

G. Source Limitations: Where possible, provide products for each type of wiring device produced by a single manufacturer and obtained from a single supplier.

**2.03 WIRING DEVICE APPLICATIONS**

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

D. Provide tamper resistant receptacles for all interior locations.

E. Provide GFCI protection for receptacles installed within 6 feet of sinks.

F. Provide GFCI protection for receptacles installed in kitchens.

G. Provide GFCI protection for receptacles serving electric drinking fountains.

H. Unless noted otherwise, do not use combination switch/receptacle devices.

## 2.04 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.

## 2.05 WALL SWITCHES

A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

B. 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.

C. Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with toggle type three position switch actuator and momentary contacts; single pole double throw, off with switch actuator in center position.

## 2.06 RECEPTACLES

A. 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.

B. Convenience Receptacles:
   1. Standard Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
   2. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
   3. Tamper Resistant and Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

C. 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. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.
   4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
   5. Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

D. Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.

## 2.07 WALL PLATES AND COVERS

A. 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.

B. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

C. Weatherproof Receptacle Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### 3.03 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section.
1. Mounting Heights: Unless otherwise indicated, as follows:
   a. Receptacles: 48 inches above finished floor or 6 inches above counter.
2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
3. Provide minimum of 24 inches horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
4. Where multiple receptacles are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
5. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.
6. 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 Engineer to obtain direction prior to proceeding with work.
7. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
8. Locate outlet boxes so that wall plate does not span different building finishes.
9. Locate outlet boxes so that wall plate does not cross masonry joints.

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 top 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.

O. Install identification label for wall switches and wall dimmers in accordance with Section 26 0526 indicating load served when controlling loads that are not visible from the control location or multiple wall switches or wall dimmers are installed at one location.

P. Install identification label for all receptacles in accordance with Section 26 0526 indicating serving branch circuit.

Q. Install voice/data box rough-ins 18 inches above finished floor.

## 3.04 FIELD QUALITY CONTROL

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

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch with circuit energized to verify proper operation.

D. Verify that each receptacle device is energized.

E. Test each receptacle to verify operation and proper polarity.

F. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

G. Correct wiring deficiencies and replace damaged or defective wiring devices.

## 3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Engineer.

## 3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

**END OF SECTION**

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# SECTION 26 28 13

# FUSES

# RFB #923902-01

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Fuses.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 2816.16 - Enclosed Switches: Fusible switches.

### 1.03 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

D. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
   a. Fusible Enclosed Switches: See Section 26 2816.16.
2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
3. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

### 1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Bussmann, a division of Eaton Corporation: www.cooperindustries.com.

B. Mersen (formerly Ferraz Shawmut): ferrazshawmut.mersen.com.

C. Littelfuse, Inc: www.littelfuse.com.

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

### 2.02 APPLICATIONS

A. Individual Motor Branch Circuits: Class RK1, time-delay.

### 2.03 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Class R Fuses: Comply with UL 248-12.
   1. Class RK1, Time-Delay Fuses:

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

**END OF SECTION**

**SECTION 26 28 16.16**

**ENCLOSED SWITCHES**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Enclosed safety switches.

B. Fuse-stat switches.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 26 0526 - Grounding and Bonding for Electrical Systems.

D. Section 26 0529 - Hangers and Supports for Electrical Systems.

E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 2813 - Fuses.

### 1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

F. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

G. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

### 1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

D. Project Record Documents: Record actual locations of enclosed switches.

E. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

**1.06 QUALITY ASSURANCE**

A. Comply with requirements of NFPA 70.

**1.07 DELIVERY, STORAGE, AND HANDLING**

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

A. ABB/GE: www.geindustrial.com/#sle.

B. Eaton Corporation: www.eaton.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Source Limitations: Provide enclosed switches and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

**2.02 ENCLOSED SAFETY SWITCHES**

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. 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. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
   2. Minimum Ratings:
      a. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 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 insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

K. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

L. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   a. Indoor Clean, Dry Locations: Type 1.
   b. Outdoor Locations: Type 3R.
2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

M. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

N. Heavy Duty Switches:
1. Comply with NEMA KS 1.
2. Conductor Terminations:
   a. Provide mechanical lugs unless otherwise indicated.
   b. Lug Material: Copper, suitable for terminating copper conductors only.
3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

**2.03 FUSE STAT SWITCH**

A. Bussmann 2 -1/4-Inch Handy box cover unit.
1. Single receptacle fuse holder with toggle switch control.
2. Current rating: 15 Amps
3. Voltage rating: 125 Volts
4. Buss dual element fusetron or fustat plug fuses.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

B. Verify that mounting surfaces are ready to receive enclosed safety switches.

C. Verify that conditions are satisfactory for installation prior to starting work.

**3.02 INSTALLATION**

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

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches 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. Provide identification nameplate for each enclosed switch in accordance with Section 26 0553.

J. Provide arc flash warning labels in accordance with NFPA 70.

K. Install fuses in fusible disconnect switches.

L. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

**3.03 FIELD QUALITY CONTROL**

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

B. Perform field inspection in accordance with Section 01 4000.

C. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

**3.04 ADJUSTING**

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

**3.05 CLEANING**

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

**SECTION 26 29 13**

**ENCLOSED CONTROLLERS**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Enclosed NEMA controllers for low-voltage (600 V and less) applications:
   1. Magnetic motor starters.
   2. General purpose contactors.

### 1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Division 00 - Procurement and Contracting Requirements

C. Division 01 - General Requirements

D. Section 26 0529 - Hangers and Supports for Electrical Systems.

E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

### 1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

C. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000 (R2005), with errata, 2008.

D. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; 2000 (R2010).

E. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (R2011).

F. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   2. Coordinate the work to provide controllers and associated wiring suitable for interface with control devices to be installed.
   3. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

### 1.05 SUBMITTALS

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

B. 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.

### 1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

### 1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to internal components, enclosure, and finish.

### 1.08 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. ABB; General Electric: www.electrification.us.abb.com/#sle.

B. Eaton Corporation: www.eaton.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens Industry, Inc: www.usa.siemens.com/#sle.

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

F. Source Limitations: Provide enclosed motor controllers and associated components produced by single manufacturer and obtained from single supplier.

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

### 2.02 ENCLOSED CONTROLLERS

A. Provide enclosed controller assemblies consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Description: Enclosed controllers complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; ratings, configurations and features as indicated on the drawings.

D. Service Conditions:
   1. Provide controllers and associated components suitable for operation under the following service conditions without derating:
      a. Altitude:
         1) Class 1 Km Equipment (devices utilizing power semiconductors, e.g. variable frequency controllers): Less than 3,300 feet.
         2) Class 2 Km Equipment (electromagnetic and manual devices): Less than 6,600 feet.
      b. Ambient Temperature: Between 32 degrees F and 104 degrees F.
   2. Provide controllers and associated components suitable for operation at indicated ratings under the service conditions at the installed location.

E. Short Circuit Current Rating:
   1. Provide controllers with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 0573.

F. Conductor Terminations: Suitable for use with the conductors to be installed.

G. Enclosures:
   1. Comply with NEMA ICS 6.
   2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1 or Type 12.
   3. Finish: Manufacturer's standard unless otherwise indicated.

H. Magnetic Motor Starters: Combination or noncombination type as indicated.

1. Noncombination Magnetic Motor Starters: NEMA ICS 2, Class A noncombination motor controllers with magnetic contactor(s) and overload relay(s).
2. Configuration: Full-voltage non-reversing unless otherwise indicated.
3. Minimum Starter Size: NEMA Size 0.
4. Overload Relays: Bimetallic thermal type unless otherwise indicated.

I. General Purpose Contactors: Combination type unless otherwise indicated.
1. Combination Contactors: NEMA ICS 2, Class A combination controllers with magnetic contactor(s) and externally operable disconnect, but without integral overload relay(s).
2. Configuration: Full-voltage non-reversing unless otherwise indicated.
3. Disconnects: Circuit breaker type.
   a. Circuit Breakers: Thermal magnetic unless otherwise indicated or required.
   b. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
   c. Provide auxiliary interlock for disconnection of external control power sources where applicable.

## 2.03 CONTROL ACCESSORIES

A. Auxiliary Contacts:
1. Comply with NEMA ICS 5.
2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each magnetic motor starter, minimum.

B. Pilot Devices:
1. Comply with NEMA ICS 5; heavy-duty type.
2. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.
3. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.
4. Indicating Lights: Push-to-test type unless otherwise indicated.
5. Provide LED lamp source for indicating lights and illuminated devices.

C. Control and Timing Relays:
1. Comply with NEMA ICS 5.
2. Provide number and type of relays indicated or required to perform necessary functions.

# PART 3 EXECUTION

## 3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings of enclosed controllers are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed controllers.

D. Verify that conditions are satisfactory for installation prior to starting work.

## 3.02 INSTALLATION

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

B. Install controllers in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install enclosed controllers plumb and level.

F. Provide grounding and bonding in accordance with Section 26 0526.

G. Install all field-installed devices, components, and accessories.

H. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

I. Set field-adjustable controllers and associated components according to installed motor requirements, in accordance with manufacturer's recommendations and NFPA 70.

J. Provide engraved plastic nameplates; refer to Section 26 0553 for product requirements and location.

K. Neatly type label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating. Place label in clear plastic holder.

**3.03 ADJUSTING**

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

**3.04 CLEANING**

A. Clean dirt and debris from controller enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

**3.05 CLOSEOUT ACTIVITIES**

A. Demonstration: Demonstrate proper operation of controllers to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of enclosed controllers and associated devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

**3.06 PROTECTION**

A. Protect installed enclosed controllers from subsequent construction operations.

**END OF SECTION**

**SECTION 26 51 00**

**INTERIOR LIGHTING**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Ballasts and drivers.

E. Lamps.

F. Accessories.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0533.16 - Boxes for Electrical Systems.

E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 0923 - Lighting Control Devices.
   1. Includes automatic controls for lighting including occupancy sensors, outdoor motion sensors, and outdoor photo controls.
   2. Includes lighting contactors.

G. Section 26 2726 - Wiring Devices: Manual wall switches and wall dimmers.

H. Section 26 5600 - Exterior Lighting.

### 1.03 REFERENCE STANDARDS

A. IES LM-63 - IESNA Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002 (Reaffirmed 2008).

B. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.

C. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; Illuminating Engineering Society; 2015.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

E. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.

F. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

G. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. NFPA 101 - Life Safety Code; 2015.

J. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

K. UL 1598 - Luminaires; Current Edition, Including All Revisions.

L. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

## 1.04 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 Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

## 1.05 SUBMITTALS

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

B. Shop Drawings:
   1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
   2. Provide photometric calculations where luminaires are proposed for substitution upon request.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
      b. Include IES LM-79 test report upon request.
   2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.

D. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

E. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

## 1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 and NFPA 101.

## 1.07 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting) and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

## 1.08 FIELD CONDITIONS

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

## 1.09 WARRANTY

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

B. Provide five year manufacturer warranty for all LED luminaires, including drivers.

C. Provide 5-year pro-rata warranty for batteries for emergency lighting units.

D. Provide 10-year pro-rata warranty for batteries for self-powered exit signs.

## PART 2 PRODUCTS

### 2.01 LUMINAIRE TYPES

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

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

### 2.02 LUMINAIRES

A. Furnish products as indicated in Schedule included on the Drawings.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products that comply with requirements of NFPA 70 and NFPA 101.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. 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.

F. 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.

G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

H. 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.

I. 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.

J. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

### 2.03 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. 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.

C. Battery:
   1. Sealed maintenance-free lead calcium unless otherwise indicated.
   2. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

F. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

G. Accessories:

1. Provide compatible accessory mounting brackets where indicated or required to complete installation.
2. Where indicated, provide emergency remote heads that are compatible with the emergency lighting unit they are connected to and suitable for the installed location.

### 2.04 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single- or double-face as indicated or as required for installed location.
   2. Directional Arrows: As indicated or as required for installed location.

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 where indicated; provide indicator light(s) to report test and diagnostic status.

C. Accessories:
   1. Provide compatible accessory wire guards where indicated.

### 2.05 BALLASTS & DRIVERS

A. Drivers - General Requirements:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

B. Dimmable LED Drivers:
   1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
   2. Control Compatibility: Fully compatible with the dimming controls to be installed.
      a. Wall Dimmers: See Section 26 2726.

### 2.06 ACCESSORIES

A. Aircraft cable for suspended luminaires.

B. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

C. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

D. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate 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.

## 3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

## 3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install products in accordance with manufacturer's instructions.

D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

E. Provide required support and attachment in accordance with Section 26 0529.

F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

G. 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 recessed luminaires to ceiling support channels or framing members or to building structure.
   4. Secure pendant-mounted luminaires to building structure.
   5. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

H. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.
   2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
   3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
      a. Where fixtures in insulated ceilings are not available with an IC-rated enclosure, contractor shall install proper 1-hour rated covers over each fixture.

I. 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. Install canopies tight to mounting surface.

J. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

K. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.

L. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.

M. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

N. Exposed Grid Ceilings: Support surface mounted luminaires in grid ceiling directly from building structure.

O. Install recessed luminaires to permit removal from below.

P. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

Q. Install wall mounted luminaires, emergency lighting units, and exit signs at height as indicated on Drawings.

R. Install accessories furnished with each luminaire.

S. Connect luminaires, emergency lighting units, and exit signs to branch circuit outlets provided under Section 26 0537 as indicated.

T. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

U. Bond products and metal accessories to branch circuit equipment grounding conductor.

V. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.

W. Emergency Lighting Units:
   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.

X. 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.

**3.04 FIELD QUALITY CONTROL**

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

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Test self-powered exit signs and emergency lighting units to verify proper operation upon loss of normal power supply.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Engineer.

**3.05 ADJUSTING**

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Engineer. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Engineer or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Engineer or authority having jurisdiction.

**3.06 CLEANING**

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

**3.07 CLOSEOUT ACTIVITIES**

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

**3.08 PROTECTION**

A. Protect installed luminaires from subsequent construction operations.

B. Replace luminaires that have failed at substantial completion.

**3.09 SCHEDULE - SEE DRAWINGS**

**END OF SECTION**

**SECTION 26 56 00**

**EXTERIOR LIGHTING**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Exterior luminaires.

B. Poles and accessories.

C. Luminaire accessories.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 03 3000 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

D. Section 26 0526 - Grounding and Bonding for Electrical Systems.

E. Section 26 0529 - Hangers and Supports for Electrical Systems.

F. Section 26 0533.16 - Boxes for Electrical Systems.

G. Section 26 0923 - Lighting Control Devices.
   1. Includes automatic controls for lighting including outdoor motion sensors, time switches, and outdoor photo controls.
   2. Includes lighting contactors.

H. Section 26 5100 - Interior Lighting.

### 1.03 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code; 2012.

B. IES LM-63 - IESNA Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002 (Reaffirmed 2008).

C. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.

D. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; Illuminating Engineering Society; 2015.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

F. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.

G. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 1598 - Luminaires; Current Edition, Including All Revisions.

J. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
   2. Notify Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

### 1.05 SUBMITTALS

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

B. Shop Drawings:
   1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
   2. Provide photometric calculations where luminaires are proposed for substitution upon request.
   3. Provide structural calculations for each pole proposed for substitution.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; 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.

D. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

E. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

### 1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

### 1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

### 1.08 WARRANTY

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

B. Provide 2-year manufacturer warranty for all LED luminaires, including drivers.

### 1.09 COORDINATION

A. Furnish bolt templates and pole mounting accessories to installer of pole foundations.

## PART 2 PRODUCTS

### 2.01 LUMINAIRE TYPES

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

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

### 2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70 and 101.

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, poles, foundations, 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. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

H. 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.

I. 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 80 percent lumen maintenance, calculated based on IES LM-80 test data.

J. Exposed Hardware: Stainless steel.

**2.03 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.

B. Dimmable LED Drivers:
   1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
   2. Control Compatibility: Fully compatible with the dimming controls to be installed.
   3. Driver Operating Temperature: Driver & LED's capable of operating at a minimum of -20 degrees F, unless otherwise indicated.

**2.04 POLES**

A. Furnish products as indicated in Schedule included on the Drawings.

B. All Poles:
   1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
   2. Structural Design Criteria:
      a. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.
         1) Design Wind Speed: 110 miles per hour, with gust factor of 1.3.
   3. Material: Steel, unless otherwise indicated.
   4. Shape: Round straight, unless otherwise indicated.
   5. Finish: Match luminaire finish, unless otherwise indicated.
   6. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.

C. Metal Poles: Provide ground lug, accessible from handhole.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate 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.

**3.02 PREPARATION**

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### 3.03 INSTALLATION

A. 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 in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Luminaires:
   1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
   2. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet in length, with no more than 4 feet between supports.

G. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

H. Install accessories furnished with each luminaire.

I. Bond products and metal accessories to branch circuit equipment grounding conductor.

### 3.04 FIELD QUALITY CONTROL

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

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Engineer.

### 3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Engineer. Secure locking fittings in place.

B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Engineer.

### 3.06 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

B. Clean photometric control surfaces as recommended by manufacturer.

### 3.07 CLOSEOUT ACTIVITIES

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

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

### 3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

### 3.09 SCHEDULE - SEE DRAWINGS

**END OF SECTION**

**SECTION 27 10 00**

**STRUCTURED CABLING FOR VOICE AND DATA**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Communications system design requirements.
B. Communications pathways.
C. Fiber optic cable and interconnecting devices.
D. Communications equipment room fittings.
E. Communications grounding and bonding.
F. Communications identification.
G. Cabling and pathways inside building(s).
H. Cabling and pathways connecting building(s).
I. Distribution frames, cross-connection equipment, enclosures, and outlets.
J. Grounding and bonding the telecommunications distribution system.

### 1.02 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements
B. Division 01 - General Requirements
C. Section 07 8400 - Firestopping.
D. Section 26 0526 - Grounding and Bonding for Electrical Systems.
E. Section 26 0533.13 - Conduit for Electrical Systems.
F. Section 26 0533.16 - Boxes for Electrical Systems.
G. Section 26 0553 - Identification for Electrical Systems: Identification products.

### 1.03 REFERENCE STANDARDS

A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.
B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; Electronic Industries Alliance/Electrical Components Association; Revision E, 2005.
C. ICEA S-83-596 - Indoor Optical Fiber Cables; Insulated Cable Engineers Association; 2011.
D. NECA/BICSI 568 - Standard for Installing Building Telecommunications Cabling; National Electrical Contractors Association; 2006.
E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
F. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; 2012.
G. TIA-492CAAA - Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers; 1998 (R 2002).
H. TIA-492CAAB - Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak; Telecommunications Industry Association; 2000 (R2005).
I. TIA-526-7 - Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant; Rev A, 2015.
J. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2015.

K. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2009c, with Addendum (2016).

L. TIA-568.3 - Optical Fiber Cabling and Components Standard; 2016d.

M. TIA-569 - Telecommunications Pathways and Spaces; 2015d, with Addendum (2016).

N. TIA-598 - Optical Fiber Cable Color Coding; 2014d.

O. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2017c.

P. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2015c, with Addendum (2017).

Q. UL 444 - Communications Cables; Current Edition, Including All Revisions.

R. UL 1651 - Fiber Optic Cable; Current Edition, Including All Revisions.

S. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

## 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
   2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
   3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

## 1.05 GENERAL SUMMARY

A. A complete Structured Cabling System for the movement of LAN data traffic within the Owner's facilities shall be provided, installed, tested, and labeled. Design must include a complete and functioning Structured Cabling System including cable routes, interconnect locations, distribution frame locations, building and floor layouts and any other items associated with the implementation of the complete Structured Cabling System for new outlet locations indicated on the drawings.

B. The new cabling system shall connect with the existing cabling system and be 100% compatible with the existing components. Contractor shall supply proper interface and termination equipment as required for a complete and functional system.
   1. **Important Note** - this single mode fiber optic cabling system will primarily be used to transmit fire alarm signal between this building and the existing NCF Facility Fire Alarm system, but could also be used for other data network connections. Contractor providing/installing the Structured Cabling system shall confer and coordinate the installation with the Owner and Fire Alarm vendor prior to installation - see specifications section 28 3100.

C. The Electrical Contractor shall be responsible for providing conduits, boxes, and wiring pathways to accommodate the work in this section.

D. All equipment and material shall be new and of the highest quality and reliability.

E. Upon completion of the Structured Cabling System testing, the Awarded Bidder will provide the Owner with a complete record of all testing performed on CD-ROM disc, including any proprietary reading software. The Owner reserves the right to randomly test any cabling, both passive and active. If problems are discovered, it is the responsibility of the Awarded Bidder to make corrections in the time frames outlined within the contract documents.

## 1.06 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding.

D. Manufacturer Qualifications.

E. Evidence of qualifications for installer.

F. Field Test Reports.

G. Project Record Documents:
   1. Record actual locations of outlet boxes and distribution frames.
   2. Identify distribution frames and equipment rooms by room number on drawings.

H. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

**1.07 QUALITY ASSURANCE**

A. Manufacturer Qualifications: At least acceptable industry experience manufacturing products of the type specified.

B. Installer Qualifications: A company having at least acceptable industry experience in the installation and testing of the type of system specified, and:
   1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
   2. Supervisors and installers factory certified by manufacturers of products to be installed.
   3. Employing experienced technicians for all work; technicians shall have industry acceptable experience in the installation of the type of system specified.
   4. Testing shall be completed by a Level III or higher field tester.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

**1.08 DELIVERY, STORAGE, AND HANDLING**

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep stored products clean and dry.

**1.09 WARRANTY**

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

B. Correct defective Work within a 1 year period after Date of Substantial Completion.

C. The Contractor shall warrant that all materials and equipment are new, in good working order, and free from defects. All installed equipment must conform to the manufacturer's official published specifications. The warranty shall begin at the acceptance date. The Contractor shall agree to repair, adjust and/or replace (as determined by the Owner to be in its best interest) any defective equipment, materials or other parts of the Structured Cable System at the Contractor's sole cost. The Owner will incur no costs for service or replacement of parts within the channel during the warranty.

D. The warranty for the Structured Cabling System shall begin at the acceptance date and remain in effect for a period of fifteen (15) years from that date. The Contractor shall agree to repair, adjust and/or replace (as determined by the Owner to be in its best interest) any defective equipment, materials or other parts of the Structured Cabling System at the Contractor's sole cost. The Owner will incur no costs for service or replacement of parts within the channel during the warranty period of fifteen (15) years.

E. The Contractor shall warrant and supply evidence that the installation of materials and hardware will be made in strict compliance with all applicable provisions of the National Electric Code, the rules and regulations of the Federal Communications Commission, and state and/or local codes or ordinances that may apply.

F. The Contractor shall warrant that the Structured Cabling System will function as specified in the approved manufacturer's Technical Description Guide.

G. The Contractor shall warrant that the Structured Cabling System will accommodate traffic at the levels specified in all appropriate sections of this Request for Proposal. (ZERO BIT ERROR RATE WITHIN THE CHANNEL, as defined by IEEE).

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Cabling and Equipment:
   1. Basis of design is Corning: www.corning.com
   2. Ortronics: www.ortronics.com
   3. CommScope: www.commscope.com
   4. Panduit: www.panduit.com
   5. Substitutions: See Section 01 6000 - Product Requirements.

### 2.02 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
   1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
   2. Comply with Communications Service Provider requirements.
   3. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
   4. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.
   5. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. System Description:
   1. Building Entrance Cable: By Contractor.
   2. Backbones: two (2) sets of 6 pairs or as noted, fiber optic.
   3. Horizontal Cabling: Fiber optic.

C. The MDF is existing.

D. Local Main Distribution Frame (LMDF): Centrally located support structure for terminating horizontal cables that extend from building equipment to the existing Main Distribution Frame (MDF) located at the main NCF facility.
   1. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.

E. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

### 2.03 PATHWAYS

A. Conduit: As specified in Section 26 0534 and as shown on the drawings. Minimum size is 1".

B. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

### 2.04 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

A. Fiber Optic Backbone Cable:
   1. Description: Loose tube, gel free, non-conductive single mode fiber optic cable complying with TIA-492CAA, TIA-492CAAB, TIA-526-7, ICEA S-104-696 and listed as complying with UL 444 and UL 1651.
   2. Cable Type: Single-mode, 8.3/125 um (OS2) complying with TIA-492CAAB.
   3. Fiber Category G.652.D
   4. Wavelengths: 1310 nm / 1383 nm / 1550 nm
   5. Cable Capacity: two (2) sets of 12-strand-fiber.
   6. Cable Applications:

a. Riser Applications: Use listed NFPA 70 Type OFNR riser cable or Type OFNP plenum cable.

7. Cable Jacket Color:
   a. Single-Mode Fiber (OS1/OS2): Yellow.
8. Product(s):
   a. Corning Fiber, part number 012EU4-T4101D20.

B. Fiber Optic Interconnecting Devices:
1. Connector Type: Type ST.
2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
3. Maximum Attenuation/Insertion Loss: 0.5 dB.
4. Application: Indoor, and outdoor - waterproof / suitable for underground handhole connections
5. Product(s):
   a. Corning Fiber Optic Connectors; UniCam Connector, part number 95-200-51

C. Fiber Optic Patch Cords:
1. Description: Factory-fabricated 2-fiber cable assemblies with suitable connectors at each end.
2. Patch Cords for Patch Panels:
   a. Quantity: One for each pair of patch panel ports.

## 2.05 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Fiber Optic Cross-Connection Equipment:
1. Manufacturers:
   a. Basis of design, Corning: www.corning.com.
   b. Substitutions: See Section 01 6000 - Product Requirements.
2. Wall Mounting Patch Panels for Fiber Optic Cabling: Sized to fit (2) cassette style splice connection units; 0.09 inch thick aluminum.
3. Pigtailed Splice Cassette with coiled fiber storage, fiber strain relief, and up to 12 ST style connectors for patch cable connection.
   a. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
   b. Provide dust covers for unused adapters.
4. Product(s):
   a. Wall-mountable Connector Housing (Corning, WCH-02P), quantity as required.
   b. Pigtailed Splice Cassette (Corning, CCH) suitable for up to 12 fiber connections using ST connectors, quantity as required.

B. Equipment Frames, Racks and Cabinets:
1. Wall Mounted Cabinets: Wall mounted cabinet sized to contain equipment specified herein and in Specifications Section 28 3100. Refer to Specifications Section 26 0533.16 for wall mounted enclosure.

C. Cable Management:
1. Product(s):
   a. CommScope Cable Runway: www.commscope.com/#sle.
   b. CommScope Horizontal/Vertical Cable Managers; HCM-SS-XX-XX/VCM-DS-XX-XX Series: www.commscope.com/#sle.
   c. CommScope FiberGuide Raceway: www.commscope.com/#sle.

## 2.06 GROUNDING AND BONDING COMPONENTS

A. Comply with TIA-607.

B. Comply with Section 26 0526.

## 2.07 IDENTIFICATION PRODUCTS

A. Comply with TIA-606.

B. Comply with TIA-606-B.

C. Comply with Section 26 0553.

**2.08 SOURCE QUALITY CONTROL**

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

B. Factory test cables according to TIA-568 (SET).

**PART 3 EXECUTION**

**3.01 INSTALLATION - GENERAL**

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

C. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

D. Install structured cabling system wiring in continuous conduit/raceway system in exposed locations of locations subject to damage. Plenum rated cable may be used without conduit in concealed but accessible locations. Properly support cables from structure with J-Hooks or similar support.

**3.02 INSTALLATION OF PATHWAYS**

A. Underground Service Entrance: Install conduit at least 18 inches below finish grade.

B. Install pathways with the following minimum clearances:
   1. 48 inches from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
   2. 12 inches from power conduits and cables and panelboards.
   3. 5 inches from fluorescent and high frequency lighting fixtures.
   4. 6 inches from flues, hot water pipes, and steam pipes.

C. Conduit, in Addition to Requirements of Section 26 0533.13:
   1. Arrange conduit to provide no more than the equivalent of two 90 degree bend(s) between pull points.
   2. Conduit Bends: Inside radius not less than 10 times conduit internal diameter.
   3. Arrange conduit to provide no more than 100 feet between pull points.
   4. Do not use conduit bodies.
   5. Minimum Cover - Underground Service Entrance: Comply with NFPA 70 and Communications Service Provider requirements.
   6. Leave pull cords in place where cables are not initially installed.
   7. Conceal conduit under floor slabs and within finished walls, ceilings, and floors except where specifically indicated to be exposed.
      a. Conduit may remain exposed to view in mechanical rooms, electrical rooms, and telecommunications rooms.
      b. Where exposed to view, install parallel with or at right angles to ceilings, walls, and structural members.
      c. Under floor slabs, locate conduit at 12 inches, minimum, below vapor retarder; seal penetrations of vapor retarder around conduit.

D. Grounding and Bonding: Perform in accordance with ANSI/J-STD-607 and NFPA 70.

E. Firestopping: Seal openings around pathway penetrations through fire-rated walls, partitions, floors, and ceilings in accordance with Section 07 8400.

**3.03 INSTALLATION OF EQUIPMENT AND CABLING**

A. Cabling:

1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
2. Do not over-cinch or crush cables.
3. Do not exceed manufacturer's recommended cable pull tension.
4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
1. At Distribution Frames: 60 inches.

C. Fiber Optic Cabling:
1. Prepare for pulling by cutting outer jacket for 10 inches from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
2. Support vertical cable at intervals as recommended by manufacturer.

D. Identification:
1. Use wire and cable markers to identify cables at each end.
2. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

E. Field-Installed Labels: Comply with TIA/EIA-606 using encoded identifiers.
1. Cables: Install color coded labels on both ends.
2. Outlets: Label each jack on its face plate as to its type and function, with a unique numerical identifier.
3. Patch Panels: Label each jack as to its type and function, with a unique numerical identifier.
4. Coordinate labeling schemes with the Owner.

## 3.04 FIELD QUALITY CONTROL

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

B. Comply with inspection and testing requirements of specified installation standards.

C. Visual Inspection:
1. Inspect cable jackets for certification markings.
2. Inspect cable terminations for color coded labels of proper type.
3. Inspect outlet plates and patch panels for complete labels.
4. Inspect patch cords for complete labels.

D. Testing - Fiber Optic Cabling:
1. Backbone: Perform optical fiber end-to-end attenuation test using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures; perform verification acceptance tests and factory reel tests.
2. Single Mode Backbone: Perform tests in accordance with TIA-526-7.
3. Submit test results with Operation and Maintenance Manuals.

E. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

## 3.05 DOCUMENTATION

A. Prior to System acceptance, the Awarded Bidder shall submit the following to the Owner:
1. Two (2) complete sets of system manuals in paper and soft (Microsoft Word or PDF) files including installation, operation and maintenance procedures. The Awarded Bidder agrees to update these manuals as updates are published and shall grant the Owner permission to copy any or all portions of these documents for internal use.
2. Fully documented drawings in paper and soft (AutoCAD and PDF) files of the entire distribution system including building and floor layouts, distribution frames, cable routes, interconnect locations, main distribution frame location, riser locations and all other information pertinent to the installation.

3. After installation is complete, drawings must be updated to reflect any as-built modifications.

**3.06 REJECTED WORK**

A. The Owner reserves the following rights to itself or its designated representatives.
   1. To inspect all work performed.
   2. To approved cable pulling operations and termination method.
   3. To designate patch panel locations.
   4. To stop work in progress that does not conform to industry standards.

B. The Contractor shall promptly remove from the premises any equipment rejected by the Owner for failure to comply with the contract documents. The Contractor shall promptly replace any rejected equipment in accordance with the contract documents and without further expense to the Owner.

C. If the Contractor does not take action to remove and replace all rejected equipment within ten (10) days after receipt of written notice, the Owner reserves the right to remove and replace such work at the Awarded Bidders expense. The Contractor shall be responsible for shipping, handling, and storage expense of said materials.

**END OF SECTION**

**SECTION 28 31 00**

**FIRE ALARM SYSTEM**

**RFB #923902-01**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

B. Addressable fire alarm system design and installation, including all components, wiring, and conduit.

C. Transmitters for communication with supervising station.

### 1.02 RELATED SECTIONS

A. Division 00 - Procurement and Contracting Requirements

B. Division 01 - General Requirements

C. Section 07 8400 - Firestopping: Materials and methods for work to be performed by this installer.

D. Section 21 1300 - Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.

E. Section 23 3300 - Air Duct Accessories: Smoke dampers monitored and controlled by local fire alarm devices.

### 1.03 REFERENCES

A. IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low-Voltage Power Circuits; 1991 (R1995).

B. NFPA 70 - National Electrical Code; 2005.

C. NFPA 72 - National Fire Alarm Code; 2002.

D. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; 2006.

### 1.04 SYSTEM DESCRIPTION

A. The fire alarm system in this building will be a new system, but must be compatible for full alarm notification interface with the existing Simplex Fire Alarm Control panel located in the existing Newton Correctional Facility (NCF) system.

1. Coordinate system interface requirements between the new panel and the existing NCF panel. Fire alarm notification interface shall utilize the existing single mode fiber optic system. Refer to Specification Section 27 1000 for fiber optic cabling interconnection work.

### 1.05 SUBMITTALS

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

B. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:

1. Copy (if any) of list of data required by authority having jurisdiction.
2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
3. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
4. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
5. List of all devices on each signaling line circuit, with spare capacity indicated.

6. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
7. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
8. Contractor is responsible for all submittal costs to authority having jurisdiction.

C. Inspection and Test Reports:
1. Submit documentation of satisfactory inspections and tests.
2. Submit NFPA 72 "Inspection and Test Form," filled out.

D. Operating and Maintenance Data: ; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by authority having jurisdiction.
2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
4. List of recommended spare parts, tools, and instruments for testing.
5. Replacement parts list with current prices, and source of supply.
6. Detailed troubleshooting guide and large scale input/output matrix.
7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

E. Project Record Documents: See Section 01 7800 for additional requirements; have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
2. "As installed" wiring and schematic diagrams, with final terminal identifications.

F. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with his installation requirements, is complete, and is in satisfactory operating condition.
2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
3. Certificate of Occupancy.

## 1.06 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

B. Installer Qualifications: Firm with minimum industry acceptable documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
2. Installer Personnel: At least industry acceptable of experience installing fire alarm systems.
3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
4. Certified in Iowa as fire alarm installer.

## 1.07 WARRANTY

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

B. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.

C. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Fire Alarm Control Units - Basis of Design: Simplex.

B. Initiating Devices, and Notification Appliances:
   1. Same manufacturer as control units.
   2. Provide all initiating devices and notification appliances made by the same manufacturer.

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

### 2.02 FIRE ALARM SYSTEM

A. Provide a new addressable automatic fire detection and alarm system:
   1. Provide all components necessary, regardless of whether shown in the contract documents or not, for a complete functioning system.
   2. Protected Premises: Entire building shown on drawings.
   3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
      a. The Americans With Disabilities Act (ADA).
      b. The requirements of the State Fire Marshall.
      c. The requirements of the local authority having jurisdiction, which is Jasper County, Iowa.
      d. Applicable local codes.
      e. The contract documents (drawings and specifications).
      f. NFPA 101.
      g. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
   4. Evacuation Alarm: general evacuation of entire premises.
   5. Hearing Impaired Occupants: Provide visible notification devices in all public areas.
   6. Combined Systems: Do not combine fire alarm system with other non-fire systems.

B. Circuits:
   1. Initiating Device Circuits (IDC): Class B, Style B.
   2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 4.
   3. Notification Appliance Circuits (NAC): Class B, Style Y.

C. Wiring:
   1. UL labeled power limited fire protective signal cable.
   2. Refer to Manufacturer's recommendations for quantity and size.

D. Power Sources:
   1. Primary: Dedicated branch circuits of the facility power distribution system.
   2. Secondary: Storage batteries.
   3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
   4. Provide additional power sources as required for new devices.

### 2.03 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
   1. Sprinkler water control valves.

B. HVAC:
   1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.
   2. Smoke Dampers: Close all dampers on activation of the fire alarm system.
   3. Unit Shut Down: Shut down all units as scheduled on the drawings.

**2.04 COMPONENTS**

A. General:
   1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
   2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units, Initiating Devices, and Notification Appliances: Analog, addressable type; listed by Underwriters Laboratories as suitable for the purpose intended.

C. Master Control Unit: As specified for Basis of Design above, or equivalent.

D. Remote Monitoring and Annunciation Interface:
   1. Provide full monitoring and alarm interface from this new panel to the existing FACP located in the NCF facility. Interconnection will utilize the existing single mode fiber cabling near this facility. Refer to Specifications Section 27 1000 for fiber installation.
   2. Single mode fiber equipment will be installed adjacent to the new FACP. Provide proper interface modules to communicate monitoring and alarm via the single mode fiber cabling system.
   3. Provide proper interface modules and equipment to receive remote monitoring and annunciation into the existing NCF system. Coordinate requirements with existing system requirements so the NCF staff will be the official "remote alarm monitoring station" for properly coordinating emergency response from the local fire department and NCF/IPI staff.

E. Initiating Devices:
   1. Manual Pull Stations:
      a. Addressable
      b. Non-break glass type
      c. Red enamel semi-flush units for mounting on a single gang box
      d. Single downward stroke locking design
      e. Mechanical key lock release/reset mechanism
      f. Tamper-proof protective clear Lexan cover where indicated on the drawings. Lifting cover shall allow access to pull station.
   2. Smoke Detectors:
      a. Addressable
      b. Photoelectric
      c. Separate head and base
   3. Duct Smoke Detectors:
      a. Addressable
      b. Photoelectric
      c. Separate head and base
      d. Housing
      e. Sampling tube
      f. Remote test station and annunciator
   4. Heat Detectors:
      a. Addressable
      b. 135 F fixed temperature/Rate-of Rise combination
      c. Separate head and base
   5. Addressable Interface Devices: .

F. Notification Appliances:
   1. Horns: 98 dBm at 10', flush mounting red enamel finish grille horn. Weather proof type for exterior applications..
   2. Strobes:
      a. Pulsing Xenon, candela rating to suit application
      b. Semi-flush mounting
      c. ADA compliant wireguards where noted

d. Combination audible/visual where noted

G. Circuit Conductors: Copper; provide 200 feet extra; color code and label.

H. Surge Protection: In accordance with IEEE C62.41 B3 combination waveform and NFPA 70; except for optical fiber conductors.
1. Equipment Connected to Alternating Current Circuits: Maximum let through voltage of 350 V(ac), line-to-neutral, and 350 V(ac), line-to-line; do not use fuses.
2. Initiating Device Circuits, Notification Appliance Circuits, and Communications Circuits: Provide surge protection at each point where circuit exits or enters a building; rated to protect applicable equipment; for 24 V(dc) maximum dc clamping voltage of 36 V(dc), line-to-ground, and 72 V(dc), line-to-line.
3. Signaling Line Circuits: Provide surge protection at each point where circuit exits or enters a building, rated to protect applicable equipment.

I. Locks and Keys: Deliver keys to Owner.
1. Provide the same standard lock and key for each key operated switch and lockable panel and cabinet; provide 5 keys of each type

J. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.

## PART 3 EXECUTION

### 3.01 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and the contract documents.

B. Install fire alarm panel inside electrical enclosure to maintain temperature requirements for FACP, refer to drawings and Specifications Section 26 0529.16.

C. Conceal all wiring, conduit, boxes, and supports where installed in finished areas. Use and routing of surface raceway shall be approved by the Architect prior to installation.

D. Install fire alarm system wiring in continuous conduit/raceway system in exposed locations of locations subject to damage. Plenum rated cable may be used without conduit in concealed but accessible locations. Properly support cables from structure with D-rings or similar support.

E. Fire alarm vendor to review and adjust speaker & strobe annunciation locations to add any additional devices to meet NFPA and local requirements.

### 3.02 INSPECTION AND TESTING FOR COMPLETION

A. Notify Owner 7 days prior to beginning completion inspections and tests.

B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

E. Provide all tools, software, and supplies required to accomplish inspection and testing.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

H. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.
1. Record all system operations and malfunctions.
2. If a malfunction occurs, start diagnostic period over after correction of malfunction.
3. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.

4. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

### 3.03 OWNER PERSONNEL INSTRUCTION

A. Provide the following instruction to designated Owner personnel:
   1. Hands-On Instruction: On-site, using operational system.

B. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

### 3.04 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
   1. Be prepared to conduct any of the required tests.
   2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
   3. Have authorized technical representative of control unit manufacturer present during demonstration.
   4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
   5. Repeat demonstration until successful.

B. Occupancy of the project will not occur prior to Substantial Completion.

C. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
   1. Specified diagnostic period without malfunction has been completed.
   2. Approved operating and maintenance data has been delivered.
   3. Spare parts, extra materials, and tools have been delivered.
   4. All aspects of operation have been demonstrated to Owner.
   5. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
   6. Occupancy permit has been granted.

### 3.05 MAINTENANCE

A. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
   1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
   2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
   3. Record keeping required by NFPA 72 and authorities having jurisdiction.

B. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within 2 hours of notification.
   2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
   3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

C. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.

D. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

E. Comply with Owner's requirements for access to facility and security.

**END OF SECTION**

**SECTION 31 10 00**

**SITE CLEARING**

**RFB #923902-01**

## PART 1- GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to this Section.

### 1.2 SUMMARY

A. This section includes the following:
   1. Protection of existing trees.
   2. Removal of Trees and other Vegetation.
   3. Clearing and Grubbing.
   4. Removing above-grade improvement.
   5. Removing below grade improvements.

### 1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 31 20 00 Earthwork

### 1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specifications Section.
B. Schedule indicating proposed sequence of operations for selective demolition work to Owner's Representative for review prior to start of work.

### 1.5 PROJECT CONDITIONS

A. Traffic: Conduct site demolition operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction. Coordinate all work with the District.
B. Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering trees by stockpiling construction materials or excavated materials with drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary fencing to protect trees and vegetation.
C. Utility Services: Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.
D. Environmental Controls: Comply with governing regulations pertaining to environmental protection.
   1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.
   2. If unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure both nature and extent of conflict. Submit report to Owner's Representative, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.
   3. Salvageable Improvements: Carefully remove items indicated to be salvaged, and store on owner's premises where indicated or directed.

## PART 2 - PRODUCTS (Not Applicable)

## PART 3 - EXECUTION

### 3.1 DEMOLITION

A. General: Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.
B. Demolition work shall include the demolition, removal and legal disposal of existing construction debris as required to accommodate the new construction. The Contractor shall take care to prevent damages to existing utilities, construction and materials not scheduled for demolition, repair or replacement, and shall repair damages to the construction and materials to the satisfaction of the Architect and at no additional cost to the Owner.
C. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction. Do not use water for dust control if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution. Sweep pavements as often as necessary to control the spread of debris.
D. Whenever possible, all features demolished shall be salvaged or recycled in lieu of being disposed of as waste in a landfill. Existing features to be demolished which are not salvageable or reused, shall become the property of the Contractor and shall be removed from project site.
E. Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights. Provide temporary traffic control in accordance with MUTCD.
F. Protect existing work that is to remain in place, be reused, or remain the property of the Owner. At no additional expense to the Owner, repair all items that are damaged during performance of the work to their original condition, or replace with new. Do not overload pavements to remain.
G. Make the maximum use of low-noise emission products, as certified by the EPA.
H. Saw cut full depth along perimeter of pavement to be removed. Remove to nearby existing pavement joints when possible. Do not leave panel of parking lot and drive panels less than six feet wide. Do not leave panels of sidewalk pavement less than four feet wide.

### 3.2 SITE CLEARING

A. General: Remove trees, shrubs, grass, and other vegetation, improvements or obstructions as required to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated.
    1. Removal includes digging out and off-site disposing of stumps and roots.
    2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner, where such roots and branches obstruct installation of new construction.
B. Clearing and Grubbing: Clear sites of trees, shrubs and other vegetation, except those indicated to be left standing.
C. Completely remove stumps, roots, and other debris protruding through ground surface.
    1. Use only hand methods for grubbing inside drip line of trees indicated to remain.
    2. Fill depressions caused by clearing and grubbing operations with satisfactory soil materials, unless further excavation of earthwork is indicated.
        a. Compact fill material in accordance with requirements of Section 31 20 00 - Earthwork.
D. Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated on drawings.

### 3.3 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove from site debris, rubbish, and other materials resulting from demolition operations. Transport and legally dispose of off site.

1. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.
2. Burning of removed materials is not permitted on project site.

## 3.4 CLEAN UP AND REPAIR

A. General: Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections:
   1. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start of operations. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION

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**SECTION 31 20 00**

**EARTHWORK**

**RFB #923902-01**

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Extent of Earthwork is indicated on Drawings
B. Work includes:
   1. Stripping, topsoil stockpiling
   2. Excavation
   3. Fill
   4. Compaction
   5. Preparation of subgrade for walls, parking and drives, and steps and walks.
   6. Grading.
   7. Topsoil placement.
   8. Finish grading.
   9. Erosion control.
   10. Import of embankment material.
   11. Export of excess and unsuitable material.

### 1.2 RELATED SECTIONS

A. Section 31 10 00: Site Clearing.
B. Section 31 22 00: Grading.
C. Section 31 23 23: Fill.
D. Section 31 23 23: Excavation.

### 1.3 PROJECT CONDITIONS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.
B. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
C. The Contractor shall supply all construction layout staking for this project, including for exterior improvements and utilities. Engineer will supply geometric information for purposes of staking upon request. Contractor shall give Engineer 48-hour notice per request for said information.
D. Soil Borings:
   1. Test borings and other exploratory operations may be made by Contractor at no cost to Owner with Owner approval.
E. Existing Utilities:
   1. Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.
   2. Underground utilities shown on the drawings have been taken from existing public records, Owner's records and available as-built drawings and are correct to the best of our knowledge and provided for information only.
   3. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities caused by Contractor's negligence to the satisfaction of utility owner at no cost to the Project Owner.
   4. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, during occupied hours, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.

