A preletting conference will be held at 10:00 a.m. Friday, February 14, 2020, at the Public Works Yard, 903 S.E. 22nd Street, Des Moines, Iowa.

PUBLIC IMPROVEMENTS
CONTRACT DOCUMENTS

PUBLIC WORKS SALT SHED EXPANSION

ACTIVITY ID
102019010

PLAN FILE NO.
584-190/203

CITY COUNCIL APPROVAL

APPROVAL DATE
March 9, 2020

ROLL CALL NO.

CONTRACT NO.

CONTRACTOR

CONTRACT AMOUNT
$.00

ENGINEERING DEPARTMENT
Steven L. Naber, P.E.
Des Moines City Engineer

Funding Information
Object Code 543060
Organization No. C034PK99
Project No. BL131
The following documents are part of this contract:

   Document

Instructions to Bidders
Official Publications
Proposal
Bid Bond
Contract
Performance, Payment and Maintenance Bond
Addenda:

Special Provisions:
   Bidding Requirements
   Contractual Requirements
   Technical Specifications
Supplemental Specifications:
   General Supplemental Specifications to SUDAS, 2019 Edition

PROJECT ENGINEER: Jill Tenney
Phone Number: (515) 283-4032

April 22, 2019
INSTRUCTIONS TO BIDDERS

Activity ID 10-2019-010
Project Name Public Works Salt Shed Expansion

Fed/St. Project No.

The work comprising the above referenced project shall be constructed in accordance with the SUDAS Standard Specifications, 2019 Edition; and as further modified by the supplemental specifications and special provisions included in the contract documents. The Des Moines City Engineer is the Engineer. The terms used in the contract documents are defined in said SUDAS Standard Specifications. The City of Des Moines is the Contracting Authority on this project and shall hereinafter be referred to as the "Jurisdiction". Before submitting your bid, please review the SUDAS Standard Specifications, in particular, Division 1 - General Provisions and Covenants, including the sections regarding proposal requirements, bonding, contract execution and insurance requirements. Please be certain that all documents have been properly completed and submit them to the City Clerk, 1st Floor, City Hall, 400 Robert D. Ray Drive, Des Moines, Iowa, 50309.

I. BID SECURITY

The bid security must be in the minimum amount of 10% of the total bid amount including all add alternates (do not deduct the amount of deduct-alternates). Bid security shall be as defined in Section 26.8 of the Iowa Code and shall be in the form of a cashier's check or certified check drawn on a state-chartered or federally chartered bank, or a certified share draft drawn on a state-chartered or federally chartered credit union, or a bid bond executed by a corporation authorized to contract as a surety in Iowa or satisfactory to the Jurisdiction. The bid bond must be submitted on the enclosed Bid Bond form (DSM Urban 04/20/98) as no other bid bond forms are acceptable. All signatures on the bid bond must be original signatures in ink; facsimile (fax) of any signature on the bid bond is not acceptable. Bid security other than said bid bond shall be made payable to the City of Des Moines. "Miscellaneous Bank Checks", and personal checks, as well as "Money Orders" and "Traveler's Checks" issued by persons, firms or corporations licensed under Chapter 533B of the Iowa Code, are not acceptable bid security. **NOTE: If the Bidder submits Bid Security in the form of a Bid Bond, and the Bidder wishes to have their Bid Bond returned to them after an approved contract and bond has been executed or after there is a rejection of all bids (in accordance with Iowa Code 26.10), the Bidder shall include a self-addressed envelope with the Bid Bond.**

II. SUBMISSION OF THE PROPOSAL AND IDENTITY OF BIDDER

A. The proposal shall be sealed in an envelope, properly identified as the Proposal with the project title and the name and address of the bidder, and deposited with the Jurisdiction at or before the time and at the place provided in the Notice to Bidders. It is the sole responsibility of the bidder to see that its proposal is delivered to the Jurisdiction prior to the time for openings bids, along with the appropriate bid security sealed in the separate envelope identified as Bid Security and attached to the outside of the bid proposal envelope. Any proposal received after the scheduled time for the receiving of proposals will be returned to the bidder unopened and will not be considered. Bidders must either utilize the two envelopes provided with the Bidding documents, or Bidders provide their own two envelopes, for their proposals and bid security for submission of their bids.

**Sales Tax:** The bidder should not include sales tax in the bid pursuant to Iowa Code. A sales tax exemption certificate will be available for all material purchased for incorporation in the project.

**Accessibility for individuals with disabilities.** The City of Des Moines is pleased to provide accommodations to individuals with disabilities or groups and encourages participation in City government. To better serve you, please notify us at least three business days in advance when possible at 515-283-4209, should special accommodations be required.
B. All pages of the Proposal must be returned. The following documents shall be completed, signed and returned in the Proposal envelope.