5. Provide minimum of 48-hour notice to Owner and Engineer and receive written notice to proceed before interrupting any utility.
6. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

## 1.4 PROTECTION OF PERSONS AND PROPERTY

A. Barricade open excavations occurring as part of this work and post with warning lights.
B. Operate warning lights as recommended by authorities having jurisdiction.
C. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

## 1.5 QUALITY ASSURANCE

A. Codes and Standards:
   1. Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.
   2. The entire installation shall fully comply with all local and state laws and ordinances, and with all established codes applicable thereto.
B. Testing and Inspection Service:
   1. Cost of field and laboratory testing will be borne by the Contractor. Testing by laboratory approved by the Owner.
   2. Contractor will cooperate with testing laboratory and geotechnical Engineer in coordinating compaction testing, installation and protection of settlement monitoring devices.

## 1.6 SUBMITTALS

A. Testing Reports - Excavating: Submit the following reports directly to the Architect from the testing services, with copies to the Contractor and the Owner
   1. Test reports on borrow material/lab analysis of fill materials.
   2. Field density test reports.
   3. One optimum moisture-maximum density curve for each type of soil encountered.
   4. Report of actual unconfined compressive strength and/or results of bearing tests of each strata tested.

# PART 2 - PRODUCTS

## 2.1 SOIL MATERIALS/ DEFINITIONS

A. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups CL, GC, GW, CP, GM, ML, SC, SM, SW, and SP.
B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups MG, DH, OL, OH, PT and any bedrock material.
C. Subbase material (granular fill): Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, natural or crushed sand.
D. Fill materials:
   1. The fill material type shall be cohesive, non-expansive soil having a "CL" or "CL-ML" classification in accordance with the Unified Soil Classification System and shall have a maximum laboratory dry density (100%) of 100 pounds per cubic foot or more as determined by ASTM D698 (Standard Proctor).
   2. No organic dark colored soils or plastic and potentially expansive soils, such as clay shale, are considered suitable engineered fill materials. Topsoils should be sorted and stockpiled for landscaping purposes.

3. When fill material includes rock, the maximum rock size acceptable shall be three inches (3"). No large rocks shall be allowed to nest and all voids must be carefully filled with small stones or earth, properly compacted. No large rocks will be permitted within twelve inches (12") of the finished grade.

E. Topsoil: Secure and stockpile from naturally well drained areas during stripping operations; use satisfactory soil materials free of admixture of subsoil, reasonably free from clay lumps, stone or other debris a greater than 1-1/2" in diameter.

F. Erosion Fence: Three (3) foot wide, 10 mil, 100 percent spunbonded nylon reinforced silt fence fabric with a maximum vertical water flow of 500 gallons per minute per square foot. Posts shall be steel T posts, minimum length 5 foot.

G. Straw Bales: Bound, rectangular, straw bales and suitable stakes. Straw bales to be in good condition. Loose, broken or deteriorated bales will not be accepted.

## PART 3 – EXECUTION

### 3.1 EXCAVATION

A. Excavation is unclassified, and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.

B. Unauthorized Excavation:
   1. Consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer.
   2. Unauthorized excavation, as well as remedial work directed by Engineer shall be at Contractor's expense.
   3. Backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.

C. Additional Excavation:
   1. When excavation has reached required subgrade elevations, notify Engineer who will make an inspection of conditions. Engineer shall evaluate and advise if bearing material is suitable and shall provide unconfined compressive strength tests.
   2. If unsuitable bearing materials are encountered at required elevations, carry excavations deeper and replace excavated material with engineered compacted backfill as directed by Engineer.
   3. Unsuitable soil shall be removed to the dimension and grade as directed by the Engineer. This area shall be refilled with compacted crushed stone to 98 percent standard proctor D698 (70 percent relative density D2049).
   4. Removal or reworking of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work.

D. Stability of Excavations:
   1. Slope sides of excavations to comply with local codes and ordinances having jurisdiction.
   2. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
   3. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

E. Dewatering:
   1. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
   2. Do not allow water to accumulate in excavations.
   3. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations.
   4. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
   5. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas.

6. Do not use trench excavations as temporary drainage ditches.

F. Material Storage:
   1. Stockpile satisfactory excavated materials where directed, until required for backfill or fill.
   2. Place, grade and shape stockpiles for proper drainage.
   3. Locate and retain soil materials away from edge of excavations.
   4. Do not store within drip line of trees indicated to remain.
   5. Dispose of excess soil material and waste materials as herein specified.

G. Subgrade Preparation: Pavements (Parking and Roadways and Sidewalks):
   1. Provide a 12" compacted depth subgrade for Parking and Roadways including crushed rock surfaces, 6-inches for Sidewalks.
   2. Scarify, mix and recompact materials to provide uniform composition at least 12" below top of subgrade for parking lots and drives and 6" below top of subgrade for sidewalks for full width of subgrade plus 2'-0" each side of parking lots and drives and 1'-0" on each side of sidewalks.
   3. Construct 12" thick uniform subgrade by excavating top 6" of subgrade, scarifying, mixing, and recompacting next 6" of subgrade base and proof rolling.
   4. Construct 6" thick uniform subgrade (sidewalks) by scarifying, mixing, and recompacting the top 6" of subgrade.
   5. Proof roll existing soils prior to placing fill to determine location of unsuitable bearing materials. Proof roll with heavy rubber-tired construction equipment in the presence of the Geotechnical Engineer. Unsuitable material encountered in the subgrade base shall be over excavated and replaced with suitable material and re-compacted. Notify Engineer if unsuitable conditions are encountered for direction.
   6. Compact as per Paragraph 3.2 Compaction requirements.

## 3.2 COMPACTION

A. General: Control soil compaction during construction providing minimum percentage of density specified for each area classification indicated below.

B. Compaction Requirements: Compaction shall be not less than the following percentages of maximum dry density:

| Standard Proctor ASTM D698 Construction Type | Cohesive Soils |
|---|---|
| Paving, roadway, Parking lot and critical backfill area beneath same; e.g. trenches | 95% |
| Backfill adjacent to structures not supporting other structures- minor subsidence possible. | 95% |
| Lawn areas. Non-critical areas- moderate subsidence possible. | 90% |

*Use relative density technique (ASTM D4253 and D4254) where standard proctor technique (ASTM D698) does not result in a definable maximum dry density and optimum moisture content.

C. Moisture Control and Content:
   1. When subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations.
   2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

D. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory value.

E. Protect The fill material shall be compacted at a moisture content typically within a range of minus two percent to plus four percent (0% to +4%) of optimum moisture content as determined by ASTM D698 (Standard Proctor). Other acceptable moisture content ranges determined by the Engineer may be necessary to produce desirable results with specific soils.

## 3.3 BACKFILL AND FILL

A. General: Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.
   1. In excavations, use satisfactory excavated or borrow material.
   2. Under grassed areas, use satisfactory excavated or borrow material.
   3. Under walks and pavements, use subbase material, or satisfactory excavated or borrow material, or combination of both.
   4. Under steps, use subbase material.
   5. Under piping and conduit, use subbase material where subbase is indicated under piping or conduit; shape to fit bottom 90 degrees of cylinder.
   6. Utilize loess soil for fill only in the lower portion of deep fill sections or below frost depth under pavement/structures.

B. Ground Surface Preparation:
   1. Clearing area to be filled: All timber, logs, trees, brush and rubbish shall be removed, piled or burned or otherwise acceptably disposed of.
   2. Scarifying area to be filled:
      a. All vegetable matter and dark colored organic soil shall be removed from the surface upon which the fill is to be placed, and the surface shall then be plowed or scarified to a depth of at least six inches and until the surface is free from ruts, hummocks or other uneven features which would tend to prevent uniform compaction by the equipment to be used.
      b. Where fills are made on hillsides or slopes, the slope of the original ground upon which the fill is to be placed shall be plowed or scarified deeply or where the slope ratio of the original ground is steeper than 5 horizontals to 1 vertical, the bank shall be stepped or benched. Ground slopes which are flatter than 5 to 1 shall be benched when considered necessary by the Engineer.
   3. Compaction area to be filled: After the foundation for the fill has been cleared and plowed or scarified, it shall be disced or bladed until it is uniform and free from large clods, brought to within the specified moisture content range and compacted to not less than ninety-five percent (95%) of maximum dry density in accordance with current ASTM D698 (Standard Proctor).

C. Placement and Compaction:
   1. Depth and Mixing of Fill Layers: The selected fill material shall be placed in level, uniform layers which, when compacted, shall have a density conforming to a minimum of ninety-five percent (95%) of maximum dry density in accordance with ASTM D698 (Standard Proctor). Each layer shall be thoroughly blade mixed during the spreading to insure uniformity of material in each layer. Compacted layer thickness will be compatible with the demonstrated compatibility of the compaction equipment being used, with a compacted layer thickness of 6" considered typical.
   2. Amount of Compaction: After each layer (lift) has been placed, mixed and spread evenly, it shall be thoroughly compacted to a minimum of ninety-five percent (95%) of the material's

maximum dry density as determined by ASTM D698 (Standard Proctor) for areas supporting building foundations and floor slabs. Grassed areas or areas not supporting buildings or slabs-on-grade should be compacted to a minimum of ninety percent (90%).

3. Compaction of Fill Layer: Compaction equipment shall be of such design to be able to compact the fill to the specified density. Compaction shall be accomplished while the fill material is within the specified moisture content range. Compaction of each layer shall be continuous over its entire area and the compaction equipment shall make sufficient trips to ensure that the required density has been obtained.
4. Compaction of Slopes: Fill slopes shall be compacted. Compacting operations shall be continued until the slopes are stable but not too dense for planting on the slopes. Compacting of the slopes may be done progressively in increments of three to five feet (3' to 5') in fill height or after the fill is brought to its total height.
5. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

## 3.4 GRADING

A. General:
   1. Uniformly grade areas within limits of grading under this Section, including adjacent transition areas.
   2. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.
B. Grading Outside Paving Lines:
   1. Grade areas to adjacent to paving lines to drain away from structures and to prevent ponding.
   2. Finish surfaces free from irregular surface changes, and as follows:
      a. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10' above or below required subgrade elevations.
      b. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.10' above or below required subgrade elevation.
C. Grading Surface of Fill Under Paving:
   1. Grade smooth and even, free of voids, compacted as specified, and to required elevation.
   2. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

## 3.5 EMBANKMENTS

A. General: Prepare site, place and compact excavated materials to required elevation and cross section.
B. Construction:
   1. Construct embankment in horizontal layers not more than 6" in loose thickness.
   2. Deposit each layer over full width of embankment as separate and distinct operation.
   3. After layer is deposited, smooth to uniform depth by means of suitable motor patrol or bulldozer.
   4. Compact layer by rolling with tamping type roller until full weight of roller is supported by tamping feet, but with not less than one pass per inch of loose thickness of layer.
   5. Roller will be considered to be supported entirely on its tamping feet when feet do not penetrate more than 3" into material being compacted.
   6. If soil is wet so that it will not sufficiently compact by one passing of roller per inch of loose thickness, provide one discing per 2" of loose thickness.
      a. Cut and stir full depth of layer.
      b. Allow interval of not longer than two hours between successive discings, or as directed by Engineer.
      c. After discing is completed compact layer by specified rolling.

7. If soil is dry so that it will not satisfactorily compact by rolling, moisten material before compaction; manipulate material to secure proper distribution of moisture before compaction.
8. Whenever operations are suspended during periods rain is likely to occur, smooth and compact surface to shed water readily.
9. Compact to not less than 95% maximum density with moisture content not more than three percentage points above or below optimum; maximum density determined by ASTM D698.

## 3.6 TOPSOIL SPREADING

See Section 31 22 00 - Grading

## 3.7 FINISH GRADING

See Section 31 22 00 - Grading

## 3.8 MAINTENANCE

A. Protection of Graded Areas:
   1. Newly graded areas from traffic and erosion. Keep free of trash and debris.
   2. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
   3. Keep public streets clean from soil, soil tracking and debris at all times.
B. Reconditioning Compacted Areas: Where completed graded areas are disturbed by subsequent construction operations, erosion or adverse weather, scarify surface, re-shape and compact to required density prior to further construction.
C. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work and eliminate evidence of restoration to greatest extent possible.

## 3.9 EROSION PROTECTION

A. The Contractor shall comply with soil erosion control requirements of the Iowa Code, and the local ordinances. The Contractor shall take all necessary measurements to protect against erosion and dust pollution on this project site and all off-site borrow or deposit areas, during performance or as a result of performance.
B. The Contractor shall take all steps necessary to protect adjoining property, including public sanitary and storm drainage systems and streets, from any damage resulting from the movement of earth or other debris thereto from the site; and such steps as are necessary to prevent the accumulation of earth or debris on adjoining public or private property from the construction site. The Contractor shall take into consideration all factors which might cause the movement of earth or debris from the construction site onto any adjoining public or private property.
C. The Contractor shall take immediate corrective action should damage occur to adjoining public or private property (including sanitary or storm drainage systems and streets). The Contractor shall take immediate corrective action to remove any debris should any earth or other debris move from the construction site to adjoining public or private property. Further, the Contractor shall take steps required to prevent the repetition of any instance where dirt or other debris moves from the construction site to adjoining public or private property.
D. The Contractor will hold the Owner harmless from any and all claims of any type whatsoever resulting from damages to adjoining public or private property, including reasonable attorney's fees incurred to Owner. Further, if the Contractor fails to take necessary steps to promptly remove earth or debris which comes onto adjoining public or private property, the Owner may, but need not, remove such debris and deduct the cost thereof from amounts due the Contractor.

E. The Contractor shall maintain storm sewer systems throughout construction and provide erosion control measures acceptable to protect against siltation and erosion or any adverse conditions resulting from storm water. Use straw bales and other means at all intakes and outfall structures and at all locations where erosion or siltation is anticipated or occurring; including drainage courses and swales.
F. Silt fences shall be installed as shown on drawings, in locations as directed by Engineer, and in locations as required by Contractors erosion control plan.
   1. Drive T-posts 5' O.C. in drainage swales, 8' O.C. for slope control, to a minimum depth of 2 1/2'. Attach fabric to posts with continuous cord or wire. Bury 12" of fabric in continuous trench in front of posts.
   2. Contractor to routinely inspect condition of fences and repair and clean, as necessary to maintain them in good working order.
   3. After vegetative cover is established, silt fences will be removed by Contractor and disposed of off site.
G. In lieu of silt fences, straw bale dikes may be installed with the approval of the Engineer. Contractor shall furnish a detail of the dike for approval to the Engineer. Contractor shall routinely inspect the conditions of the straw bales and replace damaged bales or dikes as necessary. Periodic cleaning of sediment and removal of straw bale dikes shall conform to similar requirements for silt fences.

## 3.10 FIELD QUALITY CONTROL

A. Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed.
B. Perform field density tests in accordance with ASTM D2922 (nuclear method) or ASTM D1556 (sand cone method), as applicable.
C. Footing Subgrade: For each strata of soil on which footings will be placed, conduct at least one test every 50 lineal feet to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to Engineer.
D. Paved Areas and Building Slab Subgrade: Make at least one field density test of subgrade for every 2000 sq. ft. of paved area, but in no case less than 3 tests. In each compacted fill layer, make one field density test for every 2000 sq. ft. of overlaying building slab or paved area, but in no case less than 3 tests.
E. If, in opinion of Engineer, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no additional expense.

## 3.11 NATURAL AND ARTIFICAL DRAINAGE

A. If necessary during the progress of the work to interrupt the natural drainage of the surface water, Contractor shall provide approved temporary drainage facilities.
B. All excess excavation shall be removed from site to location determined by Contractor.

## 3.12 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash and debris from site to an approved location for disposal by Contractor.
B. All excess excavation shall be removed from site to location determined by Contractor.

END OF SECTION

**SECTION 31 20 05**

**EARTH MOVING FOR BUILDING**

**RFB #923902-01**

## 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. Preparing subgrades for building slabs-on-grade.
2. Excavating and backfilling for buildings and structures.

B. Related Requirements:

1. Section 01 45 00 "Special Inspections and Tests" for required verifications and inspections.

### 1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

B. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

C. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

E. Fill: Soil materials used to raise existing grades.

F. Structures: Buildings, footings, foundations, retaining walls, slabs, or other man-made stationary features constructed above or below the ground surface.

G. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

### 1.4 SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Controlled low-strength material, including design mixture.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 698.

### 1.5 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.

C. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified are in place.

D. Do not commence earth-moving operations until plant-protection measures specified are in place.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Unsatisfactory Soils: Soil Classification Groups OL, CH, CL/CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within +/- 3 percent of optimum moisture content for granular soil and -2/+3 percent of optimum moisture content for low plasticity cohesive soil at time of compaction.

C. General Building Fill: Satisfactory Soils shall consist of low plasticity soil or granular soil:

1. Soil Classification Groups GW, GP, GM, GC, SW, SP, SM and SC according to ASTM D 2487, or a combination of these groups.

2. Low plasticity soil classification groups CL, CL-ML, ML with liquid limit less than 45 and a plasticity index less than or equal to 23.

3. Soil shall be free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

D. Subbase Material: Satisfactory Soils shall consist of low plasticity soil or granular soil:

1. Low plasticity soil classification groups CL, CL-ML, ML with liquid limit less than 45 and a plasticity index less than or equal to 23.

2. Granular soil: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2840M; with at least 90 percent passing a 1 ½ inch sieve and at least 18 percent passing a No. 200 sieve.

E. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and less than 6 percent passing a No. 200 sieve.

F. Over-Excavation Fill Below Footings: Iowa DOT Section 4120.04 (Class A Roadstone).

G. Sand: ASTM C 33/C 33M; fine aggregate.

### 2.2 LEAN CONCRETE FILL MATERIAL

A. Lean Concrete Fill Material: Flowable concrete material produced from the following:

1. Portland Cement: ASTM C 150/C 150M, Type I.

2. Fly Ash: ASTM C 618, Class C or F.

3. Normal-Weight Aggregate: ASTM C 33/C 33M, 1 1/2-inch nominal maximum aggregate size.

4. Water: ASTM C 94/C 94M.

B. Produce conventional-weight, controlled low-strength material with 1000-psi at 28 day compressive strength.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

### 3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

### 3.3 EXCAVATION, GENERAL

A. Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.

### 3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

### 3.5 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs with a pneumatic-tired tandem-axle dump truck weighing not less than 20 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.

2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

### 3.6 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Architect.

## 3.7 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations.

## 3.8 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring, bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
8. Installation of settlement plate.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

## 3.9 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under building slabs, use General Building Fill and Subbase Material.
2. Under footings and foundations, use Over-Excavation Fill Below Footings.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

## 3.10 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within +/- 3 percent of optimum moisture content for granular soil and -2/+3 percent of optimum moisture content for low plasticity cohesive soil at time of compaction.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

## 3.11 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 9 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under building foundation compact each layer of backfill or fill soil material at 98 percent.
2. Under building slabs and above building foundations compact each layer of backfill or fill soil material at 95 percent.
3. Lean to fat clay should not be compacted to more than 100 percent of standard Proctor maximum dry density.

4. If the granular material is a coarse sand or gravel, or of a uniform size, or has a low fines content; granular material shall be compacted to at least 70 percent relative density according to ASTM D 4253 and D 4254.

## 3.12 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

## 3.13 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections.

B. Inspections: Refer to Section 01 45 00 “Special Inspections and Tests” for required verifications and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:

1. Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of building slab but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 200 feet or less of wall length but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

## 3.14 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

## 3.15 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and legally dispose of them off Owner’s property, unless otherwise indicated by owner to stockpile on site with location to be coordinated with owner.

B. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

**END OF SECTION**

# SECTION 31 22 00

# GRADING

# RFB #923902-01

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Rough grading and finish grading the site for site structures and pavements.

### 1.2 RELATED SECTIONS

A. Section 31 23 16, Excavation.
B. Section 31 23 23, Fill.
C. Section 31 20 00, Earthwork

### 1.3 PROJECT CONDITIONS

A. Protect above- and below-grade utilities that remain.
B. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from grading equipment and vehicular traffic.
C. The Contractor shall supply all construction layout staking for this project, including for exterior improvements and utilities. Engineer will supply geometric information for purposes of staking upon request. Contractor shall give Engineer 48-hour notice per request for said information.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Topsoil: See Section 31 23 23 Non-Building Fill.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

### 3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.
B. Stake and flag locations of known utilities.

### 3.3 ROUGH GRADING

A. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
B. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

### 3.4 SOIL REMOVAL

A. Stockpile topsoil to be re-used on site; remove remainder from site.
B. Stockpile subsoil to be re-used on site; remove remainder from site.

## 3.5 FINISH GRADING

A. Remove debris, roots, branches, stones, in excess of 1/2 inch (13 mm) in size. Remove soil contaminated with petroleum products.
B. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches (75 mm).
C. Place topsoil to nominal depth of 6 inches (150 mm).
D. Remove roots, weeds, rocks, and foreign material while spreading.
E. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

## 3.6 CLEANING AND PROTECTION

A. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

# SECTION 31 23 16

# EXCAVATION

# RFB #923902-01

## PART 1 – GENERAL

### 1.1 SECTION INCLUDES

A. Excavating for building volume below grade, footings, slabs-on-grade, site structures, and utilities within the building.

### 1.2 RELATED SECTIONS

A. Section 31 22 00, Grading.
B. Section 31 23 23, Fill.
C. Section 31 20 00, Earthwork.

### 1.3 PROJECT CONDITIONS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.
B. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
C. The Contractor shall supply all construction layout staking for this project, including for exterior improvements and utilities. Engineer will supply geometric information for purposes of staking upon request. Contractor shall give Engineer 48-hour notice per request for said information.

## PART 2 - PRODUCTS - NOT USED

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Identify required lines, levels, contours, and datum locations.
B. Locate, identify, and protect utilities that remain and protect from damage.

### 3.2 EXCAVATING

A. Excavate to accommodate new structures and construction operations.
B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
C. Slope banks of excavations deeper than 4 feet (1.2 meters) to angle of repose or less until shored.
D. Do not interfere with 45 degree bearing splay of foundations.
E. Cut utility trenches wide enough to allow inspection of installed utilities.
F. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; See Section 31 23 23.
G. Grade top perimeter of excavation to prevent surface water from draining into excavation.
H. Remove excavated material that is unsuitable for re-use from site.
I. Remove excess excavated material from site.

## 3.3 PROTECTION

A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

**SECTION 31 23 23**

**FILL**

**RFB #923902-01**

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade, footings, slabs-on-grade, and paving.
B. Backfilling and compacting for utilities outside the building to utility main connections.

### 1.2 RELATED SECTIONS

A. Section 31 22 00, Grading.
B. Section 31 23 16, Excavation.
C. Section 31 20 00, Earthwork.

### 1.3 REFERENCES

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2001 (2004).
B. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2000a.
C. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2000.
D. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2002.
E. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 1994(R 2001).
F. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.
G. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

### 1.4 PROJECT CONDITIONS

A. Verify that survey bench marks and intended elevations for the Work are as indicated.
B. The Contractor shall supply all construction layout staking for this project, including for exterior improvements and utilities. Engineer will supply geometric information for purposes of staking upon request. Contractor shall give Engineer 48-hour notice per request for said information.

## PART 2 – PRODUCTS

### 2.1 FILL MATERIALS

A. General Fill - Fill Type Landscaped Areas: Subsoil excavated on-site.
   1. Free of lumps larger than 3 inches (75 mm), rocks larger than 2 inches (50 mm), and debris.
B. Structural Fill - Fill Type Paved Areas: Subsoil excavated on-site.
   1. Free of lumps larger than 3 inches (75 mm), rocks larger than 2 inches (50 mm), and debris.
C. Topsoil - Fill Type Landscaped Areas: Topsoil excavated on-site.

1. Free of roots, rocks larger than 1/2 inch (12 mm), subsoil, debris, large weeds and foreign matter.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

### 3.2 PREPARATION

A. Scarify subgrade surface to a depth of 6 inches (150 mm) under concrete paving.
B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Structural Fill.
C. Compact subgrade to 95 percent of maximum dry density.
D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

### 3.3 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.
B. Employ a placement method that does not disturb or damage other work.
C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
D. Maintain optimum moisture content of fill materials to attain required compaction density.
E. Slope grade away from building minimum 2 inches in 10 ft (50 mm in 3 m), unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
F. Correct areas that are over-excavated.
   1. Other areas: Use general fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density.
G. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving, slabs-on-grade, and similar construction: 95 percent of maximum dry density.
   2. At other locations: 95 percent of maximum dry density.
H. Reshape and re-compact fills subjected to vehicular traffic.

### 3.4 FIELD QUALITY CONTROL

A. Compaction density testing will be performed on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.
B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor"), ASTM D 1557 ("modified Proctor"), or AASHTO T 180.
C. If tests indicate work does not meet specified requirements, remove work, replace and retest at Contractor's expense.
D. Owner will select and pay for independent testing laboratory and Contractor shall coordinate work with testing laboratory before proceeding with each phase or stage of work.

### 3.5 CLEAN-UP

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

# SECTION 31 23 33

# TRENCHING AND BACKFILLING

# RFB #923902-01

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES

A. Trench excavation for pipe systems, manholes, intakes and other structures.
B. Trench bedding and foundation stabilization.
C. Pipe and structure placement and backfill.

### 1.02 DESCRIPTION OF WORK

A. Perform all excavations required to complete the work shown on the plans.
B. Prepare trench excavations and shoring for new work, and install the utility lines, structures, and system components, including bedding and foundation stabilization.
C. Complete specified backfill operation.
D. Reference is made to the Iowa Department of Transportation Standard Specifications for Highway and Bridge Construction, Series 2001, and all current General Supplemental Specifications and Materials Instructional Memorandum by the term "Iowa DOT Specifications" and/or "Iowa DOT I.M."

### 1.03 SUBMITTALS

A. Submit under provisions of Division 1.
B. Results of Proctor and In-Place Density Tests on backfill.
C. Contractor will provide Material Certifications to the Engineer.

### 1.04 SUBSTITUTIONS

A. Use only materials conforming to these specifications unless permitted otherwise by Engineer.
B. Obtain approval of Engineer for all substitutions prior to use.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver only materials that fully conform to these specifications or for which submittals have been provided to Engineer and approved for use.
B. Store delivered materials and excavated materials in locations that will not interfere with operations and minimize environmental damage.
C. Grade and shape stockpiles for drainage and protect adjacent areas from runoff. Provide erosion control around stockpiles.
D. Remove unsuitable and excess materials from the site.

### 1.06 SCHEDULING AND CONFLICTS

A. Construction Sequence:
   1. Attend a preconstruction meeting if required by Engineer.
   2. Submit plan for construction sequence and schedule prior to commencing construction.
B. Conflict Avoidance:
   1. Expose possible conflicts in advance of construction, such as utility lines and drainage structures. Verify elevations and locations of each and verify clearance for proposed construction.

2. Complete other elements of the work that can affect line and grade in advance of other open cut construction unless noted on the plans.
3. Notify Engineer of conflicts discovered or changes needed to accommodate unknown or changed conditions.

## 1.07 SPECIAL REQUIREMENTS

A. Stop Work: Stop work and notify Engineer immediately if contaminated soils, historical artifacts, or other environmental or historic items are encountered.
B. Conform to local, state, and federal requirements.
C. Abandoned Utilities: Remove and dispose of abandoned utility lines including gas mains, water mains, sewer mains, telephone conduits, service lines, etc. required to complete the work. Said work shall be incidental to the project unless otherwise specified.

# PART 2 - PRODUCTS

## 2.01 EXCAVATED MATERIALS

A. Unclassified Excavation: Excavation of all materials encountered, except rock and over-excavation.
B. Rock Excavation: Boulders or sedimentary deposits that cannot be removed without continuous use of pneumatic tools or blasting.
C. Over-excavation: Excavation of soil or rock in trenches below the pipe zone.
D. Suitable Excavated Materials for Backfill:
   1. Soil, clay, silt, sand, and gravel with moisture content suitable to achieve required compaction. ASTM D 2321, Class II through IVA (see 2.01, E).
   2. Fine-grained soils according to ASTM D 2321 Class IVB (inorganic) (see 2.01, E) may be used in the final backfill upon approval of the Engineer.
   3. Adjust moisture content of excessively wet, but otherwise acceptable, material by spreading, turning, aerating, and otherwise working material as necessary to achieve required moisture range.
   4. Adjust moisture content of excessively dry, but otherwise acceptable material by adding water, then turning, mixing, and otherwise blending the water uniformly throughout the material until the required moisture range is achieved.
   5. Lime or fly ash may be added to soils to produce a suitable backfill material. Uniformly mix soil and additive. Determine Standard Proctor maximum density and optimum moisture content of the modified material. Amount of additive applied is subject to Engineer's approval.
E. Non-Manufactured (Excavated) Backfill Materials: (See Sections 2.03 and 2.04 for manufactured backfill)

| Class | Type | Soil Group Symbol D 2487 | Description | Percentage Passing Sieve Sizes | | | Atterberg Limits | | Coefficients | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1½ in. (40 mm) | No. 4 (4.75 mm) | No. 200 (0.075 mm) | LL | PI | Uniformity $C_u$ | Curvature $C_c$ |
| II | Coarse-Grained Soils, clean | GW | Well-graded gravels and gravel-sand mixtures; little or no fines | 100% | ‹50% of "Course Fraction" | ‹5% | Non Plastic | | ›4 | 1 to 3 |
| | | GP | Poorly-graded gravels and gravel-sand | | | | | | ‹4 | ‹1 or ›3 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | mixtures; little or no fines. | | | | | | | |
| | | SW | Well-graded sands and gravelly sands; little or no fines. | | ›50% of “Coarse Fraction” | | | | ›6 | 1 to 3 |
| | | SP | Poorly-graded sands and gravelly sands; little or no fines. | | | | | | ‹6 | ‹1 or ›3 |
| | Coarse-Grained Soils, borderline clean to w/fines | e.g. GW-GC, SP-SM | Sands and gravels which are borderline between clean and with fines. | 100% | Varies | 5% to 12% | Non Plastic | | Same as for GW, GP, SW and SP | |
| III | Coarse-Grained Soils, with Fines | GM | Silty gravels, gravel-sand-silt mixtures. | 100% | ‹50% of “Coarse Fraction” | 12% to 50% | | ‹4 or ‹”A” Line | | |
| | | GC | Clayey gravels, gravel-sand-clay mixtures. | | | | | ‹7 and ›”A” Line | | |
| | | SM | Silty sands, sand-silt mixtures. | | ›50% of “Coarse Fraction” | | | ›4 or ‹”A” Line | | |
| | | SC | Clayey sands, sand-clay mixtures. | | | | | ›7 and ›”A” Line | | |
| IVA | Fine-Grained Soils (inorganic) | ML | Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, silts with slight plasticity. | 100% | 100% | ›50% | ‹50 | ‹4 or ‹”A” Line | | |
| | | CL | Inorganic clays of low to medium plasticity, gravely clays, sandy clays, silty clay, lean clays. | | | | | ›7 and ›”A” Line | | |
| IVB (1) | Fine-Grained Soils (inorganic) | MH | Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts. | 100% | 100% | ›50% | ›50 | ‹”A” Line | | |
| | | CH | Inorganic clays of high plasticity, fat clays. | | | | | ›”A” Line | | |
| V | Organic Soils (Unsuitable for backfill) | OL | Organic silts and organic silty clays of low plasticity. | 100% | 100% | ›50% | ‹50 | ‹4 or ‹”A” Line | | |
| | | OH | Organic Clays of Medium to high plasticity, organic silts. | | | | ›50 | ‹”A” Line | | |
| | Highly Organic (Unsuitable for backfill) | PT | Peat and other high organic soils. | | | | | | | |

(1) See section 2.01, F, 2 for restrictive use.

F. Unsuitable Material: Remove unsuitable materials from the site, including, but not limited to, the following:
   1. Rock with gradation not meeting the stated gradation for stabilization material.
   2. Individual stones or concrete chunks larger than 6 inches and averaging more than one per each cubic foot of soil.
   3. Frozen materials.
   4. Stumps, logs, branches, and brush.
   5. Trash, metal, or construction waste.
   6. Soil in clumps or clods larger than 6 inches, and without sufficient fine materials to fill voids during placement.
   7. Unsuitable soils, as defined in Section 2010, 2.03, excluding material used as topsoil.
   8. Class V Material (ASTM D 2321), as defined in Section 3010, 2.08.
   9. Environmentally-contaminated soils.

G. Replacement of Unsuitable Soils:
   1. If the excavated material is determined by the Engineer to be unsuitable and cannot be conditioned so that it becomes suitable, furnish all necessary backfill material.
   2. Remove and dispose of unsuitable material from the site.

## 2.02 STABILIZATION (FOUNDATION) MATERIALS

A. Clean 2-1/2 inch crushed stone or crushed portland cement concrete (PCC) material, with the following gradation:

| Sieve | Percent Passing |
|---|---|
| 2-1/2” | 100 |
| 2” | 90 to 100 |
| 1-1/2” | 35 to 70 |
| 1” | 0 to 15 |
| 1/2” | 0 to 5 |

B. Engineer may authorize a change in gradation subject to materials available locally at time of construction. Subject to the Engineer’s approval, crushed concrete may be used if it is within plus or minus 5% of the gradation for each size of material.

## 2.03 CLASS I GRANULAR BEDDING AND BACKFILL MATERIAL (Storm Sewers and Sanitary Sewers)

A. Use gravel or crushed stone for granular bedding, complying with the following gradation:

| Sieve | Percent Passing |
|---|---|
| 1-1/2” | 100 |
| 1” | 95 to 100 |
| 1/2" | 25 to 60 |
| No. 4 | 0 to 10 |
| No. 8 | 0 to 5 |

Note: Engineer may authorize the use of crushed PCC, for pipe sizes up to 12 inches, or a change in gradation subject to materials available locally at time of construction.

B. Compaction: See Section 3.06.

**2.04 CLASS II BACKFILL MATERIAL (Storm Sewers, Sanitary Sewers, and Water Mains)**

A. Class II material is manufactured and non-manufactured open graded (clean) or dense graded (clean) processed aggregate, clean sand, or coarse-grained natural soils (clean) with little or no fines.
B. Class II material is non-plastic soil less than 1-1/2 inches in size and consists of the following:

| SOIL TYPE | DESCRIPTION OF MATERIAL CLASSIFICATION | REMARKS SECTION |
|---|---|---|
| GW | Well-graded gravels and gravel-sand mixtures, little or no fines. 50% or more retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean. | Where hydraulic gradient exists check gradation to minimize migration. Clean groups suitable for use as drainage blanket and underdrain. |
| GP | Poorly graded gravels and gravel sand mixtures, little or no fines. 50% or more retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean. | |
| SW | Well-graded sands and gravelly sands, little or no fines. More than 50% passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean. | |
| SP | Poorly graded sands and gravelly sands, little or no fines. More than 50% passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean. | |

C. Compaction: See Section 3.06.
D. Class II material may be specified in the contract documents by the Engineer between the pipe embedment zone and the top 2 feet of final backfill when the trench is under the pavement.

**2.05 CLASS III BACKFILL MATERIAL (Storm Sewer, Sanitary Sewer, and Water Mains)**

A. Class III material is natural coarse-grained soils with fines.
B. Class III material follows Section 2.01, G and consists of the following:

| SOIL TYPE | DESCRIPTION OF MATERIAL CLASSIFICATION | REMARKS SECTION |
|---|---|---|
| GM | Silty gravels, gravel-sand-silt mixtures. 50% or more retained on No. 4 sieve. More than 50% retained on No. 200 sieve. | Do not use where water condition in trench may cause instability. |
| GC | Clayey gravels, gravel-sand-clay mixtures. 50% or more retained on No. 4 sieve. More than 50% retained on No. 200 sieve. | |
| SM | Silty sands, sand-silt mixtures. More than 50% passes No. 4 sieve. More than 50% retained on No. 200 sieve. | |
| SC | Clayey sands, sand-clay mixtures. More than 50% passes No. 4 sieve. More than 50% retained on No. 200 sieve. | |

C. Compaction: See Section 3.06.

**2.06 CLASS IVA BACKFILL MATERIAL (Storm Sewer, Sanitary Sewer, and Water Mains)**

A. Class IVA material is natural fine grained inorganic soils.
B. Class IVA material follows Section 2.01, G and consists of the following:

| SOIL TYPE | DESCRIPTION OF MATERIAL CLASSIFICATION | REMARKS SECTION |
|---|---|---|
| ML | Inorganic silts, very fine sands, rockflous, silty or clayey fine sands. Liquid limit 50% or less. 50% or more passes No. 200 sieve. | Obtain geotechnical evaluation of proposed material. May not be suitable under deep fills, surface applied wheel loads, and under heavy vibratory compactors and tampers. Do not use where water conditions in trench may cause instability. |
| CL | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. Liquid limit 50% or less. 50% or more passes No. 200 sieve. | |

C. Compaction: See Section 3010, 3.06.
D. Suitable only in dry trench conditions.

**2.07 CLASS IVB BACKFILL MATERIAL (Storm Sewer, Sanitary Sewer and Water Mains)**

A. Class IVB material is natural fine-grained inorganic (high elastic silts and plastic clays - fat clay) with a liquid limit greater than 50%.
B. Class IVB material follows Section 3010, 2.01 and consists of the following:

| SOIL TYPE | DESCRIPTION OF MATERIAL CLASSIFICATION | REMARKS SECTION |
|---|---|---|
| MH | Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts. Liquid limit greater than 50%. 50% or more passes No. 200 sieve. | Not to be used in pipe embedment zone. |
| CH | Inorganic clays of high plasticity, fat clays. Liquid limit greater than 50%. 50% or more passes No. 200 sieve. | |

C. Compaction: See Section 3.06.
D. When approved by the Engineer, Class IVB material may be used as final trench backfill in a dry trench.
E. Do not use in the pipe embedment zone.

**2.08 CLASS V BACKFILL MATERIAL (Topsoil)**

A. Class V Material is natural highly organic soils with a liquid limit greater than 50%. See Section 2.01.
B. Use Class V Material only as topsoil outside of the pavement, unless otherwise specified or allowed by the Engineer.
C. Do not use Class V Material in the pipe embedment zone.

## 2.09 BEDDING AND BACKFILL MATERIALS FOR PIPE CULVERTS

A. Bedding:
   1. Use minimum Type C embedment.
   2. Install water stop or curtain wall at culvert inlet, as specified in the contract documents.
B. Backfill Material:
   1. Use all suitable material excavated for pipe culvert work, as specified in Section 2.01, for backfill material.
   2. Dry suitable material that has excessive moisture prior to placement.
   3. Remove unsuitable material, as specified in Section 2.01, from the project site.

## 2.10 BEDDING AND BACKFILL MATERIALS FOR SUBDRAINS

A. Drainable Bedding and Backfill Materials Include:
   1. Porous backfill material.
   2. Pea gravel.
   3. Use as shown on the plans or on the detailed drawings.
B. Porous Backfill Material:
   1. Crushed stone or gravel with the following gradation:

| Sieve | Percent Passing |
|---|---|
| 3/4" | 100 |
| 1/2" | 95 to 100 |
| 3/8" | 50 to 100 |
| No. 4 | 10 to 50 |
| No. 8 | 0 to 8 |

Iowa DOT Gradation No. 29.

C. Coarse Aggregate: Use Stabilization Materials, per Section 3010.
D. Pea Gravel: Use commercially available pea gravel.
E. Impervious Bedding: Use least permeable on-site materials.
F. Engineering Fabric: Use Iowa DOT 4196.

## 2.11 SPECIAL PIPE EMBEDMENT MATERIAL

A. Concrete Supports: Where specified in the contract documents, construct concrete support systems.
B. Concrete Bedding, Arch, or Encasement:
   1. Concrete: commercial, 4,000 psi compressive strength.
   2. Unreinforced, unless otherwise shown on the plans.
   3. Minimum concrete thickness: 6 inches or as shown on the plans.
C. Flowable Mortar:
   1. Approximate quantities per cubic yard:
      a. Cement 100 pounds
      b. Fly ash 300 pounds
      c. Fine aggregate 2,600 pounds
      d. Water, approximate 70 gallons
   2. Compressive strength at 28 days; 100 psi to 200 psi.
D. Controlled Low Strength Material (CLSM):
   1. Approximate quantities per cubic yard:
      a. Cement 50 pounds
      b. Fly ash 250 pounds
      c. Fine aggregate 2910 pounds

d. Water, approximate 60 gallons
2. Compressive strength at 28 days 50 psi.

## PART 3 - EXECUTION

### 3.01 PREPARATION

A. When natural soils for Class II, III, and IV backfill material is required as specified in Figure 3010.1, provide written certification from a testing laboratory that the material meets the class specified if so requested by the Engineer.
B. Locate, mark, and protect existing utilities and facilities in the work area.
C. Provide access to utility service locations, such as valves, manholes, and utility poles.
D. Identify owners of utilities on or near the site, and notify them of operations to occur.
E. Protect existing facilities and landscaping features, or replace as shown on the plans.
F. Protect bench marks, control points and land survey monumentation, or replace at Contractor's expense.

### 3.02 TRENCH EXCAVATION

A. Notify the Engineer prior to the start of excavation activities.
B. Remove and stockpile a minimum of 6” of topsoil for subsequent reuse.
C. Place excavated material away from trench. Grade spoil piles to drain. Do not allow spoil piles to obstruct drainage.
D. Remove rock, rubbish, boulders, debris, and other unsuitable materials at least 6 inches below, and on each side of the pipe. Restore grade using soil suitable for backfill.
E. Correct unauthorized excavation at no cost to Owner, using bedding or stabilization materials.
F. Provide protective fences and barricades around open excavations, appropriate to the surrounding area.
G. Provide weight tickets for stabilization material to the Engineer at the time of delivery.
H. Provide safety fence around open excavations.
I. Trench Excavation for Sanitary Sewers, Storm Sewers, Water Mains, and Pipe Culverts:
    1. Maximum and minimum pipe trench width: Min.=Pipe Dia.+1.5’; Max.=1.25*Pipe Dia. or 54”, whichever is greater.
    2. Flat trench bottom, conduit bearing directly on trench bottom (not applicable for rock excavation) for water main pipe only with bell hole shaping:
        a. Shape trench bottom to support pipe around 1/4 of perimeter for the full length of the pipe barrel.
        b. Provide bell holes.
    3. Trench bottom, conduit supported by bedding material:
        a. Excavate trench as shown on the detailed drawings.
        b. Install bedding material to support the full length of the pipe barrel.
    4. Trench depth:
        a. Flow Line plus Pipe Dia/8, or 4” min.
    5. Conform all trench operations to current OSHA regulations.
J. Structure Excavation:
    1. For concrete structures and parts of structures without footings, 18 inches outside the horizontal projection of the structure.
    2. For concrete structures with footings, 18 inches outside the footings.
    3. For anchor rods, 12 inches on each side of the rod.
    4. For buried anchors, the face of the buried anchor on one side and 24 inches outside the buried anchor on the other face.

### 3.03 ROCK OR UNSTABLE SOILS IN TRENCH BOTTOM

A. Notify the Engineer prior to over-excavation.

B. Engineer will determine the need for trench bottom stabilization prior to installation of pipes and structures.
C. See Figure 3010.1 for over-excavation of rock and wet or soft foundations.
D. Provide weight tickets for the stabilization material to the Engineer at the time of delivery.

## 3.04 SHEETING, SHORING, AND BRACING

A. Conform sheeting and bracing of all excavations to the latest state and federal regulations governing safety of workers in the construction industry.
B. Leave in place all temporary sheeting below 2 feet over top of pipe unless sheeting removal plan is approved by Engineer. Conform all trench operations to current OSHA regulations.
C. Move trench boxes carefully to avoid excavated wall displacement or damage.
D. When necessary or required, install adequate sheeting and bracing to prevent ground movement that may cause damage or settlement to adjacent structures, pipelines, and utilities.
E. Any damage due to settlement because of failure to use sheeting or because of inadequate bracing, or through negligence or fault of the Contractor in any other manner, shall be repaired at the Contractor's expense.
F. For sides of trenches in unsuitable, loose, or soft material, shore, sheet, brace, slope, or otherwise support by means of sufficient strength to protect employees working within them.
G. Where excavations are made with vertical sides that require supporting, use sufficient strength for sheeting and bracing to sustain the sides of the excavations and to prevent movement that could in any way injure the work or adjacent structures, or diminish the working space sufficiently to delay the work.
H. Select sheeting and bracing material of sufficient dimensions and strength to adequately support the sides of trenches and excavations, which will not split when driving and will be free of imperfections that may impair its strength or durability.
I. Drive sheeting to true alignment and ensure contact of adjacent pieces.
J. In wet excavation, use grooved sheeting to prevent passage of soil. Fill any voids between sheeting and face of excavation with suitable material.
K. Do not remove sheeting and bracing before the completion of the work, unless otherwise directed by the Engineer.
L. For sheeting left in place, cut off 18 inches for clearance below the bottom of the pavement in streets/highways and 18 inches below the original ground surface, unless otherwise required by the contract documents or the Engineer. Leave in place all temporary sheeting below 2 feet over top of pipe, unless a sheeting removal plan is approved by Engineer.

## 3.05 DEWATERING

A. Do all work in dry conditions; do not install pipes on excessively wet soil.
B. Perform the dewatering operation according to the dewatering plan submitted to the Engineer. Dewatering operations may be modified from the plan for actual field conditions, with approval of the Engineer.
C. Adequate dewatering is the Contractor's responsibility unless otherwise stated in the contract documents.
D. Install dewatering system appropriate for the soil conditions.
E. Maintain water levels sufficiently below the bottom of trench excavation, (typically 2 feet) to prevent upward seepage.
F. Provide for handling water encountered during construction:
    1. Prevent surface water from flowing into excavation. Remove water as it accumulates.
    2. Do not use sanitary sewers for disposal of trench water. Discharging water into storm sewers requires Engineer's approval.
    3. Do not discharge water onto adjacent property.
    4. Maintain and control water discharge as necessary to prevent a safety hazard for vehicular and pedestrian traffic.
    5. Direct water discharge away from electrical facilities or equipment and intersections.
    6. Use noise and fume reducing dewatering equipment to minimize disturbance.

7. Provide at least two operating pumps for each trench opened in wet ground, and at the same time have one pump in reserve.

G. Place backfill in trenches prior to stopping dewatering operations.
H. Protect trench water discharge points from erosion.
I. Operate dewatering systems to prevent damage to adjoining structures and facilities.
J. Monitor adjoining structures and facilities during dewatering operations. Cease dewatering operations and notify the Engineer if damage is observed.

## 3.06 PIPE INSTALLATION

A. Pipe Bedding:
   1. Shape pipe bed to evenly support pipe at the proper line and grade, with full contact under the bottom of the pipe.
   2. Install pipe and system components.
   3. Place bedding simultaneously on both sides of the pipe. Correct any pipe displacements before proceeding.
   4. Place bedding in lifts no greater than 6 inches thick and consolidate.
   5. Concrete encasement: Install where shown on the plans.
   6. If required in the contract documents or if approved by the Engineer, flowable mortar or controlled low strength material may be used in lieu of other bedding material types.
   7. Secure pipe against displacement or flotation prior to placing flowable mortar or concrete encasement.
B. Haunch Support:
   1. Place granular haunch material in lifts no greater than 6 inches thick and consolidate by slicing with a shovel or using other approved techniques.
   2. If required in the contract documents, or if approved by the Engineer, concrete, flowable mortar, or controlled low strength material may be used instead of other haunch material types. Secure pipe against displacement or flotation prior to placing flowable mortar, controlled low strength material, or concrete encasement.
C. Primary and Secondary Backfill (Pipe Cover):
   1. Place pipe cover material in 6-inch lifts and compact to densities required according to class of material.
   2. If required in the contract documents or if approved by the Engineer, flowable mortar or controlled low strength material may be used in lieu of other cover material types. Secure pipe against displacement or flotation prior to placing flowable mortar or concrete encasement.
   3. Special pipe support: If required, provide special pipe support as shown on the plans.
D. Final Trench Backfill:
   1. Place backfill in the trench immediately after recording locations of connections and appurtenances or at Engineer's direction.
   2. Place backfill adjacent to structures immediately after concrete has reached design strength and connecting work has been completed.
   3. Allow no more than 100 feet of trench to be open overnight or when work is not in progress except as provided on the plans.
   4. Place suitable excavated backfill:
      a. Carefully place backfill over top of pipe and around structures.
      b. Compact as required.
   5. Compaction:
      a. Within street right-of-way and under pavement, compact each lift to at least 95% of maximum Standard Proctor Density, otherwise compact to at least 90%.
      b. In areas more than 3 feet below pavement structure, place backfill in lifts no thicker than 8 inches.
      c. In areas less than 3 feet below pavement structure, place backfill in lifts no thicker than 6 inches. Terminate backfill at 8 inches below finish grade in areas to remain unpaved, and to subgrade elevation in areas to be paved. Place 8 inches of topsoil in unpaved areas.

d. When crossing under levees, railroads, and State or Federal highways, comply with the compaction requirements of these jurisdictions, if more stringent than these requirements.
e. For Vitrified Clay Pipe (VCP), keep all heavy compaction equipment 5 feet above the top of the pipe. In the area less than 5 feet, use hand held compactors. Do not allow the compactor to come in contact with the pipe.

6. Moisture Range: Obtain required compaction within a soil moisture range of optimum moisture to 4% above optimum moisture content.
7. Dispose of surplus and unsuitable materials unless otherwise directed by owner.
8. Hydraulic compaction is not allowed unless authorized by the Engineer.

## 3.07 PIPE INSTALLATION IN CONSTRUCTED EMBANKMENTS

A. Install all pipes in trenches according to Section 3.06. When allowed by the contract documents, pipes may be constructed in embankments as follows:
B. Placing Backfill for Pipes:
1. Thoroughly tamp backfill under and around the pipe and in layers not to exceed 8 inches for the full length and width of the pipe.
2. Place backfill and thoroughly tamp around and over the pipe for its full length.
3. Extend the completed embankment on both sides of the pipe from the original ground line to at least 1 foot above the top of the pipe with a slope as shown in the contract documents. Construct the embankment over the pipe with a width no less than the outside diameter of the pipe and centered over the pipe. If necessary to accommodate construction traffic, increase the height of fill to the nominal diameter of the pipe or 3 feet, whichever is greater.
4. When pipe are laid wholly or partly in a trench, granular backfill material may be required for backfill. Compact the remainder of the fill to at least 1 foot above the top of the pipe with slopes as outlined above.
5. If the trench has been cut wide enough to permit use of a roller, after the pipe is bedded, thoroughly tamp the backfill material under and alongside the pipe with a mechanical tamper to the mid-height elevation of the pipe.
6. The contract documents may require placement of pipe with moisture control. When not required, place roadway pipe after construction of an embankment by methods that will produce results equivalent to those required for construction of the embankment, except that moisture determinations will be waived for placing backfill completed within 48 hours after excavation.
7. In addition to the normal backfill material requirements, when directed by the Engineer, build such approach fills to provide a roadway 10 feet in width over the pipe with grades no steeper than 10%.

## 3.08 STRUCTURE BEDDING

A. Bedding for Structures Bearing on Undisturbed Soils:
1. Shape the bottom to accurate grade and size.
2. Remove loose material, large clods, stones, and foreign materials.
3. In unstable soils or rock conditions, see Section 3.03 for stabilization requirements.

B. Bedding for Structures Bearing on Bedding Material:
1. Over excavate to minimum of 8 inches or as specified in the contract documents.
2. Place bedding material for structures according to the contract documents.

## 3.09 STRUCTURE BACKFILL

A. Removal of Forms and Falsework: See Section 6010, 3.06.
B. Placement of Backfill: Place backfill after structure concrete has reached at least 80% of the design strength and connecting work has been completed, unless otherwise specified. Determine strengths under comparable conditions. If strength is not determined, place backfill after 14 days.

C. Backfill Against Walls and Around Structures:
   1. Where backfill is required on both sides of a concrete wall and around all sides of monolithic structures, proceed with filling operations simultaneously on all sides of walls and structures so the fill is kept at approximately the same elevation at all times. Consider concrete box, arch, and circular culvert monolithic structures.
   2. Compact the 3 feet closest to all walls or wing faces by pneumatic or hand tampers only.
D. Placing Backfill with Excavated Material:
   1. Unless otherwise specified, see Section 3.06, D for suitable excavated materials for backfill.

## 3.10 OPEN CUT CASING PIPE INSTALLATION

A. Casing Pipe: Install casing pipe according to Section 3.01 to 3.07, as appropriate.

## 3.11 TRACER SYSTEM

A. Tracer wire shall be provided on all site utilities, including but not limited to:
   1. Telecommunication/copper.
   2. Empty conduits.
   3. Storm
   4. Sanitary.
   5. Gas.
   6. Water.
   7. Exceptions:
      a. Straight storm runs with daylight each end do not require tracer wire).
      b. Underground electrical lines do not require tracer wire.
B. Tracer wire: Solid, AWG #12, blue insulated, direct bury, Type TWHN. Install in trench attached directly to, parallel with, and centered above or below the utility.
C. Underground splices: Use Scotchcast splicing kits, 3M Company or approved equal.
D. Engineer shall provide specific details for tracer wire termination at each condition. Avoid receptacle boxes on posts in lawn areas (Install receptacle boxes on face of building or in flush ground boxes).
E. Test tracer wire for continuity after installation (see comment under “Specifications - Project Close-Out” above); All tracer wire which fails continuity testing shall be repaired or replaced as required until passing continuity testing. Provide Owner 48 hour notice of this activity.
F. In addition to tracer wire, Contractor shall install underground pipe markers: bright colored continuously printed plastic ribbon tape, 6” wide by 3.5 mils thick, manufactured for direct burial, with aluminum foil core for location by non-ferric metal detectors and bold lettering identifying buried item. Install 8” to 10” below grade directly above buried utilities.

## 3.12 FIELD QUALITY CONTROL

A. References:
   1. ASTM C 136; Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
   2. ASTM D 698; Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Moisture Using 5.5 pound (4.54 kg) Rammer and 12 inch (305 mm) Drop. (Standard Proctor Method)
   3. ASTM D 1556; Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   4. ASTM D 2216; Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
   5. ASTM D 2922 and D 3017; Test Methods for Density of Soil and Soil-Aggregate in Place and Water Content of Soil and Rock by Nuclear Methods (Shallow Depth).
   6. ASTM D 4253 and D 4254, Test Methods for Maximum Index Density of Soils using a Vibratory Table and Minimum Index Density of Soils and Calculation of Relative Density.

B. Compaction Testing: Compaction testing of backfill, cooperate and coordinate with an independent testing laboratory selected by the Owner. Cost of initial compaction testing will be paid for by the Owner. Cost of retesting of failed test areas shall be paid for by the Contractor. Refer to Section 014000, 1.5, Test and Inspection Services, and this Section 3.12, G. below for additional requirements.
C. Schedule Testing: Notify the Owner's Representative and the independent testing laboratory when work is prepared for testing.
D. Granular Material Testing
   1. Testing of samples for compliance will be provided before delivery to site.
   2. If tests indicate materials do not meet specified requirements, change material and retest at Contractor's expense.
   3. Provide materials of each type from same source throughout the work.
   4. Upon delivery of 50 tons of aggregate to the site prior to spreading of rock, owner's geotechnical engineer will test gradation of aggregate and verify it meets specification. Contractor must notify owner's geotechnical engineer with a minimum 4 working day notice.
   5. During rock placement, gradation testing compliance will be required every 50 tons of aggregate material delivered to site. Contractor required to coordinate testing with geotechnical engineer. If aggregate does not pass gradation, contractor responsible for removal and replacement of material as determined by geotechnical engineer and owner.
   6. Contractor responsible for any subsequent gradation testing that is required for aggregate that does not pass gradation tests.
E. Soil Testing:
   1. Cohesive soils: Determine moisture-density relationships by ASTM D 698 (Standard Proctor). Perform at least one test for each type of cohesive soil used.
   2. Cohesive soils: Determine in-place density and moisture content using ASTM D 1556 (sand-cone method) and D 2216 or ASTM D 2922 and D 3017 (nuclear).
   3. Non-cohesive soils: Determine maximum and minimum index density and calculate relative density using ASTM D 4253 and D 4254 (cohesionless soils).
   4. Gradation: Test according to ASTM C 136.
F. Testing Frequency and Locations: Perform testing of the final trench backfill, beginning at a depth of 2 feet above the top of the pipe, as follows:
   1. Contractor provided:
      a. Make one test per each 2 vertical feet of consolidated fill at each street crossing.
      b. Make one test per each 2 vertical feet of consolidated fill for each 200 horizontal feet of trench.
      c. Additional testing may be required by Engineer if non-compliance or a change in conditions occur.
      d. Coordinate the timing of testing with the Engineer.
      e. The Engineer will determine the location of testing.
      f. If necessary, excavate to the depth and size as required by the Engineer to allow compaction tests. Place backfill and recompact.
   2. Owner provided:
      a. Coordinate the timing of testing with the Engineer.
      b. The Engineer will determine the location of testing.
      c. Test frequency will not exceed one test per each 2 vertical feet of consolidated fill for each 200 horizontal feet of trench.
G. Test Failure: Rework, recompact, and retest as necessary until specific compaction is achieved in all areas of the trench.
H. Retesting: In event of failed tests, rework the failed area and retest. Costs of such retesting shall be paid by the Contractor, at no additional cost to the owner.

**END OF SECTION**

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**SECTION 31 35 00**

**EROSION AND SEDIMENT CONTROL**

**RFB #923902-01**

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES

A. NPDES General Permit No. 2
B. Stormwater Pollution Prevention Plan (SWPPP)
C. Erosion Control Measures
D. Velocity and Flow Control Measures
E. Sediment Control Measures
F. Application/Installation of Measures
G. Removal/Replacement of Measures

### 1.02 DESCRIPTION OF WORK

A. Furnish all materials; install, construct, maintain, and remove specified erosion control devices; at locations specified in the contract documents, or where specified by the Engineer, Owner and City.
B. Complete the required construction work on this project, while minimizing soil erosion and controlling water pollution. Maintain these features as specified, from initial construction stages to final completion of the project.

### 1.03 SUBMITTALS

Comply with Division 1 -General Provisions and Covenants, as well as the following:
Upon request, provide copies of all records and documentation related to compliance with the Iowa DNR NPDES Permit.

### 1.04 SUBSTITUTIONS

Comply with Division 1 -General Provisions and Covenants.

### 1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 -General Provisions and Covenants.

### 1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 -General Provisions and Covenants, as well as the following:
A. Implement erosion and sediment control measures at the appropriate time(s).
B. Coordinate construction to minimize damage to erosion and sediment control devices.

### 1.07 SPECIAL REQUIREMENTS

A. Permit:
   1. When applicable, comply with the requirements of the Iowa Department of Natural Resources, NPDES (National Pollutant Discharge Elimination System) General Permit No. 2 for Stormwater Discharge Associated with Industrial Activity for Construction Activities, and the Stormwater Pollution Prevention Plan.
   2. For projects covered under the Iowa DNR General Permit No. 2, sign on as a co-permittee with the owner and any other contractors or subcontractors.

3. When applicable, comply with the local jurisdiction's permitting requirements.

B. Protection of Property: Prevent accumulation of soil, sediment, or debris from project site onto adjoining public or private property. Remove any accumulation of soil or debris immediately and take remedial actions for prevention.

Protect Existing Facilities At The Site Against Damage Including The Following:

1. The Contractor shall take precautions to ensure that equipment, vehicles, and construction operations do not disturb or damage existing grades, walls, drives, pavement, utilities, plants, lawns, and other facilities.
2. Verify locations and depths of all underground utilities prior to excavation and report any conflicts with new work to the Engineer.
3. Any damage to existing trees or shrubs branches and root systems to remain and be protected shall be repaired and/or pruned by an experienced arborist.
4. Repair, replace, and/or return to original condition any damaged item, without additional compensation.

C. Permit Compliance: When applicable, conduct all operations in compliance with the Iowa DNR NPDES General Permit No. 2. Labor, equipment, or materials not included as a bid item, but necessary to prevent stormwater contamination from construction related sources, are considered incidental. Incidental work related to compliance with the permit may include, but is not limited to: hazardous materials protection, fuel containment, waste disposal, and providing employee sanitary facilities.

D. Project Staging: Replacing erosion and sediment control practices that are damaged or removed by the contractor in a manner that is inconsistent with the current project staging or SWPPP is the Contractor's responsibility and will be at the Contractor's expense.

## PART 2 - PRODUCTS

### 2.01 COMPOST BLANKETS

Comply with Section 32 92 19, Seeding, 2.07, C for compost material requirements for compost blankets.

### 2.02 COMPOST BLANKET AND FILTER BERM TACKIFIER

A. Use a biodegradable, organic binding agent or polyacrylamide that can be mixed with, or injected into, compost or filter material as it is placed, which is not detrimental to the establishment of vegetation.
B. Use in filter berms or compost blankets when specified in the contract documents.
C. Apply at the rate recommended by the manufacturer.

### 2.03 FILTER MATERIAL

Material for use in filter socks, filter berms, and other areas, as specified in the contract documents.

A. Use material derived from wood, bark, or other, non-toxic vegetative feedstocks.
B. Use material with no visible admixture of refuse or other physical contaminants, nor any material toxic to plant growth.
C. Use material meeting the following particle sizes:

| Sieve Size | Percent Passing[1] |
|---|---|
| 2” | 100 |
| 1” | 90-100 |
| 3/8” | 0-30 |

[1]The target flow rate of in-place material is 10 gal/min/lf. The Engineer may approve use of alternate materials meeting the target flow rate.

## 2.04 FILTER SOCK

A. For slope and sediment control applications, use a continuous, tubular, knitted, mesh netting with 3/8 inch openings, constructed of 5 mil thickness, photodegradable HDPE.
B. For inlet protection, use a continuous, tubular, knitted, mesh netting with 3/8 inch openings, constructed of 500 denier polypropylene.
C. Use 1 inch by 2 inch (minimum) hardwood stakes or stakes of equivalent strength.

## 2.05 TEMPORARY ROLLED EROSION CONTROL PRODUCTS (RECP)

Use temporary rolled erosion control products that are classified and have material properties according to the Erosion Control Technology Council's (ECTC) guidelines as follows:

A. Material Classification:
    1. RECP Type 1 (Ultra Short-term): Functional longevity of 3 months or less and classified as follows:
        a. RECP Type 1.A: Mulch control net, consisting of a photodegradable synthetic mesh or woven biodegradable natural fiber netting.
        b. RECP Type 1.B: Netless rolled erosion control blankets, consisting of natural and/or polymer fibers, mechanically interlocked and/or chemically adhered together to form a RECP.
        c. RECP Type 1.C: Single-net erosion control blankets and open weave textiles, consisting of processed degradable natural and/or polymer fibers, mechanically bound together by a single rapidly-degrading, synthetic or natural fiber netting, or an open weave textile of processed rapidly-degrading natural or polymer yarns or twines woven into a continuous matrix.
        d. RECP Type 1.D: Double-net erosion control blankets, consisting of processed degradable natural and/or polymer fibers, mechanically bound together between two rapidly-degrading, synthetic or natural fiber nettings.
    2. RECP Type 2 (Short-term): Functional longevity between 3 and 12 months and classified as follows:
        a. RECP Type 2.A: Mulch control net, consisting of a photodegradable synthetic mesh or woven biodegradable natural fiber netting.
        b. RECP Type 2.B: Netless rolled erosion control blankets, consisting of natural and/or polymer fibers, mechanically interlocked and/or chemically adhered together to form a RECP.
        c. RECP Type 2.C: Single-net erosion control blankets and open weave textiles, consisting of an erosion control blanket composed of processed degradable natural or polymer fibers, mechanically bound together by a single degradable synthetic or natural fiber netting to form a continuous matrix, or an open weave textile composed of processed degradable natural or polymer yarns or twines woven into a continuous matrix.
        d. RECP Type 2.D: Double-net erosion control blanket, consisting of processed degradable natural and/or polymer fibers, mechanically bound together between two degradable synthetic or natural fiber nettings.
    3. RECP Type 3 (Extended Term): Functional longevity between 12 and 24 months and classified as follows:
        a. RECP Type 3.A: Mulch control nets, consisting of a slow-degrading synthetic mesh or woven natural fiber netting.
        b. RECP Type 3.B: Erosion control blankets and open weave textiles, consisting of processed slow-degrading natural or polymer fibers, mechanically bound together between two slow-degrading synthetic or natural fiber nettings to form a continuous matrix, or an open weave textile composed of processed slow-degrading natural or polymer yarns or twines woven into a continuous matrix.
    4. RECP Type 4 (Long Term): Functional longevity of 36 months and classified as follows: Erosion control blankets and open weave textiles, consisting of processed slow-degrading natural or polymer fibers, mechanically bound together between two slow degrading

synthetic or natural fiber nettings to form a continuous matrix, or an open weave textile composed of processed slow-degrading natural or polymer yarns or twines woven into a continuous matrix.

B. Properties and Performance:
   1. Testing performed according to the ECTC's Testing Procedures for Rolled Erosion Control Products. Verify manufacturer's test results by independent testing.
   2. Material properties meeting the Erosion Control Technology Council's (ECTC) Standard Specifications for Rolled Erosion Control Products as follows:

| Classification | Slope Application | Channel Application | Min. Tensile Strength |
|---|---|---|---|
| | Max. Grade* | Permissible Shear Stress | |
| RECP Type 1.A | 5:1 (H:V) | 0.25 lb/ft2 | 5 lb/ft |
| RECP Type 1.B | 4:1 (H:V) | 0.50 lb/ft2 | 5 lb/ft |
| RECP Type 1.C | 3:1 (H:V) | 1.50 lb/ft2 | 50 lb/ft |
| RECP Type 1.D | 2:1 (H:V) | 1.75 lb/ft2 | 75 lb/ft |
| RECP Type 2.A | 5:1 (H:V) | 0.25 lb/ft2 | 5 lb/ft |
| RECP Type 2.B | 4:1 (H:V) | 0.50 lb/ft2 | 5 lb/ft |
| RECP Type 2.C | 3:1 (H:V) | 1.50 lb/ft2 | 50 lb/ft |
| RECP Type 2.D | 2:1 (H:V) | 1.75 lb/ft2 | 75 lb/ft |
| RECP Type 3.A | 5:1 (H:V) | 0.25 lb/ft2 | 25 lb/ft |
| RECP Type 3.B | 1.5:1 (H:V) | 2.00 lb/ft2 | 100 lb/ft |
| RECP Type 4 | 1:1 (H:V) | 2.25 lb/ft2 | 125 lb/ft |

*Product tested according to ECTC Test Method No. 2 and meeting the ECTC Standard Specifications for "C" factor.

C. RECP Anchors: Stakes or staples as recommended by manufacturer, with a minimum length of 6 inches.

## 2.06 WATTLES

A. Netting: Open weave, degradable netting. Nominal diameter of 9 inches, or as specified.
B. Fill Material: Straw, wood excelsior, coir, or other natural materials approved by the Engineer.
C. Stakes: 1 inch by 1 inch (minimum) wooden stakes, or stakes of equivalent strength.

## 2.07 CHECK DAMS

A. Synthetic Permeable Check Dam (HDPE):
   1. Ditch Berm:
      a. Installed height of 9 to10 inches.
      b. Manufactured check dam constructed from sheets of perforated, UV-stabilized High Density Polyethylene (HDPE).
      c. Perforations of 30 to 40% open area.
   2. RECP for Permeable Check Dam (when specified): RECP Type 4, 4 feet wide.
   3. Anchors: As recommended by the manufacturer.
B. Triangular Foam Check Dam: Triangular-shaped device with a height of 8 to 10 inches and a base of 16 to 20 inches.
   1. Inner Support Material: Urethane foam.
   2. Outer Cover: Woven geotextile material shaped to fit around the inner support material, extending 2 to 3 feet beyond the bottom edge of the triangular-shaped inner support.
   3. Length: 7 feet.
C. Rock Check Dam:
   1. Aggregate: Erosion stone complying with Iowa DOT Article 4130.04.
   2. Engineering Fabric: Comply with Section 2.20.

## 2.08 LEVEL SPREADERS

A. Provide 2 inch by 8 inch (minimum) pressure-treated timber of the length specified.
B. Use timbers that are relatively straight and have a minimum length of 5 feet each.

## 2.09 RIP RAP

A. Class A Revetment: Comply with Iowa DOT Section 4130.
B. Class B Revetment: Comply with Iowa DOT Section 4130.
C. Class D and E Revetment: Comply with Iowa DOT Section 4130.
D. Erosion Stone: Comply with Iowa DOT Section 4130.

## 2.10 TEMPORARY PIPE SLOPE DRAINS

A. PVC, HDPE, and metal pipes as specified in Section 33 40 00, Storm Sewer, 2.01.
B. HDPE, Type C (corrugated interior).
C. All pipes listed are allowed for use within the right-of-way.

## 2.11 SEDIMENT BASIN OUTLET STRUCTURES

A. Base: Class C concrete unless otherwise specified in the contract documents.
B. Riser: CMP complying with Section 33 40 00, Storm Sewer; diameter as specified in the contract documents.
C. Dewatering Device:
    1. Drill holes in the riser of the number, diameter, and at the elevation specified in the contract documents.
    2. 1/4 inch by 1/4 inch or 1/2 inch by 1/2 inch wire mesh for hardware cloth.
D. Barrel: CMP complying with Section 33 40 00, Storm Sewer; diameter as specified in the contract documents.
E. Anti-Vortex Device: CMP complying with Section 33 40 00, Storm Sewer; diameter and riser diameter as specified in the contract documents.
F. Anti-Seep Collar: Corrugated metal sheet of same material and gage as barrel section.
G. Size according to plans.

## 2.12 SEDIMENT TRAPS

A. Erosion Stone: Comply with Section 2.09
B. Engineering Fabric: Comply with Section 2.20.

## 2.13 SILT FENCE

A. Fabric: Comply with Iowa DOT Article 4196.01.
B. Posts: 4 foot minimum steel (T-section) weighing at least 1.25 pounds per foot, exclusive of anchor plate. Painted posts are not required.
C. Fastener: Wire or plastic ties with a minimum tensile strength of 50 pounds.

## 2.14 STABILIZED CONSTRUCTION ENTRANCE

A. Entrance Stone: Comply with Iowa DOT Section 4122, Gradation 13, Macadam crushed stone.
B. Subgrade Stabilization Material: Use woven, UV-stabilized geotextile with a minimum tensile strength of 135 lb/ft.

## 2.15 DUST CONTROL

A. Water: Use potable water or water from a source approved by the engineer.
B. Calcium Chloride: Comply with Iowa DOT Article 4194.01.

C. (Not Used)
D. Soapstock (Soybean Oil):
   1. Use a commercially-available, undiluted, soybean oil soapstock emulsion.
   2. Comply with manufacturer's recommendations for storage, transportation, temperature, and application equipment requirements.

## 2.16 EROSION CONTROL MULCH

A. Conventional Mulch:
   1. Use dry cereal straw (oats, wheat, barley, or rye) or native grass straw.
   2. Use material that is free of noxious weeds, seed-bearing stalks, or roots, and will be inspected and approved by the Engineer prior to use.
   3. Other materials, subject to the approval of the Engineer, may be used.
B. Hydromulch:
   1. Wood Cellulose Mulch:
      a. Use material that is a natural or cooked cellulose fiber processed from whole wood chips, or a combination of up to 50% of cellulose fiber produced from whole wood chips, recycled fiber from sawdust, or recycled paper (by volume).
      b. Product contains a colloidal polysaccharide tackifier adhered to the fiber to prevent separation during shipment and avoid chemical co-agglomeration during mixing.
      c. Form a homogeneous slurry of material, tackifier, and water.
      d. Use a slurry that can be applied with standard hydraulic mulching equipment.
      e. Dye the slurry green to facilitate visual metering during application.
      f. Do not use materials that have growth or germination-inhibiting factors or any toxic effect on plant or animal life when combined with seed or fertilizer.
   2. Bonded Fiber Matrix (BFM):
      a. Produced from long-strand wood fibers, held together by organic tackifiers and bonding agents that, when dry, become insoluble and non-dispersible.
      b. Upon curing 24 to 48 hours, form a continuous, 100% coverage, flexible, absorbent, erosion-resistant blanket that encourages seed germination.
      c. Manufactured to be applied hydraulically.
      d. Physical Properties:
         1) Fibers: Virgin wood, greater than 88% of total volume.
         2) Organic Material: Greater than 96% of total volume.
         3) Tackifier: 8-10%.
         4) pH: 4.8 minimum.
         5) Moisture Content: 12% +/- 3%.
         6) Water-holding Capacity: 1.2 gal/lb.
      e. Dyed green to facilitate visual metering.
   3. Mechanically Bonded Fiber Matrix (MBFM): See Section 32 92 19, Seeding.
      a. Produced from long-strand wood fibers and crimped, interlocking synthetic fibers.\
      b. Within two hours of application, form a continuous, 100% coverage, flexible, absorbent, porous, erosion-resistant blanket that encourages seed germination.
      c. Manufactured to be applied hydraulically.
      d. Physical Properties:
         1) Wood Fibers: 73% minimum.
         2) Tackifier: 10% +/- 1%.
         3) Crimped, Interlocking Synthetic Fibers: 5% +/- 1%.
         4) Moisture Content: 12% +/- 3%.
         5) Water holding capacity: 1.2 gal/lb.
         6) Minimum pH: 4.8.
      e. Dyed green to facilitate visual metering.

## 2.17 TURF REINFORCEMENT MATS (TRM)

A. Material Classification:

1. TRM Type 1: Use a TRM that is constructed of a web of mechanically or melt-bonded polymer netting, monofilaments, or fibers that are entangled to form a strong and dimensionally stable mat. Bonding methods include polymer welding, thermal or polymer fusion, or the placement of synthetic fibers between two high-strength, biaxially-oriented nets, mechanically bound by parallel stitching with polyolefin thread. Products may contain a degradable component.
2. TRM Type 2 and 3: Use a TRM that is constructed of a web of mechanically or melt-bonded polymer netting, monofilaments, or fibers that are entangled or woven to form a strong and dimensionally stable mat. Non-woven bonding methods include polymer welding, thermal or polymer fusion, or the placement of fibers between two high-strength, biaxially oriented nets, mechanically bound by parallel stitching with polyolefin thread. Use only components that are 100% synthetic and resistant to biological, chemical, and ultraviolet degradation.
3. TRM Type 4: Use a high performance/survivability TRM that is composed of monofilament yarns woven into a resilient uniform configuration. Use a mat that has a matrix that exhibits very high interlock and reinforcement capacities with both soil and root systems and demonstrate a high tensile modulus. TRMs manufactured from discontinuous or loosely held together by stitched or glued, netting, or composites are not allowed in this category. Use only components that are 100% synthetic and resistant to biological, chemical, and ultraviolet degradation. Use this category when field conditions exist with high loading and/or high survivability requirements.

B. Properties and Performance: Meet the minimum material and performance requirements contained in the following table:

| **Property1** | | **Test Method** | **Type 1** | **Type 2** | **Type 3** | **Type 4** |
|---|---|---|---|---|---|---|
| **Material** | Thickness | ASTM D 6525 | 0.25 in | 0.25 in | 0.25 in | 0.25 in |
| | Tensile Strength2 | ASTM D 6818 | 125 lb/ft | 240 lb/ft | 750 lb/ft | 3,000 lb/ft |
| | UV Resistance3 | ASTM D 4355 | 80% @ 500 hrs | 80% @ 1,000 hrs | 80% @ 1,000 hrs | 90% @ 3,000 hrs |
| **Perfor** | Maximum Shear Stress4 (Channel Applications) | ASTM D 6460 | 7 lb/ft2 | 10 lb/ft2 | 12 lb/ft2 | 15 lb/ft2 |
| | Maximum Slope Gradient (Slope Applications) | N/A | 1:1 (H:V) or flatter | 1:1 (H:V) or flatter | 1:1 (H:V) or greater | 1:1 (H:V) or greater |

1 For TRMs containing degradable components, all values must be obtained on the non-degradable portion of the matting.
2 Minimum Average Roll Values, machine direction only.
3 Tensile strength of structural components retained after UV exposure.
4 Minimum shear stress that fully-vegetated TRM can sustain without physical damage or excess erosion (0.5 in soil loss)
during a 30 minute flow event in large scale testing. Acceptable large scale testing protocol includes ASTM D 6460 or independent testing conducted by the Texas Transportation Institute, Colorado State University, Utah State University, or other approved testing facility. Bench scale testing is not acceptable.

## 2.18 INLET PROTECTION

A. Drop-in Intake Protection:
   1. Use a manufactured device that is inserted into the intake and is capable of trapping or filtering sediment from runoff prior to entering the storm sewer.
   2. All components must be contained entirely below the surface of the intake grate.
   3. Incorporate means of emergency outflow to prevent flooding if plugged with sediment.

B. Surface-applied Intake Protection:
   1. Use devices or filter socks, placed around or over the intake, that are capable of trapping or filtering sediment from runoff prior to entering the storm sewer.
   2. Do not allow the device to completely block or plug the intake, preventing inflow.

### 2.19 FLOW TRANSITION MATS

A. UV-stabilized HDPE plastic sheet with openings for vegetation growth and energy dissipation.
B. Use a nominal sheet size of 4 feet by 4 feet by 1/2 inch.
C. Use duckbill style anchors, as specified by the mat manufacturer.

### 2.20 ENGINEERING FABRIC

Comply with Iowa DOT Article 4196.01, B (Embankment Erosion Control) and Iowa DOT Materials I.M. 496.01, Appendix G.

## PART 3 - EXECUTION

### 3.01 SWPPP PREPARATION

A. Prepare a SWPPP according to the requirements of the Iowa DNR NPDES General Permit No. 2.
B. Ensure that controls utilized in the SWPPP conform to the type and quantity of erosion and sediment controls specified in the contract documents. MidAmerican Energy Environmental Services will provide a Notice of Intent template that must be used
C. Submit the completed SWPPP to the Engineer and MidAmerican Energy Environmental Services for review and approval prior to filing the Notice of Intent.
D. Upon approval of the Engineer, file public notices, as required by the NPDES General Permit No. 2.
E. File the Notice of Intent and fee, as required by the NPDES General Permit No. 2 and any local ordinance requirements.

### 3.02 SWPPP MANAGEMENT

Coordinate and carry out all the requirements of Iowa DNR NPDES General Permit No. 2 and any local ordinance requirements, including:
A. Update the SWPPP according to the requirements of the NPDES General Permit No. 2.
B. Revise the SWPPP and implement changes, as necessary, to prevent sediment or hazardous materials from being transported off the site.
C. Submit all SWPPP revisions to the Engineer for review and approval.
D. MidAmerican Energy will hire an approved Inspector to perform and maintain records of weekly erosion and sediment control site inspections, unless otherwise specified in the contract documents.
E. Maintain records of transfer of responsibility under the NPDES General Permit No. 2.
F. Retain all records on-site, or as required by the NPDES General Permit No. 2.
G. After final stabilization, MidAmerican Energy Environmental Services will file a Notice of Discontinuation, according to the NPDES General Permit No. 2 and at the recommendation of the Inspector and local authority.
H. Provide all records and documentation to the Engineer upon completion of the project. MidAmerican Energy will retain a copy of all records for the period required under the Permit.
I. Continue to perform the work required under this item throughout the duration of the project, and until final stabilization is achieved and a Notice of Discontinuation is filed.

### 3.03 EROSION AND SEDIMENT CONTROL INSPECTION

A. MidAmerican Energy will hire an approved Inspector to perform inspections according to and at frequency required by the Iowa DNR NPDES General Permit No. 2.
B. Schedule necessary maintenance or improvements for items that are included in the contract documents.

C. Notify the Engineer immediately of situations requiring attention beyond that provided for in the contract documents.
D. Provide copies of the inspection reports to the Engineer.

## 3.04 EQUIPMENT

Comply with Iowa DOT Article 2601.03.

## 3.05 COMPOST BLANKETS

A. Loosen the ground surface to a minimum depth of 1 inch.
B. Evenly spread compost, as specified in the contract documents, or as directed by the Engineer.
C. Divert concentrated flows away from the slope.
D. Do not operate heavy equipment over the compost blanket after placement, or throughout the required period of protection.
E. Inspect the ground under the blanket at regular intervals for signs of erosion.

## 3.06 FILTER BERMS

A. Install filter berm along the contour as specified in the contract documents, or as directed by the Engineer.
B. Turn the ends of the filter berm uphill to prevent runoff from flowing around the end of the berm.
C. When a vegetated berm is specified, apply seed to the surface of the berm.
D. Replace the berm when sediment accumulation reaches one-half of the height of the berm.

## 3.07 FILTER SOCKS

A. Installation:
    1. Pneumatically fill mesh filter sock of size and length specified in the contract documents, or as directed by the Engineer. Alternative methods of filling the sock may be allowed upon approval of the Engineer.
    2. Fill socks with filter material.
    3. Place the filter sock along the contour as specified in the contract documents, or as directed by the Engineer.
    4. Place additional filter material or soil from the site, on the upstream side of the sock, in the seam between the tube and the ground.
    5. Construct a “J-hook” at each end of a continuous run of filter sock, by turning the end of the sock uphill, as necessary to prevent runoff from flowing around the ends when water behind the sock ponds up to a level even with the top of the sock.
    6. Drive stakes into the ground at a maximum spacing of 10 feet, and as required to secure the sock and prevent movement.
    7. Repair or replace non-functioning filter socks that allow water to flow under the sock, are torn, or are otherwise damaged, due to inadequate installation.
    8. Remove filter material from damaged socks that are located along streambanks, around intakes, in ditches, or in other locations where the material may be carried to surface waters.
B. Removal: When specified in the contract documents, or as directed by the Engineer; remove the filter sock upon completion of the project, and after final stabilization is achieved; or as indicated in the SWPPP, if applicable.
    1. Upon completion of the project, completely remove socks and filter material that are located along streambanks, around intakes, in ditches, or in other locations where the filter material may be carried to surface waters if the sock degrades and/or tears.
    2. Slice the sock longitudinally. Remove and dispose of the filter sock material and stakes.
    3. Spread the filter material and accumulated sediment to match finished grade and to ensure proper drainage.

4. If the site has been brought to finished grade and prepared for permanent seeding, spread and incorporate the filter material into the surface by tilling, or as required to break up any large particles and provide a finished surface suitable for permanent seeding.

C. Replacement:
1. When accumulated sediment reaches a level one-half the height of the sock, or when the sock becomes clogged with sediment and no longer allows runoff to flow through, remove the sock as described above, and replace according to the installation instructions above.
2. At the Engineer's option, the existing filter sock and accumulated sediment may be left in place, and a new filter sock installed up-slope from the existing filter sock.

## 3.08 TEMPORARY ROLLED EROSION CONTROL PRODUCTS (RECP)

Install temporary RECPs according to the manufacturer's published installation recommendations, subject to the following minimum requirements:

A. Slope Application:
1. Grade and smooth surface. Remove all rocks, clods, vegetation, or other obstructions that will prevent direct contact between the RECP and the soil surface.
2. When specified, prepare seedbed and place seed and fertilizer according to Section 32 92 19, Seeding prior to placing RECP.
3. Install anchor trench at top of slope. Seed and fertilize trench after backfill and compaction, if seeding is specified.
4. Unroll the RECP down or horizontally across the slope.
5. Place consecutive blankets down the slope end-over-end, shingle style.
6. Overlap ends of consecutive rolls a minimum of 3 inches, and install anchors at a maximum spacing of 18 inches along all overlaps.
7. Overlap edges of adjacent rolls a minimum of 2 inches.
8. Install anchors at edge seams between rows.

B. Channel/Ditch Application:
1. When specified, prepare seedbed and place seed and fertilizer according to Section 32 92 19, Seeding, prior to placing RECP.
2. Place end of first roll in the anchor slot at the center of the upstream channel and secure with anchors.
3. Position adjacent rolls in the anchor slot, overlapping adjacent rolls a minimum of 3 inches.
4. Place backfill material in anchor slot and compact. Unroll RECP over compacted slot and secure with anchors.
5. Unroll RECP downstream. Maintain a minimum 3 inch overlap between adjacent rolls. Secure edge lap with anchors.
6. Install intermittent staple check slots every 30 feet.
7. Construct end lap at end of roll and beginning of new roll. Overlap roll ends with upstream RECP on top.
8. Excavate longitudinal trench along both sides of the channel at the outside edges of installation. Place outer edges of RECP into longitudinal slot. Install anchors, place backfill material, and compact.
9. Terminate installation at downstream end with staple check.
10. Install anchors in a regular pattern over entire area covered according to manufacturer's published recommendations (minimum three anchors per square yard).

## 3.09 WATTLES

A. Installation:
1. Construct a shallow trench, 2 to 4 inches deep, matching the width and contour of the wattle.
2. Install wattle along contour of slope.
3. Turn ends of wattle uphill to prevent water from flowing around ends.
4. Place and compact excavated soil against the wattle, on the uphill side.

5. Drive stakes through the center of the wattle, into the ground at a maximum spacing of 4 feet along the length of the wattle, and as needed to secure the wattle and prevent movement.
6. Abut ends of adjacent wattles tightly. Wrap joint with a 36 inch wide section of silt fence and secure with stakes.

B. Removal: When specified in the contract documents, or as directed by the Engineer, remove the wattle upon completion of the project, and after final stabilization is achieved; or as indicated in the SWPPP, if applicable.
1. Completely remove the wattle netting, filler material, and stakes.
2. Spread the accumulated sediment to match finished grade and to ensure proper drainage.
3. When allowed by the Engineer, the wattle netting may be sliced open and the filler material spread out over the ground. Removal of netting and stakes and spreading of sediment is still required.

C. Replacement:
1. When accumulated sediment reaches a level one-half the height of the wattle, or when the wattle becomes clogged with sediment and no longer allows runoff to flow through, remove the wattle as described above, and replace according to the installation instructions above.
2. At the Engineer’s option, the existing wattle and accumulated sediment may be left in place, and a new wattle installed up-slope from the existing wattle.

## 3.10 CHECK DAMS

A. Synthetic Permeable Check Dam (HDPE):
1. Install according to the manufacturer's recommendations.
2. When specified, provide an RECP under the check dam, installed according to the manufacturer’s recommendations.

B. Triangular Foam Check Dam: Install according to the manufacturer's recommendations.
C. Rock Check Dam: Construct according to plans.
D. Removal: When specified in the contract documents, or as directed by the Engineer, remove check dams upon completion of the project, and after final stabilization is achieved; or as indicated in the SWPPP, if applicable.
1. Remove the check dam and dispose of materials, or salvage to the contractor.
2. Remove the accumulated sediment or spread to match finished grade; ensure proper drainage.
3. Stabilize the area disturbed by removal operations.

## 3.11 TEMPORARY EARTH DIVERSION STRUCTURES

A. Ensure positive drainage along the diversion toward the outlet area.
B. Adequately compact fill to prevent failures or seepage.
C. Outlet the diversion to undisturbed and/or stabilized areas only.
D. Stabilize the surface of the earth diversion with temporary erosion control seeding, as specified in Section 32 92 19, Seeding.

## 3.12 LEVEL SPREADERS

A. Butt multiple timbers together, as necessary to provide the required length.
B. Ensure the spreader is installed level in all directions. Adjust as necessary during construction to maintain spreader in a level condition.
C. Excavate a depression behind the spreader to the depth specified in the contract documents. The depression may be over-excavated up to 1 foot to provide an area for sediment accumulation.
D. Grade as required to prevent flow around the ends of spreader.
E. Remove the accumulated sediment from the depression when the depth is reduced below that specified in the contract documents.

## 3.13 RIP RAP

Install the quantity of rip rap (revetment stone or erosion stone) as specified in the contract documents.

## 3.14 TEMPORARY PIPE SLOPE DRAINS

A. Place slope drain on undisturbed soil or well compacted fill.
B. Carefully compact cohesive soils around inlet ends of the drain in 6 inch lifts.
C. Discharge slope drain to a stable outlet or to a sediment retention device.

## 3.15 SEDIMENT BASIN OUTLET STRUCTURES

A. Concrete Base: Construct the concrete base and anchor riser section, as shown on plans.
B. Dewatering Device:
    1. Drill holes in the riser section. The number, diameter, and configuration will be specified in the contract documents.
    2. Wrap the perforated section of the riser pipe with metal hardware cloth.
C. Anti-vortex Device: If required by the contract documents, firmly attach the cylinder to the top of the riser by welding or other means. Comply with plan details for fabrication.

## 3.16 ANTI-SEEP COLLAR

A. General: Place backfill material and compact overexcavation areas to a minimum of 95% Standard Proctor Density per Section 31 23 33 Trenching and Backfilling.
B. Concrete Collar:
    1. Place collars a minimum of 2 feet from pipe joints.
    2. Provide Class C concrete per Section 33 49 00 Storm Drainage Structures.
C. CMP Collar:
    1. Provide collar of same gage as the pipe barrel on which it is used.
    2. Paint or tag unassembled collars to identify matching pairs.
    3. Furnish each collar with two 1/2 inch diameter rods with tank lugs for connecting collars to pipe.
    4. Install collar with corrugations vertical.
    5. Seal the tap between the two half sections and between the pipe and connecting band with a bituminous jointing compound at the time of installation.

## 3.17 SEDIMENT TRAPS

Construct the storage area to the size and elevations specified in the contract documents.

## 3.18 SILT FENCES

A. Installation:
    1. Install material along the contour of the ground, as specified in the contract documents, or as directed by the Engineer.
    2. Install silt fence with a mechanical soil slicing machine that creates a slit in the ground while simultaneously installing the fabric. The trenching method may be used when situations will not allow soil slicing, as determined by the Engineer.
    3. Construct a “J-hook” at each end of a continuous run of silt fence, by turning the end of the silt fence uphill, as necessary to prevent runoff from flowing around ends when water behind the fence ponds to a level even with the top of the fence.
    4. Insert 12 inches of fabric to a minimum depth of 6 inches (fabric may be folded below the ground line).

5. Compact installation by driving along each side of the silt fence, or by other means, as necessary to adequately secure the fabric in the ground, to prevent pullout and water flow under the fence.
6. Drive steel posts into the ground alongside the silt fence, to a minimum depth of 20 inches, unless otherwise specified by the Engineer. Space posts at 5 feet on-center maximum, or as required to adequately support silt fence.

B. Maintenance: Repair or replace non-functioning silt fence that allows water to flow under the fence, is torn, or is otherwise damaged, due to inadequate installation, at no additional cost to the Contracting Authority.
C. Removal:
1. Remove the silt fence upon final stabilization of the project area, or according to the staging indicated in the SWPPP.
2. Remove and dispose of silt fence and posts.
3. Remove sediment or spread to match finished grade; ensure proper drainage.
4. Stabilize the area disturbed by removal operations.

D. Replacement:
1. When accumulated sediment reaches a level one-half the height of the fence, remove the silt fence as described above, and replace according to the installation instructions above.
2. At the Engineer's option, the existing silt fence and accumulated sediment may be left in place, and a new silt fence installed up-slope from the existing silt fence.
3. When allowed by the Engineer, the existing silt fence may be left in place and the accumulated sediment removed to the original ground line and within 6 inches of the silt fence. Carefully inspect the existing silt fence for structural integrity and signs of undermining. Make any necessary repairs.

## 3.19 STABILIZED CONSTRUCTION ENTRANCE

A. Install a stabilized construction entrance at all locations where construction traffic leaving the site presents the potential for sediment track-out.
B. Remove vegetation and excavate soft soils from entrance area. Thoroughly compact subgrade prior to placing stone.
C. Install culvert under entrance if necessary to maintain drainage.
D. Grade entrance to prevent runoff from flowing onto street. Direct all runoff from entrance to a sediment retention device.
E. When specified, install subgrade stabilization fabric prior to placing crushed stone.
F. Install layer of crushed stone to the thickness (6 inches minimum) and dimensions specified in the contract documents.
G. Remove the accumulated sediment and install new stone, as required to prevent track-out.