PROPOSAL - Complete each of the following parts:
- Part B - Acknowledgement of Addenda, if any have been issued;
- Part C - Bid Items, Quantities and Prices;
- Part F - Additional Requirements; The following proposal attachment documents must be completed and attached:

<table>
<thead>
<tr>
<th>ITEM NO.</th>
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<tbody>
<tr>
<td>1.</td>
<td>Reciprocal Resident Bidder and Labor Force</td>
</tr>
<tr>
<td>2.</td>
<td>General</td>
</tr>
</tbody>
</table>

- Part G - Identity of Bidder.

The Bidder shall sign the proposal. The signature on the proposal and all proposal attachments must be an original signature in ink signed by the same individual who is the Company Owner or an authorized Officer of the Company; copies or facsimile of any signature will not be accepted. The Bidder Status Form (PROPOSAL Part F Item 2B) is required by the Iowa Labor Commissioner, pursuant to Iowa Admin. Code rule 875-156.2(1). The Bidder must complete and submit the Bidder Status Form, signed by an authorized representative of the Bidder, with their bid proposal. Under Iowa Admin. Code rule 875-156.2(1), failure to provide the Bidder Status Form with the bid may result in the bid being deemed non-responsive and may result in the bid being rejected. The Worksheet: Authorization to Transact Business from the Labor Commissioner is included on page 3 of 3 of the Instructions to Bidders, to assist Bidders in completing the Bidder Status Form.

C. Out-of-State Contractors:

1. Pursuant to Section 91C.7 of the Iowa Code, an out-of-state contractor, before commencing a contract in excess of five thousand dollars in value in Iowa, shall file a bond with the Division of Labor Services of the Iowa Department of Workforce Development. The contractor should contact 515-242-5871 for further information. Prior to contract execution, the City Engineer may forward a copy of this contract to the Iowa Department of Workforce Development as notification of pending construction work. It is the contractor's responsibility to comply with said Section 91C.7 before commencing this work.

2. Prior to entering into contract, the designated low bidder, if it be a corporation organized under the laws of a state other than Iowa, shall file with the Engineer a certificate from the Secretary of the State of Iowa showing that it has complied with all the provisions of Chapter 490 of the Code of Iowa, or as amended, governing foreign corporations. For further information contact the Iowa Secretary of State Office at 515-281-5204.

III. GENERAL

A. All bid documents must be submitted as printed. No alterations, additions, or deletions are permitted. If the Bidder notes a requirement in the contract documents that the Bidder believes will require a conditioned or unsolicited alternate bid, the Bidder must immediately notify the Engineer in writing. The Engineer will issue any necessary interpretation by an addendum.

B. Additional information regarding addenda, plan holders, bid tabulations, etc. can be found on the Engineering Department web site at <http://www.dmsgov.org/Departments/Engineering/Pages/BidsContracts.aspx>.
Worksheet: Authorization to Transact Business

This worksheet may be used to help complete Part A of the Resident Bidder Status Form. If at least one of the following describes your business, you are authorized to transact business in Iowa.

Yes___ No___ My business is currently registered as a contractor with the Iowa Division of Labor.

Yes___ No___ My business is a sole proprietorship and I am an Iowa resident for Iowa income tax purposes.

Yes___ No___ My business is a general partnership or joint venture. More than 50 percent of the general partners or joint venture parties are residents of Iowa for Iowa income tax purposes.

Yes___ No___ My business is an active corporation with the Iowa Secretary of State and has paid all fees required by the Secretary of State, has filed its most recent biennial report, and has not filed articles of dissolution.

Yes___ No___ My business is a corporation whose articles of incorporation are filed in a state other than Iowa, the corporation has received a certificate of authority from the Iowa secretary of state, has filed its most recent biennial report with the secretary of state, and has neither received a certificate of withdrawal from the secretary of state nor had its authority revoked.

Yes___ No___ My business is a limited liability partnership which has filed a statement of qualification in this state and the statement has not been canceled.

Yes___ No___ My business is a limited liability partnership which has filed a statement of qualification in a state other than Iowa, has filed a statement of foreign qualification in Iowa and a statement of cancellation has not been filed.

Yes___ No___ My business is a limited partnership or limited liability limited partnership which has filed a certificate of limited partnership in this state, and has not filed a statement of termination.

Yes___ No___ My business is a limited partnership or a limited liability limited partnership whose certificate of limited partnership is filed in a state other than Iowa, the limited partnership or limited liability limited partnership has received notification from the Iowa secretary of state that the application for certificate of authority has been approved and no notice of cancellation has been filed by the limited partnership or the limited liability limited partnership.

Yes___ No___ My business is a limited liability company whose certificate of organization is filed in Iowa and has not filed a statement of termination.

Yes___ No___ My business is a limited liability company whose certificate of organization is filed in a state other than Iowa, has received a certificate of authority to transact business in Iowa and the certificate has not been revoked or canceled.
NOTICE TO BIDDERS
CITY OF DES MOINES PUBLIC IMPROVEMENT PROJECT

Time and Place for Filing Sealed Proposals. Sealed bids for the work comprising each improvement as stated below must be filed at or before 11:00 a.m. on February 25, 2020, in the office of the City Clerk, 1st Floor, City Hall, 400 Robert D. Ray Drive, Des Moines, Iowa, 50309.