## 3.20 DUST CONTROL

A. Water: Apply frequent light watering to ground surface, as required to control dust.
B. Calcium Chloride: Apply according to Iowa DOT Section 2314.
C. (Not Used)
D. Soapstock (Soybean Oil):
1. Loosen the top 1 to 2 inches of the roadway surface.
2. Apply undiluted soapstock at a rate of 0.70 gal/yd2.
3. Allow product to penetrate through the loosened material.
4. Tight-blade road surface.

## 3.21 EROSION CONTROL MULCHING

A. Conventional Mulching:
1. Use conventional mulching when the surface cannot be stabilized by seeding, due to season or ground conditions.

2. Uniformly distribute mulch over the required areas, at a rate of 2 tons/acre for dry cereal straw, or 2.5 tons/acre for prairie hay.
3. Work the mulch into the soil with a mulch tucker, designed to anchor the mulch into the soil, by means of dull blades or disks.

B. Hydromulching:
1. Place mulch and tackifier (if applicable) in equipment specifically manufactured for hydraulic mulching.
2. Mix materials with fresh, potable water using a combination of re-circulation through the equipment's pump and mechanical agitation to form a homogeneous slurry.
3. If necessary, dampen any dry, dusty soil as required to prevent balling of the material during application.
4. Apply hydromulch in multiple layers from opposing directions, where possible.
5. Apply the slurry evenly over all specified areas, at the minimum component material rates specified:
   a. Wood Cellulose Mulch: 1) Mulch: 2,600 lb/acre dry weight. 2) Tackifier: 50 lb/acre.
   b. Bonded Fiber Matrix: 3,600 lb/acre dry weight.
   c. Mechanically Bonded Fiber Matrix: 3,600 lb/acre dry weight.
6. Retain and count empty bags of mulch to ensure final application rate.

## 3.22 TURF REINFORCEMENT MATS

Install according to the manufacturer's published installation literature for the product specified and application (slope or channel).

## 3.23 SURFACE ROUGHENING

A. Directional Tracking:
1. Do not use on slopes steeper than 3:1.
2. Operate tracked equipment up and down exposed slope to create ridges perpendicular to the slope.
3. Continue operation until the entire surface has been tracked.

B. Grooving/Furrowing:
1. May be used on all slopes.
2. Use rippers, disks, harrows, chisel plows, or other equipment capable of operating on the slope and creating grooves a maximum of 15 inches apart and 3 inches deep.
3. Operate equipment along the contour of the slope to create grooves that are perpendicular to the slope.
4. Perform over all exposed slopes as specified.

## 3.24 INLET PROTECTION

A. Install inlet protection devices according to the manufacturer's recommendations.
B. Remove the accumulated sediment, as required to maintain the inlet protection device in working order. Remove any accumulated sediment from streets open to traffic if it encroaches into the traveled roadway.

## 3.25 FLOW TRANSITION MATS

Install according to the manufacturer's published recommendations.

## 3.26 TEMPORARY EROSION CONTROL SEEDING

Comply with Section 32 92 19, Seeding.

END OF SECTION

# SECTION 32 11 23

# AGGREGATE BASE COURSES

# RFB #923902-01

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES

A. Aggregate base.

### 1.02 RELATED SECTIONS

A. Section 31 20 00 - Earthwork.
B. Section 32 13 13 - Concrete Paving.

### 1.03 REFERENCES

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2001 (2004).
B. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2000a.
C. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2000.
D. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2002.
E. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 1994(R 2001).
F. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2000.
G. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.
H. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

### 1.04 SUBMITTALS

A. Materials Sources: Submit name of imported materials source and provide material certifications.

### 1.05 PROJECT CONDITIONS

A. Verify that survey bench marks and intended elevations for the Work are as indicated.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

A. Aggregate Base Course: Conforming to State of Iowa Highway Department standard 4121 unless otherwise stated in the plans.

### 2.02 SOURCE QUALITY CONTROL

A. Testing of samples for compliance will be provided before delivery to site.
B. If tests indicate materials do not meet specified requirements, change material and retest at Contractor's expense.
C. Provide materials of each type from same source throughout the work.
D. Upon delivery of 1,000 tons of aggregate to the site prior to spreading of rock, owner's geotechnical engineer will test gradation of aggregate and verify it meets specification. Contractor must notify owner's geotechnical engineer with a minimum 4 working day notice.
E. During rock placement, gradation testing compliance will be required every 200 tons of aggregate material delivered to site. Contractor required to coordinate testing with geotechnical engineer. If aggregate does not pass gradation, contractor responsible for removal and replacement of material as determined by geotechnical engineer and owner.
F. Contractor responsible for any subsequent gradation testing that is required for aggregate that does not pass gradation tests.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

A. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

### 3.02 PREPARATION

A. Do not place aggregate on soft, muddy, or frozen surfaces.

### 3.03 INSTALLATION

A. Under Paving:
   1. Place aggregate base course to a total compacted thickness as specified on site plan.
   2. Compact to 95 percent of maximum dry density.
B. Level and contour surfaces to elevations and gradients indicated.
C. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
D. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

### 3.04 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch (6 mm) measured with 10 foot (3 m) straight edge.
B. Variation From Design Elevation: Within 1/2 inch (12 mm).

### 3.05 FIELD QUALITY CONTROL

A. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556.
B. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor").
C. If tests indicate work does not meet specified requirements, remove work, replace and retest at Contractor's expense.
D. Contractor shall coordinate work with testing laboratory before proceeding with each phase or stage of work.

**3.06 CLEAN-UP**

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

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**SECTION 32 13 13**

**CONCRETE PAVING – NOT IN CONTRACT**

**RFB #923902-01**

## PART 1 – GENERAL

### 1.1 SECTION INCLUDES

A. Concrete integral curbs, gutters, and driveways.

### 1.2 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including Bidding Requirements, General and Supplementary Conditions and Division I Specification Sections, apply to work specified in this Section.
B. Comply with ACI 316 "Recommended Practice for Construction of Concrete Pavement and Concrete Bases" for all work.

### 1.3 SUBMITTALS

A. Design Data: Indicate pavement thickness, designed concrete strength, reinforcement, and typical details.
B. Certification of concrete C-4 design mix with Class 3 durability aggregate by a testing laboratory. Submit prior to placement.
C. Submit plan for construction sequence and schedule prior to commencing construction.

### 1.4 QUALITY ASSURANCE

A. Obtain cementitious materials from same source throughout.
B. Follow recommendations of ACI 306R when concreting during cold weather.
C. Cost of field and laboratory testing will be borne by the Contractor. Testing by laboratory approved by the Owner. Lab reports shall be simultaneously forwarded to the Owner, Contractor and Engineer.
D. Testing:
    1. Slump to be checked in accordance with ASTM C143. One test minimum per hour.
    2. Air content measured in accordance with ASTM C231, or C173. One test minimum daily.
    3. Strength tests:
        a. Take three (3) cylinders for each one hundred fifty (150) cubic yards or part thereof. Minimum one set of three (3) cylinders per each day's pour.
        b. Each cylinder shall be plainly marked showing cylinder designation (1A, 1B, 1C).
        c. Job cure each cylinder three (3) days.
        d. After three (3) days, send cylinders A and B to the laboratory approved by the Engineer for testing at ages seven (7) days and twenty-eight (28) days. Cylinder C to remain at the job as a "spare" cured under same conditions as concrete in the area from which it was taken.
        e. The date and location of each sample shall be marked on the Contractor’s job set of plans.
        f. Load and core tests shall be required only if cylinder tests indicate concrete does not meet Specifications. Such tests, if deemed advisable by the Engineer, shall be arranged and paid for by the Contractor.

### 1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees F (4 degrees C), or surface is wet or frozen.

### 1.6 CODES, PERMITS AND FEES

A. The entire installation shall fully comply with all local and state laws and ordinances, and with all established codes applicable thereto.

### 1.7 SITE DISTURBANCES

A. Take precautions to ensure that equipment and vehicles do not disturb or damage existing site grading, walks, drives, utilities, plants, etc.
B. Verify locations and depths of all underground utilities prior to excavation.
C. Repair and/or return to original condition any damage caused by Contractor's negligence at no cost to Owner.
D. Provide temporary barricades and warning lights as required for protection of project work and public safety.

## PART 2 - PRODUCTS

### 2.1 CONCRETE MATERIALS

A. Concrete Materials: Provide in accordance with State of Iowa Highways standards 4101 for 4,000 psi strength.

### 2.2 PORTLAND CEMENT

A. ASTM C150, type I or type III.

### 2.3 SAND

A. Clean, hard, washed and well graded. Sand shall conform with ASTM C33.

### 2.4 COARSE AGGREGATE

A. Aggregate shall conform to ASTM C33. Aggregate for footings and other unexposed concrete may be gravel. Aggregate for exterior concrete and surfaces shall be limestone (max. size 1"). No substitutions will be allowed. Evidence of staining due to impurities will be cause for rejection of work.

### 2.5 MIXING WATER:

A. Clean and free from oil, acid and injurious amounts of vegetable matter, alkalis and other impurities.

### 2.6 ADMIXTURES

A. Air entrainment: 6%, + 1% or -0.5%.
B. Air-entraining agents shall conform to ASTM C260.
C. Calcium Chloride is not to be used. No other admixtures shall be used without the expressed, written consent of the Engineer.

D. A water-reducing agent may be used as deemed necessary, to be in conformance with the latest ASTM requirements.

## 2.7 EXPANSION JOINT FILLERS

A. Expansion joint filler shall be provided with “tear off” strips equal to Expansion Strips by Reflectix or Cellu-Cushion EXP 200 by Sealed Air. Joints to receive sealant shall be primed in accordance with manufacturer’s recommendations.

## 2.8 FORM MATERIALS

A. Joint Filler: Preformed; non-extruding bituminous type (ASTM D 1751).
   1. Thickness: 1/2 inch (12 mm).

## 2.9 EXPANSION JOINT SEALANT

A. Expansion joint filler shall be provided with “tear off” strips equal to Expansion Strips by Reflectix or Cellu-Cushion EXP 200 by Sealed Air. Joints to receive sealant shall be primed in accordance with manufacturer’s recommendations.

## 2.10 CURE AND SEAL

A. CS-309 W.R. Meadows, Inc.; Rez-seal Euclid Chemical Company or equal.

## 2.11 ACCESSORIES

A. Liquid Surface Sealer: White Pigmented Curing Compound: In accordance with State of Iowa Highway standards 4105.
B. Joint Sealer: Type Hot Poured Elastic as specified in State of Iowa Highways standards 4136.

## 2.12 CONCRETE STRENGTH

Concrete mix for exterior slabs, structural slabs, walls, and steps:

A. Minimum of 4000 psi compressive strength at twenty-eight (28) days.
B. Minimum air content of 6.0%. To allow for loss during placement, the air content of fresh, un-vibrated concrete shall be 7.0%.
C. Minimum of six (6) sacks of cement per cubic yard. Maximum of 15% replacement of cement with fly ash will be permitted.
D. Slump four inches (4") maximum.

## 2.13 CONCRETE MIX DESIGN

A. Concrete Properties:
   1. Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: 4,000 psi (28 MPa).
   2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight in accordance with State of Iowa Highway standards 2301.
   3. Cement Content: Minimum 510 lb per cubic yard (306 kg per cubic meter) with fly ash and 600 lb per cubic yard (360 kg per cubic meter) without fly ash.
   4. Total Air Content: 6.5 percent, determined in accordance with ASTM C 173/C 173M.
   5. Maximum Slump: 3 inches (75 mm).

### 2.14 MIXING

A. Except as otherwise specified, concrete shall be ready-mixed or job-mixed at the Contractor's option, and in accordance with requirements of ACI 318-77. Ready-mixed concrete shall be mixed and delivered to the project in accordance with ASTM C94. Maximum mixing time is one (1) hour.

### 2.15 REINFORCING STEEL

A. Reinforcing Steel: ASTM A 615/A 615M Grade 40 (280); deformed billet steel bars; epoxy coated finish.
B. Dowels: ASTM A 615/A 615M Grade 40 (280); epoxy coated unfinished finished.

### 2.16 CURING AND PROTECTION MATERIALS

A. Liquid Curing Compounds: White pigmented; dry to the touch in 4 hours, non-tracking in 12 hours. Readily applied by spraying at temperatures above 40° F.
B. Plastic Film: White pigmented, polyethylene film, minimum thickness: 4 mil.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

A. Verify compacted granular base is acceptable and ready to support paving and imposed loads.
B. Verify gradients and elevations of base are correct.

### 3.2 SUBGRADE PREPARATION

A. Excavate, fill, compact, grade and prepare subgrade as specified in Earthwork Section 31 20 00.
B. Moisten base to minimize absorption of water from fresh concrete.

### 3.3 FORMS

A. Use wood or steel forms adequately staked and braced for all exposed slab edges.
B. Place and secure forms to correct location, dimension, profile, and gradient. Secure forms in place to maintain grade and alignment while concrete is placed and finished.
C. Set base of form at subgrade elevation or below with top of form at pavement surface elevation at edge of slab; set forms on properly compacted materials.
D. Oil forms before concrete is placed.
E. Leave forms in place not less than eight (8) hours after concrete is placed. If removal causes damage to concrete, leave forms on as long as necessary to prevent damage.
F. Remove forms with care to prevent cracking, spalling or overstressing concrete.

### 3.4 CONCRETE PLACEMENT

A. Place concrete in accordance with State of Iowa Highways standards 2301.
B. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.
C. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
D. Consolidate by tamping and screed excess concrete flush with forms; edges adjacent to forms, expansion joints, curbs, or fixture shall be thoroughly spaded for full depth.
E. All concrete shall be consolidated with mechanical vibration equipment.

## 3.5 JOINTS

A. The Contractor shall submit a concrete jointing plan to the Owners Representative for approval 10 days prior to the start of paving. Joint design for concrete pavement shall be based on the current Guide for Design and Construction of Concrete Parking Lots published by the American Concrete Institute (ACI 330R-92). It is desired to have joint lines match edges of travel lanes.
B. Align curb, gutter, and sidewalk joints.
C. Place 1/2 inch (8 mm) wide expansion joints to separate paving from vertical surfaces and other components for sidewalks.
D. Saw cut contraction joints 1/4 inch (6 mm) wide at an optimum time after finishing. Cut 1/3 into depth of slab. Minimum depth of cut shall be 1.5 inches.
E. Round outside edges of sidewalk with edging tool on approximately one half-inch (1/2") radius.
F. Round edges of sidewalk or curbs adjacent to expansion joints with edging tool with approximately one-eighth inch (1/8") radius.
G. Construction Joint - Keyed and tied joints shall be used at ends of all concrete pours. Bars shall extend through joints a minimum of twenty-four (24) bar diameters.
H. Expansion joints (isolation joints) shall be installed in concrete pavement slabs and sidewalks where the concrete meets other structures such as light pole bases, intakes, buildings and all other similar structures. Hold joint material down one-half inch (1/2") and fill with sealant. Also used were sidewalk meets concrete curb.

## 3.6 PLACING AND PROTECTING CONCRETE

A. Place no concrete when stormy or inclement weather prevents good workmanship, when subgrade is frozen or if air temperature is 38 degrees F. or below.
B. No concrete shall be placed until Owner's Representative has inspected and approved forms, placement of reinforcement, pipes, sleeves, conduit and other inserts.
C. Before placing concrete, remove all debris, water and ice from the place to be occupied by the concrete. Wet subgrade and forms immediately prior to placing concrete.
D. Concrete shall be deposited in the forms as nearly as possible to final location. The placing or depositing of all concrete shall be done in accordance with requirements of the ACI 318-77. Brush on neat grout where placing against hardened concrete.
E. Erect windbreaks to prevent strong, hot winds from drying exposed slabs while they are being finished. Keep concrete moist.
F. Use of salt or other chemicals is prohibited. Use of accelerating admixtures will not be permitted.
G. Cold weather concreting shall be done only if Contractor can maintain temperatures of seventy (70) degrees F. or above for three (3) days or fifty (50) degrees F. or above for five (5) days. Do not allow concrete to freeze for next four (4) days. Keep concrete moist. Place no concrete for foundations on backfilled earth, disturbed or frozen earth. During cold weather concreting prevent freezing of soil beneath footing. All compacted fill to receive concrete floors shall be brought to a temperature of fifty (50) degrees before concrete floor is placed and shall be maintained at this temperature until concrete has taken its final set.
H. During and immediately after depositing of concrete, compact and work around edges of vertical surfaces to produce dense homogeneous mass, free from honeycombs or other defects. Manpower, tools and equipment shall be adequate for job requirements.

## 3.7 FINISHING

A. Screed, level and float all slabs to true, level and straight lines.
B. Exterior slabs and platforms to be medium hair broom finish, with no coarse aggregate visible, unless otherwise specified on drawings.

## 3.8 CURING AND PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury. Place sealer on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.
B. Do not permit vehicular traffic over pavement until 75 percent design strength of concrete has been achieved.
C. All concrete shall be protected during cold weather for at least five (5) days after placement.
D. Concrete injured by frost action shall be removed and replaced at Contractor's expense.
E. Prevent water from flowing along edge of pavement, curb or sidewalk and undermining slab.

## 3.9 TOLERANCES

A. Maximum Variation of Surface Flatness: 3/16 inch (6 mm) in 10 ft (3 m).
B. Maximum variation from true position: 1/4 inch (6 mm).

## 3.10 FIELD QUALITY CONTROL

A. Compressive Strength Tests: ASTM C 39/C 39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd (76 cu m) or less of each class of concrete placed.
   1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
   2. Perform one slump test for each set of test cylinders taken.
B. Owner will select and pay for independent testing laboratory and Contractor shall coordinate work with testing laboratory before proceeding with each phase or stage or work.

## 3.11 SCHEDULES

A. Driveway and Sally Port Pavement: 8 inches thick typical.
B. Parking Lot Pavement: 6 inches thick typical.
C. Sidewalk Pavement: 4 inches thick typical.

END OF SECTION

# SECTION 32 13 73

# PAVEMENT JOINT SEALANTS – NOT IN CONTRACT

# RFB #923902-01

## PART 1 - GENERAL

### 1.01 SUMMARY

A. This Section includes the following:
   1. Expansion and contraction joints within cement concrete pavement.
   2. Joints between cement concrete and asphalt pavement.

### 1.02 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Samples: For each type and color of joint sealant required.
C. Product test reports.
D. Compatibility and Adhesion Test Reports: From sealant manufacturer.

### 1.03 QUALITY ASSURANCE

A. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact or affect joint sealants to joint-sealant manufacturers for testing according to ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

### 1.04 WARRANTY

A. Provide two year warranty from time of substantial completion for polyurethane sealants. Include coverage for installed sealants which fail to achieve watertight seal, exhibit loss of adhesion or cohesion, and sealants which do not cure.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.
B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

### 2.02 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.
   1. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
B. Colors of Exposed Joint Sealants: gray, unless selected by Architect from manufacturer's full range.

## 2.03 POURED JOINT SEALANTS

A. Pavement, Longitudinal and Transverse Joints:
   1. Products:
      a. Bemac, Div. of McAsphalt; Beram 195/195LM.
      b. CRAFCO; ROAD SAVER 231.
      c. Koch Pavement Solutions; Koch Product #9030
      d. Maxwell Products, Inc.; Elastoflex 71.
      e. P.T.Products; DURA FILL 3405 LM.
      f. W.R.Meadows; 3405 Modified (Hot Pour)
      g. WRM SOF SEAL (2Comp. Cold Pour)
      h. Or equal specifically approved by engineer.
B. Expansion Joints in Walks and Parking
   1. Products:
      a. Sonneborn Products; Sonolastic SL-1. Color gray.
      b. Or equal specifically approved by engineer.

## 2.05 EXPANSION JOINT FILLERS

A. Non-Linear Expansion Joints
   1. Polyethylene closed cell foam expansion joint filler. BASF, Sonoflex F.
   2. Only allowed at small curved joints, such as bollards or roof drain downspouts.
   3. Or equal specifically approved by engineer.
B. Linear Expansion Joints
   1. Resilient joint fibrous expansion board joint filler. Formflex Expansion Joint.
   2. Or equally specifically approved by engineer.

# PART 3 - EXECUTION

## 3.01 INSTALLATION

A. Timing: Unless otherwise provided, before any portion of the pavement is opened to the Contractor's forces or to general traffic, expansion joints and sawn joints shall be sealed.
B. Cleaning:
   1. Before sealing joints narrower than 3/8 inch, the residue from sawing shall be cleaned from the crack. Dry sawing residue shall be blown from the joint. Wet sawing residue shall be flushed away by high pressure water blast cleaning.
   2. For joints 3/8 inch wide or wider, sand cleaning shall be used. When the joint surfaces appear dry by visual examination, the upper 3/4 inch of each joint face shall be cleaned by sand blast methods, followed by joint cleaning with air blasting. Air compressor shall provide moisture and oil-free compressed air. The angle of approach of the sand blast nozzle to each vertical face of the reservoir shall be approximately 30 degrees and the sand blast nozzle must have a guide which inserts in the joint and assures positive location and directional control of the nozzle.
   3. Joint Sealer:
      a. Joint sealer shall be prepared and installed in the joint and to the proper level as shown in the contract documents and as recommended by the manufacturer.
      b. Hot-poured sealers shall be heated in a thermostatically controlled heating kettle; the material shall be heated to the temperature required for use, but not above that recommended by the manufacturer. After sealing, excess sealer shall be removed from the pavement surface.
      c. Joint sealer shall be placed only when the pavement and ambient air temperatures are 40 degrees Fahrenheit or higher. When near this minimum, additional air blasting or

drying time or both may be necessary to assure a satisfactory bond to the joint surfaces.

d. When this sealer cannot be properly placed due to late fall work, the Contractor shall submit a joint construction plan and sealing details to the Jurisdictional Engineer for approval before paving can begin.
e. Joints shall be sealed the same day they are cleaned. Sealing shall be done only when the joint surfaces appear dry by visual examination.
f. Where a curb does not exist, the joint opening at the pavement edges shall be sealed with tape.
g. If surface correction required the joints may need to be recleaned and resealed.

C. Install backer materials to support sealants during application and at position required to produce optimum sealant movement capability. Do not leave gaps between ends of backer materials. Do not stretch, twist, puncture, or tear backer materials. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.
D. Install sealants at the same time backings are installed to completely fill recesses provided for each joint configuration and to produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
E. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

END OF SECTION

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**SECTION 32 17 23**

**PAVEMENT MARKINGS – NOT IN CONTRACT**

**RFB #923902-01**

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES

A. Pavement Markings.

### 1.02 DESCRIPTION OF WORK

A. For marking of completed pavement surfaces.

### 1.03 SUBMITTALS

A. Minimum of two weeks prior to commencing any pavement marking operations, the Contractor shall submit a manufacture's catalogue sheet for each type of pavement marking paint used for review and approval by the Engineer.

### 1.04 SCHEDULING AND CONFLICTS

A. Construction Sequence:
   1. Submit plan for construction sequence and schedule prior to commencing construction.
B. Conflict Avoidance:
   1. Notify Engineer of conflicts discovered or changes needed to accommodate unknown or changed conditions.
C. Conform to Local, State and Federal Requirements.

### 1.05 RESTRICTIONS ON OPERATIONS

A. Surface Temperature Restrictions: Pavement markings shall not be placed when the temperature of the pavement surface is less than 40 degrees Fahrenheit, or between October 15th and April 1st.

## PART 2 - PRODUCTS

### 2.01 WATERBORNE PAINT

A. The paint shall be capable of being heated and sprayed applied up to a temperature of 140° F without damaging the formulation or serviceability of the paint. The paint shall be free from heavy metals as defined by the U.S. EPA.
B. Pigment Content: The percent pigment by weight of the finished product shall be from 45% to 55% by weight for white and 55% to 58% for yellow paint as tested by ASTM D 3723.
C. Resin Solids shall be composed of 100% acrylic emulsion polymer.
D. Nonvolatile Vehicle: The nonvolatile vehicle shall not be less than 43% by weight for white paint and not less than 45% by weight for yellow paint.
E. Volatile Organic Compounds: Volatile organic compounds shall not exceed 1.25 pounds per gallon excluding water and VOC exempt solids. ASTM D 3960 shall be used to determine the levels of VOCs.
F. Density: The density shall be a minimum of 12 pounds per gallon and the density of the production batches shall not vary more than +/- 0.2 pounds.

G. No-Pick-Up Time: The no-pick-up time for the paint shall be less than 5 minutes.

## PART 3 - EXECUTION

### 3.01 CLEANING AND PREPARATION OF PAVEMENT

A. The pavement surface shall be dry and free from dirt, dust, oil and other contaminates which may interfere with the paint from properly bonding to the surface. The clean surface shall be at least 1 inch wider than the anticipated marking. An air blast shall occur immediately prior to the new marking being placed. The air blast is not intended to remove large amounts of dust or dirt, but only a small amount of residue that might be left after the cleaning operation.

### 3.02 UNIFORM APPLICATION

A. All painted markings shall have uniform thickness and width. The width of the lines shall be as specified with a tolerance of +/- ¼ inch for 4-inch lines and +/- ½ inch for wider lines.
B. The wet film thickness of the paint shall be 14 mils, used at a rate of 305.5 ft. of solid 4” line per gallon of paint.

### 3.03 TRAFFIC CONTROL

A. Traffic control shall remain in place from the time cleaning operations have started through the completed curing time of the newly applied paint markings.

### 3.04 MARKING REQUIREMENTS

A. Parking Stalls:
Solid yellow lines, 4 inches wide by length dimensioned on plans and shall be placed for each parking stall as shown in the plans. The spacing shall be nominally 9.5 feet on center, or as otherwise specified on plans.
B. Symbols and Stop Bars:
Symbols, directional arrows, and stop bars shall be painted yellow. Size and shape shall follow the Manual of Uniform Traffic Control Devices. Locations as shown in the plans.
C. Handicap Access Symbols and Aisles:
Symbols, painted yellow, a minimum of 5 feet in height, shall be placed as shown in the plans. Access aisles shall be painted color per plan with a diagonal stripe pattern, lines placed 2 feet apart on center.
D. Loading Zones:
Solid yellow lines 4” wide shall be placed as shown in the plans for loading zones. The lines shall be placed diagonally, spaced 2 feet on center. A solid yellow line shall outline the area on the pavement and on the curb.

END OF SECTION

**SECTION 32 31 13**

**CHAIN LINK FENCING – NOT IN CONTRACT**

**RFB #923902-01**

## PART 1 – GENERAL

### 1.1 SECTION INCLUDES

A. Fence framework, fabric and accessories.
B. Concrete post bases.

### 1.2 QUALITY ASSURANCE

A. Fencing shall meet or exceed minimum standards established by the Chain Link Fence Manufacturers Institute (CLFMI) Product manual or as specified or detailed, whichever is more stringent, for materials, finishes and installation.
B. Manufacturer Qualifications:
   1. Company specializing in manufacturing the products specified in this section.
   2. Obtain chain link fences and gates, including accessories, fittings, and fastenings as complete units from a single source.
C. Perform installation under supervision of factory-authorized representative.

### 1.3 SUBMITTALS

A. Shop drawings: Indicate layout, spacing of components, gates, post foundation dimensions, hardware anchorage and schedule of components.
B. Product Data: Provide data on finishes, fabric, posts, accessories, fittings and hardware and gates.
C. Submit manufacturer's technical data and installation instructions for the chain link fencing and gates.

## PART 2 – MATERIALS

### 2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Anchor Fence Company, Inc.
   2. Anchor Die Cast, Inc.
   3. Master Halco
   4. The Tymetal Corporation
   5. Duke’s Wire Mesh
   6. Approved equal

### 2.2 MATERIALS

A. Fence Height:
   1. Provide 12’-0” to top of mesh (without razor wire top guard) where specifically indicated on the drawings.
B. All new materials; used, re-rolled, re-galvanized or open seam posts or rails not acceptable.
C. Posts, gate frames, braces, rails, tension bars, truss rods and tension wire shall be of steel. Gate hinges, post tops, tension bar bands, and other parts shall be of steel or iron except that post tops, rail ends, ties and clips may be of aluminum.

## 2.3 COMPONENTS

A. Fabric:
   1. 9-gauge (min.) steel wire woven in a 2” diamond mesh, one-piece fabric width.
   2. Minimum breaking strength: 1290 lbf.
   3. Top and bottom selvages twisted and barbed.
   4. Finish:
      a. Galvanized after weaving by hot-dip process to give a minimum of 1.2 oz. of zinc/sq. ft. of wire surface distributed over entire fabric, including cut ends, in accordance with ASTM A392 Class 1.

B. Welded Razor Wire:
   1. Welded straight-blade netting: 150mm x 300mm
   2. Surface Treatment: Galvanized Coating – 80-100g/m
   3. Diamond Hole Size: 2” short and long diagonal.
   4. Blade Type: CBT-60
   5. See drawings for locations near cantilever gates.

C. Framework:
   1. Steel Pipe – Type I: ASTM F -1083, standard weight (Schedule 40) galvanized pipe; sizes as indicated. Hot-dip galvanized with minimum average zinc coating of 1.8 oz./ft.2. Sizes as indicated.
   2. Steel Pipe – Type II: Steel pipe cold-formed and welded per ASTM F-1043, Group 1C or Group 4, having a minimum yield strength of 50,000 psi. The external zinc coating shall be Type B, zinc with polymer film, 0.90 oz./ft.2 minimum zinc coating with a chromate conversion and a verifiable polymer film. The internal coating shall be Type B, zinc 0.90 oz./ft.2 minimum or Type D, zinc pigmented, 81% nominal coating with 0.30 mils minimum thickness. Sizes as indicated.
   3. Framework Sizes:

| Description | Nominal Outside Diameter | Nominal Weight Per Foot (Lbs/Ft) | |
|---|---|---|---|
| | | Type I | Type II |
| End, corner and pull posts: | 2.875” | 5.79 | 4.64 |
| Rails and post braces: | 1.66” | 2.27 | 1.83 |
| Intermediate (Line) posts: | 2.375” | 3.65 | 3.12 |
| Gate Posts: | | | |
| Swinging: Up to 6’ wide: | 2.875” | | 4.64 |
| Over 6’ to 12’ | 4.000” | | 8.65 |
| Over 12’ to 18’ | 6.625” | | 18.02 |
| Over 18’ to 24’ | 8.625” | | 27.12 |
| Sliding: All widths | 4.000” * | | 8.65 |
| Gate Frame: | 2.00” | | 2.28 |
| Gate Interior Bracing: | 1.66” | | 1.83 |

* 4” posts shall be provided at both the counterbalance and latch side of the gate opening.

D. Accessories
   1. Post Tops: Pressed steel, cast iron, or cast aluminum alloy ornamental tops or combination tops with razor wire supporting arms, as required. The post tops shall fit over the outside of posts and shall exclude moisture from the posts.
   2. Rail and Brace Ends: Pressed steel, cast iron, or cast aluminum alloy, cup-shaped to receive rail and brace ends.
   3. Tension (Stretcher) Bars: Steel strip, Minimum 3/4” wide x 3/16” thick and not less than 2” shorter than fabric height. Provide one tension bar for each end and gate post, and two for each corner and pull post.

4. Tension (Stretcher) Bar Bands: Pressed steel, minimum 300-degree profile curvature for secure fence post attachment
5. Truss Rods: Steel rod, galvanized, 3/8” diameter merchant quality with turnbuckle.
6. Tension Wire: Marcelled 7-guage steel wire with minimum coating of 0.80 ounces of zinc or 0.40 ounces of aluminum per square foot of wire surface and conforming to ASTM A 824.
7. Stainless Steel Straps (Hog Rings):
   a. Fabric to Intermediate (Line) Posts, Rails, and Braces: ASTM F626, 9-gauge galvanized steel. Minimum zinc coating 1.20 oz/ft².
   b. Fabric to Tension Wires: ASTM F626, 9-gauge galvanized steel. Minimum zinc coating 1.20 oz/ft².
8. Barbed Tape/ Concertina: ASTM F 1910 430 Stainless Steel, .025 inch (.6mm) thick x 1” wide prior to forming, die stamped to produce 4 barbed points at 4 inches (100mm) on center. Tape cold clenched over stainless-steel core wire with minimum tensile strength of 220,000 psi (1,517Mpa). 1.2 inch (30.5mm) minimum length for each barb Concert in a 51 loop 5-clip 25-foot configuration. 30-inch (750mm) coil.
   a. Clips for fastening barbed tape to chain link fencing shall be fabricated from .065"x .375" AISI T 430 stainless steel, and capable of withstanding a minimum load of 200 lbs.
   b. Clips shall be installed to prevent the slipping of one loop past another.
9. Finishes:
   a. Unless noted otherwise, all iron and steel components, except wire and framework; hot-dip galvanized after fabrication to produce average minimum zinc coating weight of 1.2 oz. per square foot of surface.

E. Concrete Mix:
   1. ASTM C94 Portland Cement concrete with maximum 3/4" aggregate having minimum compressive strength of 3,000-psi at 28 days.

F. Manual Gates:
   1. Gate widths as indicated on plans.
   2. Gate height as indicated on plans.
   3. Gates shall be designed for manual operation by one person.
   4. Gates shall be factory assembled in one section.
   5. Gate frames: Gate frames shall be of welded construction, fabricated in accordance with ASTM F1184, Type II, Class 2, using 2” OD galvanized steel tube or aluminum alloy extrusions.
   6. Bracing: Provide adjustable bracing as required to comply with the performance deflection criteria listed in ASTM F1184. Bracing shall be 1 5/8” OD.
   7. Gate shall operate smoothly.
   8. Gate hangers, latches, brackets, guide assemblies, and stops: Malleable iron or steel, galvanized after fabrication. Provide positive latch with provisions for padlocking.
      a. Manufactured to allow installation of future Owner provided interlock to control gates. Coordinate layout with Owner prior to shop drawing submittal and fabrication.
   9. Gate Hinges shall be non-lift-off type, malleable and permit 180-degree gate opening.
   10. Chain link fence fabric shall be the same type as used in fence construction.
   11. Finish: Galvanized to match fencing.

## PART 3 – EXECUTION

### 3.1 GENERAL

A. Installation to conform to ASTM F-567.
B. Straps, rails, posts, and braces shall be constructed on the secure side of the fence. Fabric shall be placed on the opposite (non-secure) side of the fence.

C. Fence installer to verify underground utility locations or other obstructions prior to fence installation.
D. Post Spacing: Space line posts at intervals not exceeding ten feet.
E. Terminal posts (end, corner and gate posts) shall be set at the beginning and end of each continuous length of fence and at abrupt changes in vertical and horizontal alignments (30 degrees or more).
F. Post Setting:
    1. Set terminal, gate and line posts plumb in concrete footings.
        a. Footings to be:
            1) 12” (min.) diameter for intermediate (line) posts.
            2) 16” (min.) diameter for end and corner posts.
            3) 16” (min.) diameter for gate posts 4” OD and less.
            4) 24” (min.) for gate posts over 4” OD.
        b. Bottom of footings to be:
            1) 42” (min.) below grade for 4” OD posts.
            2) 46” (min.) for 6 5/8” OD posts.
            3) 52” (min.) for 8 5/8” OD posts.
    2. Set bottom of posts 6” above bottom of footings. Trowel top of footings with a 1” (min). to 2” (max.) crown to direct water away from posts. Top of crown to be 2" above grade. Footing to be uniform size full depth without flair at top of grade to prevent frost heave. Drill holes in firm, undisturbed or compacted soil. Place concrete around posts in a continuous pour and vibrate or tamp concrete around posts. Check each post for vertical and top alignment and hold in position during concrete placement.
G. Bracing: Brace gate and terminal posts back to adjacent line posts with horizontal brace rails at mid-height of fabric and diagonal truss rods. Brace line posts every 90 feet.
    1. Where fence turns corner or bends in excess of 30 degrees horizontally or vertically, provide corner post complete with bracing.
H. Tension Wires: Stretch from end to end of each stretch of fence. Fasten to outside of line posts with tie wires. Attach to fabric with hog rings at 24" O.C. The tension wire shall be taut and free of sag:
    1. Top Tension Wire: Install within the top 6” of the fabric.
    2. Bottom Tension Wire: Install within the bottom 6” of the fabric.
I. Fabric: Pull fabric taut with bottom salvage 2" (+/- 1/2”) above grade. Anchor fabric to framework so that fabric remains in tension after pulling force is released. Fasten to terminal posts with tension bars threaded through mesh and secured with tension bands at maximum 15" intervals. Tie to line posts with tie wires spaced at maximum 15" O.C and within 4” from top and bottom of fabric. Attach to top and bottom tension wires with hog rings at maximum 24" intervals. Allow minimum 24 hours after post setting.
J. Barbed Tape/ Concertina: As indicated on drawings, locate at every fence corner around the complex. Provide a roll strand from the top of the fence run vertically to the bottom and secure to the fence both top and bottom. In addition, provide Concertina wire at the top of each fence. Three (3) rolls of Concertina wire shall be attached at the bottom, middle and just below the top roll of Razor tape ran horizontally on the inside of the exterior fence (on the inside after tanglefoot); secured to the fence.
K. Gates:
    1. Install gates plumb, level and secure for full opening without interference. Anchor center stops and keepers in concrete footings. Adjust hardware for smooth operation and lubricate where necessary.
L. Fasteners: Install nuts for fittings, bands and hardware bolts on the inside of fence. Peen ends of bolts or score threads to prevent removal of nuts.
M. Grounding:
    1. Fences shall be grounded on each side of all gates, at each corner, at the closest approach to each building located within 50 feet of the fence, and where the fence alignment changes more than 15 degrees. Grounding locations shall not exceed 500 feet. Each gate panel shall be bonded with a flexible bond strap to its gate post. Fences crossed by powerlines

of 600 volts or more shall be grounded at or near the point of crossing and at distances not exceeding 150 feet on each side of crossing. Ground conductor shall consist of No. 8 AWG solid copper wire. Grounding electrodes shall be 3/4 inch by 10-foot-long copper-clad steel rod. Electrodes shall be driven into the earth so that the top of the electrode is at least 6 inches below the grade. Where driving is impracticable, electrodes shall be buried a minimum of 12 inches deep and radially from the fence. The top of the electrode shall be not less than 2 feet or more than 8 feet from the fence. Ground conductor shall be clamped to the fence and electrodes with bronze grounding clamps to create electrical continuity between fence posts, fence fabric, and ground rods. After installation, the total resistance of fence to ground shall not be greater than 25 ohms.

N. Completed security fence and gate system shall not have openings or clearances greater than those specified.
O. Thoroughly clean up all excess materials and debris from erection operations.

END OF SECTION

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**SECTION 32 31 14**

**CANTILEVERED GATES – NOT IN CONTRACT**

**RFB #923902-01**

## PART 1 – GENERAL

### 1.1 SECTION INCLUDES

A. Cantilever slide gates, gate posts, operators and related hardware. (Gate widths and slide directions as indicated on the drawings).
B. See drawings for Electrically Operated Sliding Gate layout, details and additional notes.

### 1.2 REFERENCES

A. Underwriters Laboratory Gate Operator Requirements (UL 325).
B. ASTM F 2200 – Standard Specification for Automated Vehicular Gate Construction.
C. ASTM F 1184 – Standard Specification for Industrial and Commercial Horizontal Slide Gates, Type II, Class 2.
D. American Welding Society AWS D1.2 Structural Welding Code.

### 1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Company specializing in manufacturing the products specified in this section.
   2. Obtain gates, including accessories, fittings, and fastenings as complete units from a single source.

### 1.4 SUBMITTALS

A. Shop drawings: Indicate layout, spacing of components, gates, hardware, anchorage, and schedule of components. Include complete details of gate construction, gate height and post spacing dimensions.
B. Product Data: Provide data on finishes, fabric, posts, fittings and hardware, operators, pedestals, control panels, key switches, and electronic hardware.
C. Submit manufacturer's technical data and installation instructions for the gates, operators, pedestals, control panels, key switches and hardware.

### 1.5 CERTIFICATIONS

A. Certification of Performance Criteria:
   1. Manufacturer of gate system shall provide certification stating the gate system includes the following material components providing superior performance and longevity. Alternate designs built to minimum standards that do not include these additional structural features shall not be accepted.
      a. The gate track system shall be welded and keyed to interlock into gate frame member.
      b. Gate shall have a minimum counterbalance length of 50% opening width providing a 36% increase in lateral resistance (when compared to ASTM minimum of 40% counterbalance). The counterbalance section shall be filled with fabric or other specified material.
      c. Intermediate vertical members shall be provided with spacing between verticals to be less than 50% of the gate frame height.

d. Entire gate frame (including counterbalance section) shall include 2 adjustable stainless or galvanized steel cables (minimum 3/16") per bay to allow complete gate frame adjustment to maintain square and level orientation.
e. Gate truck assemblies shall be tested for continuous duty and shall have precision ground and hardened components. Bearings shall be pre-lubricated and contain shock resistant outer races and captured seals.
f. Gate truck assemblies shall be supported by a minimum 5/8" plated steel bolt with self-aligning capability, rated to support a 2,000 # reaction load.
g. Hanger brackets shall be hot dipped galvanized steel with a minimum 3/8" thickness. Brackets shall be gusseted.
h. Gate top track and supporting hangar bracket assemblies shall be certified by a licensed professional engineer in the State of Iowa to withstand a 2,000 lb. vertical reaction load without exceeding allowable stresses.
i. Gate shall be in compliance with ASTM F 2200, Standard Specification for Automated Vehicular Gate Construction per section 2.01 C.
j. Gate operator shall be in compliance with UL 325 as evidenced by UL listing label attached to gate operator.
k. The aluminum welders and welding process must be certified.

## 1.6 WARRANTY

A. Provide a minimum five-year manufacturer warranty for cantilever slide gates, operators and controls. Warranty shall begin at date of project Substantial Completion.

# PART 2 – MATERIALS

## 2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. America's Gate Company: www.americasgatecompany.com
   2. Ameristar Security Products: www.ameristarfence.com
   3. Ametco Manufacturing Corporation: www.ametco.com
   4. The Tymetal Corporation: www.tymetal.com
   5. Approved equal per Section 01 60 00 – Product Requirements.
B. Basis of Design: Fortress Box Frame Cantilever Slide Gate – Tymetal Corporation

## 2.2 MATERIALS

A. Gate Height:
   1. Provide 12'-0" to top of mesh (without razor wire top guard) where specifically indicated on the drawings.
B. All new materials; used, re-rolled, re-galvanized or open seam posts or rails not acceptable.
C. Gate hinges, post tops, tension bar bands, and other parts shall be of steel or iron except that post tops, rail ends, ties and clips may be of aluminum.

## 2.3 COMPONENTS

A. Framework:
   1. Steel Pipe – Type II: SS 40 Steel pipe cold-formed and welded per ASTM F-1043, Group 1C or Group 4, having a minimum yield strength of 50,000 psi. The external zinc coating shall be Type B, zinc with polymer film, 0.90 oz./ft.2 minimum zinc coating with a chromate conversion and a verifiable polymer film. The internal coating shall be Type B, zinc 0.90 oz./ft.2 minimum or Type D, zinc pigmented, 81% nominal coating with 0.30 mils minimum thickness. Sizes as indicated.

2. Framework Sizes:

| Description | Nominal Outside Diameter | Nominal Weight Per Foot (Lbs/Ft) | |
|---|---|---|---|
| | | Type I | Type II |
| Gates: | | | |
| Sliding: All widths | 4.00" * | | 8.65 |
| Gate Frame: | 2.00" | | 2.28 |
| Gate Interior Bracing: | 1.66" | | 1.83 |

* 4" posts shall be provided at both the counterbalance and latch side of the gate opening. Posts shall also have a bracket equipped with (1) pair 3" (76mm) UHMW guide wheels.

B. Accessories
   1. Post Tops: Pressed steel, cast iron, or cast aluminum alloy ornamental tops or combination tops with razor wire supporting arms, as required. The post tops shall fit over the outside of posts and shall exclude moisture from the posts.
   2. Rail and Brace Ends: Pressed steel, cast iron, or cast aluminum alloy, cup-shaped to receive rail and brace ends.
   3. Tension (Stretcher) Bars: Steel strip, Minimum 3/4" wide x 3/16" thick and not less than 2" shorter than fabric height. Provide one tension bar for each end and gate post, and two for each corner and pull post.
   4. Tension (Stretcher) Bar Bands: Pressed steel, minimum 300-degree profile curvature for secure fence post attachment
   5. Truss Rods: Steel rod, galvanized, 3/8" diameter merchant quality with turnbuckle.
   6. Tension Wire: Marcelled 7-guage steel wire with minimum coating of 0.80 ounces of zinc or 0.40 ounces of aluminum per square foot of wire surface and conforming to ASTM A 824.
   7. Barbed Tape: ASTM F 1910 430 Stainless Steel, .025 inch (.6mm) thick x 1" wide prior to forming, die stamped to produce 4 barbed points at 4 inches (100mm) on center. Tape cold clenched over stainless-steel core wire with minimum tensile strength of 220,000 psi (1,517Mpa). 1.2 inch (30.5mm) minimum length for each barb.

C. Concrete Mix:
   1. ASTM C94 Portland Cement concrete with maximum 3/4" aggregate having minimum compressive strength of 3,000-psi at 28 days.

D. Cantilever Slide Gates:
   1. Gate widths as indicated on plans (40-foot minimum clear opening width).
   2. Gate height to match fence height. Provide 12'-0" high gate (without razor wire top guard) where specifically indicated on the drawings.
   3. Cantilever slide gates shall be designed for manual operation by one person. Provide provisions for gate operator where indicated on drawings.
   4. Cantilever slide gates shall be factory assembled in one section.
   5. Gate frames: Gate frames shall be of welded construction, fabricated in accordance with ASTM F1184, Type II, Class 2, using galvanized steel tube or aluminum alloy extrusions.
      a. The primary members (top and bottom) shall be "P" shaped in cross section with no less than 2" on a side and weighing not less than 1.6 lb/lf. To maintain structural integrity this top member shall be "keyed" to interlock with a "keyed" track member.

b. End vertical members of the gate frame shall be 2”x2”, weighing not less than 1.1 lb/lf. Interior vertical members shall alternate between 1"x1" and 1"x2" in cross section, weighing not less than .52 lb/lf and .82 lb/lf respectively. The 1”x2” and 1”x1” intermediate vertical members shall be spaced at a distance not to exceed the overall height of the box frame. The gate shall be constructed in "box" form with the width between the frames measuring 24" from outside to outside. Between these frames there shall be a continuous series of 1"x1" diagonal and horizontal bracing with the diagonals welded at approximately 45 degrees to the frames.
c. The semi-enclosed "keyed" track shall be extruded from 6005A-T61 or 6105-T5 aluminum alloy, shall weigh a minimum of 2.9 lb/lf. A track member shall be located on each side frame. Welds to be placed alternately along the top and side of the track at 9" centers with welds being a minimum of 2" long.

6. Diagonal “X” Bracing: Provide 3/16" or 1/4” diameter stainless or galvanized steel cable throughout the entire gate frame. Bracing shall be as required to comply with the performance deflection criteria listed in ASTM F1184
7. Gate shall operate smoothly across the entire path of travel. Gate shall be designed to open or close by applying an initial pull force no greater than 40 lbs.
8. Support from semi-closed track aluminum, extruded, two self-aligning 4-wheel, ball bearing truck assemblies.
9. Gap protectors shall be provided and installed per ASTM F 2200.
10. Gate hangers, latches, brackets, guide assemblies, and stops: Malleable iron or steel, galvanized after fabrication. Provide a positive latch with provisions for padlocking.
11. Bottom guide wheel assemblies: Two pairs of rubber-tired guide wheels straddling bottom horizontal gate rail, allowing adjustment to maintain gate frame plumb and in proper alignment. Attach one assembly to each guide post.
12. Fabric:
    a. 9-gauge (min.) steel wire woven in a 2” diamond mesh, one-piece fabric width.
    b. Minimum breaking strength: 1290 lbf.
    c. Top and bottom selvages twisted and barbed.
    d. Include fabric at counterbalance per ASTM F2200.
13. Stainless Steel Straps (Hog Rings):
    a. Fabric to Intermediate (Line) Posts, Rails, and Braces: ASTM F626, 9-gauge galvanized steel. Minimum zinc coating 1.20 oz/ft².
    b. Fabric to Tension Wires: ASTM F626, 9-gauge galvanized steel. Minimum zinc coating 1.20 oz/ft².
14. Gate Locks: Waterproof, tamper-resistant, electrically operated with six tumbler mechanical release. Provide status indicator for lock position (locked or unlocked).
15. Catcher Assembly: Catcher shall be provided at both top and bottom of gate to prevent gate deflection.
16. Finish:
    a. Galvanized after weaving by hot-dip process to give a minimum of 1.2 oz. of zinc/sq. ft. of wire surface distributed over entire fabric, including cut ends, in accordance with ASTM A392 Class 1.
17. All welds on the gate frame shall conform to Welding Procedure Specification and Procedure Qualification Record to ensure conformance to the AWS D1.2 Structural Welding Code. All individual welders shall be certified to AWS D1.2 welding code.

E. Gate Operator:
1. Gate Operator shall be listed as approved to open and close the weight of gate and to provide convenience and security.
    a. Motor Size: 208V-1ph, UL 325 compliant for Class III and IV.
    b. Provide an integral disconnect switch.
2. Gate Operator shall have capability to be easily switched to “manual” mode to disengage from chain drive and allow for gate to be opened and closed by hand. Ability to switch to manual mode shall be inaccessible from the non-secure side of the gate to prevent unauthorized usage.

a. Manual switch shall be provided inside of locked gate operator enclosure.

3. Gate Operator shall be rated and warranted for cold-weather climates.
4. Audio Alarm:
   a. This alarm shall have a dual function.
      1) The first function shall be as a warning prior to gate movement. When the motor control board recognizes a command, this alarm shall be activated three (3) seconds before the motor is energized, and the gate begins to move. This shall be continuously activated while the gate is in motion.

5. Entrapment Devices:
   a. Photoelectric through beams/photo eyes shall be installed to span the clear opening and gate path at the tail section.
6. See drawings for Electrically Operated Sliding Gate layout, details and additional notes.
7. Summary of Automatic Gate Operations:
   a. Fire Department Access:
      1) “Knox” Key Switch turned to “Emergency Open” to open. Program gate to stay open until closed by the Master Station (NCF Control Center).
   b. Owner Access:
      1) Radio to Master Station (NCF Control Center). Master Station Door Release Button to open and close.
   c. Exiting:
      1) IPI Radio to Master Station (NCF Control Center). Master Station Door Release Button to open. Auto-close timer to close.

## PART 3 – EXECUTION

### 3.1 GENERAL INSTALLATION

A. Installation to conform to ASTM F-1184 standards for aluminum cantilever slide gates, Type II, Class 2. Automated gates shall comply with ASTM F2200 and UL 325.
B. Wire ties, rails, posts, and braces shall be constructed on the secure side of the gate. Fabric shall be placed on the opposite (non-secure) side of the gate.
C. Gate installer to verify underground utility locations or other obstructions prior to installation.
D. Gates:
   1. Install gates plumb, level and secure for full opening without interference. Anchor center stops and keepers in concrete footings. Adjust hardware for smooth operation and lubricate where necessary.
   2. Install operators, pedestals, control panels, key switches, and electronic hardware in accordance with manufacturer’s instructions. Demonstrate operation of all equipment in the presence of the Owner to confirm that all requirements described in the “Summary of Gate Operations” above are met.
   3. Obstruction Sensing Systems:
      a. The inherent motor current sensors are part of the gate operator system and may not be removed or bypassed.
      b. The installation contractor shall be responsible for ensuring that appropriate external secondary entrapment protection devices be installed for the specific site conditions to protect against all potential entrapment zones. Proper operation of these safety devices shall be verified and training as to the operation and maintenance of these devices for the users and owners shall be documented.
E. Fasteners: Install nuts for fittings, bands and hardware bolts on the inside of gate. Peen ends of bolts or score threads to prevent removal of nuts.
F. Completed security gate system shall not have openings or clearances greater than those specified or detailed (or not greater than 6 inches, whichever is more restrictive) either through or under the fencing.

G. Thoroughly clean up all excess materials and debris from erection operations.

## 3.2 SYSTEM ACCEPTANCE & VALIDATION

A. Acceptance Test:
   1. Test each system function.
   2. Supply all equipment necessary for system adjustment and testing.
B. Test and Explain Safety Features:
   1. Each system feature and device are a separate component of the gate system.
   2. Read and follow all the instructions for each component.
   3. Ensure that all instructions for mechanical components, safety devices and the gate operator are available for everyone who will be using the gate system.
   4. The warning signs shipped with the gate operator must be installed in prominent position on both sides of the gate.
C. System Validation:
   1. The complete system shall be adjusted to ensure it is performing properly.
   2. The system shall be operated for a sufficient period of time to determine that the system is in proper working order.
   3. Ensure the owner is clear with regard to the safety points concerning the basic operational guidelines of the safety features of the gate operator system. These safety points are listed in the operator manual and must be read prior to system use.
   4. Installer and customer shall complete Operated Gate System Installation Checklist (see operator manual).

## 3.3 SCHEDULE

A. At all gates, provide control panels, gate operator, handholes, conduit, and electrical wiring for partial installation and operation. Access controls cabling and mechanisms shall be provided under a separate contract.

END OF SECTION

# SECTION 32 91 19

# LANDSCAPE GRADING

# RFB #923902-01

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Final grade topsoil for finish landscaping shown on Landscape Drawings.

### 1.2 RELATED SECTIONS

A. EARTHWORK: SECTION 31 20 00

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Topsoil: Fertile, friable loam, capable of sustaining vigorous plant growth, from well drained site free from flooding, not in frozen or muddy conditions; reasonably free from subsoil, clay lumps, roots, grass, weeds, stones larger than three-quarter (3/4) inch (19 mm) diameter, and foreign matter; acidity range (pH) of 5.5 to 7.5; containing minimum 4 percent and maximum 20 percent organic matter.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verify building and trench backfilling has been inspected.
B. Verify subsoil base has been contoured and compacted.

### 3.2 SUBSOIL PREPARATION

A. Eliminate uneven areas and low spots.
B. Remove debris, roots, branches, and stones in excess of 1/2 inch (13 mm) in size. Remove subsoil contaminated with petroleum products.
C. Scarify subgrade to depth of 3 inches (75 mm), where topsoil is to be placed. Scarify areas where equipment used for hauling and spreading topsoil has compacted subsoil.

### 3.3 PLACING TOPSOIL

A. Place topsoil in areas to be seeded or sodded and planted, to thickness as scheduled.
B. Use topsoil in relatively dry state. Place during dry weather.
C. Fine grade topsoil eliminating rough and low areas. Maintain levels, profiles, and contours of subgrade.
D. Remove roots, weeds, and foreign material while spreading.
E. Manually spread topsoil close to building to prevent damage.
F. Lightly compact placed topsoil.
G. Leave site clean and raked, ready to receive seeding or sodding and landscape planting.

## 3.4 TOLERANCES

A. Top of Topsoil: Plus of minus 1/4 inch (6 mm).

## 3.5 PROTECTION

A. Protect landscaping and other features remaining as final work.
B. Protect existing structures, walls, sidewalks, and paving.

## 3.6 IMPORTING TOPSOIL

A. Use topsoil stockpiled during site stripping for respread.
B. If contractor finds stockpiles have insufficient quantity for respreads requirements, topsoil must be imported to site and included in bid.

## 3.7 SCHEDULE OF TOPSOIL DEPTHS

A. The following paragraphs identify compacted topsoil thickness for various locations.
   1. Ornamental Grass Planting Beds: Minimum 12 inches
   2. Native Plants and Grass Areas: Minimum 8 inches.
   3. Shrub Beds: Minimum 8 inches .
   4. Turf seeded and sodded Areas: Minimum 8 inches

**END OF SECTION**

**SECTION 32 92 19**

**SEEDING**

**RFB #923902-01**

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Description of Work
B. Warranty
C. Seeding Dates
D. Seedbed Preparation
E. Seed Preparation
F. Application of Seed
G. Watering
H. Reseeding
I. Cleanup
J. Acceptance

### 1.2 DESCRIPTION OF WORK

A. This section shall include preparation of the seedbed, furnishing and installing seed, fertilizer and mulch, maintenance, and guarantee for completed seeded areas, as specified in the contract documents.
B. The Contractor has the option of using pneumatic, hydraulic, or conventional seeding methods; unless specified otherwise in the contract documents.

### 1.3 PROTECTION OF PROPERTY

A. Protect existing conditions at the site against damage including the following:
   1. Take precautions to ensure that equipment, vehicles, and seeding operations do not disturb or damage existing grades, drives, pavement, utilities, plants and other facilities.
   2. Verify locations and depths of all underground utilities prior to excavation and report conflicts with new seeding operations.
   3. Repair, replace, and/or return to original condition any damaged item, without additional compensation.

### 1.4 SUBMITTALS

A. Submit from an established seed dealer or certified seed grower the certified blue tag from each container of seed of grass seed mixture dated within 9 months of delivery, indicating percentage by weight and percentage of purity, germination and weed seed for each grass, legume, and cereal crop stating botanical and common name of each species as specified in contract documents.
B. Submit certificates of inspection as required by governmental authorities and manufacturer's or vendor's certified analysis for soil amendments.
C. Submit written maintenance instructions recommending procedures for maintenance of seeded areas for one year, prior to final acceptance of the seeded areas.
D. Upon request the Contractor will provide Material Certifications to the Construction Manager.

### 1.5 QUALITY ASSURANCE

A. All seed shall have a certified blue tag from each container.

B. All materials to be in accordance with Iowa Seed Law and Iowa Department of Agricultural Regulations and shall be labeled accordingly.
C. All materials and method of operation shall be subject to inspection and approval by Construction Manager.

## 1.6 DELIVERY, HANDLING, AND STORAGE

A. Packaged materials shall be delivered in original, unopened, and undamaged containers.
B. Store and protect materials off the ground to prevent wetting and deterioration.
C. Deliver all seed in original containers.

## 1.7 SCHEDULING

A. Notify Construction Manager at least 3 days prior to start of seeding operations.
B. Perform seeding operations after grading and planting operations are complete as approved by the Construction Manager.

## 1.8 WARRANTY

A. A warranty is to be provided for completed seeded areas, starting upon the date of initial acceptance. The warranty is to guarantee completed seeded areas to provide a uniformly dense, live, and healthy stand of grass, free of weeds and undesirable grasses, debris, and free of eroded areas, bare spots, diseases, and insects at the end of the warranty period of one full year.
B. During warranty period, any defects in the seeded area and grass stand such as weedy areas, eroded areas and bare spots shall be corrected and reseeded as originally specified until all affected areas are accepted by the Jurisdictional Engineer; without additional compensation.
C. Repair and replace to original condition all damages to property resultant from the seeding operation and all damages as a resultant from the remedying of these defects, without additional compensation.

# PART 2 - PRODUCTS

## 2.1 SEED

A. Provide fresh, clean, new crop, certified blue tag seed complying to tolerance for germination and purity and free of poa annua, bent grass, and free of noxious weed seed.
B. Mix seed to the specified proportions by weight by methods approved by the Engineer.
C. Seed Quality: The seed provided shall exceed the following minimum requirements of purity and germination stated on a certified blue tag.

| KIND OF SEED | PURITY | GERMINATION |
|---|---|---|
| NATIVE GRASSES | | PURITY (PLS) |
| Big Bluestem - Kaw, Pawnee, Roundtree, or Champ | | 30% |
| Little Bluestem - Blaze, Aldous, or Camper | | 30% |
| Switchgrass – Blackwell, Pathfinder, Cave-in-Rock, or | | 63% |
| Nebr. 28 | | 30% |
| Indiangrass - Neb. 54, Oto, Holton Rumsey | | 30% |
| Sidecoats Gramma - Trailway, Butte, or El Reno | | 56% |
| Western Wheatgrass - Barton or Common | | |

## 2.2 SEED MIXTURES

A. Provide the certified blue tag seed mixture type and application rate as defined on the plans.

B. Type (1) Erosion Control Mixture:

| Type of Seed | Application Rate lb/acre |
|---|---|
| Little Blue Stem | 3 |
| Side Oats Gramma | 4 |
| Indiangrass | 4 |
| Switchgrass | 1.5 |
| Big Blue Stem | 3 |
| Western Wheatgrass | 4.5 |
| Oats | 1/2 bushel |

## 2.3 FERTILIZER

A. Fertilizer shall comply with the rules of the Iowa Department of Agriculture and as follows:
   1. The grade of fertilizer will be identified according to the percent nitrogen (N), percent of available phosphoric acid ($P_2O_5$), and percent water soluble potassium ($K_2O$), in that order, and approval will be based on that identification.
   2. All fertilizer shall be furnished from an established fertilizer dealer and guaranteed percentage analysis shall be provided by the fertilizer supplier on each container with the proper scale weight records.
   3. Fertilizer shall be of a type that can be uniformly distributed by the application equipment. Fertilizer may be furnished in a dry or liquid form.
   4. When applied dry, the fertilizer shall be a granular, non-burning chemically combined product composed of not less than 50% organic slow acting, guaranteed analysis professional fertilizer. Granular or pellet form shall be uniform in composition, dry, and free flowing without caking or other damage not suitable for use.
   5. When applied in a liquid form, fertilizer may be chemically combined or may be furnished as separate ingredients.
   6. Upon request of the Contracting Authority, the Contractor shall provide a test of the fertilizer for conformance with the required analysis with no additional compensation; a tolerance of 1.0 percentage point plus or minus of that specified will be considered to be in substantial compliance.

## 2.4 WATER

A. Water shall be free of any substance harmful to seed growth.
B. The Contractor shall provide water, equipment, methods of transportation, water tanker, hoses, sprinklers, and labor necessary for the application of water.

## 2.05 MULCH

A. Hydraulic Seeding:
   1. The material shall be a natural or cooked cellulose fiber processed from whole wood chips (no recycled material) which will disperse readily in water to form a homogeneous slurry and remain in such state when agitated in the hydraulic mulching unit.
   2. The homogeneous slurry of material and water shall be capable of being applied with standard hydraulic mulching equipment.
   3. The slurry shall be dyed greed to facilitate visual metering during application with said material or homogeneous slurry having no growth or germination-inhibiting factors, being completely non-injurious to plant or animal life and having no toxic effect when combined with seed, fertilizer, and water.

4. When applied, the wood cellulose fiber slurry shall be free from weeds or other foreign matter toxic to seed, consisting of a classification of fibers with a minimum of 30 percent having an average length of 0.15 inches or passing a Clarke Classifier 24 mesh screen, will form an absorptive mat, but not a plant-inhibiting membrane, which will allow moisture to percolate into the underlying soil.
5. Mulch shall have a water-holding capacity of not less than 9 pounds of water per pound of fiber.
6. The wood cellulose fiber shall have an equilibrium air dry moisture content of 12 percent or less a time of manufacture, as defined by the pulp and paper industry standards, and shall have a ph range of 4.0 – 5.5.
7. It shall be packaged in new labeled containers and be applied at a rate of 1,800 pounds per acre (41.3 lb/1,000 sf).

B. Tackifier (Hydraulic Seeding):
1. The mulch shall include a colloidal polysaccharide tackifier which shall be adhered to the fiber to prevent separation during shipment and avoid chemical co-agglomeration during mixing within the hydraulic mulching equipment.
2. The material shall be homogeneous within the slurry and shall have no growth or germination-inhibiting factors nor any toxic effect on plant or animal life when combined with seed or fertilizer.
3. The tackifier shall be applied at a minimum rate of 50 pounds per acre (0.11 lb/sq) and shall be packaged in new labeled containers.

C. Conventional Seeding:
1. Material used as mulch may consist of straw (oats, wheat, barley, or rye).
2. Hay (bromegrass, timothy, orchard grass, alfalfa, or clover) shall not be used to mulch areas where lawn mixtures are seeded but may be used to mulch areas where erosion control and perennial ground covers are seeded.
3. All material used as mulch will be free from all noxious weed, seed-bearing stalks, or roots and shall be inspected and approved by the Engineer prior to its use.
4. Other materials, subject to the approval of the Engineer, may be used.

D. Pneumatic Seeding: Use compost meeting the following requirements:
1. Derived from a well-decomposed source of organic matter.
2. Produced using an aerobic composting process, meeting Code of Federal Regulations (CFR) 503 for time, temperature, and heavy metal concentrations.
3. No visible admixture of refuse or other physical contaminants, nor any material toxic to plant growth.
4. Certified by the U.S. Composting Council’s Seal of Testing Assurance (STA) program.
5. Conforms to chemical, physical, and biological parameters of AASHTO MP 10-03, with the following additional requirements:
   a. Follow U.S. Composting Council’s TMECC guidelines for all testing.
   b. Organic Matter Content: 30% minimum.
   c. pH: between 6.0 and 8.0.
   d. Maturity (growth screening): Minimum 90% emergence for all compost to be vegetated.
   e. Particle Size:

| Sieve Size | Percent Passing* |
|---|---|
| 2” | 100 |
| 1” | 90-100 |
| 3/4” | 65-100 |
| 3/8” | 0-75 |
| *6-inch maximum particle length. | |

### 2.6 STICKING AGENT

A. A sticking agent shall be a commercial material recommended by the manufacturer to improve adhesion of inoculant to the seed.
B. For small quantities, less than 50 pounds, the sticking agent need not be a commercial agent, but it must be approved by the Construction Manager and must be applied separately prior to application of inoculant.

## PART 3 - EXECUTION

### 3.1 AREA OF SEEDING

A. Areas to be seeded shall conform to the limits shown on the construction plans and contract documents. Areas disturbed outside the contract limits approved for seeding shall be seeded by the Contractor at no additional compensation.
B. Where weeds have developed over the area to be seeded, due to delays in permission for the seeding operations to start, at no fault of the seeding contractor, weed removal shall be an additional compensation; except when the cause is due to rain delays.

### 3.2 SEEDING DATES

A. Normal spring seeding dates shall be between March 1 and May 31. Commence only when ground temperatures are 55 degrees Fahrenheit or greater. Normal fall seeding dates shall be between August 20 and September 30.
B. Dormant seeding dates shall be between November 1 and March 1, with permission of Construction Manager.
C. Install stabilizing crop seed type specified in contract documents between June 1 and August 15.
D. Fall seeding will include only grass seed.
E. At the option and at the full responsibility of the Contractor, seeding operations may be conducted under unseasonable conditions. The final results shall be as specified and guaranteed without additional compensation should the seeded areas require reseeding.

### 3.3 SEEDBED PREPARATION

A. Limit preparation of seedbed to areas which will be seeded immediately upon completion.
B. Remove all weeds and weed debris where weed growth has developed, in the opinion of the Engineer. Weed growth and weed debris removal process shall be approved by the Engineer and shall be done without additional compensation.
C. The Contractor shall shape and fine grade to remove washes or gullies, water pockets, and irregularities to provide a smooth, firm, and even surface true to grade and cross-section.
D. Disk or rototill and cultivate seedbed to a minimum 3-inch depth to a fine texture and without soil lumps. Where the area is inaccessible to machinery, it shall be prepared by hand to a minimum depth of 1 1/2 inches after the fertilizer has been applied.
E. Application of Fertilizer:
    1. Apply fertilizer after shaping and fine grading and prior to the combined tillage and rock-removal operations. On areas inaccessible to machinery, the fertilizer may be spread prior to tillage and cultivated seedbed preparation and uniformly mixed into the top 1 1/2 inches of soil.
    2. Fertilizer shall be spread with a mechanical spreader or sprayer uniformly to all areas to be seeded at the minimum rate specified herein. The fertilizer shall be tilled into the soil to a minimum depth of 3 inches.

3. The Contractor shall be permitted to substitute other fertilizer containing analysis percentages different from those specified, provided that the minimum amounts of actual nitrogen (N), phosphate (P), and potash (K) per acre are supplied and that in no case shall the total amount per acre of the three fertilizer elements (N), (P), or (K) be exceeded by 30 percent of the following minimum amounts.
4. Conventional Seeding:
    a. Apply 13-13-13 commercial fertilizer or the equivalent units of nitrogen (N), phosphate (P), and potash (K) at the rate of 450 pounds per acre. A minimum of 40 percent of the total nitrogen (N) shall be water insoluble nitrogen.
5. Hydraulic Seeding:
    a. Apply 6-24-12 commercial fertilizer or the equivalent units of nitrogen (N), phosphate (P), and potash (K) at the rate of 200 pounds per acre prior to seeding.
    b. In addition to the above, a minimum of 100 pounds per acre of a 20-26-6 fertilizer in which a minimum of 50 percent of the total nitrogen is water insoluble nitrogen shall be applied as part of the seed, fertilizer, mulch, and water slurry.
6. Pneumatic Seeding:
    a. Based on the compost nutrient analysis, supply any additional commercial fertilizer necessary to meet the 13-13-13 units of nitrogen, phosphate, and potash at the rate of 450 pounds per acre as the compost is applied.
7. Tilling:
    a. After fertilizer has been applied, a mechanical rock picker shall be used on areas accessible to machinery to mix fertilizer in the soil to a depth of 3 inches and to remove all rocks, debris, and solid non-soil material larger than 1 1/2 inches in diameter from the upper 3 inches of the soil. A spring tooth cultivator may be used in lieu of a rock picker. The rock shall then be removed by hand after each use of the cultivator--the process to be repeated until the soil is relatively free of rock as determined by the Engineer.
    b. Remove all rock remnants from rock piles used on project smaller than 1 1/2 inches.
    c. The seedbed shall then be smoothed with a cultivator-type tillage tool having a rake bar--such as the Roseman rake (or a rock rake such as the York) gauged by rear gauge wheels or by a blade gauged by a landscape roller (such as the Viking roller blade).
    d. Tilling shall be parallel to the contours.
    e. Ruts and wheel tracks in the seedbed from seedbed preparation are to be removed prior to seeding. This must be completed just prior to seeding and the work approved by the Engineer before the seeding application.

## 3.4 SEED PREPARATION

A. Inoculated seed shall not be exposed to direct sunlight for more than 1/2 hour. Seed which is not sown within 8 hours after inoculation shall be reinoculated prior to use.
B. Additional inoculation is required for preinoculated seed. Preinoculated seed will be considered as inoculated at not more than two times the rate specified by the inoculant manufacturer.

## 3.5 APPLICATION OF SEED

A. Prior to seeding, the seedbed shall be inspected and approved by the Jurisdictional Engineer.
B. Conventional Seeding:
    1. Sowing:
        a. On all areas accessible to machinery, all grasses shall be sown with a drop-type seeder attached to a landscape roller in such a manner that the seed is applied and then covered by rolling which firms the soil.
        b. On areas inaccessible to field machinery, the use of cyclone seeders will be permitted, but no other hand-seeding methods will be accepted.
        c. The application of grass and legume seed with hand seeders on early spring work must be performed as separate operations. No mixing of the two types of seed will be permitted.

2. Mulching:
   a. All seeded areas shall be mulched within 24 hours after the seed is sown. The mulch shall be uniformly distributed over the required areas at a rate of 2 tons of dry mulch per acre.
   b. The mulch shall then be worked into the soil with a mulch tucker which shall be designed to anchor the mulch into the soil. The tucker shall be designed to anchor mulch into soil by means of dull blades or disks.

C. Hydraulic Seeding:
1. All material, seed, fertilizer, mulch, and tackifier shall be placed in hydraulic-mulching equipment specifically manufactured for hydraulic seeding and mulching.
2. The hydraulic equipment, pump, and application process shall not damage or crack seeds.
3. Materials shall be mixed with fresh potable water using a combination of both recirculation through the equipment's pump and mechanical agitation to form a homogeneous slurry.
4. It shall be applied evenly over all specified areas in a workmanlike manner at component material rates specified.
5. Site cleanup shall be considered part of application and shall include the removal of hydraulic mulch slurry from buildings, landscaping, sidewalks, and any other areas not specified for application. All debris resulting from this application shall be removed from the site.

D. Pneumatic Seeding:
1. Place all material, seed, fertilizer, and compost in equipment with a calibrated seeder attachment specifically designed for pneumatic seeding. Do not apply fertilizer with native grass, wildflower, or wetland seeding.
2. Apply the compost evenly over specified areas at material rates specified.
3. Inject seed and fertilizer into the top 1/4 inch to 1/2 inch of compost during application with a calibrated seed injector at the specified rate.

## 3.6 WATERING

A. All seeded areas shall be kept moist at all times. The areas shall be artificially watered a minimum of twice a day (early morning and evening) every day for the first week after seeding is completed.
B. For the second and third weeks after seeding, the seeded areas shall be artificially watered once a day (early morning or evening).
C. The quantity of water used shall be adequate to keep the soil and mulch moist to a depth of 1 inch and ensure growth of the seed. If natural rainfall is adequate to keep the soil and mulch moist as stated above, artificial watering may be deleted.
D. Any area seeded in the month of May shall be maintained for an additional 3 weeks. The seeded areas shall receive a minimum of 1 inch of water each week (either natural, artificial, or combination) for the fourth, fifth, and sixth week after seeding.

## 3.7 RESEEDING

A. When all work related to seeding on an area has been completed but is washed out or damaged prior to final acceptance of the seeding area and that area involves seeding in combination with mulching or fertilizing or both, the area shall be reseeded, refertilized, and remulched at the contract unit price or prices when so ordered by the Jurisdictional Engineer.
B. Fertilized or seeded areas damaged by rain prior to required mulching or areas where the mulch is not tucked shall be refertilized or reseeded or both at a rate not to exceed the specified rate, as designated by the Jurisdictional Engineer, without additional compensation.

## 3.8 CLEANUP

A. Perform cleanup operations during installation of work and upon completion.
B. Remove from site all excess materials, debris, and equipment.
C. Hose down and/or broom clean all paved surfaces.

D. Repair any damage resulting from seeding operations.
E. Remove hydraulic slurry from buildings landscaping and plantings, mulch, sidewalks, pavement, and any other areas not specified for application.

## 3.9 FINAL ACCEPTANCE

A. The areas seeded shall be given an initial acceptance, prior to the warranty period, based upon the following criteria:
   1. All requirements for the completed installation and a minimum of 60 days maintenance have been provided.
   2. Seeded areas shall be in a live, healthy, growing, and well-established condition without eroded areas, bare spots, free of weeds, undesirable grasses, disease, or insects.
   3. Reseeding operations are completed.
B. Final acceptance may be given by the Engineer upon fulfillment of all items completed as required under the warranty.

END OF SECTION

# SECTION 33 10 00

# WATER UTILITIES

**Subparts:**
**A. WATERMAIN**
**B. VALVES, HYDRANTS & APPURTENANCES**
**C. TESTING AND DISINFECTION**

**RFB #923902-01**

## SUBPART A. WATERMAIN

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES

A. Pipe.
B. Fittings.
C. Special Fittings.
D. Pipeline Accessories.

### 1.02 DESCRIPTION OF WORK

A. Construct water mains and building service pipes.
B. Reference is made to the Iowa Department of Transportation Standard Specifications for Highway and Bridge Construction, Series 2001, and all current General Supplemental Specifications and Materials Instructional Memorandum by the term "Iowa DOT Specifications" and/or "Iowa DOT I.M."

### 1.03 SUBMITTALS

A. Submit under provisions of Division 1.
B. Manufacturer′s instructions for installation for all pipe and fittings utilized.
C. Construction sequencing.
D. Catalog cuts, samples, manufacturer′s data and listing of applicable standards for special, unique or proposed substitute materials if requested by Engineer.
E. Joint restraint system.
F. Project Record Documents.
G. Upon requests the Contractor will provide Material Certifications to the Engineer.

### 1.04 SUBSTITUTIONS

A. Use only materials required by city code and plumbing code and conforming to these specifications unless permitted otherwise by Engineer.
B. Obtain written approval of Engineer for all substitutions prior to use.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver only materials that fully conform to these specifications or for which submittals have been provided to Engineer and approved for use.
B. Store materials in a protected environment, on pallets or lagging.
C. Pipe and fittings contaminated with mud and surface water shall be removed from the site and not used in construction unless thoroughly cleaned, inspected and approved by Engineer.
D. Handle all materials so as to avoid damage. Replace any damaged materials. Remove damaged materials from the site.

## 1.06 SCHEDULING AND CONFLICTS

A. Construction Sequence:
   1. Attend a preconstruction meeting if required by Engineer.
   2. Submit plan for construction sequence prior to commencing construction unless specifically not required by Engineer.
B. Conflict Avoidance:
   1. Expose possible conflicts in advance of construction, such as utility lines and drainage structures. Verify elevations of each and verify clearances for proposed construction.
   2. Complete elements of the work which can affect line and grade in advance of other open cut construction unless noted on plans.
   3. Notify Engineer of any conflicts discovered, or any changes needed to accommodate unknown or changed conditions.

## 1.07 SPECIAL REQUIREMENTS

A. Stop Work: Stop work and notify Engineer immediately if contaminated soils, historical artifacts or other environmental or historic items are encountered.
B. Conform to local, state and federal requirements.

## 1.08 MEASUREMENT FOR PAYMENT

A. The project will be a lump sum bid.
B. All quantity callouts on the plans are for reference only and the contractor is responsible for measuring the pipes shown on the plans.
C. Incidental Items:
   1. Items required for proper completion of the work or required by applicable codes, and whether or not the items are shown in the Plans, but which are not shown in the Bid Schedule, shall be considered incidental to the contract.
   2. Include the cost for incidental items including all required testing and disinfection in the unit bid price for pipe and fittings.

# PART 2 - PRODUCTS

## 2.01 WATER MAIN PIPE

A. Polyvinyl Chloride (PVC) Pipe:
   1. Conform to ANSI/AWWA C900 or C905 with gray iron pipe equivalent outside diameters.
   2. Wall Thicknesses:
      a. 4-inch through 24-inch sizes: DR 18.
      b. Sizes over 24-inch: Refer to Plans.
   3. Markings on Pipe:
      a. Name of manufacturer.
      b. Size and class.
      c. Spigot insertion depth gauge.
      d. National Sanitation Foundation (NSF) seal.
B. Ductile Iron Pipe:
   1. Minimum Thickness Class:
      a. 4-inch through 24-inch sizes; Class 52 per ANSI/AWWA C151/A21.51.
      b. Sizes over 24-inches; as shown in the Plans.
   2. Cement-mortar lined, per ANSI/AWWA C104/A21.4 with asphaltic seal coat.
   3. External coating: asphaltic.
   4. Joint Type: Use push-on type, except as otherwise required in the Plans or specifically authorized by Engineer.
      a. Push-on: per ANSI/AWWA C111/A21.11.

b. Mechanical: per ANSI/AWWA C111/A21.11.
c. Restrained, buried: Pipe manufacturer′s standard field removable system.
d. Restrained, in structures: Restraining gland, flanged or grooved.
e. Flanged: ANSI/AWWA C111/A21.11.
f. Grooved: ANSI/AWWA C606.
g. Gaskets: Per ANSI/AWWA C111/A21.11.

5. Markings on Pipe:
   a. Name of manufacturer.
   b. Size and class.
   c. Spigot insertion depth gauge.

## 2.02 WATER SERVICE PIPE AND APPURTENANCES

A. Controlling Standards: Local plumbing and fire codes.
B. Materials (as allowed by Jurisdiction or specified in contract documents):
   1. Copper Pipe:
      a. Comply with ASTM B 88.
      b. Wall thickness: Type K.
   2. Ductile Iron Pipe: As specified in Section 5010, 2.01. Polyethylene wrap is required.
   3. PVC Pipe: ASTM D 1785, SDR 21, Schedule 80, Type S joints.
   4. Brass Pipe: Red, seamless, per ASTM B 43.
   5. Polyethylene Pipe: Class 200, per AWWA C901.
   6. PEX Pipe: PEXa standards (PEXb not allowed).
C. Corporations and Stop Boxes: Contact the Jurisdiction for requirements.

## 2.03 BOLTS FOR WATER MAIN PIPE AND FITTINGS

A. Corrosion Resistant:
   1. Low alloy steel.
   2. Ductile iron.
   3. Zinc or cadmium plated.
   4. Cor-Blue or approved equal
B. Uncoated Cor-Ten steel bolts are not allowed.

## 2.04 FITTINGS

A. For Polyvinyl Chloride (PVC) Pipe: Use only ductile iron mechanical joint fittings as specified elsewhere in this Section.
B. For Ductile Iron Pipe:
   1. ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53.
   2. Joint Type: Mechanical or restrained, as required by Engineer.
   3. Cement-mortar lined per ANSI/AWWA C104/A21.4 with asphaltic coating.
   4. Restrained Joints:
      a. Restrained Mechanical Joints: Pipe manufacturer's standard field removable system.
      b. Flanged: ANSI/AWWA C110/A21.10:
         1) Nuts: ASTM A 563, Grade A, heavy hex head.
         2) Gaskets: Rubber or approved composition; 0.125-inch thick; full face.
      c. Grooved:
         1) ANSI/AWWA C606.
         2) Face to face dimensions: Equivalent to flanged, ANSI/AWWA C110/A21.10.
   5. Wall thickness: ANSI/AWWA C153/A21.53.
   6. Gaskets: Per ANSI/AWWA C111/A21.11.

## 2.05 SPECIAL FITTINGS

A. Flange Adapter:
   1. Utilize where noted on drawings to allow for ease of dismantling piping in the future.
   2. Body: Ductile iron conforming to the requirements of ASTM A 536.
   3. End Rings (Follower Rings): Ductile iron conforming to the requirements of ASTM A 536.
   4. Gaskets: New rubber compounded for water service and resistant to permanent set.
   5. Bolts and Nuts: High strength, low alloy corrosion resistant steel or carbon steel bolts conforming to the requirements of ASTM A 307.

B. Pipe Coupling:
   1. Utilize where noted on drawings to allow for ease of dismantling piping in the future, unless grooved fittings are furnished.
   2. Center Sleeve (Center Ring): Steel pipe or tubing conforming to the requirements of ASTM A 53, A 512; or formed carbon steel with a minimum yield of 30,000 psi.
   3. End Ring (Follower Ring): Ductile iron conforming to the requirements of ASTM A 536, or steel meeting or exceeding the requirements of ASTM A 576, grade 1010-1020.
   4. Gaskets: New rubber compounded for water service and resistant to permanent set.
   5. Bolts and Nuts: High strength, low alloy corrosion resistant steel.

C. Restrained Joints (Ductile iron pipe and PVC pipe only):
   1. Utilize to restrain mechanical joints at tees, bends, dead ends, or where required by Engineer.
   2. Required for pipe sizes greater than 16 inches in diameter.
   3. On pipe size 16 inch diameter or smaller, restrained joints are to be used in lieu of or in addition to thrust blocks when specified in the contract documents or by the Engineer.
   4. Manufacturer′s standard field removable restraint system.
      a. Suitable for buried service.
      b. Corrosion resistant components.
      c. Joint restraint system to be field installable, field removable and re-installable.
   5. Restraint systems involving pipe clamps and connecting rods are not acceptable unless specifically required in the Plans.
   6. Joint restraint system approval; in writing from Engineer.
   7. Install restrained joints for lengths shown on the plans.

D. Concrete Thrust Blocks:
   1. For use with all pipe sizes 16 inch diameter or smaller.
   2. On pipe sizes greater than 16 inches, use in lieu of or in addition to restrained joints when specified in the contract documents or by Engineer.
   3. Refer to detailed drawings for dimensions and installation of thrust blocks. See Figures 5010.1A, 1B, 1C.
   4. Concrete thrust blocks shall be poured in place with a C-4 mix.

## 2.06 PIPELINE ACCESSORIES

A. Polyethylene Wrap:
   1. Utilize: On all ductile iron pipe and fittings in buried service.
   2. Conform to ANSI/AWWA C105/A21.5.
   3. Minimum thickness: 8 mil.

B. Tracer System: Some of the following equipment may be supplied by some jurisdictions. Check with appropriate jurisdiction for a list of components that will be supplied.
   1. Tracer Wire: #12 solid single copper conductor.
      a. Insulation material: Linear low-density polyethylene (LLDPE) installation suitable for direct burial applications.
      b. Insulation thickness: 0.045 inches, minimum.
   2. Ground Rod: 3/8 inch dia., 60 inch long steel rod uniformly coated with metallically bonded electrolytic copper.
   3. Ground-rod Clamp: High-strength, corrosion-resistant copper alloy.

4. Splice Kit: Inline resin splice kit with split bolt for 1kV and 5kV. Insulates and seals single conductor and unshielded cable splices for direct bury and submersible applications.
5. Tracer Wire Test Station (Figure 5010.5):
   a. Two (2) internal terminals with shunt.
   b. 5-foot white plastic triangular post.
   c. Removable top cap with lock.
   d. Three (3) 2-7/8-inch by 14-inch custom-vinyl decals.
   e. Tri-grip anchor.

## 2.07 GASKETS, SPECIAL

A. Use special pipe gaskets in contaminated soils if so directed by Engineer.
B. Soils contaminated with gasoline; Neoprene or Buna N material.
C. Use special pipe gaskets to handle volatile organic compounds, Nitrile (NBR) or fluoro carbon gaskets.
D. Other soil contaminants; as required by Engineer.

## 2.08 SPECIAL WATER ACCESSORIES

A. Tennis Court Drinking Fountain: HAWS 3380GFR with 5874PB standard push button assembly and with 6518FR valve system. Valve Box and Insulation incidental.
B. Yard Hydrant: Woodford S3 Sanitary Freeze-resistant yard hydrant.

# PART 3 - EXECUTION

## 3.01 GENERAL PIPE INSTALLATION

A. Install only approved materials with plumbing code, and City code.
B. Protect pipe joints and valves from damage while handling and storing.
C. Use no deformed, defective, gouged, or otherwise damaged pipe or fittings.
D. Excavate and prepare trench as outlined in Division 3 -Trench Excavation and Backfill.
E. Prepare the trench bottom with sufficient exactness so that only minor movement of the pipe will be necessary after installation.
F. Clean pipe interior prior to placement in the trench.
G. Install pipe with fittings and valves to the lines and grades shown in the plans, with a maximum allowable variation of 3 inches.
H. Provide uniform bearing along the full length of the pipe barrel. Provide bell holes.
I. Clean joint surfaces thoroughly and apply lubricant approved for use with potable water.
J. Make joints according to pipe manufacturer′s recommendations and these specifications.
K. Limit joint deflections to one degree less than pipe manufacturer′s recommended maximum limit.
L. Tighten bolts in a joint evenly around the pipe.
M. Install concrete thrust blocks or joint restraints where shown or required. Refer to Figures 5010.1A, 1B, 1C.
N. Install remaining pipe bedding in accordance with Detailed Drawings using material conforming to these specifications.
O. Do not install pipe in water. Keep trench free of water. Refer to ANSI/AWWA C651 for wet trench installation procedures, if such installation is approved by Engineer.
P. Keep exposed pipe ends closed with rodent-proof end gates at all times when pipe installation is not occurring.
Q. Close ends of installed pipe with water-tight plugs during nights and non-working days.
R. Do not allow any water from the new pipeline to enter existing distribution system piping.
S. Do not locate water service lines under proposed driveway locations.
T. All water main including service lines and 1” lines under football field shall have a minimum of 5.5’ bury, as measure to top of pipe.

## 3.02 ADDITIONAL REQUIREMENTS FOR DUCTILE IRON PIPE INSTALLATION

A. Install in accordance with AWWA C600.
B. Cut pipe perpendicular to pipe barrel. Do not damage cement lining. Bevel cut ends for push-on joints according to AWWA C600.
C. Encase all pipe, valves and fittings with polyethylene wrap. Refer to Detailed Drawings.
D. Refer also to AWWA C600.

## 3.03 ADDITIONAL REQUIREMENTS FOR PVC PIPE INSTALLATION

A. Cut pipe perpendicular to pipe barrel.
B. Bevel cut end of pipe barrel per pipe manufacturer's recommendation.
C. Refer also to AWWA C605.

## 3.04 (Not Used)

## 3.05 POLYETHYLENE ENCASEMENT INSTALLATION

A. Application: All buried ductile iron pipe, fittings, fire hydrants and appurtenances.
B. Install in accordance with AWWA C105.
C. The polyethylene encasement is to prevent contact between the pipe and the bedding material but need not be airtight or watertight.
D. Secure and repair encasement material using polyethylene tape or replace as necessary.

## 3.06 TRACER SYSTEM INSTALLATION

A. Applicability: All buried water main piping.
B. Begin and terminate system at all connections to existing mains.
C. Install wire continuously along lower quadrant of pipe. Do not install wire along the bottom of pipe. Attach wire to pipe at midpoint of each pipe length; use two (2) inch wide ten (10) mil thickness polyethylene pressure sensitive tape.
D. Install splices only as authorized by Engineer. Allow Engineer to inspect all below grade splices of tracer wire prior to backfill.
E. Install ground rods adjacent to connections to existing piping and at locations shown on plans or as directed by Engineer.
F. Bring double run of wire to surface at each hydrant location and into tracer wire test station; connect to internal terminals.
G. Location of Tracer Wire Test Station: At each hydrant location, unless directed otherwise in the plans. Verify exact termination locations and method with local jurisdiction prior to proceeding.
H. Final inspection of the tracer system will be conducted at the completion of the project and prior to acceptance by the Owner and/ or City. Verify the electrical continuity of the system. Repair any discontinuities.

## 3.07 SPECIAL WATER ACCESSORIES INSTALLATION

A. Install all items listed under special water accessories per manufacturer recommendations.
B. For the installation of the drinking fountain, include valve box in concrete and insulate per manufacture recommendations.

## 3.08 CONFLICTS

A. Provide temporary support for existing gas, telephone, power or other utilities or services that cross trench.
B. Compact backfill under existing utility crossing as specified in Section 3010 - Trench and Backfill or construct utility line supports where indicated on plans or as directed by Engineer.
C. Separate water mains from gravity sewers by horizontal distance of at least 10 feet unless:

1. Bottom of water main is at least 18 inches above top of sewer.
2. Sewer is placed in separate trench or in same trench on bench of undisturbed earth with at least 3 feet separation from water main.

D. Use ductile iron pipe as specified in Section 4010, 2.01 G for gravity sewers with less than 10 feet horizontal distance and bottom of water main less than 18 inches above top of sewer; maintain at least 2 feet linear separation.
E. Where water main or service crosses under gravity sewer or where bottom of water main or service is less than 18 inches above top of sewer:
   1. If physical conditions prohibit the separation, the water main may not be placed closer than 6 inches above a sewer or 18 inches below a sewer. The separation distance shall be the maximum feasible in all cases.
   2. Use 20 feet length of ductile iron pipe as specified in Section 4010, 2.01 G for gravity sewer centered on water main.
   3. The water main and sewer must be adequately supported and have watertight joints (See Figures 3010.4-6).
   4. Backfill trench with low permeability soil for 20 feet length centered on crossing.
F. Separate water mains from sanitary sewer force mains by horizontal distance of at least 10 feet unless the force main is constructed of water main materials meeting minimum pressure rating of 200 psi and is installed at least 4 feet horizontally from the water main.

## 3.09 TRANSITIONS IN PIPING SYSTEMS

A. Where the specified material of piping system entering or exiting a structure changes, the change shall occur at the outside of the structure wall, beyond any wall pipe or wall fitting required, unless otherwise shown or specified.

## 3.10 STRUCTURE PENETRATIONS

A. Wall Pipes:
   1. Install where pipes penetrate and terminate at a wall or floor surface of a concrete structure, or where the pipe protrudes through the concrete wall or floor and the protrusion is otherwise unsupported.
   2. Provide a waterstop flange near the center of the embedment length. Waterstop is to be cast integrally with the wall pipe or fully welded to it around the pipe circumference.
B. Wall Sleeves:
   1. Install where a pipe passes through a structure wall.
   2. Sleeves in concrete walls are to be supplied with a waterstop collar, fully welded, and shall be cast in place in the concrete.