Accessibility for individuals with disabilities. The City of Des Moines is pleased to provide accommodations to individuals with disabilities or groups and encourages participation in City government. To better serve you, please notify us at least three business days in advance when possible at 515-283-4209, should special accommodations be required.

Time and Place Sealed Proposals Will be Opened and Considered. Sealed proposals will be opened and bids tabulated at 11:00 a.m., on February 25, 2020, in the City Council Chambers, 2nd Floor, City Hall, 400 Robert D. Ray Drive, Des Moines, Iowa, for consideration by the City Council (Council) at its meeting on March 9, 2020. The City of Des Moines (Jurisdiction) reserves the right to reject any and all bids.

Time for Commencement and Completion of Work. Work on each improvement shall be commenced upon approval of the contract by the Council, and completed as stated below.

Bid Security. Each bidder shall accompany its bid with bid security as defined in Section 26.8 of the Iowa Code and as specified by the Jurisdiction.

Contract Documents. Copies of the contract documents will be available after February 10, 2020, from the City Engineer's Office, 2nd Floor, City Hall, 400 Robert D. Ray Drive, Des Moines, Iowa 50309, at no cost, phone (515) 283-4573.

Preference for Iowa Products and Labor. By virtue of statutory authority, preference will be given to products and provisions grown and coal produced within the State of Iowa, and to Iowa domestic labor, to the extent lawfully required under Iowa statutes.

Sales Tax. The bidder should not include sales tax in the bid. A sales tax exemption certificate will be available for all material purchased for incorporation in the project.

General Nature of Public Improvement.
Public Works Salt Shed Expansion, 10-2019-010
The improvement includes the construction of a 12,000 ton capacity, pre-engineered hoop truss salt storage building including pavement removal, grading, foundation, electrical, and Hot Mix Asphalt (HMA) pavement; all work in accordance with the contract documents, including Plan File Nos. 584-190/203, located at the Des Moines Public Works Supply Yard, 903 S.E. 22nd Street, Des Moines, Iowa.

This project shall be fully completed not later than September 18, 2020.

Engineer's Construction Estimate, $1,380,000.00

Preletting Conference. A preletting conference will be held at 10:00 a.m. Friday, February 14, 2020, at the Public Works Yard, 903 S.E. 22nd Street, Des Moines, Iowa.
NOTICE OF PUBLIC HEARING
CITY OF DES MOINES PUBLIC IMPROVEMENT PROJECT

Public Hearing on Proposed Contract Documents and Estimated Costs for Improvement. A public hearing will be held by the City Council on the proposed contract documents (plans, specifications and form of contract) on file in the City Engineer’s Office, and estimated cost for each improvement at its meeting on March 9, 2020, at 5:00 p.m., in the City Council Chambers, 2nd Floor, City Hall, 400 Robert D. Ray Drive, Des Moines, Iowa. The City Council Meetings are open to all individuals regardless of disability. To better serve you, please notify the City Clerk at least three business days in advance, when possible, should special accommodations be required.

General Nature of Public Improvement

Public Works Salt Shed Expansion, 10-2019-010
The improvement includes the construction of a 12,000 ton capacity, pre-engineered hoop truss salt storage building including pavement removal, grading, foundation, electrical, and Hot Mix Asphalt (HMA) pavement; all work in accordance with the contract documents, including Plan File Nos. 584-190/203, located at the Des Moines Public Works Supply Yard, 903 S.E. 22nd Street, Des Moines, Iowa

Published in the Des Moines Register
February 19, 2020
PROPOSAL

To the Honorable Mayor and Members of the
City Council, City of Des Moines, Iowa

PROPOSAL: PART A - SCOPE

The City of Des Moines, hereinafter called the "Jurisdiction", has need of a qualified contractor to complete the work comprising the below referenced improvement. The undersigned Bidder hereby proposes to complete the work comprising the below referenced improvements or project as specified in the contract documents, which are officially on file with the Jurisdiction, in the Des Moines City Engineer's Office, at the prices hereinafter provided in Part C of this Proposal, for the following described improvements:

Public Works Salt Shed Expansion, 10-2019-010

The improvement includes the construction of a 12,000 ton capacity, pre-engineered hoop truss salt storage building including pavement removal, grading, foundation, electrical, and Hot Mix Asphalt (HMA) pavement; all work in accordance with the contract documents, including Plan File Nos. 584-190/203, located at the Des Moines Public Works Supply Yard, 903 S.E. 22nd Street, Des Moines, Iowa

PROPOSAL: PART B - ACKNOWLEDGEMENT OF ADDENDA

The Bidder hereby acknowledges that all addenda become a part of the contract documents when issued, and that each such addendum has been received and utilized in the preparation of this bid. The Bidder hereby acknowledges receipt of the following addenda by inserting the number of each addendum in the blanks below:

ADDENDUM NUMBER ___________ ADDENDUM NUMBER ___________
ADDENDUM NUMBER ___________ ADDENDUM NUMBER ___________

and certifies that said addenda were utilized in the preparation of this bid.