## 3.11 TESTING

A. Test in accordance with Section below regarding Testing.

## 3.12 FLUSHING

A. Method of flushing is subject to approval of Jurisdiction. Flush in accordance with the approved method under the supervision of the Jurisdiction.
B. Disinfection: According to Section below regarding Testing.

## 3.13 PROTECTION

A. Close pipe ends in trench securely when work is stopped. Install watertight plug in pipe end when work is stopped overnight or for longer periods.

## SUBPART B. VALVES, HYDRANTS & APPURTENANCES

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES

A. Butterfly valves.
B. Gate valves.
C. Tapping valve assemblies.
D. Fire hydrant assemblies.
E. Flushing devices (blowoffs).
F. Valve boxes.
G. Incidental items.

### 1.02 DESCRIPTION OF WORK

A. Install valves, hydrants, and appurtenances for water mains.
B. Reference is made to the Iowa Department of Transportation Standard Specifications for Highway and Bridge Construction, Series 2001, and all current General Supplemental Specifications and Materials Instructional Memorandum by the term "Iowa DOT Specifications" and/or "Iowa DOT I.M."

### 1.03 SUBMITTALS

A. Submit under provisions of Division 1.
B. Manufacturer′s instructions for installation for all valves, hydrants and assemblies.
C. Construction sequencing.
D. Catalog cuts, samples, manufacturer's data and listing of applicable standards for special, unique or proposed substitute materials if requested by Engineer.
E. Upon requests the Contractor will provide Material Certifications to the Engineer.

### 1.04 SUBSTITUTIONS

A. Use only materials conforming to these specifications unless permitted otherwise by Engineer.
B. Obtain written approval of Engineer for all substitutions in accordance with project front end documents.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver only materials that fully conform to these specifications, or for which submittals have been provided to Engineer and approved for use.
B. Store materials in a protected environment, on pallets or lagging.
C. Valves, hydrants and appurtenances contaminated with mud and surface water shall be removed from the site and not used in construction unless thoroughly cleaned, inspected and approved by Owner.
D. Handle all materials so as to avoid damage. Remove from the site and replace any damaged materials.

### 1.06 SCHEDULING AND CONFLICTS

A. Construction Sequence:
   1. Attend a preconstruction meeting if required by Engineer.
   2. Submit plan for construction sequence prior to commencing construction unless specifically not required by Engineer.

B. Conflict Avoidance:
   1. Expose possible conflicts In advance of construction, such as utility lines and drainage structures. Verify elevations of each and verify clearances for proposed construction.
   2. Complete elements of the work which can affect line and grade in advance of other open cut construction unless noted on plans.
   3. Notify Engineer of any conflicts discovered or any changes needed to accommodate unknown or changed conditions.

## 1.07 SPECIAL REQUIREMENTS

A. Stop Work: Stop work and notify Engineer immediately if contaminated soils, historical artifacts or other environmental or historic items are encountered.
B. Conform to local, state and federal requirements.

## 1.08 MEASUREMENT FOR PAYMENT

A. The project will be a lump sum bid and the contractor responsible for everything shown on the plans.
B. Butterfly Valve:
   1. Butterfly valve item includes all components attached to the valve or required for its complete installation, including but not limited to underground or above ground operator, square valve operating nut, valve box, valve box extension, extension shaft sufficient to position the valve operating nut within two feet and below the ground surface, hand wheels and incidental items.
C. Gate Valve:
   1. Gate valve includes all components attached to the valve or required for its complete installation, including but not limited to underground or above ground operator, square valve operating nut, valve box, valve box extension, extension shaft sufficient to position the valve operating nut within two feet and below the ground surface, hand wheels, and Incidental items.
   2. Count each gate valve of each size installed.
D. Tapping Valve Assembly:
   1. Unit includes tapping sleeve and all other components needed to complete the installation, and for successfully completing of the tap.
   2. Count each tapping valve assembly of each size installed.
E. Fire Hydrant Assembly:
   1. Fire hydrant includes the fire hydrant, with barrel extensions sufficient to achieve proper hydrant bury length of the unit.
   2. Count each fire hydrant installed.
   3. Components to connect the fire hydrant to the water main, including pipe, fittings and auxiliary valve, except tapping valve assembly if used, shall be considered to be integral parts of the fire hydrant assembly, and no separate or additional payment shall be made therefor.
F. Flushing Device (Blowoff):
   1. Each blowoff assembly includes the valve, fittings, and all pipe segments. Pipe used in the blowoff assembly shall not be paid for separately under any other item.
G. Valve Box:
   1. Each valve box shall include the lid and any extensions required extend from the valve to the ground surface.
   2. Valve box or extensions shall not be measured separately for payment unless identified separately in the Bid Schedule as a payment item. If so identified, measure each valve box, with extensions, if any, as a unit.
H. Incidental Items:
   1. Items required for proper completion of the work or required by applicable codes, and whether or not the items are shown in the Plans, but which are not shown in the Bid Schedule, shall be considered incidental to the contract.

2. No separate payment shall be made for incidental items.
3. Tracer wire termination per city standards is incidental.

## PART 2 - PRODUCTS

### 2.01 VALVES

A. General:
   1. Same size as pipeline in which it is installed, unless noted otherwise on drawings.
   2. Manufacturer′s name or initial and working pressure cast on valve body.
   3. Open when turned counterclockwise for most jurisdictions. If the contractor is not sure of the direction of opening of the valve, the contractor is to contact the Jurisdiction.
   4. Factory tested to twice the rated working pressure.
   5. Buried service: Mechanical joints, unless noted otherwise on Plans.
   6. Service within structure:
      a. Flanged, per ANSI/AWWA C110/A21.10.
      b. Flanges, drilled to conform to ASME/ANSI B16.1 class 125, unless noted otherwise on drawings.
   6. All valve operators to be supplied by valve supplier.
   7. Bolts for joints: Refer to Section A. Watermain.

B. Butterfly Valves, Buried Service:
   1. Type: Rubber seat.
   2. Pressure rating: 150 psi working pressure.
   3. Bubble- tight at rated pressures with flow in either direction.
   4. Comply with: ANSI/AWWA C504 class 150B.
   5. Body:
      a. Gray iron per ASTM A 126 class B.
      b. Two trunnions for shaft bearings.
   6. Ends:
      a. Flanged, with flange adapters, except as otherwise shown in the Plans.
      b. Flange adapter: Refer to Section 5010.
   7. Disc:
      a. Material: Ductile iron ASTM A 536 or gray iron ASTM A 126 class B, with plasma applied nickel-chromium edge or ASTM A 240, Type 316 stainless steel edge.
      b. Connection to shaft: Mechanically fixed stainless steel pins.
   8. Shaft:
      a. Material: Stainless steel, ASTM A 240, Type 304.
      b. Turned, ground and polished.
   9. Seat:
      a. Material: Synthetic rubber compound.
      b. Simultaneously molded in, vulcanized and bonded to body or mechanically retained.
   10. Bearings:
      a. Corrosion resistant non-metallic and self-lubricating, sleeve type.
      b. Bearing load: No greater than 1/5 the compressive strength of the bearing or shaft material.
   11. Packing: Self adjusting chevron type.
   12. Operator:
      a. Type: Buried service.
      b. Three bolt, minimum, mounting to valve.
      c. Hold valve in any intermediate position between fully open and fully closed without creeping or fluttering.
      d. Equipped with mechanical stop-limiting devices to prevent over-travel of the disc in the open and closed positions.
      e. Fully enclosed, gasketed and grease packed.

f. Designed to operate the valve under full rated working pressure with a maximum of 80 foot-pounds applied force.
g. Withstand an input of 450 foot-pounds at extreme operator position without damage.

13. Finish: In accordance with ANSI/AWWA C504.
14. Exposed bolts and hex nuts: Stainless steel.

C. Gate Valves, Buried Service:
1. Type: Non-rising stem, resilient seat.
2. Pressure rating: 200-psi working pressure, minimum.
3. Comply with: ANSI/AWWA C509.
4. Body, Bonnet and Discs: Gray iron per ASTM A 126 class B.
5. Ends: Mechanical connection, except as otherwise shown on the plans.
6. Seat: Field replaceable with stainless steel fasteners.
7. Shaft seals: Double O-rings permanently lubricated between seals. Lubricant certified for use in potable water.
8. Exposed bolts and hex nuts: ASTM A 240, Type 304 stainless steel.
9. Operator: 2-inch square nut.
10. Interior and exterior valve coating shall be minimum 10-mil thick fusion bonded epoxy per AWWA C550.
11. Valve design shall not allow metal-to-metal contact between gate and body.

D. Tapping Valve Assemblies:
1. Valve: Tapping valve conforming to ANSI/AWWA C509.
2. Sleeve:
a. Minimum 14 gauge.
b. Stainless steel, ASTM A 240, Type 304.
c. Working pressure 200 psi.
d. Must fully surround pipe.
e. Refer to table for minimum sleeve length
3. Gasket:
a. To completely surround pipe.
b. Minimum thickness 0.125 inch.
c. Material: nitrile rubber.
4. Outlet Flange:
a. Stainless steel, ASTM A 240, Type 304.
b. ANSI B16.1, 125 pound pattern.
5. Bolts: Stainless steel, ASTM A 240, Type 304.
6. Minimum sleeve length:

| Outlet Flange Size (Inches) | Minimum Sleeve Length (Inches) |
|---|---|
| 4 | 15 |
| 6 | 15 |
| 8 | 21 |
| 10 | 27 |
| 12 | 30 |
| Sizes over 12 inch | Consult Engineer |

7. Consult Engineer for applicability. Use tapping valve assemblies only where approved and authorized or shown on the plans.

## 2.03 APPURTENANCES

A. Flushing Device (Blowoff):
1. Construct according to Detailed Drawings for Temporary or Permanent unit. Refer to Plans for applicable type at each location.

2. Nominal size: Two pipe diameters less than the water main to which it is attached.
3. Locations: Where shown on the Plans.
4. Components: Pipe, gate or butterfly valve, valve box, tee, reducer, thrust block, elbow, pipe cap and miscellaneous fittings, all as specified elsewhere in these Specifications.

B. Valve Box:
1. Applicability: For all buried gate or butterfly valves.
2. Type:
   a. In paved areas; slide type.
   b. In all other areas; screw extension.
3. Material: Gray iron.
4. Cover: Gray iron, labeled "WATER"
5. Wall thickness: 3/16-inch, minimum.
6. Inside diameter: 5-inches, minimum.
7. Length: Adequate to bring top to ground surface.
8. Factory finish: Asphalt coating.
9. Installation to include valve box ring.

C. Incidental Items:
1. Valve Stem Extension: Provide for all buried valves. Raise 2-inch operating nut to within two feet of, but not closer than 6 inches of the surface. Stem diameter per valve manufacturer's recommendations, but not less than 1 inch.
2. Other Items: As required to complete the installation in accordance with the Plans.

## PART 3 - EXECUTION

### 3.01 GENERAL

A. Install only approved materials.
B. Install in accordance with the Plans, plumbing code, city code, and the Engineer′s instructions, as appropriate.
C. Test and disinfect all valves, hydrants, and appurtenances as components of the completed water main in accordance with Section 5030.
D. Apply polyethylene wrap to all iron pipe, valves, valve boxes, hydrants and fittings.
E. Set tops of valve boxes to finish grade unless otherwise directed by Engineer.
F. Check the working order of all valves by opening and closing through entire range. Before exercising the valve, check with Jurisdiction on operating requirements.

### 3.02 FLUSHING DEVICE (BLOWOFF)

A. Install where shown on the plans, in accordance with Figures 5020.2 and 5020.3.
1. Install gravel backfill.
2. Install thrust block, bearing on perpendicular excavation face of undisturbed earth.

B. Temporary locations to be used only where approved by Engineer. Temporary blowoff must be removed prior to project completion and acceptance.

### 3.03 FIRE HYDRANT

A. If auxiliary valve is positioned adjacent to water main, attach it to anchoring tee.
B. If auxiliary valve is positioned away from water main, restrain all joints between valve and water main.
C. Position auxiliary valve at least 15 inches (clearance) away from fire hydrant.
D. Fire Hydrant Depth Setting:
1. Use adjacent finish grade to determine setting depth.
2. Nozzle not less than 1′-6" nor more than 1′-11" above grade, measured from centerline of nozzle to grade. Adjust barrel length or add or remove extensions as required.

3. If finish grade is not to be obtained during the current project, consult with Jurisdiction Engineer for proper setting dimension.

E. Coordinate installation with tracer wire installation.
F. Refer to Figure 5020.1.
G. Orient fire hydrant nozzles as directed by Jurisdiction Engineer.

## SUBPART C. TESTING AND DISINFECTION

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES

A. Pressure and leak testing of water system.
B. Disinfection of potable water systems.

### 1.02 DESCRIPTION OF WORK

A. Test and disinfect water mains, valves, hydrants, and appurtenances.
B. Reference is made to the Iowa Department of Transportation Standard Specifications for Highway and Bridge Construction, Series 2001, and all current General Supplemental Specifications and Materials Instructional Memorandum by the term "Iowa DOT Specifications" and/or "Iowa DOT I.M."

### 1.03 SCHEDULING

A. Notify Engineer one working day in advance of testing or disinfection operations to coordinate the operations.
B. Engineer or his representative must be in attendance during testing or disinfection.

### 1.04 REGULATORY REQUIREMENTS

A. Conform to the standards of the Iowa Department of Natural Resources.

### 1.05 MEASUREMENT FOR PAYMENT

A. All measurements for payments will be made by the Engineer or authorized representative.
B. Testing and inspection of water systems is incidental to construction. Include the costs in the prices bid for pipe and fittings.

## PART 2 - PRODUCTS

### 2.01 DISINFECTION AGENT - CHLORINE

A. Meet Requirements:
   1. Calcium Hypochlorite, per ANSI/AWWA B300.
   2. Sodium Hypochlorite, per ANSI/AWWA B300.
B. Chlorine containers must have AWWA stamp.

## PART 3 - EXECUTION

### 3.01 SEQUENCE OF OPERATION

A. New Water System Construction: Perform operations in the following sequence:
   1. 1. Perform initial flush.
   2. 2. Make all service taps.
   3. 3. Perform pressure and leak testing.
   4. 4. Perform disinfection.
   5. 5. Flush after disinfection.

B. Water System Rehabilitation: Perform operations in the following sequence:
   1. 1. Perform initial flush.
   2. 2. Perform pressure and leak testing.
   3. 3. Perform disinfection.
   4. 4. Flush after disinfection.
   5. 5. Make all service taps.

C. Successfully complete each operation before commencing to the next operation.
D. Jurisdiction will provide reasonable quantities of water for flushing and testing.

### 3.02 PRESSURE AND LEAK TESTING

A. Remove any debris from within pipe. Clean and swab out pipe if required.
B. Secure any unrestrained pipe ends against uncontrolled movement.
C. Isolate new piping from the existing water system.
D. Fill and flush all new piping with potable water. Ensure that all trapped air is removed.
E. Pressurize the new pipe to the test pressure at the highest point in the isolated system. Do not pressurize to more than five psi over the test pressure at the highest point in the isolated system.
F. Test the completed piping system at 1½ times the system working pressure or 150 psi, whichever is greater, for two hours.
G. Monitor the pressure in the line for a period of not less than two hours.
H. If at any time during the test the pressure drops to five psi below the test pressure, repressurize the pipe by pumping in potable water in sufficient quantity to bring the pressure back to the original test pressure.
I. Accurately measure the amount of water required to repressurize the system to the test pressure.
J. Maximum Allowable Leakage Rate at 150 psi (not applicable at other pressures).

| Pipe Diameter (inches) | Maximum Allowable Leakage Rate, (gallons per hour per 1,000 feet of pipe) |
|---|---|
| 4 | 0.37 |
| 6 | 0.55 |
| 8 | 0.74 |
| 10 | 0.92 |
| 12 | 1.10 |
| 14 | 1.29 |
| 16 | 1.47 |
| 18 | 1.66 |
| 20 | 1.84 |
| 24 | 2.21 |
| 30 | 2.76 |
| 36 | 3.31 |

Note: For unusual conditions or for water lines shorter than 500 feet, consult Engineer for allowable leakage rate. The following formula shall apply:

$$L = \frac{(S)(D)(P)^{1/2}}{133{,}200}$$

Where:
L = leakage allowable, in gallons per hour.
S = length of pipe test section, in feet.
D = pipe diameter, in inches.
P = average test pressure, psig.

K. If the average measured leakage per hour exceeds the Maximum Allowable Leakage Rate, repair and retest the water line.
L. If the measured pressure loss does not exceed 5 psi the test will be considered acceptable.
M. Repair all visible leaks regardless of the amount of leakage.

## 3.03 INITIAL FLUSHING

A. Flushing:
   1. Flush pipe prior to disinfection using potable water.
   2. Use pitot tube to measure flushing velocity.
   3. Obtain a minimum flushing velocity of 2.5 feet per second in the pipe to be disinfected.
B. Minimum Flushing Rate:

| Pipe Diameter (inches) | Flow Rate for Flushing (gpm) | Pipe Diameter (inches) | Flow Rate for Flushing (gpm) |
|---|---|---|---|
| 4 | 100 | 16 | 1,600 |
| 6 | 220 | 18 | 2,000 |
| 8 | 390 | 20 | 2,500 |
| 10 | 600 | 24 | 3,500 |
| 12 | 870 | 30 | 5,500 |
| 14 | 1,200 | 36 | 8,000 |

C. Property Protection: Protect public and private property from damage during flushing operations.

## 3.04 DISINFECTION

A. General:
   1. Applicable standard: ANSI/AWWA C651.
   2. Disinfect only after satisfactory pressure testing has been completed.
   3. Keep piping to be chlorinated isolated from lines in service and from points of use.
   4. Coordinate disinfection with Engineer.
   5. Engineer will obtain and test water samples.
B. Disinfection:
   1. Induce flow of potable water through the pipe.
   2. Introduce highly chlorinated water to the pipe at a point within 5 pipe diameters of the pipe's connection to an existing potable system, or within 5 pipe diameters of a closed end, if there is no connection to an existing system.
   3. Introduce water containing 25 mg/L free chlorine minimum until the entire new pipe contains 25 mg/L free chlorine minimum.
   4. Retain chlorinated water in pipe for at least 24 hours and not more than 48 hours.
   5. If test is not successful, repeat disinfection procedure.

## 3.05 FLUSHING AFTER DISINFECTION IS COMPLETE

A. Maintain isolation of the new pipe from the existing potable water system until test results have been approved, but not less than 24 hours after flushing has been completed.
B. Flush pipe using potable water until chlorine residual equals that of the existing potable water system.
C. Discharge chlorinated water in a safe manner.
D. Disposal of heavily chlorinated water
   1. Check with the local sewer department for the conditions of disposal to the sanitary sewer.
   2. Chlorine residual of water being disposed will be neutralized by treating with one of the chemicals listed in Table C.1.

Table C.1 Amounts of chemicals required to neutralize various residual chlorine concentrations in 100,000 gal (378.5 $m^3$) of water*

| Residual Chlorine concentration | Sulfur Dioxide ($SO_2$) | | Sodium Bisulfite ($NaHSO_3$) | | Sodium Sulfite ($Na_2SO_3$) | | Sodium Thiosulfate ($Na_2S_2O_3 + 5H_2O$) | |
|---|---|---|---|---|---|---|---|---|
| *Mg / L* | *lb* | *(kg)* | *lb* | *(kg)* | *lb* | *(kg)* | *lb* | *Kg* |
| 1 | 0.8 | (.36) | 1.2 | (.54) | 1.4 | (.64) | 1.2 | (.54) |
| 2 | 1.7 | (.77) | 2.5 | (1.13) | 2.9 | (1.32) | 2.4 | (1.09) |
| 10 | 8.3 | (3.76) | 12.5 | (5.67) | 14.6 | (6.62) | 12.0 | (5.44) |
| 50 | 41.7 | (18.91) | 62.6 | (28.39) | 73.0 | (33.11) | 60.0 | (27.22) |

* Except for residual chlorine concentration, all amounts are in pounds (kilograms).

## 3.06 PUTTING WATER MAIN IN SERVICE

A. Obtain city approval to put the completed water system in service.

END OF SECTION

# SECTION 33 31 00

# SANITARY SEWERAGE PIPING

# RFB #923902-01

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES

A. Sanitary sewer drainage piping, fittings, accessories and bedding.
B. Connection of project sanitary drainage system to the municipal sanitary sewer system.
C. Clean-out and access structures.

### 1.02 RELATED DOCUMENTS:

A. The Contract Documents, as defined in Section 01 11 00 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

### 1.03 RELATED SECTIONS:

A. Section 31 23 33, Trenching and Backfilling.

### 1.04 REFERENCES

A. American Association of State Highway and transportation Officials (AASHTO):
   1. AASHTO M294 - Corrugated Polyethylene Pipe, 300-1200 mm Diameter.
   2. AASHTO M252 - Corrugated Polyethylene Drainage Pipe.
B. American National Standards Institute (ANSI):
   1. ANSI A21.14 - Ductile Iron Fittings, 3-Inch Through 24-Inch, for Gas.
C. American Society for Testing and Materials (ASTM):
   1. ASTM C 12 - Practice for Installing Vitrified Clay Pipe Lines.
   2. ASTM C 14 - Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
   3. ASTM C 76 - Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
   4. ASTM C 425 - Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
   5. ASTM C 443 - Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
   6. ASTM D 3034 - Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
   7. ASTM A 746 - Specification for Ductile Iron Gravity Sewer Pipe.
   8. ASTM C 700 - Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength and perforated.
   9. ASTM F 477 – Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

### 1.05 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

### 1.06 SUBMITTALS

A. Section 01 35 16 – Alteration Project Procedures: Procedures for submittals.
   1. Product Data: Data for each type of pipe and pipe accessory specified.
B. Section 01 78 00 - Closeout Submittals: Procedures for closeout submittals.
   1. Project Record Documents: Accurately record the following.

a. Actual locations of pipe runs, connections, manholes, cleanouts, and invert elevations.
b. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

### 1.07 QUALITY ASSURANCE

A. Regulatory Requirements: Perform work in accordance with utility company requirements and applicable health codes and authority having jurisdiction requirements.

## PART 2 - PRODUCTS

### 2.01 PIPE MATERIALS

A. All pipe and materials shall comply with the local jurisdiction's Plumbing Code and SUDAS.
B. Ductile Iron Pipe:
   1. Pipe: Class 52, conforming to AWWA C151/ANSI A21.51, inside nominal diameter as indicated on Drawings with bell and spigot end.
   2. Pipe Joint: AWWA C111/ANSI A21.11, rubber gasket joint devices.
C. Solid Wall Polyvinyl Chloride Pipe (PVC) 8 inch to 15 inch:
   1. Comply with ASTM D 3034, pipe stiffness per ASTM D 2412, minimum thickness solid wall pipe, SDR 23.5 (153 psi), 26 (115 psi), 35 (46 psi).
   2. PVC plastic meeting ASTM D 1784, Cell Classification 12454 or 12364. Do not exceed 10 parts by weight per 100 of PVC resin in the compound for additives and fillers, including but not limited to stabilizers, antioxidants, lubricants, and colorants.
   3. Integral bell and spigot joints with elastomeric seals complying with ASTM D 3212 and ASTM F 477.
D. Solid Wall Polyvinyl Chloride Pipe (PVC) 18 inch to 27 inch:
   1. Comply with ASTM F 679. Minimum pipe stiffness of 46 psi as per ASTM D 2412.
   2. PVC plastic meeting ASTM D 1784, Cell Classification 12454 or 12364. Do not exceed 10 parts by weight per 100 of PVC resin in the compound for additives and fillers, including but not limited to stabilizers, antioxidants, lubricants, and colorants.
   3. Integral bell and spigot joints with elastomeric seals complying with ASTM D 3212 and ASTM F 477.
E. Polyvinyl Chloride Composite Pipe (truss type PVC) 8 inch to 15 inch:
   1. Comply with ASTM D 2680 (composite pipe), minimum pipe stiffness 200 psi. Pipe constructed with truss-type structure between inner and outer PVC walls with voids filled with lightweight concrete.
   2. PVC plastic meeting ASTM D 1784, Cell Classification 12454. Do not exceed 10 parts by weight per 100 of PVC resin in the compound for additives and fillers, including but not limited to stabilizers, antioxidants, lubricants, and colorants.

### 2.02 PIPE ACCESSORIES

A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene ribbed gasket for positive seal.
B. Fittings: Mechanical Joint Cast Iron Fittings.
C. Trace Wire: Refer to Section 31 23 33 Part 3.11 for general tracer system requirements.
D. Pipe Markers: Aluminum Foil core for non-ferric metal detectable conductor, clear brightly colored plastic covered, imprinted with "SEWER SERVICE" in large letters.
E. Protect all ductile iron pipe and fittings with 8 mil polyethylene wrap conforming to AWWA C105/ANSI A21.5.

### 2.03 CLEANOUTS AND MANHOLES

A. Lid and Frame: Heavy duty cast iron with removable lid as indicated on Drawings.

B. Shaft Construction: Cast Iron shaft of internal diameter as indicated on Drawings with 3500 psi concrete collar for cleanouts.
C. Manhole pipe connections shall include flexible, watertight gasket cast integrally with barrel sections per ASTM C923.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

A. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
   1. Verify trench cut, excavations, dimensions, and elevations are as indicated on Drawings.
B. Report in writing to Contracting Officer prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
C. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

### 3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.
B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

### 3.03 BEDDING

A. Excavate pipe trench and place bedding material in accordance with Section 31 23 33 for work of this Section.
B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth, each layer. Place compacted bedding material to elevation of paving subgrade as indicated on Drawings.
C. Maintain optimum moisture content of bedding material to attain required compaction density.
D. Remove excess backfill and excavated material from site.

### 3.04 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM C 12, ASTM C 14, manufacturer's published instructions and state or local requirements. Seal joints watertight.
B. Install pipe on minimum 4 inch bedding as specified in Section 31 23 33.
C. Lay pipe to slope gradients indicated on Drawings.
D. Refer to Section 31 23 33 for trenching requirements. Do not displace or damage pipe when compacting.
E. Connect to building sanitary sewer outlet and municipal sewer system as indicated on Drawings.
F. Refer to Section 31 23 33 Part 3.11 for general tracer system requirements.

### 3.05 INSTALLATION - CLEANOUTS

A. Form bottom of excavation clean and smooth to elevation indicated on Drawings.
B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe to be placed at required elevations.
C. Mount lid and frame level in grout, secured to top section at elevation indicated.

## 3.06 SERVICE CONNECTIONS

A. Coordinate the Work with termination of sanitary sewer connection outside building including connection to municipal sanitary sewer system.
B. Connect to existing municipal sanitary sewer system in compliance with utility requirements for new service connections.

## 3.07 FIELD QUALITY CONTROL

A. Site Tests:
   1. Perform inspections prior to and immediately after placing bedding.
   2. Compaction: Specified in Section 31 23 33.
      a. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
      b. Frequency of Tests: One test for each 50 lineal feet of trench.
   3. Perform the following tests in accordance with applicable local Public Works Department Standard Specifications and requirements.
      a. Pressure Test.
      b. Infiltration Test
      c. Deflection Test

END OF SECTION

# SECTION 33 31 01

# SANITARY SEWER STRUCTURES

# RFB #923902-01

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES

A. Manholes for sanitary sewers.
B. Adjustment of existing manholes.
C. Connection to existing manholes.
D. Abandonment of manholes.
E. Existing Manhole Rehabilitation

### 1.02 DESCRIPTION OF WORK

A. Construct sanitary and storm sewer manholes, modify existing manholes, and abandon manholes where shown in the Plans.

### 1.03 SUBMITTALS

A. Submit under provisions of Division 1.
B. Shop drawings showing compliance with this Specification.
C. Shop drawing schedule of new manholes showing total depth, relative elevations of all connecting sanitary or storm sewer lines, all drops, and orientation of connecting lines.
D. Catalog cuts of iron castings and sewer line connection gaskets.
E. Upon requests the Contractor will provide Material Certifications to the Engineer.

### 1.04 SUBSTITUTIONS

A. Use only materials conforming to these specifications unless permitted otherwise by Engineer.
B. Obtain written approval of Engineer for all substitutions prior to use.
C. Precast sections meeting the requirements of ASTM C 478.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver only materials that fully conform to these specifications or for which submittals have been provided to Engineer and approved for use.
B. Store and handle materials to avoid damage. Replace any damaged materials. Remove damaged materials from the site.

### 1.06 SCHEDULING AND CONFLICTS

A. Construction Sequence:
   1. Attend a preconstruction meeting if required by Engineer.
   2. Submit plan for construction sequence and schedule prior to commencing construction.
B. Conflict Avoidance:
   1. Expose possible conflicts in advance of construction, such as utility lines and drainage structures. Verify elevations and locations of each and verify clearance for proposed construction.
   2. Complete elements of the work which can affect line and grade in advance of other open cut construction unless noted on plans.
   3. Notify Engineer of conflicts discovered or changes needed to accommodate unknown or changed conditions.

## 1.07 SPECIAL REQUIREMENTS

A. Stop work and notify Engineer immediately if contaminated soils, historical artifacts or other environmental or historic items are encountered.
B. Conform to local, state, and Federal requirements.
C. Sanitary Manholes and Castings:

1. Manhole Types:

| Type | Description | Main Pipe Size | Typical Depth |
|---|---|---|---|
| A | 48" Min. Dia. Barrel with Eccentric Cone and Integral Precast Base | See Table for Max. Dia. Pipe | No Limit |
| E | Poured-in-Place Box | 18" or Greater Dia. Pipe | 6' - 12' |
| F | Combination Poured in Place Manhole with 48" Dia. Riser and Eccentric Cone | 18" or Greater Dia. Pipe | 12' - 22' |
| I | 48" Dia. Barrel with Eccentric Cone and Poured in Place Base for Manhole Placement on Existing Sewer | 18" Max. Dia. Pipe without Engineer Approval | No Limit |
| J | 48" Dia. Barrel with Eccentric Cone and T-Section | 42" Dia. or Greater Eccentric Reducer Required | 8.5' Min. |

2. Ring and Cover Types:

| Type | Ring & Cover | No. of Pieces | Bolted Frame | Bolt Cover | Gasketed |
|---|---|---|---|---|---|
| A | Standard* | 2 | Yes | No | Yes |
| B | Adjustable** | 3 | No | No | Yes |
| C | Standard* | 2 | Yes | Yes | Yes |
| D | Adjustable** | 3 | No | Yes | Yes |

* Use when placed in earth fill, asphalt pavement, or ACC manhole boxout.
** Use when placed in PCC pavement or PCC manhole boxout.

## 1.08 MEASUREMENT FOR PAYMENT

All measurements for payments will be made by the Engineer or authorized representative.

A. Manhole: For each type and size of manhole required and furnished, measure manhole vertical dimension in feet from the flow line to the top of the ring casting. Payment shall be at the unit bid price for each type and size of manhole properly installed. The unit bid price for manholes shall include all bedding, backfill, compaction and all appurtenances including castings and lids necessary for the proper installation.
B. Drop Connection: Measure vertical feet of drop, from the flow line of the incoming sewer to the flow line of the drop at its entry into the manhole, for each size of sewer line. Payment shall be at the unit bid price for vertical feet of drop per size of sewer line.
C. Manhole Adjustment, Minor: Removal or addition of Manhole adjusting rings are considered an incidental item to manholes, unless otherwise specified as a pay item in the contract documents. If specified as a pay item, it shall be at the unit price bid for each adjustment. If so specified, count the number of manholes adjusted to finished grade by raising or lowering an adjustable casting or by addition or removal of manhole adjusting rings.
D. Manhole Adjustment, Major: Count the number of manholes adjusted to grade by addition or removal of manhole barrel, cone or flat top sections, or the exchange of existing sections with sections having revised vertical dimensions. Count separately the cast in place manholes that will require removal of concrete to accommodate adjustment. Payment shall be at the bid price for each major adjustment.

E. Connection to Existing Manhole: Count the number of connections made to existing manholes. Payment shall be at the unit bid price for each connection.
F. Abandoned Manhole: Count the number of manholes abandoned in place. Payment shall be at the unit bid price for each abandoned manhole. (NOTE: Refer to Section 6020, 3.05 for removal of manholes.)

## PART 2 - PRODUCTS

### 2.01 MANHOLES

A. Placement: Conform to elevations, locations and connection orientations shown on the Plans and detailed drawings.
B. Barrel Diameter, Inside: For sewers up to 24-inch size with two connections use 48 inches diameter barrel or as shown in the contract documents. For larger sewers or more connections, see Plans and detailed drawings.
C. Wall Thickness: See Detail Plates
D. Coating: Exterior: when exterior waterproof coating is specified, provide bituminous or coal tar coating.
E. Top Configuration: Eccentric top except as noted on the Plans or detailed drawings. Total manhole depth 6 feet or more use cone top section. Total manhole depth less than 6 feet use minimum 9" thick flat top.
F. Joints, Barrel: Male and female ends.
    1. Seals, rubber 'O' ring or profile gasket, flexible joint, per ASTM C 443.
    2. Apply Bituminous joint compound or butyl sealant wrap meeting ASTM C 877 to all exterior joints.
    3. Provide tapered rubber lift hole plug manufactured of SBR with a minimum tensile strength of 800 psi and 80 durometer + or –5.
    4. Provide non-shrink grout to cover lift hole plug and to fill interior joints.
G. Concrete: Precast: Comply with ASTM C 478.
H. Base: Precast manhole: Integral base and riser section in accordance with ASTM C 478.
I. Pipe Connection:
    1. New Sanitary Sewer Manhole:
        a. Flexible, watertight gasket per ASTM C 923 cast integrally with riser section(s).
        b. Drop connection where required on Plans. See also Detailed Drawings.
        c. When specified, coat interior per 4010, 2.01 F, 5, 6, 8, 9, 10.
        d. Grout internal joint space: non-shrink grout.
    2. Existing Sanitary Manhole:
        a. Cored or drilled opening: Provide a flexible, watertight connection that meets and/or exceeds ASTM C 923.
        b. Knock out opening:
            1) Provide a watertight connection (waterstop or other method), meeting the material requirements of ASTM C 923, that is securely attached to the pipe with stainless steel bands or other means.
            2) Grout opening in manhole wall with non-shrink grout.
            3) Pour concrete collar around pipe and outside manhole opening.
            4) Provide flexible pipe joint or flexible connector within 2' of collar.

J. Manhole Steps: None, unless required on the Plans. If required, space steps at 12 to 16 inches, comply with ASTM C 478. Align with vertical side of eccentric cone top section.

### 2.02 MANHOLE ADJUSTMENT RINGS (Grade rings)

A. All grade adjustments of manhole frame and cover assemblies shall be completed utilizing one of the following:

1. Reinforced Concrete Grade Adjustment Rings: Comply with ASTM C 478 and be free from cracks, voids and other defects. Concrete rings will be set with asphalt mastic.
2. High Density Polyethylene Grade Adjustment Rings: Comply with ASTM D 1248 for recycled plastic.
   a. Material properties shall be tested and certified for usage by the following ASTM methods:

| Property | Test Method | Acceptable Value |
|---|---|---|
| Melt Flow Index | ASTM D 1238 | 0.3 to 30 g / 10 min. |
| Density | ASTM D 792 | 0.94 to 0.98 g / $cm^3$ |
| Tensile Strength | ASTM D 638 | 2.00 to 5 x $10^3$ lb / $in^2$ |

   b. Polyethylene adjusting rings shall not be used when they are exposed to heated hot mix asphalt pavement.
   c. Tapered configuration: When used in a single configuration tapered adjusting ring thickness will range from 0.5 inch to 3.0 inch.
   d. Grade adjustment rings are to be installed on clean flat surfaces according to the manufacturer's recommendations with the proper Butyl Rubber sealant/adhesives.

B. The inside diameter of the adjustment ring shall not be less than the inside diameter of the manhole frame.
C. Manholes shall be constructed with at least two adjustment rings.
D. Maximum height of adjustment ring stack: 12 inches max. for new manholes and 16 inches max. on existing manholes.

**2.03 CASTINGS (Ring and Cover)**

A. Gray Cast Iron: ASTM A 48, Class 35.
B. Sanitary Sewer Manhole Ring and Covers:
   1. Refer to Plans for locations of types.
   2. Machined bearing surfaces.
   3. All covers must be gasketed.
   4. Grassed areas not subject to flooding: Type A.
   5. Grassed areas subject to flooding, bolted down cover: Type C.
   6. Paved areas, sidewalks, and areas subject to vehicular traffic and not subject to flooding or in sloped paved areas use cover: Type B.
   7. Paved areas, sidewalks, and areas subject to vehicular traffic and flooding or in sloped paved areas subject to flooding, use bolted down cover: Type D.

**2.04 CHIMNEY SEAL (Required on all Sanitary Sewer Manholes)**

A. External Seal:
   1. Rubber Sleeve and Extension:
      a. Corrugated, minimum thickness of 3/16 inches, per ASTM C 923.
      b. Minimum vertical unexpanded length of 6 and 9 inches with allowable vertical expansion of at least 2 inches.
      c. Top section of sleeve shall contain multiple sealing fins to extend both over and under the manhole frame's base flange. Bottom section of sleeve shall contain an integrally formed compression band recess with multiple slaking fins.
      d. Top section of extension to be shaped to fit into the bottom band recess of the sleeve. Bottom section of extension shall contain an integrally formed compression band recess with multiple sealing fins.
   2. Compression Bands:

a. One piece band assembly to compress sleeve or extension against manhole surface.
b. Material 16 gauge ASTM A 240 Type 304 stainless steel, minimum 1 inch width, minimum adjustment range of 4 diameter inch.
c. Top band shaped to lock sleeve to manhole frame's base flange.
d. Stainless steel fasteners, ASTM F 593 and 594, Type 304.

B. Internal Seal:
1. Rubber sleeve and extension:
a. Double pleated, minimum thickness 3/16 inch thick, per ASTM C 923.
b. Minimum vertical unexpanded length of 8 and 10 inches with allowable vertical expansion of at least 2 inches.
c. Integrally formed expansion band recess top and bottom with multiple sealing fins.
d. Top section of extension shaped to fit bottom band recess of the sleeve. Bottom section of extension shall contain an integrally formed expansion band recess with multiple sealing fins.
2. Expansion Bands:
a. One-piece band assembly to compress sleeve or extension against manhole surfaces.
b. Material 16 gauge ASTM A 240 Type 304 stainless steel, minimum 1 3/4 inch width, minimum adjustment range of 2 inches.
c. Locking mechanism of studs and nuts used to be stainless steel conforming to ASTM F 923 & 594, Type 304.

## 2.05 INVERT

A. Poured in place concrete. Shape to provide a smooth transition between pipe inverts. Bring manhole invert up to one half of pipe diameter to produce a half pipe shape. Slope invert bench toward pipe 1/4 inch per foot perpendicular to flow line.

# PART 3 - EXECUTION

## 3.01 MANHOLE INSTALLATION

A. Manhole Chimney
1. Install internal or external rubber chimney seal in accordance with Section 6020, 3.04.
2. Aromatic Flexible Urethane Seal:
a. Surface Preparation shall be in accordance with the manufacturer’s recommendations and shall include sandblasting, pressure washing, sealing leaks or gaps, and drying surface.
b. Apply primer, prepare product and apply in accordance with manufacturer’s recommendations.

B. Subgrade Preparation:
1. Undisturbed soil: Hand grade to accurate elevation.
2. Disturbed soil: Machine compact to 95 percent of Standard Proctor Density and hand grade to accurate elevation or install stabilization material as directed by Engineer.

C. Installation of Poured In Place Base: Sanitary sewers: embed base riser in base slab 3 inches, minimum. Assure proper vertical and horizontal alignment of base riser section.
D. Installation of Precast Base with Base Riser: Assure proper vertical and horizontal alignment of base riser section.
E. Additional Risers: Install additional riser sections as required. Grout inside face of joints.
F. Repair: Repair any honeycomb areas or damaged areas as directed by Engineer.
G. Backfill up to pipe grades. Connect and bed pipes using bedding material up to one foot above top of pipes.
H. Sanitary sewers: Grout inside pipe/manhole joint. Install rubber plug and grout over manhole lift holes.
I. Install manhole invert. Remove any projections and repair any voids to assure a hydraulically smooth channel between pipe ends.

J. Install manhole top slab or cone.
K. Install manhole adjustment rings. Bed each ring with cold-applied bituminous jointing compound. Do not install more than total ring stack height of 12 inches. For greater adjustment, modify barrel riser section(s).
L. Install manhole ring and cover. Adjust accurately to proper grade. Where manhole is to be in a paved area, adjust slope to match finished surface.
M. Install chimney seal: Install chimney seal per manufacturer's recommendations on sanitary sewer manholes.
N. Seal Manhole Joints: Apply bituminous joint compound or butyl sealant wrap to exterior of sanitary sewer manholes joints.
O. Backfill and compact. Refer to Section 2322. Use extra care to assure proper and uniform compaction of backfill around structure.

## 3.02 MODIFICATION OF EXISTING MANHOLES

A. Minor Adjustment: adjustment by adding or removing adjusting rings:
   1. Add adjustment rings if necessary, up to a total ring stack height of 16 inches to adjust existing manhole to finished pavement grade or finished topsoil grade. Bed each ring with cold applied bituminous jointing material.
   2. Remove one or more adjustment rings, as appropriate to reduce casting elevation.
   3. Replace castings. Install new frame and cover for manholes located within new full depth pavement: use adjustable frame and cover as specified.
   4. Replace chimney seal for sanitary sewer manholes using only new materials.
   5. Refer to Section 2751 and 2741 for additional manhole adjustment requirements in pavement.
B. Major Adjustment: adjustment by adding or removing barrel or cone sections
   1. Remove castings.
   2. Remove top.
   3. Modify barrel riser or modify type of top section, as appropriate, or both.
   4. Replace castings. Install new frame and cover for manholes located within new full depth pavement. Use an adjustable frame and cover as specified.
   5. Replace chimney seal for sanitary sewer manholes using only new materials.

   Connection to Existing Manhole: Unless otherwise specified in the contract documents, or approved by the Engineer, all new openings in existing manholes shall be cored.
   1. Excavate as appropriate. Mark manhole barrel for point of insertion of added sewer line.
   2. Divert flow as necessary. Maintain sewer service at all times unless otherwise permitted by Engineer.
   3. Carefully cut and chip or core out opening to manhole. Remove existing manhole invert as necessary to install pipe at required elevation and develop hydraulic channel.
   4. Cored opening:
      a. Insert flexible watertight connector into new opening.
      b. Install and tighten internal expansion sleeve to hold flexible connector in place.
      c. Insert pipe through flexible connector and tighten external compression ring.
      d. Do not grout opening or pour collar for cored opening with flexible connector.
   5. Cut and chipped opening (knockout): When allowed, refer to Figure 6020.21
      a. Install waterstop around outside of pipe. Secure in place.
      b. Position end of pipe flush with interior wall of manhole and with waterstop located within wall opening.
      c. Grout opening between manhole wall and outside of pipe with non-shrink grout.
      d. Pour concrete collar around pipe and exterior manhole opening.
   6. Reconstruct manhole invert.
   7. Bed pipe and backfill per Section 2322.

### 3.03 CHIMNEY SEALS (Required on All Sanitary Sewer Manholes)

A. Install internal chimney seal if manhole is to be under pavement or, if not under pavement, is set more than 3 inches above final grade or subject to movement.
B. Install external chimney seal if manhole is not to be under pavement except as noted in 3.04 A.
C. Install seals on a smooth sealing surface. Seals to extend from the flange of the manhole frame to 3 inches below the adjusting ring, use multiple seals, if necessary. Install compression bands (external chimney seal) or expansion bands (internal chimney seal) to lock the rubber sleeve or extension into place and to provide a positive watertight seal. Once tightened lock into place. Use only manufacturer recommended installation tools and sealants.

### 3.04 ABANDONED MANHOLES

A. Remove top and walls of structure to a minimum of 10 feet below subgrade in paved areas or 10 feet below finish grade in other areas.
B. Plug all pipes in structure using 3,000 psi concrete.
C. Fill remaining structure using flowable mortar.
D. Place compacted earth fill over structure as required for embankment or compacted backfill.

END OF SECTION

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**SECTION 33 40 00**

**STORM SEWER AND DRAINAGE**

**RFB #923902-01**

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES

A. Storm Sewers.
B. Subdrains.
C. Footing Drain Sewer Collectors.
D. Storm Sewer Service.

### 1.02 DESCRIPTION OF WORK

A. Construct storm sewers, subdrains, and footing drain collectors.
B. Construct storm sewer service and connections.
C. Reference is made to the Iowa Department of Transportation Standard Specifications for Highway and Bridge Construction, Series 2012, and all current General Supplemental Specifications and Materials Instructional Memorandum by the term "Iowa DOT Specifications" and/or "Iowa DOT I.M."

### 1.03 SUBMITTALS

A. Submit under provisions of Division 1.
B. Manufacturer′s instructions for installation of pipe and appurtenances.
C. Construction sequence.
D. Catalog cuts, samples, manufacturer′s data, and listing of applicable standards for special, unique, or proposed substitute materials if requested by Engineer.
E. Certification that materials being provided meet the requirements of these specifications or that alternate materials or substitutions have received written approval of the Engineer.
F. Project Record Documents.
G. Upon requests the Contractor will provide Material Certifications to the Engineer.

### 1.04 SUBSTITUTIONS

A. Use only materials conforming to these specifications unless permitted otherwise by Engineer.
B. Obtain written approval of Engineer for all substitutions prior to use.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver only materials that fully conform to these specifications or for which submittals have been provided to Engineer and approved for use.
B. Store materials and handle to avoid damage. Replace any damaged materials. Remove damaged materials from site.

### 1.06 SCHEDULING AND CONFLICTS

A. Construction Sequence:
   1. Attend a preconstruction meeting if required by Engineer.
   2. Submit plan for construction sequence and schedule prior to commencing construction.
B. Conflict Avoidance:

1. Expose potential conflicts such as utility lines and drainage structures in advance of construction. Verify elevations and locations and verify clearance for proposed construction.
2. Complete elements of work that can affect line and grade in advance of storm sewer construction unless noted on plans.
3. Notify Engineer of conflicts discovered or changes needed to accommodate unknown conditions.

## 1.07 SPECIAL REQUIREMENTS

A. Stop Work: Stop work and notify Engineer immediately if contaminated soils, historical artifacts or other environmental or historic items are encountered.
B. Conform to local, state and federal requirements.

## 1.08 MEASUREMENT FOR PAYMENT

A. All measurements for payments will be made by the Engineer or authorized representative.
B. Storm Sewers and Subdrains:
   1. Measurement of pipe, except aprons, will be in linear feet along centerline of pipe in place.
   2. Measurement of each size and type of pipe installed will be from end of pipe to end of pipe.
   3. Payment will be made at the unit bid price for each size and type installed.
C. Incidental Items:
   1. Items that are not listed as specific bid items, but are required for proper completion of the work, are incidental to construction. Pipe testing is incidental.
   2. Incidental items may or may not be shown on plans.
   3. No payment shall be made for incidental items.

# PART 2 - PRODUCTS

## 2.01 STORM SEWERS

A. Reinforced Concrete Pipe (RCP):
   1. Conform to ASTM C 76.
   2. Minimum Class III, Wall B.
   3. Tongue and groove joints.
      a. Use cold applied bituminous jointing materials, unless otherwise specified.
      b. If specified, use rubber O-ring flexible joint conforming to ASTM C 443.
   4. If specified, wrap exterior of each joint with engineering fabric.
B. Polyvinyl Chloride Pipe (PVC):
   1. Use pipe conforming to the following:
      a. Minimum pipe stiffness of 46 psi.
      b. ASTM F 949, corrugated exterior, smooth interior; ASTM D 3034, solid wall PVC; ASTM F 679, solid wall PVC (up to 27 inches).
      c. Gasketed integral bell and spigot joints per ASTM D 3212 and ASTM F 477.
   2. Do not use in right-of-way.
   3. Use only outside of right-of-way in public utility easement areas where no utilities exist or are proposed (running parallel or crossing) or where the trench for the PVC pipe will not be disturbed, and where the Engineer allows.
C. High Density Polyethylene (HDPE): N-12 PIPE: PIPE SHALL BE ADS N-12 MEGA GREEN.
   1. Pipe shall consist of smooth interior and annular exterior corrugations.
   2. 4- through 10-inch (100 to 250 mm) shall meet ASTM F2648(virgin/recycled material),Type S.
   3. 12- through 60-inch (300 to 1500 mm) shall meet ASTM F2648 (virgin/recycled resins), Type S.
   4. Use only fittings supplied or recommended by pipe manufacturer for soil tight service.

5. Only use outside of Public Right of Way where allowed by jurisdiction.

D. Bituminous Jointing Material:
   1. Use with RCP, RCAP, and RCEP, unless indicated otherwise on plans.
   2. Use a cold applied mastic sewer joint sealing compound recommended by the manufacturer for the intended use and approved by the Engineer. Supply in either rope form or flat type form or suitable for trowel application. Meet the requirements of AASHTO M 198.

E. Bituminous Joint Primer: Meet the requirements of ASTM D 41, which is intended for use in priming concrete pipe joints prior to application of bituminous jointing material.

F. Engineering Fabric:
   1. Use for wrapping exterior of storm sewer pipe joints where indicated on plans.
   2. Use Iowa DOT 4196.01B fabric for use in subsurface drains.

G. Reinforced Concrete Apron:
   1. Use where indicated on plans.
   2. Use pipe conforming to ASTM C 76.
   3. Strength not less than adjoining pipe sections.

H. Apron Guard:
   1. Use where indicated on plans.

## 2.02 SUBDRAINS

A. Polyvinyl Chloride Pipe and Fittings (Solid Wall PVC):
   1. Conform to ASTM D 3034, minimum thickness SDR 35, 46 psi minimum pipe stiffness.
   2. PVC plastic according to ASTM D 1784, Cell Classification 12454.
   3. Integral bell and spigot type rubber gasket joint conforming to ASTM D 3212 and ASTM F 477.
   4. Fabricated or preformed saddle wye or saddle tee for service tap conforming to AASHTO M 252 or M 294.
   5. Slot subdrain pipe according to ASTM F 949 or perforate with four rows of 1/4 inch to 3/8 inch diameter holes along the bottom of the pipe.

B. Polyvinyl Chloride Corrugated Pipe and Fittings (Corrugated PVC):
   1. Corrugated exterior, smooth interior, PVC.
   2. Conform to ASTM F 949, minimum pipe stiffness, 46 psi.
   3. PVC plastic according to ASTM D 1784, Cell Classification 12454.
   4. Integral bell and spigot type rubber gasket joint conforming to ASTM D 3212 and ASTM F 477.
   5. Slot subdrain pipe according to ASTM F 949.

C. Polyethylene Corrugated Tubing (Corrugated PE):
   1. Conform to AASHTO M 252, Type C, corrugated interior and exterior or Type S, corrugated exterior, smooth interior.
   2. Use only fittings supplied or recommended by pipe manufacturer for soil tight service.
   3. Perforated with slots conforming to AASHTO M 252, Type CP, or Type SP.

D. Aggregate Backfill: Conform to State of Iowa Department of Transportation Standard 4131, Porous Backfill Material; Crushed stone or gravel meeting Iowa DOT Gradation No.29.

E. Engineering Fabric: Use fabric conforming to Iowa DOT 4196.01B.

# PART 3 - EXECUTION

## 3.01 EXAMINATION

A. Verify measurements at site; make necessary field measurements to accurately determine pipe makeup lengths or closures.

B. Examine site conditions to ensure construction operations do not pose hazards to adjacent structures or facilities.

## 3.02 LINE AND GRADE

A. Install pipe to line and grade shown on plans. Set field grades to invert of pipes or culverts.
B. Notify Engineer immediately if discrepancies or irregularities are discovered in line or grade shown by grade stakes.
C. Make detailed measurements as required to construct work to line and grade established by line and grade hubs.
D. Batter Boards:
   1. Set grade points at 25-feet intervals at convenient offset from centerline of pipe or culvert.
   2. Set batter boards as necessary to construct to design line and grade.
   3. Provide at least three batter boards at all pipe laying areas during construction as check on accuracy of grades.
   4. Check line and grade of each pipe length with grade rod and plumb bob.
E. Laser Beam:
   1. Set laser equipment to proper line and grade from line and grade hubs.
   2. Check line and grade of laser at 25-feet intervals for first 100 feet and then at 50-feet intervals for each setup.
   3. Check line and grade of each pipe length.
F. Correct Misalignment: Correct misalignment, displacement, or otherwise defective pipe by removing, relaying, or replacing pipe at Contractor′s expense.

## 3.03 PIPE INSTALLATION

A. Provide trench excavation, pipe bedding, and backfill as specified in Section 31 23 33.
B. Provide proper facilities for lowering the sections into place without damaging the pipe.
C. Begin at lowest point in line. Lay groove or bell end point upstream unless specifically noted otherwise.
D. Prepare trench bottom to design line and grade so only minor movement of pipe is necessary after installation.
E. Inspect pipe for defects before carefully lowering into trench. Do not install damaged or defective pipe.
F. Clean pipe interior and joints prior to lowering into trench. Keep pipe clean during construction.
G. Do not lay pipe in water or on saturated soil or bedding. Do not allow water to rise in trench around pipe.
H. Place pipe with lifting holes at the top of the pipe and fill lift hole with non-shrink grout or manufactured plugs.
I. Lay pipe to design line and grade.
J. Provide uniform bearing for full pipe barrel length.
   1. Excavate bell holes as necessary for uniform support of pipe barrel on bedding material.
   2. Do not block pipe above bedding.
K. Assemble joints as specified.
L. Protect exposed upstream ends of pipe to prevent soil sediment from entering storm sewer system with the watertight stopper, cap, or plug.
M. Do not disturb installed pipe and bedding when using movable trench boxes and shields. Block or anchor pipe as necessary to prevent joint displacement.
N. Saw cut ends of pipe at manholes, intakes, and structures. Do not hammer cut or break pipe.
O. Provide manholes and intakes where indicated on plans and as specified.

## 3.04 PIPE JOINTING

A. Joint Cleaning: Clean joint surfaces with wire brush to remove soil or foreign material prior to jointing pipe.
B. Assemble Joints According to Pipe Manufacturer′s Recommendations:
   1. Use equipment that does not apply damaging forces to pipe joints.
   2. Use bar and block or internal or external jointing devices or other methods recommended by pipe manufacturers.

C. RCP, RCAP, and RCEP:
   1. Use cold applied bituminous jointing materials unless otherwise specified.
      a. Apply joint material to entire tongue or to top half of tongue and bottom half of groove, in sufficient quantity to fill joint; close joint between pipes.
      b. Fill remaining voids in joint both inside and outside of pipe with joint material; smooth joint material on inside of pipe 24 inches and larger.
   2. If rubber O ring is specified, coat rubber ring gasket and joint with soap based lubricant immediately prior to closing joint.
   3. If wrapped pipe joint is specified,
      a. Secure engineering fabric in place to prevent displacement during backfill operations.
      b. For combination storm sewer/subdrain or Type II subdrain, do not use joint sealant.
   4. Joint openings on the outside or inside of the pipe that do not exceed 1/8 inch at the bottom and 5/8 inch at the top are acceptable.
   5. Fully encase large joint openings, unless required for camber, with a Type II concrete collar (see Figure 4020.1A). Use Class C structural concrete.
D. RCPP: Coat rubber ring gasket and joint with soap based lubricant immediately prior to closing joint.
E. CMP and CMAP:
   1. Install coupling bands that match ends of pipes.
   2. End of coupling bands must lap or be fabricated to form tightly closed joint upon installation.
F. PVC Pipe and Corrugated PVC Pipe: Coat rubber gasket and joint with soap based lubricant immediately prior to closing joint.
G. High Density Polyethylene (HDPE): Coat rubber gasket and joint with soap based lubricant immediately prior to closing joint.
H. High Density Polyethylene (HDPE): N-12 MONSTER GREEN PIPE:
   1. Fittings shall conform to ASTM F2648.
   2. Joints shall be N12 ST IB (Soil Tight)
      a. Join pipes with bell & spigot joint meeting ATSM F2648.
      b. Soil Tight gaskets shall meet the requirements of ASTM F477.
      c. Gaskets shall be installed by pipe manufacturer and covered with removable wrap to ensure gasket is free of debris.
      d. Joint lubricant available from manufacture shall be used on the gasket and bell during assembly
I. Connections between Dissimilar Pipes:
   1. Use manufactured adapters or couplings approved by Engineer.
   2. Where adapters or couplings are not available, Engineer may authorize use of concrete collar.

## 3.05 PIPE END SECTIONS

A. Provide reinforced concrete or metal pipe aprons where indicated on plans.
B. Install footings with aprons according to figure, if required.
C. Anchor last three pipe sections and aprons together with two pipe connections per joint.
D. Install apron guard where indicated on plans.

## 3.06 SUBDRAINS AND TRENCH DRAINS

A. Provide subdrain where indicated on plans.
B. Provide trench drains where indicated on plans.
C. If specified, install engineering fabric.

## 3.07 FOOTING DRAIN COLLECTOR

A. Install footing drain collector per Section 31 23 33.
B. If specified, install engineering fabric.
C. Provide cleanouts and connections.

1. Connect footing drain sewer collectors to storm sewer manhole or intake.
2. Provide fabricated or preformed wye or tee service fitting for each platted lot or building.

D. Provide manholes, if specified.

### 3.08 STORM SEWER SERVICE STUBS

A. Provide storm sewer service connection and line from storm sewer or footing drain sewer for each platted lot or building as shown on plans.
B. Use fabricated or preformed saddle wye or saddle tee for service tap to storm sewers. Clamp with two stainless steel clamps and install according to the manufacturer′s recommendations.
C. Extend storm sewer service from storm sewer or footing drain collector to 10 feet outside of the right-of-way line or as shown on the plans.
D. Place watertight stopper or plug in end of storm sewer service.

### 3.09 TOLERANCES

A. Horizontal and vertical alignment of gravity sewer lines shall not vary from design line and grade at any point along the pipe by more than 1% of the inside diameter of the pipe or 1/4 inch, whichever is larger.
B. Tolerance allowed only if design line and grade is sufficient to prevent backslope when tolerance limits are reached.
C. Reverse slope on pipe is prohibited.

### 3.10 CONFLICTS

A. Provide temporary support for existing water, gas, telephone, power, and other utilities or services that cross trench.
B. Compact backfill under existing utility crossing as specified in 3123 33 or construct utility line supports where indicated on plans or as directed by Engineer.

### 3.11 STORM SEWER ABANDONMENT

A. When sewers are to be abandoned, standard sewer plugs shall be placed. Prior to placing the plug, ensure the line is not in use. If noted on the plans, fill the line with gravity flow or pump the line full of flowable mortar or controlled low strength material.

### 3.12 CLEANING

A. Clean all storm sewers by flushing with water and by removing sheeting, bracing, shoring, forms, soil sediment, concrete, or other debris as directed by Engineer prior to final acceptance.
B. Do not discharge soil sediment or debris to drainage channels or existing storm sewer or sanitary sewer systems.

## PART 4 - TESTING

### 4.01 DESCRIPTION OF WORK

A. Test and inspect storm sewers, culverts, footing drain sewers and building storm sewers.

### 4.02 SCHEDULING

A. Notify Owner’s Representative when installation is complete and ready for testing.
B. Notify Owner’s Representative at least 24 hours prior to performing testing.
C. Owner’s Representative must be present to review testing procedures and to record results.

## 4.03 TESTING EQUIPMENT

A. Conform with applicable sections of ASTM.
B. Conform to other applicable industry standards and codes.

## 4.04 VISUAL INSPECTION

A. Check each section of storm sewer by lamping.
B. Light should be visible through section of pipe lamped.
C. Visually inspect each section of pipe.
D. Repair or replace defective pipe or joints or remove and relay pipe not meeting alignment tolerances as directed by Engineer.

## 4.05 DEFLECTION TESTING

A. Perform deflection tests on all HDPE storm sewer pipe 12" diameter or greater.
B. Perform deflection tests after backfill has been in place at least 30 days and before paving activity takes place or as per appropriate sections of these specifications.
C. Pipe deflection shall not exceed 5% of average inside diameter as established by ASTM Standards.
D. Pull approved 9-arm deflection mandrel through sewer by hand.
E. Approved mandrel must conform to applicable ASTM Standards.
F. Remove and replace pipe exceeding deflection limits.
G. Handle and divert existing flows during deflection testing.

END OF SECTION

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# SECTION 33 49 00

# STORM DRAINAGE STRUCTURES

# RFB #923902-01

**SUBPARTS:**

- **A. MANHOLES**
- **B. INTAKES**
- **C. CAST-IN-PLACE**
- **D. NYPLOPLAST INTAKE SUBSTITUTES**

## SUBPART A. MANHOLES

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES

A. Manholes for storm sewers.
B. Adjustment of existing manholes.
C. Connection to existing manholes.
D. Abandonment of manholes.

### 1.02 DESCRIPTION OF WORK

A. Construct storm sewer manholes, modify existing manholes, and abandon manholes where shown in the Plans.

### 1.03 SUBMITTALS

A. Submit under provisions of Division 1.
B. Shop drawings showing compliance with this Specification.
C. Shop drawing schedule of new manholes showing total depth, relative elevations of all connecting sanitary or storm sewer lines, all drops, and orientation of connecting lines.
D. Catalog cuts of iron castings and sewer line connection gaskets.
E. Upon requests the Contractor will provide Material Certifications to the Engineer.

### 1.04 SUBSTITUTIONS

A. Use only materials conforming to these specifications unless permitted otherwise by Engineer.
B. Obtain written approval of Engineer for all substitutions prior to use.
C. Precast sections meeting the requirements of ASTM C 478.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver only materials that fully conform to these specifications or for which submittals have been provided to Engineer and approved for use.
B. Store and handle materials to avoid damage. Replace any damaged materials. Remove damaged materials from the site.

### 1.06 SCHEDULING AND CONFLICTS

A. Construction Sequence:
   1. Attend a preconstruction meeting if required by Engineer.
   2. Submit plan for construction sequence and schedule prior to commencing construction.

B. Conflict Avoidance:
   1. Expose possible conflicts in advance of construction, such as utility lines and drainage structures. Verify elevations and locations of each and verify clearance for proposed construction.
   2. Complete elements of the work which can affect line and grade in advance of other open cut construction unless noted on plans.
   3. Notify Engineer of conflicts discovered or changes needed to accommodate unknown or changed conditions.

## 1.07 SPECIAL REQUIREMENTS

A. Stop work and notify Engineer immediately if contaminated soils, historical artifacts or other environmental or historic items are encountered.
B. Conform to local, state, and Federal requirements.
C. Storm Sewer Manholes:

1. Manhole Types:

| Type | Description | Main Pipe Size | Typical Depth | Figure No. |
|---|---|---|---|---|
| SW-401 | 48" Min. Dia. Short Cone or Flat Top with Poured or Precast Base | See Table 1 for Max. Dia. Pipe | 7' Min. | 6010.401 |
| SW-402 | Precast or Poured-in-Place Box with Precast or Poured-in-Place Base | 24" or Greater | 8' Max. | 6010.402 |
| SW-403 | Poured-in-Place Box with Poured-in-Place Base | 12" Dia. or Greater | 6' - 12' | 6010.403 |
| SW-404 | Combination 48" Dia. Short Cone with Poured-in-Place Barrel and Poured-in-Place Base | 12" Dia. or Greater | 12' - 22' | 6010.404 |
| SW-405 | 48" Dia. Short Cone with T-Section | 42" Dia. or Greater eccentric reducer required for 42" | 8.5' Min. | 6010.405 |

2. Ring and Cover Types:

| Type | Ring & Cover | No. of Pieces | Bolted Frame | Bolt Cover | Gasketed | Figure No. |
|---|---|---|---|---|---|---|
| E* | Standard | 2 | Yes | No | No | |
| F** | Adjustable | 3 | No | No | No | |
| G* | Machined Bearing Surfaces | 2 | No | No | No | |

* Use when placed in earth fill, asphalt pavement, or ACC manhole boxout.
** Use when placed in PCC pavement or PCC manhole boxout.

## 1.08 MEASUREMENT FOR PAYMENT

A. All measurements for payments will be made by the Engineer or authorized representative.
B. Manhole: For each type and size of manhole required and furnished, measure manhole vertical dimension in feet from the flow line to the top of the ring casting. Payment shall be at the unit bid price for each type and size of manhole properly installed. The unit bid price for manholes shall include all bedding, backfill, compaction and all appurtenances including castings and lids necessary for the proper installation.

## PART 2 - PRODUCTS

### 2.01 MANHOLES

A. Placement: Conform to elevations, locations and connection orientations shown on the Plans and detailed drawings.
B. Barrel Diameter, Inside: For sewers up to 24-inch size with two connections use 48 inches diameter barrel or as shown in the contract documents. For larger sewers or more connections, see Plans and detailed drawings.
C. Wall Thickness: See Detailed plans and Iowa SUDAS plans.
D. Top Configuration: Eccentric top except as noted on the Plans or detailed drawings. Total manhole depth 6 feet or more use cone top section. Total manhole depth less than 6 feet use minimum 9" thick flat top.
E. Joints, Barrel: Male and female ends with Mastic seal
F. Concrete: Precast: Comply with ASTM C 478. Cast in place: Refer to Cast-In-Place Storm Sewer Structure Section.
G. Base: Precast manhole: Separate base from riser section; use with precast base or poured base. Cast in place manhole: Use with precast base or poured base.
H. Pipe Connection:
    1. New Storm Sewer Manhole:
        a. Precast manholes: factory fabricated openings.
        b. Poured in place structures: structure wall poured around pipe stub.
    2. Existing Storm Sewer Manhole:
        a. Cored or drilled opening: Provide a flexible, watertight connection that meets and/or exceeds ASTM C 923.
        b. Knock out opening:
            1) Provide a watertight connection (waterstop or other method), meeting the material requirements of ASTM C 923, that is securely attached to the pipe with stainless steel bands or other means.
            2) Grout opening in manhole wall with non-shrink grout.
            3) Pour concrete collar around pipe and outside manhole opening.
            4) Provide flexible pipe joint or flexible connector within 2' of collar.
I. Manhole Steps: None, unless required on the Plans. If required, space steps at 12 to 16 inches, comply with ASTM C 478. Align with vertical side of eccentric cone top section.

### 2.02 MANHOLE ADJUSTMENT RINGS (Grade rings)

A. All grade adjustments of manhole frame and cover assemblies shall be completed utilizing one of the following:
    1. Reinforced Concrete Grade Adjustment Rings: Comply with ASTM C 478 and be free from cracks, voids and other defects. Concrete rings will be set with asphalt mastic.
    2. High Density Polyethylene Grade Adjustment Rings: Comply with ASTM D 1248 for recycled plastic.
        a. Material properties shall be tested and certified for usage by the following ASTM methods:

| Property | Test Method | Acceptable Value |
|---|---|---|
| Melt Flow Index | ASTM D 1238 | 0.3 to 30 g / 10 min. |
| Density | ASTM D 792 | 0.94 to 0.98 g / $cm^3$ |
| Tensile Strength | ASTM D 638 | 2.00 to 5 x $10^3$ lb / $in^2$ |

        b. Polyethylene adjusting rings shall not be used when they are exposed to heated hot mix asphalt pavement.
        c. Tapered configuration: When used in a single configuration tapered adjusting ring thickness will range from 0.5 inch to 3.0 inch.

   d. Grade adjustment rings are to be installed on clean flat surfaces according to the manufacturer's recommendations with the proper Butyl Rubber sealant/adhesives.

B. The inside diameter of the adjustment ring shall not be less than the inside diameter of the manhole frame.
C. Manholes shall be constructed with at least two adjustment rings.
D. Maximum height of adjustment ring stack: 12 inches max. for new manholes and 16 inches max. on existing manholes.

**2.03 CASTINGS (Ring and Cover)**

A. Gray Cast Iron: ASTM A 48, Class 35.
B. Storm Sewer Manhole Ring and Covers:
   1. Grassed areas: Type E.
   2. Paved areas, sidewalks, areas subject to vehicular traffic and sloped surfaces: Type F.
   3. For installation directly into concrete pipe riser manhole, Type G.
   4. Bolt all castings set above grade.
   5. Storm sewer manhole lids shall not be bolted.

**2.04 CEMENT MORTAR -** Refer to Cast-In-Place Storm Sewer Structure Section.

**2.05 REINFORCING STEEL -** Refer to Cast-In-Place Storm Sewer Structure Section.

**2.06 INVERT**

A. Poured in place concrete. Shape to provide a smooth transition between pipe inverts. Bring manhole invert up to one half of pipe diameter to produce a half pipe shape. Slope invert bench toward pipe 1/4 inch per foot perpendicular to flow line.

**PART 3 - EXECUTION**

**3.01 MANHOLE INSTALLATION**

A. Subgrade Preparation:
   1. Undisturbed soil: Hand grade to accurate elevation.
   2. Disturbed soil: Machine compact to 95 percent of Standard Proctor Density and hand grade to accurate elevation or install stabilization material as directed by Engineer.
B. Installation of Poured In Place Base: Bed base riser section in Class C concrete. Assure proper vertical and horizontal alignment of base riser section.
C. Installation of Precast Base with Base Riser: Assure proper vertical and horizontal alignment of base riser section.
D. Additional Risers: Install additional riser sections as required. Grout inside face of joints.
E. Repair: Repair any honeycomb areas or damaged areas as directed by Engineer.
F. Backfill up to pipe grades. Connect and bed pipes using bedding material up to one foot above top of pipes.
G. Install manhole invert. Remove any projections and repair any voids to assure a hydraulically smooth channel between pipe ends.
H. Install manhole top slab or cone.
I. Install manhole adjustment rings. Bed each ring with cold-applied bituminous jointing compound. Do not install more than total ring stack height of 12 inches. For greater adjustment, modify barrel riser section(s).
J. Install manhole ring and cover. Adjust accurately to proper grade. Where manhole is to be in a paved area, adjust slope to match finished surface.
K. Backfill and compact. Refer to Section 31 23 33. Use extra care to assure proper and uniform compaction of backfill around structure.

**3.02 MANHOLE TESTING - Refer to Section 33 40 00.**

**SUBPART B. INTAKES**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

A. Intakes for storm sewers.
B. Special structures for storm sewers.

**1.02 DESCRIPTION OF WORK**

A. Construct intakes and special structures for storm sewers.
B. Modify existing intakes
C. Abandon intakes.
D. Reference is made to the Iowa Department of Transportation Standard Specifications for Highway and Bridge Construction, Series 2001, and all current General Supplemental Specifications and Materials Instructional Memorandum by the term "Iowa DOT Specifications" and/or "Iowa DOT I.M."

**1.03 SUBMITTALS**

A. Submit under provisions of Division 1.
B. Shop drawings showing compliance with this Specification.
C. Schedule of new intakes showing total depth, and relative elevations and orientations of all connecting storm sewer lines.
D. Catalog cuts of iron castings.
E. Upon requests the Contractor will provide Material Certifications to the Engineer.

**1.04 SUBSTITUTIONS**

A. Use only materials conforming to these specifications unless permitted otherwise by Engineer.
B. Obtain written approval of Engineer for all substitutions prior to use.

**1.05 DELIVERY, STORAGE, AND HANDLING**

A. Deliver only materials that fully conform to these specifications or for which submittals have been provided to Engineer and approved for use.
B. Store and handle materials to avoid damage. Replace any damaged materials. Remove damaged materials from the site.

**1.06 SCHEDULING AND CONFLICTS**

A. Construction Sequence:
   1. Attend a preconstruction meeting if required by Engineer.
   2. Submit plan for construction sequence and schedule prior to commencing construction.
B. Conflict Avoidance:
   1. Expose possible conflicts in advance of construction, such as utility lines and drainage structures. Verify elevations and locations of each and verify clearance for proposed construction.
   2. Complete elements of the work which can affect line and grade in advance of other open cut construction unless noted on plans.
   3. Notify Engineer of conflicts discovered or changes needed to accommodate unknown or changed conditions.

## 1.07 SPECIAL REQUIREMENTS

A. Stop Work: Stop work and notify Engineer immediately if contaminated soils, historical artifacts or other environmental or historic items are encountered.
B. Conform to local, state, and Federal requirements.

## 1.08 MEASUREMENT FOR PAYMENT

A. All measurements for payments will be made by the Engineer or authorized representative.
B. Intake: Measure the number of all properly completed intakes. Payment shall be at the unit bid price for each size and type, and shall include all bedding, backfill, compaction, grates and appurtenances for proper installation.
C. Intake Adjustment: Count each item as a completed individual unit, as identified in the Bid Schedule. Payment shall be at the unit bid price for each adjustment as per plan.
D. Special Structure: Count each item as a completed individual unit, as identified in the Bid Schedule.

# PART 2 - PRODUCTS

## 2.01 INTAKES

A. Conform to elevations, locations and connection orientations shown on the Plans.
B. Intake type; Refer to Plans.
C. Configuration and Dimensions; Refer to Detailed Drawings.
D. Top Configuration:
    1. As noted on Detailed Drawings.
    2. Number of grate sections; Refer to Plans.
E. Joints, Wall:
    1. Precast; Male and female ends, mastic seal.
    2. Poured in place: construction joints.
F. Concrete:
    1. Precast: Precast concrete intakes constructed in accordance with the requirements of following Cast In Place Section, and with the dimensions and reinforcement shown in standard detailed drawings.
    2. Cast in place:
        a. Refer to following Cast-In-Place Section.
        b. Minimum concrete reinforcing cover 2 inches.
        c. Minimum total section thickness; see Standard Detailed Drawings.
G. Base:
    1. Separate. Use with base riser section with square bottom edge.
    2. Precast may have surface finish block outs on one side only.
H. Pipe Connection:
    1. Precast intake; factory fabricated openings.
    2. Poured in place structures; structure wall poured around pipe stub.
I. Manhole Steps: None, unless required on the Plans. If required, space steps at 12 to 16 inches, comply with ASTM C 478.

## 2.02 INTAKE ADJUSTMENT RINGS (Grade rings)

A. All grade adjustments of intake frame and cover assemblies shall be completed utilizing one of the following:
    1. Reinforced Concrete Grade Adjustment Rings: Comply with ASTM C 478 and be free from cracks, voids and other defects. Concrete rings will be set with asphalt mastic.
    2. High Density Polyethylene Grade Adjustment Rings: Comply with ASTM D 1248 for recycled plastic.

a. Material properties shall be tested and certified for usage by the following ASTM methods:

| Property | Test Method | Acceptable Value |
|---|---|---|
| Melt Flow Index | ASTM D 1238 | 0.3 to 30 g/10 min. |
| Density | ASTM D 792 | 0.94 to 0.98 g/cm$^3$ |
| Tensile Strength | ASTM D 638 | 2.00 to 5 x 10$^3$ lb/in$^2$ |

b. Polyethylene adjusting rings shall not be used when they are exposed to heated hot mix asphalt pavement.
c. Tapered configuration: When used in a single configuration tapered adjusting ring thickness will range from 0.5 inch to 3.0 inch.
d. Grade adjustment rings are to be installed on clean flat surfaces according to the manufacturer's recommendations with the proper Butyl Rubber sealant/adhesives.

B. The inside dimension of the adjustment ring shall not be less than the inside dimension of the intake grate opening.
C. Intakes shall be constructed with at least two adjustment rings.
D. Maximum height of adjustment ring stack: 12 inches for new and existing intakes.

**2.03 CASTINGS (Covers and Grates)**

A. Gray Cast Iron: ASTM A 48, Class 35.
B. Type: Refer to Detailed Drawings and Plans.

**2.04 CEMENT MORTAR - Refer to following Cast In Place Section.**

**2.05 REINFORCING STEEL - Refer to following Cast In Place Section.**

**2.06 INVERT**

A. Poured in place concrete. Establish a full seal between base and base riser section.
B. Shape to provide a smooth transition between pipe inverts.
C. Bring intake invert up to one half of pipe diameter to produce a half pipe shape.

**PART 3 - EXECUTION**

**3.01 INTAKE INSTALLATION**

A. Subgrade Preparation:
1. Undisturbed soil: Hand grade to accurate elevation.
2. Disturbed soil: Machine compact to 95 percent of Standard Proctor Density and hand grade to accurate elevation, or install Stabilization Material as directed by Engineer.
3. Unstable soil: Install Stabilization Material as directed by Engineer.

B. Concrete Intakes:
1. Install Stabilization Material if unstable base exists.
2. Install Granular Bedding Material if required by Detailed Drawings.
3. Install base; assure proper vertical and horizontal alignment of base riser section.
4. Install additional riser section as required. Seal all joints.
5. Repair any honeycomb areas or damaged areas.
6. Compact backfill up to connecting pipes.
7. Connect and bed pipes per Section 3010. Grout inside pipe/riser joint.
8. Install intake invert. Remove any projections and repair any voids to assure a hydraulically smooth channel through intake.
9. Install top.

10. Install adjustment rings. Install at least two rings. Bed each ring with cold-applied bituminous jointing compound. Do not install more than total ring stack height of 12 inches. For greater adjustment, modify riser section(s).
11. Install top casting. Adjust accurately to proper line and grade.
12. Backfill and compact. Refer to Section 3010. Use extra care to assure proper and uniform compaction of backfill around structure.

C. Anchoring Castings: All castings not encased in concrete shall be bolted down.

**3.02 CONCRETE, REINFORCEMENT, AND PLACEMENT. Refer to Cast In Place Section.**

**3.03 SPECIAL STRUCTURES**

A. Construct in accordance with this Section, as applicable.
B. Refer to Plans for locations, dimensions and special details and provisions.

**3.04 ABANDONED INTAKES**

A. Remove entire structure to a minimum of 10 feet below subgrade in paved areas or 6 feet below finish grade in other areas.
B. Plug all pipes in structure.
C. Fill remaining structure using flowable mortar.
D. Place compacted earth fill over structure as required for embankment or compacted backfill.

## SUBPART C. CAST-IN-PLACE CONCRETE

## PART 1 - GENERAL

**1.01 SECTION INCLUDES**

A. Structural Portland cement concrete and reinforcing for manholes and intakes for sanitary and storm sewer systems, and other structures such as concrete thrust blocks and sewage air release pits as designated by the Engineer.

**1.02 DESCRIPTION OF WORK**

A. Construct Portland cement concrete structures for sanitary and storm sewers.
B. Reference is made to the Iowa Department of Transportation Standard Specifications for Highway and Bridge Construction, Series 2001, and all current General Supplemental Specifications and Materials Instructional Memorandum by the term "Iowa DOT Specifications" and/or "Iowa DOT I.M."

**1.03 SUBMITTALS**

A. Submit under provisions of Division 1.
B. Shop drawings of steel reinforcement, showing sizes, lengths, bends, and counts, if required.
C. Concrete mix design, if required by Engineer.
D. Sample test results and certifications.
E. Certification that materials being provided meet the requirements of these specifications or that alternate materials or substitutions have received written approval of the Engineer.
F. Project Record Documents.
G. Upon requests the Contractor will provide Material Certifications to the Engineer.

**1.04 SUBSTITUTIONS**

A. Use only materials conforming to these specifications unless permitted otherwise by Engineer.

B. Obtain written approval of Engineer for all substitutions prior to use.

## 1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver only materials that fully conform to these specifications and for which submittals have been provided to Engineer and approved for use.
B. Store and handle materials to avoid damage. Store reinforcing steel only on pallets or lagging. Replace any damaged materials. Remove damaged materials from the site.
C. Aggregate storage and concrete transport shall follow Section 7010, 1.05.

## 1.06 SCHEDULING

A. Construction Sequence:
   1. Schedule concrete placement to coordinate with other work, such that trenching, backfilling and other work can proceed in an orderly manner and to provide the greatest protection for new work.
B. Conflict Avoidance:
   1. Expose potential conflicts such as utility lines and drainage structures in advance of construction. Verify elevations and locations and verify clearance for proposed construction.
   2. Complete elements of work which can affect line and grade in advance of pipe construction unless noted on plans.
   3. Notify Engineer of conflicts discovered or changes needed to accommodate unknown conditions.

## 1.07 SPECIAL REQUIREMENTS

A. Stop Work: Stop work and notify Engineer immediately if contaminated soils, historical artifacts or other environmental or historic items are encountered.
B. Conform to local, state, and federal requirements.
C. Restrictions: Restriction on operations shall follow Section 7010, 1.07.

## 1.08 MEASUREMENT FOR PAYMENT

A. The cost for concrete and reinforcing in the construction of manholes and intakes for storm sewer systems, or other special structures, will not be measured separately but will be considered incidental to intakes and manholes or other concrete structures as described in this specification document, including sampling and testing.

# PART 2 - PRODUCTS

## 2.01 CONCRETE MATERIALS

A. Portland Cement:
   1. ASTM C 150, Type I or Type III when specified.
   2. Air entrained per ASTM C 260.
   3. Iowa DOT Class C concrete unless otherwise specified in the contract documents.
B. Aggregates:
   1. Per ASTM C 33.
   2. Coarse and fine aggregate shall follow Section 7010, 2.02.
C. Water: Follow Section 7010 2.02 E
D. Liquid Admixtures for Portland Cement Concrete:
   1. Description
      a. Meet requirements of AASHTO M 154 for air entraining mixtures.
      b. Meet requirements of AASHTO M 194 for other liquid admixtures.

c. Submit tests by a recognized laboratory for Engineer approval.
d. Admixtures containing more than 1% chloride ions shall not be allowed unless approved by Engineer.
e. Inspection and acceptance of liquid admixtures will be in accordance with Iowa DOT Materials I.M. 403

2. Air Entraining Admixtures: Provisions shall be made to stir, agitate, or circulate air entraining admixtures prior to use to ensure a uniform and homogeneous mixture.
3. Retarding and Water Reducing Admixtures
   a. Shall be compatible with air entraining agent.
   b. Shall be introduced into the mixer after all other ingredients
   c. Agitate prior to and during use in accordance with Iowa DOT Materials I.M. 403
   d. Dosage rate shall be applied to both cement and fly ash when used.
4. Other Admixtures: Other admixtures may be used with the approval of the Engineer in accordance with the manufacturer's recommendations.

**2.02 CONCRETE QUALITY**

A. Compressive Strength: Minimum 4,000 psi at 28 days.
B. Water-Cement Ratio: Follow Section 7010, 2.03.
C. Air Content: The intended air entrainment is 6.0%. To allow for loss during placement, the air content of fresh, unvibrated structural concrete shall be 6.5%, as a target value, with a maximum variation of plus or minus 1.0%.
D. Slump: Structural concrete shall be placed with a slump between 1 inch and 3 inches as a target range, allowing a maximum of 4 inches unless specifically modified by the Engineer.
E. Admixtures: Per manufacturer’s recommendations.

**2.03 REINFORCEMENT**

A. Reinforcing Steel:
   1. Use deformed bars.
   2. Epoxy coated deformed bars apply only when specified.
   3. Billet steel; ASTM A 615, Grade 60.
   4. Fabricate and bend, per approved submittals or Plans.
   5. Fabricate all bars prior to delivery to site unless field bends are required.
B. Wire Fabric:
   1. Per ASTM A 185.
   2. Size and mesh; as shown on Detailed Drawings or on Plans.
   3. Placement; as shown on Detailed Drawings or on Plans.
   4. Joints; lap not less than 6 inches.

**2.04 CEMENT MORTAR:** Mix in the following portions:

A. Portland Cement: Type I; 10 Parts
B. Mortar Sand: 20 Parts
C. Lime, Hydrated: 3/4 to 1 Part

**PART 3 - EXECUTION**

**3.01 FORMING**

A. All cast in place manholes and structures shall be formed on both the inside and the outside face above the base. No earth excavation next to the proposed manhole shall be used as forming.
B. Use metal or plywood-lined forms for exposed surfaces.
C. Erect and secure forms to true line and grade.

D. Coat forms with non-staining mineral oil before placing reinforcing. Do not apply oil to surfaces to which concrete must be bonded.
E. Use 3/4 inch bevel for exposed corners, unless otherwise required.

**3.02 REINFORCING STEEL**

A. Remove dirt, scale and other materials that might impair concrete bond.
B. Place reinforcement where shown. Space bars properly and secure in position.
C. Reinforcement for slabs; support with chairs or bolsters. Do not use wood, bricks, stones or other foreign materials.
D. Lap bars 36 diameters, except as otherwise shown.

**3.03 MIXING: (IOWA DOT 2403)**

A. Provide accurate control for measuring materials.
B. Concrete, as discharged from the mixer, shall be uniform in composition and consistency. Each batch of concrete shall be thoroughly discharged from the mixer before the next batch is introduced. Upon cessation of mixing for any considerable length of tie, the mixer shall be thoroughly cleaned and flushed with water.
C. Ready-Mixed Concrete: conform to ASTM C 94.

**3.04 PLACING**

A. Clean and dampen forms, reinforcing steel and embedded items.
B. Prevent segregation during placement. Do not allow concrete to fall more than 4 feet from placement chute to final position.
C. Place concrete continuously in each section until complete. Do not allow more than 30 minutes between depositing adjacent layers of concrete within each section.
D. Thoroughly compact, puddle and vibrate concrete into corners and around reinforcing and embedded items. Vibrate sufficiently to work concrete into crevices and around steel. Refer to Iowa DOT 2403.09.
E. Place sections of concrete in a sequence which eliminates the effect of shrinkage to the greatest extent practicable.
F. Concrete shall not be placed when the air temperature is less than 40 degrees Fahrenheit without the approval of the Engineer. Refer to Iowa DOT 2403.11.

**3.05 FINISHING**

A. Refer to Iowa DOT 2403.21.
B. Use rough form finish to areas not visible to the public.
C. Use smooth form finish for areas visible to the public.
D. Use broomed finish for slabs, except as noted on Plans or Detailed Drawings.

**3.06 STRIPPING AND CLEANING**

A. Remove forms for manhole and intake walls and tops according to Iowa DOT 2403.18.
   1. References to culverts shall include all sanitary and storm structures.
   2. When allowed by the Engineer, compressive strengths at six times the stated flexural strengths may be used in determining concrete strength of structure roofs.
B. Chip out and repair any honeycomb areas per direction of Engineer.
C. Break back form ties and fill holes with portland cement mortar.
D. Remove flashing and thin webs.

**3.07 CURING**

A. Refer to Iowa DOT 2403.10.

B. Apply curing system immediately after finishing or stripping of forms, as applicable.
C. Slabs on grade, visible to the public; use only curing compounds meeting ASTM C 309, Type 1-D or Type 2.

### 3.08 EXTERIOR LOADING

A. Restrict loads on concrete, other than the load caused by the weight of the concrete itself, according to Iowa DOT Section 2403.19.
B. When allowed by the Engineer, compressive strengths at six times the stated flexural strengths may be used.

### 3.09 TESTING

A. Provide required testing by a testing service approved by Engineer, unless such services are provided by Jurisdiction.
B. Review and test proposed mix design when required by Engineer.
C. Obtain production samples of job-delivered concrete mix after any needed water has been added and the concrete remixed.
D. Mold and cure three specimens per ASTM C 31.
E. Strength Testing: Unless otherwise specified in the contract documents strength testing will be the responsibility of the Contractor by a certified testing service.
    1. Test specimens in accordance with ASTM C 39. Test one sample at 7 days for information. Test two samples at 28 days. The acceptance test results shall be the average of the compressive strength of the two specimens tested at 28 days. If one of the 28 day samples manifests evidence of improper sampling, molding or testing, it shall be discarded and the strength of the remaining sample shall be considered the test result.
    2. Make at least one strength test for each 100 cubic yards or fraction thereof, and at least one test for each structure. When the total quantity is less than 50 cubic yards the strength tests may be waived by the Engineer.
F. Slump Testing: Unless otherwise specified in the contract documents testing will be by the Engineer. Determine slump of concrete sample for each strength test and whenever consistency of concrete mix appears to vary, using ASTM C 143.
G. Air Testing: Unless otherwise specified in the contract documents testing will be by the Engineer. Determine air content of concrete sample for each strength test in accordance with either ASTM C 231, ASTM C 173, or ASTM C 138.

## SUBPART D. NYLOPLAST INTAKES

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES

A. Nyloplast Intake substitutes for certain types of concrete Intakes and vice versa.

### 1.02 DESCRIPTION OF WORK

A. Nyloplast Structures are allowed to be substituted for Iowa SUDAS SW-501 and SW-512 Intakes. Nyloplast intake substitutions for SW-512 area intakes must be the same size vertical barrel and grate that is called out on plans.
B. No other concrete structures are allowed to have substitutions including other types of intakes and all manholes.
C. Nyloplast Basins can be substituted with SUDAS Pre-Cast Manholes/ Intakes. SW-512 intakes are NOT an approved substitution for Nyloplast structures.

### 1.03 SUBMITTALS

A. Shop drawings of Nyloplast structure prior to fabrication.
B. Certification that materials being provided meet the requirements of these specifications or that alternate materials or substitutions have received written approval of the Engineer.
C. Project Record Documents.

### 1.04 SUBSTITUTIONS

A. Use only materials conforming to these specifications unless permitted otherwise by Engineer.
B. Obtain written approval of Engineer for all substitutions prior to use.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver only materials that fully conform to these specifications and for which submittals have been provided to Engineer and approved for use.
B. Store and handle materials to avoid damage. Replace any damaged materials. Remove damaged materials from the site.
C. Aggregate storage shall follow Section 7010, 1.05.

### 1.06 SCHEDULING

A. Construction Sequence:
   1. Schedule intake placement to coordinate with other work, such that trenching, backfilling and other work can proceed in an orderly manner and to provide the greatest protection for new work.
B. Conflict Avoidance:
   1. Expose potential conflicts such as utility lines and drainage structures in advance of construction. Verify elevations and locations and verify clearance for proposed construction.
   2. Complete elements of work which can affect line and grade in advance of pipe construction unless noted on plans.
   3. Notify Engineer of conflicts discovered or changes needed to accommodate unknown conditions.

### 1.07 SPECIAL REQUIREMENTS

A. Stop Work: Stop work and notify Engineer immediately if contaminated soils, historical artifacts or other environmental or historic items are encountered.
B. Conform to local, state, and federal requirements.
C. Restrictions: Restriction on operations shall follow Section 7010, 1.07.

### 1.08 MEASUREMENT FOR PAYMENT

A. The cost for granular backfill and intake castings for storm sewer systems, or other special structures, will not be measured separately but will be considered incidental to intakes and manholes.

## PART 2 PRODUCTS

### 2.01 MATERIALS

A. Intake:
   1. PVC Stock Pipe, utilizing a thermo-molding process to reform the pipe stock to the specified configuration.

2. Drainage pipe connection stubs stall be PVC pipe stock and formed to provide watertight connection with the specified pipe system sizes and angles.
3. The raw material used to manufacture the pipe stock that is used to manufacture the main body and pipe stubs shall conform to ASTM D1784 cell class 12454.

B. Joints:
1. Joint tightness shall conform to ASTM D3212 for drain and sewer plastic pip using flexible elastomeric seals.
2. Flexible elastomeric seals shall conform to ASTM F477.
3. The pipe bell spigot sall be joined to the main body of the drain basin or catch basin.

C. SW-512 and A2000 Area Intake Grates for Nyloplast structures:
1. Grates and frames furnished for all Nyloplast intake structures shall be ductile iron and the same size as the intake stack.
2. Intake grates shall be capable of handling H-20 loads for all structures placed into paving. All other structures shall comply with H-10 loading.
3. Metal used in manufacture of the castings shall conform to ASTM A536 grade 70-50-05 ductile iron.
4. Grates shall be natural and contain no paint.