PROPOSAL: PART C - BID ITEMS, QUANTITIES AND PRICES

UNIT BID PRICE CONTRACTS: The bidder must provide all unit prices, the amount, the total construction cost, any alternate price(s), and the total construction cost plus any add-alternates if there are alternates on the proposal on Proposal Attachment: Part C - Bid Items, Quantities, and Prices. The total construction cost plus any alternates selected by the Jurisdiction shall be used for comparison of bids. The total construction cost plus any add-alternates shall be used for determining the sufficiency of the bid security.
BASE BID CONTRACTS: The bidder must provide any bid price(s), the total base bid price, any alternate price(s), and the total base bid plus any add-alternates if there are alternates on the proposal on Proposal Attachment: Part C - Bid Items, Quantities, and Prices. The total base bid plus any alternates selected by the Jurisdiction shall be used for comparison of bids. The total base bid plus any add-alternates shall be used for determining the sufficiency of the bid security.

PROPOSAL: PART D - GENERAL

The Bidder hereby acknowledges that the Jurisdiction, in advertising for public bids for this project, reserves the right to:

1. Reject any or all bids. Award of the contract, if any, to be to the lowest responsible, responsive bidder; and

2. Reject any or all alternates in determining the items to be included in the contract. Designation of the lowest responsible, responsive bidder to be based on comparison of the total bid plus any selected alternates; and

3. Make such alterations in the contract documents or in the proposal quantities as it determines necessary in accordance with the contract documents after execution of the contract. Such alterations shall not be considered a waiver of any conditions of the contract documents, and shall not invalidate any of the provisions thereof; and

The Bidder hereby agrees to:

1. Enter into a contract, if this proposal is selected, in the form approved by the Jurisdiction and provide the following documents:
   - Proof of registration with the Iowa Division of Labor in accordance with Chapter 91C of the Iowa Code by providing a valid Registration Number,
   - Proof of insurance by a Certificate(s) of Insurance,
   - A performance, maintenance, and payment bond; and

2. Forfeit bid security, not as a penalty but as liquidated damages, upon failure to enter into such contract and/or to furnish said documents and information as requested in Item 1 above acceptable to the Des Moines City Engineer; and

3. Commence the work on this project on or before a date to be specified in a written notice to proceed by the Jurisdiction, and to fully complete the project not later than September 18, 2020; and to pay liquidated damages for noncompliance with said completion provisions at the rate of five hundred and 00/100 dollars ($500.00) for each calendar day thereafter that the work remains incomplete.
PROPOSAL: PART E - NON-COLLUSION AFFIDAVIT

The Bidder hereby certifies:

1. That this proposal is not affected by, contingent on, or dependent on any other proposal submitted for any improvement with the Jurisdiction; and

2. That no individual employed by the Bidder has employed any person to solicit or procure the work on this project, nor will any employee of the Bidder make any payment or agreement for payment of any compensation in connection with the procurement of this project; and

3. That no part of the bid price received by the Bidder was paid or will be paid to any person, corporation, firm, association, or other organization for soliciting the bid, other than the payment of their normal compensation to persons regularly employed by the Bidder whose services in connection with the construction of the project were in the regular course of their duties for the Bidder; and

4. That this proposal is genuine and not collusive or sham; that the Bidder has not colluded, conspired, connived or agreed, directly or indirectly, with any bidder or person, to put in a sham bid or to refrain from bidding, and has not in any manner, directly or indirectly, sought, by agreement or collusion, or communication or conference, with any person, to fix the bid price of the Bidder or of any other bidder, and that all statements in this proposal are true; and

5. That the individual(s) executing this proposal have the authority to execute this proposal on behalf of the Bidder.

PROPOSAL: PART F - ADDITIONAL REQUIREMENTS

The Bidder hereby agrees to comply with the additional requirements listed below, which are included in this proposal and identified as proposal attachments:

<table>
<thead>
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<tbody>
<tr>
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<td>Reciprocal Resident Bidder and Labor Force</td>
</tr>
<tr>
<td>2.</td>
<td>General</td>
</tr>
</tbody>
</table>
PROPOSAL: PART G - IDENTITY OF BIDDER

The Bidder shall indicate whether the bid is submitted by a/an

☐ Individual,
   Sole Proprietorship

☐ Partnership

☐ Corporation

☐ Limited Liability Company

☐ Joint-venture: all parties must join-in and execute all documents

☐ Other ____________________________

By ____________________________

______________________________
Bidder

______________________________
Signature

______________________________
Name (Print/Type)

______________________________
Title

______________________________
Street Address

______________________________
City, State, Zip Code

______________________________
Telephone Number / Email Address

A contract will not be executed until the apparent low Bidder is registered with the Iowa Commissioner of Labor pursuant to Section 91C.5 of the Iowa Code. The Bidder should contact 515-242-5871 for registration information.

Engineering Department Staff will contact the apparent low Bidder and obtain the name and title of the company's owner, president, CEO, etc. if a different person than entered above.

NOTE: The signature on this proposal must be an original signature in ink; copies or facsimile of any signature will not be accepted.
### PROPOSAL ATTACHMENT: PART C - BID ITEMS, QUANTITIES AND PRICES: 1 of 1

This is a unit bid price contract. The bidder must provide all unit prices, the amount, the total construction cost, any alternate price(s), and the total construction cost plus any add-alternates if there are alternates on the proposal. The total construction cost plus any alternates selected by the Jurisdiction shall be used for comparison of bids. The total construction cost plus any add-alternates shall be used for determining the sufficiency of the bid security.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>UNITS</th>
<th>ESTIMATED QUANTITY</th>
<th>UNIT PRICE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mobilization</td>
<td>LS</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Construction Staking</td>
<td>LS</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Excavation, Class 10/Embarkment</td>
<td>LS</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Subbase Preparation, 12-inch</td>
<td>SY</td>
<td>6200.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Granular Subbase, 6-inch</td>
<td>SY</td>
<td>3200.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Compaction Testing</td>
<td>LS</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Trench Foundation</td>
<td>TON</td>
<td>50.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Replacement of Unsuitable Backfill</td>
<td>CY</td>
<td>50.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Replacement of Contaminated Backfill</td>
<td>TON</td>
<td>50.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Water Main, Connect to existing</td>
<td>EACH</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Water Main, 6-inch</td>
<td>LF</td>
<td>450.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Resilient Wedge Gate Valve, 6-inch</td>
<td>EACH</td>
<td>1.00</td>
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<td></td>
</tr>
<tr>
<td>13</td>
<td>Fire Hydrant Assemblies</td>
<td>EACH</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Pavement Removal</td>
<td>SY</td>
<td>500.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>HMA Pavement, 8-inch, Low Traffic</td>
<td>SY</td>
<td>3100.00</td>
<td></td>
<td></td>
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<tr>
<td>16</td>
<td>HMA Pavement Samples and Testing</td>
<td>LS</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17a</td>
<td>Building Foundation - cast in place wall &amp; foundation system</td>
<td>LS</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17b</td>
<td>Building Foundation - precast concrete block wall &amp; concrete foundation system</td>
<td>LS</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Bollards</td>
<td>Each</td>
<td>11.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Truss-Supported Tensioned Fabric Enclosure</td>
<td>LS</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Electrical</td>
<td>LS</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL BASE BID</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**ADD ALTERNATE 1**
Sixteen foot bay

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>UNITS</th>
<th>ESTIMATED QUANTITY</th>
<th>UNIT PRICE</th>
<th>AMOUNT</th>
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</thead>
</table>

**ADD ALTERNATE 2**
Conveyor and hopper

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>UNITS</th>
<th>ESTIMATED QUANTITY</th>
<th>UNIT PRICE</th>
<th>AMOUNT</th>
</tr>
</thead>
</table>

**BIDDER MUST SUBMIT BIDS ON ALL ALTERNATE ITEMS.**

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**NOTE:** It is understood that the above quantities are estimated for the purpose of this bid. All quantities are subject to revision by the City. Quantity changes which amount to twenty (20) percent or less of the total bid shall not affect the unit bid price of that item.
PROPOSAL ATTACHMENT:  PART F - ADDITIONAL REQUIREMENTS
ITEM 1 - RECIPROCAL RESIDENT BIDDER AND LABOR FORCE

Iowa Code section 73A.21 provides for a Reciprocal Resident Bidder and Labor Force preference.

Because of the nature of this project (i.e. Federal-aid participation), the Reciprocal Resident Bidder and Labor Force preference,

☐ shall not apply to this project, and the bidder need not complete the Resident Bidder Information below.

☒ shall apply to this project, and the bidder shall complete the Resident Bidder Information below.

To implement section 73A.21, the Iowa Labor Commissioner adopted chapter 156 of the Iowa Administrative Code, “Bidder Preferences in Government Contracting”. Iowa Admin. Code rule 875-156.2(1) requires each bidder to complete the attached Bidder Status Form. The Bidder must complete and submit the Bidder Status Form, signed by an authorized representative of the bidder, with their bid Proposal. Under Iowa Admin. Code rule 875-156.2(1), failure to provide the statement with the bid may result in the bid being deemed nonresponsive and may result in the bid being rejected.
Bidder Status Form

To be completed by all bidders

Please answer "Yes" or "No" for each of the following:

Yes_____ No_____ My company is authorized to transact business in Iowa.

*(To help you determine if your company is authorized, please review the "Worksheet: Authorization to Transact Business", on page 3 of the "Instructions to Bidders").*

Yes_____ No_____ My company has an office to transact business in Iowa.