D. SW-501 Intake Grates for Nyloplast structures:
1. The grate, frame and hood assembly shall be ductile iron.
2. The grate, frame and hood shall all be capable of supporting H-20 loading.
3. The hood section will have a solid back and be adjustable by use of three (3) hex head bolts.
4. Metal used in manufacture of the castings shall conform to ASTM A536 grade 70-50-05 ductile iron.
5. Grates shall be natural and contain no paint.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

A. All intakes shall be staked by a licensed land surveyor.
B. Intakes shall be placed in accordance with stakes provided by surveyor. In the event of a discrepancy between stakes and plans, contractor shall contact engineer and/ or land surveyor prior to intake placement.
C. Granular backfill for base and intakes shall comply with manufacture recommendations. All backfill material shall conform with IOWA SUDAS backfill specifications for concrete intakes. Sand in NOT a permitted backfill material and backfill shall be Class 2 material defined in ASTM D2321.
D. Intakes shall be designed and placed approximately 12” over height. Upon completion of final grading, Intakes shall be cut to the grade as specified on the approved construction plans. If intake stack is either manufactured too short or cut too short in the field, intake shall be completely replaced at contractor/ manufacture’s expense.
E. All intakes installed in paved areas (H-20 loaded structures), a concrete ring shall be poured under and around the grate and frame. The concrete slab must be designed for local soil conditions, traffic loading, among any other applicable design factors.
F. For any other installation considerations such as migration of fines, ground water and soft foundations, refer to ASTM D2321 guidelines.

END OF SECTION

# Appendix

A. Geotechnical Data - Geotechnical Exploration PN 251210 (24 Pages)

ALLENDER BUTZKE ENGINEERS INC.
GEOTECHNICAL • ENVIRONMENTAL • CONSTRUCTION Q. C.

**JULY 3, 2025** **PN 251210**

# GEOTECHNICAL EXPLORATION

## NCF IPI HOMES FOR IOWA FACILITY PROJECT
## 307 S 60TH STREET
## NEWTON, IOWA

**PERFORMED FOR**

## SAMUELS GROUP
## 2929 WESTOWN PARKWAY
## WEST DES MOINES, IOWA

3660 109TH STREET • URBANDALE, IOWA 50322 • PHONE 515-252-1885 • FAX 515-252-1888

ALLENDER BUTZKE ENGINEERS INC.
GEOTECHNICAL • ENVIRONMENTAL • CONSTRUCTION Q. C.

July 3, 2025

Samuels Group
2929 Westown Parkway
West Des Moines, Iowa
Attn: Jerry Dehnke

RE: Geotechnical Exploration
NCF IPI Homes for Iowa Facility Project
307 S 60th Street
Newton, Iowa
PN 251210

Dear Mr. Dehnke:

As authorized by you, Allender Butzke Engineers Inc. (ABE) has completed the geotechnical exploration for the above referenced project. The geotechnical exploration was conducted to evaluate physical characteristics of subsurface conditions with respect to design and construction of this project. The enclosed report summarizes the project characteristics as we understand them, presents the findings of the borings and laboratory tests, discusses the observed subsurface conditions, and provides geotechnical engineering recommendations for this project.

We appreciate the opportunity to provide our geotechnical engineering services for this project. If you have any questions or need further assistance, please contact us at your convenience. We are also staffed and equipped to provide construction testing and inspection services on this project as well as environmental site assessments.

Respectfully submitted,
ALLENDER BUTZKE ENGINEERS INC.

Stacy G. Brocka, P.E.
Principal Engineer


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.

7/3/2025

Stacy G. Brocka, P.E. License Number 14203 Date
My license renewal date is December 31, 2025.
Pages covered by this seal: All Pages.

1 Email Above

**GEOTECHNICAL EXPLORATION**

**NCF IPI HOMES FOR IOWA FACILITY PROJECT**
**307 S 60TH STREET**
**NEWTON, IOWA**

**PN 251210**

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# GEOTECHNICAL EXPLORATION

## NCF IPI HOMES FOR IOWA FACILITY PROJECT
## 307 S 60TH STREET
## NEWTON, IOWA

**PN 251210**

**July 3, 2025**

## PROJECT INFORMATION

NCF IPI Homes for Iowa, with design assistance from Samuels Group and Farnsworth Group, is planning the construction of an approximately 20,600 square foot warehouse, a security gate, and pre-fabrication construction area at their existing NCF IPI site on 307 S 60$^{th}$ Street in Newton, Iowa. New pavements are proposed at the security gate and a paved apron is proposed on the north side of the warehouse. Preliminary plans by Farnsworth Group indicate that the finish floor of the warehouse will be at elevation 786.00 feet. We assume the warehouse will generate light to moderate loads with maximum wall loads of 3 kips per lineal foot and maximum column loads of 100 kips. The site where the proposed warehouse will be constructed is currently a baseball diamond and is gently sloping. Based on the grading plan, it appears that cut depths and fill thicknesses on the order of 4 to 6 feet may be necessary to achieve the desired final grades.

## FIELD EXPLORATION

The requested four soil borings were conducted at this site to depths of 20 feet below existing grades on June 11, 2025. Approximate locations of the borings are shown on the enclosed Site Plan. Boring locations were staked in the field by Samuels Group personnel prior to utility locates and drilling. The drilled boring locations and ground surface elevations were determined by ABE using GPS Survey equipment. The boring surface elevations, indicated on the enclosed Boring Logs, were Iowa Real-Time Network (RTN) derived. Methods of drilling, sampling, standard laboratory testing, and classifying of subsurface materials are discussed in the Boring Log Description/Legend pages of the Appendix. Temporary piezometers were installed in Boring Nos. 1 and 4 to obtain longer-term groundwater level readings.

## SUBSURFACE CONDITIONS

### Soil Profile

Detailed descriptions of soils encountered by this exploration are provided on the Boring Logs enclosed in the Appendix. The Profile of Borings (Plate A-1) presented in the Appendix depicts the relative deposit elevations in the borings. Unless otherwise indicated, the depths of soil stratum and groundwater levels are referenced from below the top of existing ground at the individual boring locations at the time of drilling.

Cohesive alluvium consisting of lean clay (CL) was encountered at the surface of all borings. The lean clay alluvium was very dark brown to brown, brown gray, and gray, and damp to very moist. The lean clay alluvium extended to depths of 7 and 11.5 feet in Boring Nos. 1 and 2 while Boring Nos. 3 and 4 terminated in the cohesive alluvium near a depth of 20 feet. Very dark gray to gray-brown fat clay (CH) cohesive alluvium was present below the lean clay in Boring No. 1 to a depth of 13.5 feet. Brown lean to fat clay (CL-CH) cohesive alluvium was present below the lean clay in Boring No. 2 to a depth of 14 feet.

Granular alluvium consisting of gray and brown silty fine to medium sand (SM) underlaid the cohesive alluvium in Boring Nos. 1 and 2. These two borings terminated in this granular alluvium near a depth of 20 feet.

### Groundwater Level Observations

The borings were monitored during and shortly after drilling operations to detect moisture seepage and groundwater accumulation. The results of our groundwater level observations are noted on the Boring Logs enclosed in the Appendix.

During drilling operations, saturated sand was observed near depths of 14.5 and 16 feet in Boring Nos. 1 and 2, respectively. Groundwater accumulation was observed at similar depths in Boring Nos. 1 and 2 at the completion of drilling operations while Boring Nos. 3 and 4 were dry. These short-term water levels are not necessarily a true indication of the groundwater table. Longer-term observations at 13 days were conducted in Borings 1 and 4 in the temporary piezometers. The 13-day groundwater accumulation was observed near 2 feet below existing grade in Boring No. 1 while Boring No. 4 was dry. Further long-term observations would be necessary to accurately define groundwater variations at this site. Fluctuation of groundwater levels can occur due to seasonal variations in the amount of rainfall, surface drainage, subsurface drainage, site topography, irrigation practices, and ground cover (pavement or vegetation).

## ANALYSES AND RECOMMENDATIONS

### Expansive Soil

The lean to fat clay (CL-CH) and fat clay (CH) portions of the cohesive alluvium encountered in Boring Nos. 1 and 2 after depths of 7 to 11.5 feet are moderately plastic and considered to be moderately expansive. These soils are subject to moderate volumetric change with changes in soil moisture content which can cause movement and distress to lightly loaded floor slabs and pavements. The most severe problems occur where higher clay content soils (CL-CH, CH) are in a natural state of low moisture or are highly compacted at moisture contents near or below optimum moisture content on a relatively incompressible base. Subsequent moisture content increases below the floor slab or pavement after construction then cause the moderately expansive soils to swell appreciably. If the moisture content does not fluctuate much, then the soil swelling and heave will be minor. It is advisable not to construct floor slabs, pavements, or lightly loaded footings within or immediately above the moderate to highly plastic soils.

Based on the depth of these soils, the moderately expansive soils should not adversely affect structures at this site unless the moderately expansive soils are present within 3 feet of movement sensitive structures.

### Site Preparation

Cut-and-fill construction will be performed at this site to achieve the desired final grades. Prior to the placing of concrete floors or pavements on this site, or before any fill is placed, the organic and loose materials in addition to all vegetation must be stripped. We expect that a minimum stripping depth of 6 inches will be required. The stripping depths may vary due to localized variations in vegetation cover and subgrade stability. The strippings could be used for landscaping purposes in non-critical areas where support for foundations, floor slabs, and pavements is not required. The subgrade should then be proof-rolled to delineate zones of soft soils present near the surface which may require additional removal or compaction.

### Site Grading

We recommend that low plasticity cohesive (Liquid Limit of 45 or less and Plasticity Index of 23 or less) or cohesionless soils, free of rubble and organics, be used as compacted fill. Existing soil such as the lean clay (CL) alluvium would be suitable soil types for general fill applications. The following Table A lists recommended minimum compaction requirements for cohesive and cohesionless fill materials in specific applications. For cohesive soils, moisture contents within a range of -1 to +4 percent of the material's optimum moisture content are necessary to achieve the

desired fill qualities. Soil compacted closer to its optimum moisture content will exhibit greater stability under repeated construction traffic.

**TABLE A**
**RECOMMENDED DEGREE OF COMPACTION GUIDELINES**

| Construction Application | Standard Proctor (ASTM D698) Cohesive Soil | Standard Proctor (ASTM D698) Cohesionless Soil | *Relative Density (D4253 & D4254) Cohesionless Soil |
|---|---|---|---|
| Class 1 | 95% | 98% | 70% |
| Class 2 | 90% | 93% | 45% |
| Class 3 | 85% | 88% | 20% |

Class 1 - Subgrade for building foundations, slabs-on-grade, pavements and other critical backfill areas.

Class 2 - Backfill adjacent to structures not supporting other structures - Minor subsidence possible.

Class 3 - Backfill in non-critical areas - Moderate subsidence possible.

*Use Relative Density technique (ASTM D4253 & D4254) where Standard Proctor technique (ASTM D698) does not result in a definable maximum dry density and optimum moisture content.

The on-site soils can be excavated utilizing conventional excavation equipment. Granular soils can generally be suitably compacted with vibratory compaction equipment whereas cohesive soils are more suitable for compaction with sheepsfoot or pneumatic type compactors. Care should be exercised in properly backfilling and compacting all trenches, especially utility trenches under or adjacent to the pavement. Loosely compacted or sand backfilled trenches can collect surface water and inadvertently direct it to the pavement subgrade and cause softening of the soil as well as increasing frost heave potential.

The contractor should be aware that very moist and softer lean clay (CL) alluvium which appears to have higher silt content can be easily disturbed by construction traffic and may not provide adequate support for heavy construction equipment, especially in deeper cut areas under repeated traffic loading. Therefore, low impact excavation methods, such as top loading with excavators may be required in deeper cut areas to reduce disturbance and deterioration of these softer soils. High construction traffic areas will require periodic repair of disturbed or loosened soils.

At the time of this geotechnical exploration, moisture content of the cohesive alluvium deposits was generally near or above the recommended moisture content range for compaction. Depending upon precipitation levels prior to and during construction, adjustment of soil moisture content may be required in order to lower or raise the moisture to within the recommended moisture content range. Controlled wetting and discing may be necessary to raise soil moisture content of dry soils. Discing and aeration is generally the most economical method to lower soil moisture content, if climatic conditions allow. Chemical modification (drying) of very moist soils with Portland cement or quicklime can be accomplished if construction scheduling does not permit field drying. Common chemical modification methods may not be reactive when temperatures are near or below 40° Fahrenheit if grading or fill placement at the site will be conducted during colder weather.

**Excavation Stability and Dewatering**

Boring information indicates shallow excavations at the site for foundations and utilities will encounter predominately cohesive soils with no wet sand seams or layers. It is expected that the water seepage can be controlled by permitting it to drain into temporary construction sumps and be pumped outside the perimeter of the excavations.

The extent of bracing or sloping of open cut excavations will be dependent upon depth of cut, groundwater conditions, soils encountered, length of time the excavation will be open, area available for excavation and local governing regulations. Predominately cohesive soils may appear to stand nearly vertical in shallow excavations for short periods of time. However, soil creep, surcharge loads, precipitation, subsurface moisture seepage, construction activity vibrations and other factors may cause these soils to cave within an unpredictable period of time. Excavations encountering sand may tend to cave rapidly, especially if water is flowing through the sand. Unstable granular excavation walls may also cause surrounding cohesive soils to become unstable. Temporary shoring, flattening of the excavation slopes or use of trench boxes may be required to maintain a safe condition. Determining the appropriate OSHA classifications of the soil types encountered and implementing the required provisions for sloping, shoring, and bracing of excavations throughout the project during construction are the responsibility of the contractor per OSHA.

**Slope Stability and Drainage**

Based on soil boring information and our experience with subsurface conditions in the area, cut slopes constructed at 3:1 (H:V) or flatter in the majority of on-site soil types are generally stable if not subject to moisture seepage. Where moisture seepage is encountered during earthwork operations or where cuts extend below the seasonal high groundwater table, it may be necessary to install subsurface drainlines uphill of the potential seepage areas in order to intercept

groundwater before it exits the slope. The following Figure No. 1 depicts a typical interceptor drainline cross-section. Ongoing, unmitigated moisture seepage on the slopes can lead to erosion, sloughing, and wet areas that can be difficult to build on as well as mow and maintain.

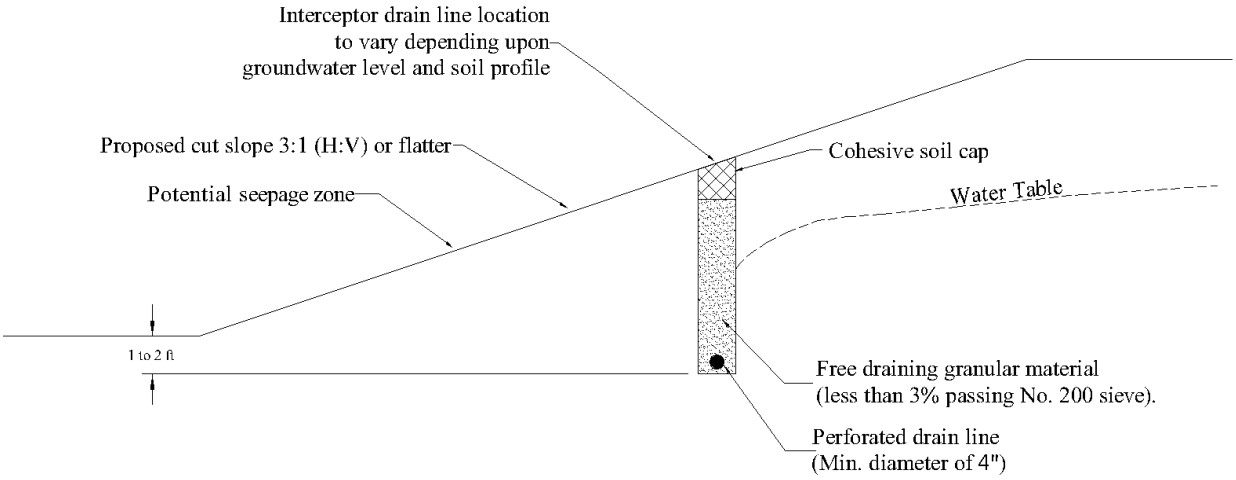



**Figure No. 1 – Typical interceptor drainline cross-section**

## Foundation Design

In our opinion, newly placed cohesive engineered compacted fill required achieve the desired final grades and suitable natural soils can provide adequate support for the proposed structure. We recommend that continuous and isolated spread foundations bearing on suitable soils be proportioned for a maximum net allowable soil bearing pressure of 1,500 pounds per square foot. We estimate long-term total settlement due to the assumed structural loads will be less than 1 inch and differential settlement may be on the order of ½ of the total settlement when foundations bear on newly placed engineered compacted fill and suitable natural soils.

Continuous foundations should be adequately reinforced to limit deflections caused by non-uniform soil support characteristics. All exterior foundations and foundations in unheated areas should be placed a minimum of 3.5 feet below final grade to provide protection against frost penetration and reduce movements associated with changes in soil moisture content. The on-site cohesive soils and newly placed cohesive fill would be suitable for trench foundations. Footing excavations should be kept free of water accumulation to prevent softening of subgrade soils.

Observations and test probing of the foundation subgrade soils should be conducted by an ABE geotechnical engineer to determine that the soils are compatible with the design criteria. If zones of soft or otherwise unsuitable soils are encountered at foundation level, we recommend that footings be extended to bear on firmer soils or an over-excavation and compacted backfill

procedure be implemented. Over-excavations should extend 9 inches laterally in each direction beyond the foundation edges for each foot of over-excavation depth.

**Floor Slab Support**

Interior floor slabs can be adequately supported on a minimum of one foot of reworked inorganic existing soils or engineered compacted fill required to provide the desired final grades. The floor slabs can be designed for a modulus of subgrade reaction value of 100 pounds per cubic inch when bearing on a minimum of one foot of prepared subgrade. Testing, observations and probing should be conducted during construction to delineate zones of soft soils which may require repair prior to concrete placement.

**Pavement Subgrade Preparation**

Uniform subgrade support is critical in pavement performance. We recommend that the prepared subgrade depth be at least 1 foot deep after fine grading or trimming and extend 2 feet beyond the edge of the pavements. The recommended 1 foot of compacted subgrade will necessitate undercutting and reworking existing subgrade soils.

Subgrade preparation to one-foot depths for some soil types is generally adequate, but isolated zones of very moist and/or low clay content, such as the soils at this site, may not be stable under heavy construction vehicle loads which may require stabilization to depths of 2 feet or more for paving purposes only (including over-excavation and replacement with more cohesive soils). If subgrade conditions deteriorate, placement of a thicker granular (rock) subbase or the placement of a geogrid below the granular rock or stabilization of the soil subgrade with Portland cement could be constructed to support construction traffic and the final pavements.

Final subgrade should be proof-rolled to delineate zones of loose soils present near the surface which may require additional removal or compaction. The subgrade support should be relativity uniform with no sudden changes in the degree of support to provide satisfactory pavement performance. Transition between cut and fill areas, varying soil types, and improper subgrade preparation such as inadequate proof-rolling and compaction can result in non-information subgrade support.

Subgrade preparation should be completed shortly before paving operations commence and is to be maintained in suitable condition until paved. Damages caused by construction traffic or deterioration due to adverse weather are to be repaired prior to paving.

Depending upon conditions encountered at the time of construction, it may be necessary to moisture condition existing soils to achieve the recommended moisture content range of -1 to +4

percent of optimum moisture content. Soils compacted closer to optimum moisture content will exhibit greater stability under construction traffic loading. Suitable cohesive soil compacted to a minimum of 95 percent of maximum dry density determined by ASTM D698 would provide a design support capability equivalent to a CBR value of 3 or a modulus of subgrade reaction value of 100 pounds per cubic inch. Subgrade compaction, moisture content and depth should be tested by an ABE representative.

## Subsurface Pavement Drainage

Based on the anticipated seasonal high groundwater levels at this site, it is our opinion that subsurface pavement drainage would not be necessary in areas of fill but would be beneficial for extending the life of pavements in areas of cut of 2 feet or more. Subsurface drainage is also recommended if a granular subbase is utilized beneath the pavement.

Where permeable subbase is utilized, it should be hydraulically connected to the free draining granular backfill (similar to Iowa DOT Specification 4131) in the subsurface drains. Subsurface drainage may be accomplished with the installation of drainlines similar to the Iowa DOT detail DR-303 or Iowa SUDAS Figure 4040.231. In parking areas, subdrains should be spaced approximately 50 to 75 feet center to center and may be constructed to daylight or be connected to gravity flow storm drains capable of handling the discharge. We are available to review the subdrain layout design, once the final grading plan becomes available, which can be modified at time of construction to accommodate site specific variations in the soil profile and if seepage zones become evident.

## Pavement Thickness Design

Either rigid (Portland cement concrete, PCC) or flexible (hot mix asphalt, HMA) pavement types could be constructed on the prepared cohesive subgrade. The following Table B summarizes alternate pavement thicknesses for typical lightly-loaded, moderately-loaded and heavily-loaded paved areas. A more specific pavement evaluation can be provided if traffic volume and loading information is available.

**TABLE B**
**TYPICAL PAVEMENT THICKNESSES**

| Traffic Volume | Rigid: PCC [1] | Flexible: HMA [2] |
|---|---|---|
| Lightly-Loaded [3] | 5" | 6" |
| Moderately-Loaded | 6" | 7" |
| Heavily-Loaded [4] | 7" | 8" |

1) PCC - Flexural strength of 550 psi
2) Type A HMA - Structural coefficient of 0.44/inch
3) Automobile and 1 to 2 trucks average daily traffic.
4) Entrances, delivery areas, dumpster areas or other areas of heavier truck traffic (25 trucks or less per day).

The above pavement thicknesses are considered to be typical and would require periodic maintenance. This maintenance would consist of sealing cracks and replacement of isolated distressed areas. Thicker pavement sections would reduce maintenance and increase the pavement service life. Likewise, thinner sections would be expected to have a shorter service life that still may satisfy particular project needs but may require more maintenance. Other criteria which influence pavement service life include surface drainage, subsurface drainage, paving material quality, reinforcement, and joint design. Construction procedures involving placement, finishing, curing, jointing and weather protection can significantly impact pavement performance.

## Frost Heave

Key elements contributing to frost heave including freezing temperatures, available water, and fine-grained frost susceptible soils are generally present at sites in Iowa. As a result, frost heave problems are generally common (and most noticeable) in pavements or sidewalks adjacent to non-frost susceptible elements such as manholes, light poles, and exterior doors or frost protected stoops. Frost heave can cause pavement cracks to develop parallel to and several feet from curbs. This generally occurs where cleared paved areas exposed to freezing temperatures heave more than adjoining paved areas insulated by piled snow. Areas cleared of snow not exposed to periodic sunshine during the winter, such as under canopies, on the north shaded side of buildings and other shaded areas may experience more frost heave than other sunshine exposed areas. Sometimes it is not readily apparent why frost heave problems occur at one location and not at another seemingly similar location.

While it is appropriate to implement measures to reduce frost heave such as insulation, replacing frost susceptible soils with less frost susceptible soils, void forms, sealing cracks/joints to reduce surface water infiltration, or drainage improvements (surface and subsurface), these measures may simply move the frost heave problem to a different location where preventative measures have not been implemented. Having a smooth transition between heaved and non-heaved areas is desirable, but may be difficult and/or costly to accomplish. We are available to consult with you to discuss options for your consideration to reduce frost heave potential on this project.

## GENERAL

The analyses and recommendations in this report are based in part upon the data obtained from the soil borings performed at the indicated locations and from any other information discussed in this report. This report does not reflect any variations which may occur between borings or across the site. The nature and extent of such variations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

It is recommended that the geotechnical engineer be provided the opportunity to review the plans and specifications so that comments can be made regarding the interpretation and implementation of our geotechnical recommendations in the design and specifications. It is further recommended that the geotechnical engineer be retained for testing and observation during earthwork and foundation construction phases to help determine that the design requirements are fulfilled.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranty, expressed or implied, is made. In the event that any changes in the nature, design or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the conclusions of this report modified or verified in writing by the geotechnical engineer.

The scope of our service was not intended to include any environmental assessment or exploration for the presence of hazardous or toxic materials in the soil, surface water, groundwater, or air on, below or adjacent to this site.

# APPENDIX

# BORING LOG DESCRIPTION/LEGEND



The material types encountered during the drilling operations were recorded on field logs. The profile represented on the Boring Log is based on final classification performed by a geotechnical engineer using the field logs, laboratory observation and testing. The material stratigraphy demarcation lines shown on the Boring Logs indicate changes in soil characteristics, however, actual soil changes or variations may occur as a gradual transition. Soil profile discussion, Log Boring information, water levels and recommendations presented in this report are based upon measured depths below ground levels existing at time of the field exploration, unless otherwise specified.

## DRILLING AND SAMPLING

The borings were conducted with either a truck or all-terrain rotary drill rig using the drilling methods indicated on each Boring Log. Soil sampling and/or in-situ testing such as Shelby Tube (ST), split-spoon (SS), drive cone (DC), or core (C) was conducted at depth intervals which were selected in consideration of the characteristics of the proposed construction. Generally undisturbed soil samples are taken at 5 foot depth intervals or change in soil types. Disturbed soil samples from the auger, either jar size or bulk size samples, may be taken at intermediate intervals for the purpose of soil classification or laboratory testing. Borings conducted for soil classification only, will show no designation of sampling although disturbed sampling is performed. Soil samples obtained in the field were identified and sealed for transportation to the laboratory for performance of pertinent physical testing and engineering classification.

### Drilling Methods

CFA - Continuous Flight Auger: 4, 6, or 8-inch diameter (ASTM D1452).
RD - Rotary Drilling: Using drilling fluid in cased or uncased boring (ASTM D2113).
HSA - Hollow Stem Auger: 6 or 8-inch diameter, continuous flight auger remains in boring with soil removed from the hollow stem through which undisturbed sampling is conducted.
HA - Hand Auger: 4-inch or less diameter.

### Sample Types

ST - Shelby Tube: Thin-walled tube samples of cohesive soils (ASTM D1587).
SS - Split Spoon with 140 lb. manual hammer: Standard penetration test and split-barrel samples (ASTM D1586).
SSA - Split Spoon with 140 lb. automatic hammer: Standard penetration test and split-barrel samples (ASTM D1586).
DC - Drive Cone: Dynamic in-place testing of soil using a 2-inch diameter cone with a 60 degree point driven into the soil for continuous 1-foot intervals in the same manner as Split Spoon, no sample is obtained.
C - Core: Sampling hard soil or bedrock with a diamond core barrel in a rotary drill boring (ASTM D2113).
SPT - Standard Penetration Test: Number of blows required to drive sampler (split spoon or drive cone) into the soil with a 140-pound weight dropping a distance of 30-inches (ASTM D1586), number of blows recorded for each 6-inch interval in an 18-inch (or more) penetration depth, values shown are for each 6-inch interval (if series of number sets are shown) or a total of the last two 6-inch intervals (if only one number is shown) which is commonly referred to as "N" in blows per foot. High resistance is indicated by a high number of blows for a lesser penetration depth listed in inches.
BS - Bulk Sample: Disturbed.
CPT - Cone Penetration Test: Quasi-static in-place testing of soils using a 60 degree cone and friction sleeve which are steadily pushed into the soil and measure skin friction and end bearing (ASTM D3441).

## STANDARD LABORATORY TESTING

Representative undisturbed soil samples obtained by the Shelby Tube sampler were tested for moisture content (ASTM D2216), density (dry) and unconfined compressive strength (ASTM D2166) in the laboratory. Results of these tests appear on the respective Boring Logs. Additional soil testing including particle size analysis (ASTM D422) and Atterberg Limits (ASTM D4318) may be conducted, if necessary, to define in more detail pertinent soil characteristics for classification in accordance with the Unified Soil Classification System. Specialized laboratory tests (if conducted) to determine pertinent soil characteristics are discussed in the "Laboratory Testing" section of the report.

## WATER LEVEL MEASUREMENT

Water levels indicated on the Boring Logs are the levels measured in the borings at the times indicated. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels is not possible with short term observations.

# BORING LOG DESCRIPTION/LEGEND



## DESCRIPTIVE SOIL CLASSIFICATION

Soil description is based on the Unified Classification System as outlined in ASTM Designations D-2487 and D-2488. This classification is primarily based upon visual and apparent physical soil characteristics, comparison with other soil samples, and our experience with the soil. Additional laboratory testing may be conducted, if necessary to define in more detail pertinent soil characteristics. The Unified Soil Classification group symbol shown on the boring logs corresponds with the group names listed below. The description includes soil constituents, moisture conditions, color and any other appropriate descriptive terms.

| Group Symbol | Group Name | Group Symbol | Group Name | Group Symbol | Group Name | Group Symbol | Group Name |
|---|---|---|---|---|---|---|---|
| GW | Well-Graded Gravel | SW | Well-Graded Sand | CL | Lean Clay | CH | Fat Clay |
| GP | Poorly-Graded Gravel | SP | Poorly-Graded Sand | ML | Silt | MH | Elastic Silt |
| GM | Silty Gravel | SM | Silty Sand | OL | Organic Clay Organic Silt | OH | Organic Clay Organic Silt |
| GC | Clayey Gravel | SC | Clayey Sand | | | PT | Peat |

| RELATIVE PROPORTIONS | | | GRAIN SIZE TERMINOLOGY | |
|---|---|---|---|---|
| Descriptive Term(s) (Of components also present in sample) | Sand and Gravel % of Dry Weight | Fines % of Dry Weight | Major Component of Sample | Size Range |
| Trace | <15 | <5 | Cobbles | 12 in. to 3 in. (300mm to 75mm) |
| With | 15-30 | 5-12 | Gravel | 3 in. to #4 sieve (75mm to 4.75mm) |
| Modifier | >30 | >12 | Sand | #4 to #200 sieve (4.75mm to 0.074mm) |
| | | | Silt or Clay | Passing #200 sieve (.074 mm) |

| CONSISTENCY OF FINE-GRAINED SOILS | | | RELATIVE DENSITY OF COARSE-GRAINED SOILS | |
|---|---|---|---|---|
| Unconfined Compressive Strength, Qu, psf | Consistency | SPT, bpf | SPT, bpf | Relative Density |
| < 500 | Very Soft | 0-2 | 0-4 | Very Loose |
| 500-1,000 | Soft | 2-4 | 4-10 | Loose |
| 1,000-2,000 | Medium Stiff | 4-8 | 10-30 | Medium Dense |
| 2,000-4,000 | Stiff | 8-15 | 30-50 | Dense |
| 4,000-8,000 | Very Stiff | 15-30 | 50-80 | Very Dense |
| 8,000-16,000 | Hard | 30-100 | 80+ | Extremely Dense |
| > 16,000 | Very Hard | >100 | | |

## BORING LOG DESCRIPTION/LEGEND



### ABBREVIATIONS

| COMMONLY USED ABBREVIATIONS | |
|---|---|
| ft. or ' - feet | elev. - Elevation |
| in. or " - inches | % - Percent |
| psf - pounds per square foot | No. - Number |
| plf - pound per lineal foot | TB - Test Boring |
| pcf - pounds per cubic feet | N - blow count (SPT, bpf) |
| kip - 1000 pounds | USCS - Unified Soil Classification System |
| ksf - 1000 pounds per square foot | LL - Liquid Limit |
| klf - 1000 pounds per lineal foot | PL - Plastic Limit |
| tsf - tons per square foot | PI - Plasticity Index |
| bpf - blows per foot (SPT, N) | |

# BORING LOG NO. 1

Project No.: 251210

Project: NCF IPI Homes for Iowa Facility Project
307 S 60th Street
Newton, Iowa

Client: Samuels Group
2929 Westown Parkway, Suite 200
West Des Moines, Iowa

Surface Elevation: 772.0'
Datum: IA RTN Derived

Date Drilled: 6/11/25
Drilling Depth, ft.: 20

Drilling Method: 4" CFA
Page: 1 of 1

| Elevation ft. | Depth ft. | Sample No. | Type | SPT bpf | Moisture Content, % | Dry Density pcf | Unconfined Compressive Strength psf | Material Description* | Graphic Log | USCS | Water Level | Depth / Elevation ft. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 772 | 0 | | | | | | | Dark brown lean clay, damp | | CL | | |
| | | 1 | SSA | 6 | 24.1 | | | | | | ▼ | |
| 770 | | | | | | | | Moist after 2.5' | | | | |
| 768 | 4 | 2 | SSA | 5 | 35.3 | | | Very dark brown after 4' | | CL | | |
| 766 | | 3 | SSA | 8 | 26.7 | | | **COHESIVE ALLUVIUM** | | | | |
| 764 | 8 | 4 | ST | | 24.7 | 99 | 3210 | Very dark gray fat clay after 7' | | CH | | |
| 762 | | | | | | | | Gray-brown after 10.5' | | | | |
| 760 | 12 | | | | | | | | | | | 13.5 |
| 758 | | 5 | SSA | 10 | 23.0 | | | Gray silty fine to medium sand, very moist<br>Saturated after 14.5' | | SM | ▽ | 758.5 |
| 756 | 16 | | | | | | | Brown after 16'<br>**GRANULAR ALLUVIUM** | | | | |
| 754 | | 6 | SSA | 3 | 21.9 | | | | | | | |
| 752 | 20 | | | | | | | End of Boring | | | | 20<br>752 |
| 750 | | | | | | | | | | | | |
| 748 | 24 | | | | | | | | | | | |
| 746 | | | | | | | | | | | | |

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation

Time: at completion ____ hrs. 13 days

Depth to water: 14.5 ft. ▽ ____ ft. ▼ 2 ft. ▼

**ALLENDER BUTZKE ENGINEERS, INC.**

Geotechnical | Environmental | Construction Q.C.

# BORING LOG NO. 2

Project No.: 251210

Project: NCF IPI Homes for Iowa Facility Project
307 S 60th Street
Newton, Iowa

Client: Samuels Group
2929 Westown Parkway, Suite 200
West Des Moines, Iowa

Surface Elevation: 775.5'
Datum: IA RTN Derived

Date Drilled: 6/11/25
Drilling Depth, ft.: 20

Drilling Method: 4" CFA
Page: 1 of 1

| Elevation ft. | Depth ft. | Sample No. | Type | SPT bpf | Moisture Content, % | Dry Density pcf | Unconfined Compressive Strength psf | Material Description* | Graphic Log | USCS | Water Level | Depth / Elevation ft. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | | | Dark brown lean clay, trace organics, damp | | CL | | |
| 774 | | 1 | SSA | 5 | 19.5 | | | | | | | |
| 772 | 4 | 2 | SSA | 5 | 23.5 | | | Brown and moist after 4' | | | | |
| 770 | | 3 | SSA | 5 | 24.9 | | | **COHESIVE ALLUVIUM** | | | | |
| 768 | 8 | | | | | | | | | | | |
| 766 | | 4 | ST | | 24.8 | 97 | 3210 | | | | | |
| 764 | 12 | | | | | | | Brown lean to fat clay, moist after 11.5' | | CL-CH | | |
| 762 | | | | | | | | | | | | 14 |
| 760 | 16 | 5 | SSA | 6 | 20.4 | | | Brown silty fine to medium sand, very moist | | SM | | 761.5 |
| 758 | | | | | | | | Saturated after 16' | | | ▽ | |
| 756 | | 6 | SSA | 5 | Sat. | | | **GRANULAR ALLUVIUM** | | | | |
| | 20 | | | | | | | | | | | 20 |
| 754 | | | | | | | | End of Boring | | | | 755.5 |
| 752 | 24 | | | | | | | | | | | |
| 750 | | | | | | | | | | | | |

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation

Time: at completion _____ hrs. _____ days

Depth to water: 16 ft. ▽ _____ ft. ▼ _____ ft. ▼

**ALLENDER BUTZKE ENGINEERS, INC.**

Geotechnical | Environmental | Construction Q.C.

# BORING LOG NO. 3

Project No.: 251210

Project: **NCF IPI Homes for Iowa Facility Project**
**307 S 60th Street**
**Newton, Iowa**

Client: **Samuels Group**
**2929 Westown Parkway, Suite 200**
**West Des Moines, Iowa**

Surface Elevation: **783.4'**
Datum: **IA RTN Derived**

Date Drilled: **6/11/25**
Drilling Depth, ft.: **20**

Drilling Method:
Page: **1** of **1**

| Elevation ft. | Depth ft. | Sample No. | Type | SPT bpf | Moisture Content, % | Dry Density pcf | Unconfined Compressive Strength psf | Material Description* | Graphic Log | USCS | Water Level | Depth / Elevation ft. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | | | Dark brown lean clay, trace organics, damp | | CL | | |
| 782 | | 1 | SSA | 4 | 23.9 | | | | | | | |
| 780 | 4 | 2 | SSA | 4 | 22.7 | | | Brown and moist after 3.5' | | | | |
| 778 | | | | | | | | | | | | |
| | | 3 | ST | | 21.8 | 90 | 1680 | | | | | |
| 776 | 8 | | | | | | | | | | | |
| 774 | | 4 | ST | | 25.3 | 93 | 2540 | **COHESIVE ALLUVIUM** | | | | |
| 772 | | | | | | | | Very moist after 11' | | | | |
| | 12 | | | | | | | | | | | |
| 770 | | 5 | ST | | 24.7 | 92 | 1470 | | | | | |
| 768 | | | | | | | | | | | | |
| | 16 | | | | | | | | | | | |
| 766 | | | | | | | | | | | | |
| 764 | | 6 | SSA | 5 | 28.0 | | | | | | | 20 |
| | 20 | | | | | | | End of Boring | | | | 763.4 |
| 762 | | | | | | | | | | | | |
| 760 | | | | | | | | | | | | |
| | 24 | | | | | | | | | | | |
| 758 | | | | | | | | | | | | |

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation

Time: at completion _____ hrs. _____ days

Depth to water: **Dry** ft. _____ ft. _____ ft.

**ALLENDER BUTZKE ENGINEERS, INC.**

Geotechnical | Environmental | Construction Q.C.

# BORING LOG NO. 4

Project No.: 251210

Project: NCF IPI Homes for Iowa Facility Project
307 S 60th Street
Newton, Iowa

Client: Samuels Group
2929 Westown Parkway, Suite 200
West Des Moines, Iowa

Surface Elevation: 786.9'
Datum: IA RTN Derived

Date Drilled: 6/11/25
Drilling Depth, ft.: 20

Drilling Method: 4" CFA
Page: 1 of 1

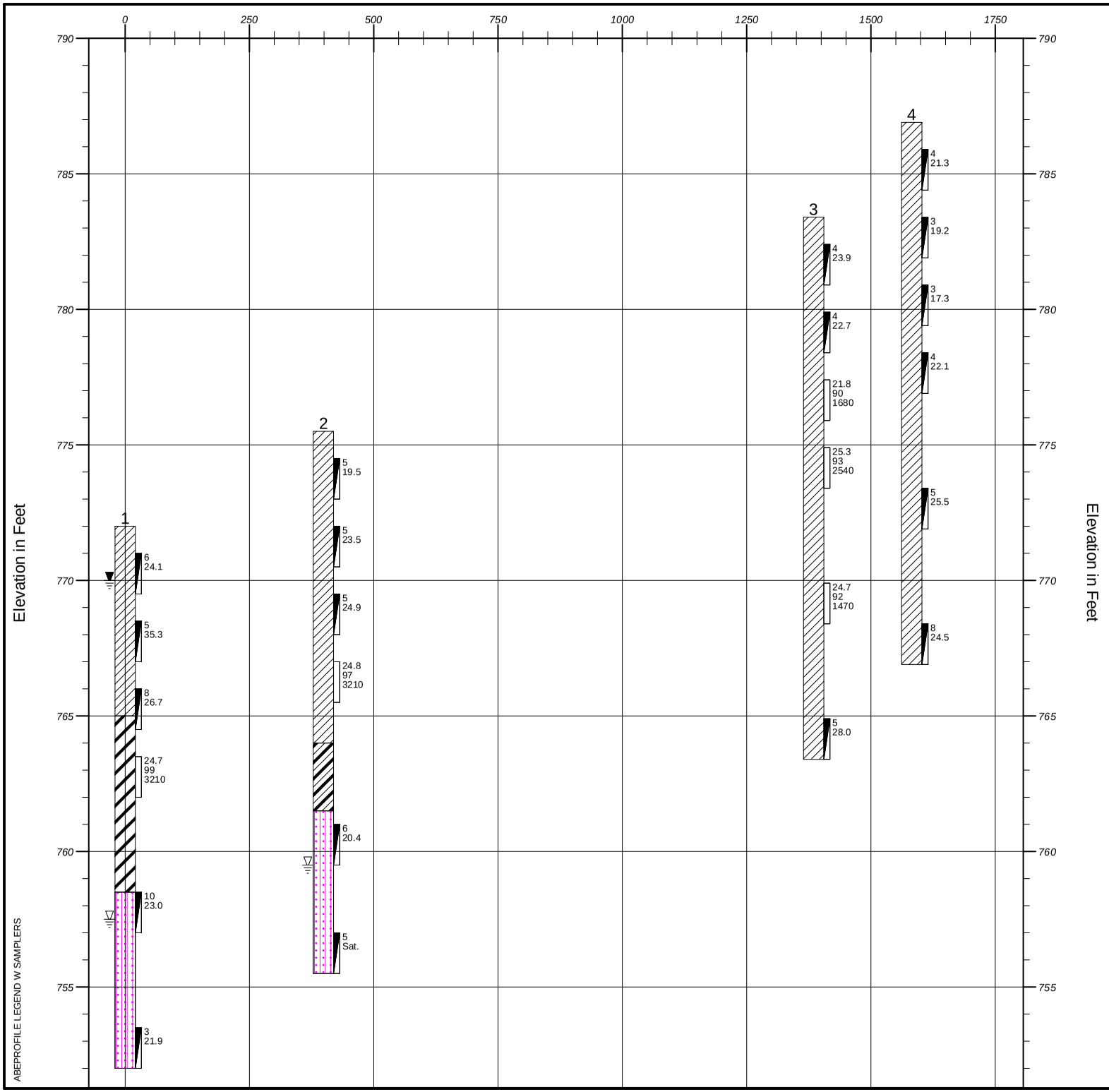
| Elevation ft. | Depth ft. | Sample No. | Type | SPT bpf | Moisture Content, % | Dry Density pcf | Unconfined Compressive Strength psf | Material Description* | Graphic Log | USCS | Water Level | Depth / Elevation ft. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 786 | 0 | | | | | | | Dark brown lean clay, trace organics, damp | | CL | | |
| | | 1 | SSA | 4 | 21.3 | | | | | | | |
| 784 | | | | | | | | | | | | |
| | 4 | 2 | SSA | 3 | 19.2 | | | Brown sandy lean clay, moist after 3.5' | | | | |
| 782 | | | | | | | | | | | | |
| | | 3 | SSA | 3 | 17.3 | | | Brown very sandy lean clay to silty sand after 6' | | | | |
| 780 | | | | | | | | | | | | |
| | 8 | | | | | | | | | | | |
| 778 | | 4 | SSA | 4 | 22.1 | | | **COHESIVE ALLUVIUM** | | | | |
| 776 | | | | | | | | | | | | |
| | 12 | | | | | | | Brown gray and very moist after 12' | | | | |
| 774 | | | | | | | | | | | | |
| | | 5 | SSA | 5 | 25.5 | | | | | | | |
| 772 | | | | | | | | | | | | |
| | 16 | | | | | | | | | | | |
| 770 | | | | | | | | | | | | |
| 768 | | 6 | SSA | 8 | 24.5 | | | | | | | 20 |
| | 20 | | | | | | | End of Boring | | | | 766.9 |
| 766 | | | | | | | | | | | | |
| 764 | | | | | | | | | | | | |
| | 24 | | | | | | | | | | | |
| 762 | | | | | | | | | | | | |
| 760 | | | | | | | | | | | | |

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

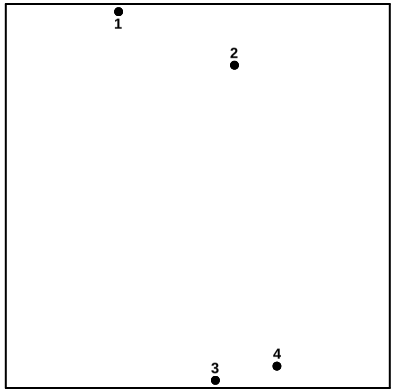
Water Level Observation
Time: at completion ____ hrs. 13 days
Depth to water: Dry ft. ____ ft. Dry ft.

**ALLENDER BUTZKE ENGINEERS, INC.**
Geotechnical | Environmental | Construction Q.C.

# PROFILE OF BORINGS




**Plan View (NORTH)**




**Profile of Borings Legend**

| Symbol | Description | Symbol | Description |
|---|---|---|---|
| **Strata symbols** | | | |
| | Lean Clay | | Undisturbed thin wall Shelby tube |
| | Fat Clay | | |
| | Silty Sand | | |
| | Lean to Fat Clay | | |
| **Misc. Symbols** | | | |
| | Water table at completion | | |
| | Water table at x days | | |
| **Soil Samplers** | | | |
| | Standard penetration test | | |

**ALLENDER BUTZKE ENGINEERS, INC.**

**NCF IPI Homes for Iowa Facility Project**

307 S 60th Street

Newton, Iowa

**PN 251210**

Vertical Scale: 1 inch = 5 feet

Plate A-1


Plan is intended to show the approximate soil boring locations only.

| | | | |
|---|---|---|---|
| **ALLENDER BUTZKE ENGINEERS INC.**<br>3660 109th Street<br>Urbandale, IA 50322 | NCF IPI Homes for Iowa Facility Project<br>S 60th Avenue West<br>Newton, Iowa | Approximate Overlay Plan by Bishop<br><br>2023 Aerial | PN 251210<br><br>Site Plan |

# NOTES

# END OF DOCUMENTS