Yes_____ No_____ My company's office in Iowa is suitable for more than receiving mail, telephone calls, and e-mail.

Yes_____ No_____ My company has been conducting business in Iowa for at least 3 years prior to the first request for bids on this project.

Yes_____ No_____ My company is not a subsidiary of another business entity or my company is a subsidiary of another business entity that would qualify as a resident bidder in Iowa.

If you answered “Yes” for each question above, your company qualifies as a resident bidder. Please complete Parts B and D of this form.

If you answered “No” to one or more questions above, your company is a nonresident bidder. Please complete Parts C and D of this form.

To be completed by resident bidders

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

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

City, State, Zip: __________________________

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

City, State, Zip: __________________________

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

City, State, Zip: __________________________

*You may attach additional sheet(s) if needed.*

To be completed by non-resident bidders

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

2. Does your company’s home state or foreign country offer preferences to bidders who are residents? Yes__ No__

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

*You may attach additional sheet(s) if needed.*

To be completed by all bidders

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

Firm Name: __________________________

Signature: __________________________ Date: __________________________

*You must submit the completed form to the governmental body requesting bids per 875 Iowa Administrative Code Chapter 156.*

*This form has been approved by the Iowa Labor Commissioner.*

309-6001 02-14

PROPOSAL ATTACHMENT: PART F: Page 2 of 3 Pages
PROPOSAL ATTACHMENT:  PART F - ADDITIONAL REQUIREMENTS
ITEM 2 - GENERAL

1. The work under this proposal shall be constructed in accordance with the SUDAS Standard Specifications, 2019 Edition, and as further modified by the supplemental specifications and special provisions included in the contract documents.

Alternate Sales Tax:
Section 1020, 1.08, B, of the Supplemental Specifications shall apply. The bidder should not include sales tax in the bid. A sales tax exemption certificate will be available for all material purchased for incorporation in the project.

2. The Bidder hereby acknowledges that the City of Des Moines in advertising for public bids for this work reserves the right to give a limited notice to proceed of a duration not longer than three months. This limited notice to proceed shall be given where all necessary right-of-way has not yet been acquired. The limited notice to proceed will allow construction to proceed as far as possible and practical on the right-of-way, which has been acquired.

3. The Bidder hereby acknowledged and agrees:
   - To comply with the Equal Employment Opportunity Program included in the City of Des Moines Contract Compliance Program, which is available at the following website <http://www.dmgov.org/Departments/Engineering/PDF/Contract%20Compliance%20Program%20(June%202017).pdf> or from the City Engineer’s Office.
   - To comply with any and all applicable provisions of the Des Moines Human Rights Ordinance, Chapter 62, of the Des Moines Municipal Code.
   - Not to discriminate against any employees, or applicants for employment, on the basis of age, race, religion, creed, color, sex, sexual orientation, national origin, ancestry, disability, familial status or gender identity.

4. The City’s Overall Annual DBE/TSB Goal for calendar year 2020 is 5.94%, which represents a target that the City would like to achieve in including DBE/TSB participation on City contracts; and is not a mandatory goal for this project. The Certified Directory of DBEs is available at the following website <https://secure.iowadot.gov/DBE/Directory/Index/>. The Certified Directory of TSBs is available at the following website <https://iowaeda.dynamics365portals.us/tsb-search/>
KNOW ALL BY THESE PRESENTS:

That we, ____________________________________________, as Principal, and
__________________________________________________________, as Surety, are held and firmly
bound unto the City of Des Moines, as Oblige (hereinafter the "Jurisdiction"), in the penal sum of

______________________________________________________ dollars

($__________________) lawful money of the United States, for which payment the Principal and Surety bind
themselves, their heirs, executors, administrators, successors, and assigns jointly and severally, firmly by
these presents.

The Principal has submitted to the Jurisdiction a proposal to enter into a contract in writing, for the following
described improvements:

Public Works Salt Shed Expansion, 10-2019-010
The improvement includes the construction of a 12,000 ton capacity, pre-engineered hoop truss salt storage
building including pavement removal, grading, foundation, electrical, and Hot Mix Asphalt (HMA) pavement;
all work in accordance with the contract documents, including Plan File Nos. 584-190/203, located at the Des
Moines Public Works Supply Yard, 903 S.E. 22nd Street, Des Moines, Iowa

The Surety hereby stipulates and agrees that the obligations of the Surety and its Bond will be in no way impaired
or affected by any extension of the time within which the Jurisdiction may accept the Bid or execute a Contract;
and the Surety does hereby waive notice of any such extension.

In the event that any actions or proceedings are initiated with respect to this Bond, the parties agree that the
venue will be Polk County, State of Iowa. If legal action is required by the Jurisdiction against the Surety or
Principal to enforce the provisions of this bond or to collect the monetary obligation accruing to the benefit of the
Jurisdiction, the Surety or Principal agrees to pay the Jurisdiction all outlay and expense incurred by the
Jurisdiction in enforcing any of the provisions of this Bond. All rights, powers, and remedies of the Jurisdiction
are cumulative and not alternative and are in addition to all rights, powers and remedies given to the Jurisdiction
by law. The Jurisdiction may proceed against the Surety for any amount guaranteed hereunder whether action is
brought against Principal or whether or not the Principal is joined in the action. As used herein, the phrase “all
outlay and expense” is not to be limited in any way, but includes the actual and reasonable costs and expenses
incurred by the Jurisdiction including interest, benefits and overhead where applicable. Accordingly, "all outlay
and expense" would include but not be limited to all contract or employee expense, outside experts, attorneys
fees (including overhead expenses of the Jurisdiction's staff attorneys), and all costs and expenses of litigation as
they are incurred by the Jurisdiction.
If the proposal by the Principal is accepted and the Principal enters into a contract with the Jurisdiction in accordance with the terms of the proposal, including the provision of insurance and bond as specified in the contract documents with good and sufficient surety for the faithful performance of the contract, for the prompt payment of labor and material furnished in the prosecution of the work, and for the maintenance of the improvements as may be required in the contract documents or, in the event the Principal does not enter into a contract and provide the required insurance and bonds, the Principal pays the penal sum to the Jurisdiction, then this obligation will become null and void; otherwise, the Surety shall pay to the Jurisdiction the full amount of the bid bond, together with court costs, attorney’s fees, and any other expense of recovery.

Signed and sealed this __________ day of ____________________, 20__________

SURETY:

________________________________________________________
Surety Company

By

________________________________________________________
Signature Attorney-in-Fact/Officer

________________________________________________________
Name of Attorney-in-Fact/Officer

________________________________________________________
Company Name

________________________________________________________
Company Address

________________________________________________________
City, State Zip Code

________________________________________________________
Company Telephone Number

PRINCIPAL:

________________________________________________________
Bidder

By

________________________________________________________
Signature

________________________________________________________
Name

________________________________________________________
Title

________________________________________________________
Address

________________________________________________________
City, State Zip Code

________________________________________________________
Telephone Number

NOTE:
1. All signatures on this bid bond must be original signatures in ink; copies or facsimile of any signature will not be accepted.

2. This bond must be sealed with the Surety’s raised, embossed seal.

3. The Certificate or Power of Attorney accompanying this bond must be valid on its face and sealed with the Surety’s raised, embossing seal, or security watermark.

4. The name and signature of the Surety’s Attorney-in-Fact/Officer entered on this bond must be exactly as listed on the Certificate or Power of Attorney accompanying this bond.
CONTRACT

THIS CONTRACT, made and entered into at Des Moines, Iowa, on ________________, by and between the City of Des Moines, by its Mayor, upon order of its City Council, hereinafter the "Jurisdiction", and ____________________________, hereinafter the "Contractor".

WITNESSETH:

The Contractor hereby agrees to complete the work comprising the below referenced improvement as specified in the contract documents, which are officially on file with the Jurisdiction, in the Des Moines City Engineer's Office. This contract includes all contract documents. The work under this contract shall be constructed in accordance with the SUDAS Standard Specifications, 2019 Edition; and as further modified by the supplemental specifications and special provisions included in said contract documents, and the Contract Attachments attached hereto. The Des Moines City Engineer is the Engineer. The Contractor further agrees to complete the work in strict accordance with said contract documents, and to guarantee the work as required by law, for the time required in said contract documents, after its acceptance by the Jurisdiction.

This contract is awarded and executed for completion of the work specified in the contract documents for the bid prices shown on the Contract Attachment: Item 2: Bid Items, Quantities and Prices which were proposed by the Contractor in its proposal submitted in accordance with the Notice to Bidders for the following described improvements:

Public Works Salt Shed Expansion, 10-2019-010
The improvement includes the construction of a 12,000 ton capacity, pre-engineered hoop truss salt storage building including pavement removal, grading, foundation, electrical, and Hot Mix Asphalt (HMA) pavement; all work in accordance with the contract documents, including Plan File Nos. 584-190/203, located at the Des Moines Public Works Supply Yard, 903 S.E. 22nd Street, Des Moines, Iowa

The Contractor agrees to perform said work for and in consideration of the Jurisdiction's payment of the bid amount of ___________________________ dollars ($____________________) which amount shall constitute the required amount of the performance, payment, and maintenance bond. The Contractor hereby agrees to commence work under this contract on or before a date to be specified in a written notice to proceed by the Jurisdiction and to fully complete the project not later than September 18, 2020; and to pay liquidated damages for noncompliance with said completion provisions in the amount of five hundred and 00/100 dollars ($500.00), for each calendar day thereafter that the work remains incomplete.
IN WITNESS WHEREOF, the Parties hereto have executed this instrument, in triplicate on the date first shown written.

JURISDICTION:

By

T. M. Franklin Cowrie, Mayor

(Seal)

ATTEST:

P. Kay Cmelik, City Clerk

FORM APPROVED BY:

Kathleen Vanderpool, Deputy City Attorney

CONTRACTOR:

By

Contractor

Signature

Title

Street Address

City, State - Zip Code

/ Telephone Number / Email Address

CONTRACTOR PUBLIC REGISTRATION INFORMATION To Be Provided By:

1. All Contractors: The Contractor's Public Registration Number, issued by the Iowa Commissioner of Labor pursuant to Section 91C.5 of the Iowa Code, is as follows:

Number

2. Out-of-State Contractors:

A. Pursuant to Section 91C.7 of the Iowa Code, an out-of-state contractor, before commencing a contract in excess of five thousand dollars in value in Iowa, shall file a bond with the division of labor services of the department of workforce development. The contractor should contact 515-242-5871 for further information. Prior to contract execution, the City Engineer may forward a copy of this contract to the Iowa Department of Workforce Development as notification of pending construction work. It is the contractor's responsibility to comply with said Section 91C.7 before commencing this work.

B. Prior to entering into contract, the designated low bidder, if it be a corporation organized under the laws of a state other than Iowa, shall file with the Engineer a certificate from the Secretary of the State of Iowa showing that it has complied with all the provisions of Chapter 490 of the Code of Iowa, or as amended, governing foreign corporations. For further information contact the Iowa Secretary of State Office at 515-281-5204.

NOTE: All signatures on this contract must be original signatures in ink: copies or facsimile of any signature will not be accepted.
CORPORATE ACKNOWLEDGEMENT
State of _____________________________ )
___________________________ County )

___________________________ SS

On this ________ day of ________________, 20________, before me, the undersigned, a Notary Public in and for
the State of _______________________, personally appeared ______________________ and ______________________, to me
known, who, being by me duly sworn, did say that they are the ______________________ and ______________________, and
___________________________, respectively, of the corporation executing the foregoing instrument;
that (no seal has been procured by) (the seal affixed thereto is the seal of) the corporation; that said instrument was signed
(and sealed) on behalf of the corporation by authority of this Board of Directors; that ______________________
and ______________________ acknowledged the execution of the instrument to be the voluntary act and deed of the
corporation, by it and by them voluntarily executed.

___________________________
Notary Public in and for the State of _______________________

My commission expires _______________________

SUDAS 04/25/2016
1. The Contractor acknowledges and agrees:
   - To comply with the Equal Employment Opportunity Program included in the City of Des Moines Contract Compliance Program, which is available at the following website <http://www.dm.gov/Departments/Engineering/PDF/Contract%20Compliance%20Program%20June%202017.pdf> or from the City Engineer's Office.
   - To comply with any and all applicable provisions of the Des Moines Human Rights Ordinance, Chapter 62, of the Des Moines Municipal Code.
   - Not to discriminate against any employees, or applicants for employment, on the basis of age, race, religion, creed, color, sex, sexual orientation, national origin, ancestry, disability, familial status or gender identity.
   - To include this provision in all subcontracts for this project.

2. The Contractor agrees to comply with the requirements of the City of Des Moines Contract Compliance Program as referenced in the proposal. Final acceptance of the project will not be made until the Contractor has submitted to the City Engineer a notarized summary of payments to and scope of work by all DBE/TSB subcontractors.

3. The City of Des Moines Master Construction Safety Packet (Safety Plan) is available at <http://www.dm.gov/Departments/Engineering/PDF/MasterConstructionSafetyPacket.pdf> and is also available upon request from the Engineering Department. The Engineering Department will make available a copy of the City of Des Moines Safety Plan to the Contractor when the contract is awarded. The Contractor understands and agrees that said Safety Plan is for the Contractor's information only and that it is the Contractor's sole responsibility to provide, or make available, this safety information to all its Subcontractors.

4. The Contractor understands and agrees that the construction of the work included in this contract is by its nature dangerous work. The Contractor agrees:
   - That the Contractor should have a safety program; however, the Contractor need not submit a safety program to the City of Des Moines, and City of Des Moines staff will not review or approve the Contractor’s safety program. The City of Des Moines assumes that the Contractor will maintain a safe worksite; however, City of Des Moines staff will not intrude in the Contractor’s responsibility for safety issues.
   - That until the work is accepted by the Jurisdiction; the work shall be in the custody of and under the charge, care, and control of the Contractor.
   - That the Contractor is responsible for the project area or work site.
   - That the Contractor is solely responsible for the safety of everyone on its work site.
   - That it is the Contractor’s sole responsibility to provide as safe a working site as possible given the nature of the work.
   - That it is the Contractor’s responsibility to notify and advise its employees, subcontractors, suppliers, and everyone on the worksite of the dangers associated with the work, and provide them with appropriate safety information to protect them from those dangers.
5. The Contractor acknowledges and agrees that no contract shall be binding upon the City of Des Moines until said contract has been executed by the Bidder, and shall have been approved by the City Council and executed by the Mayor and attested to by the City Clerk.

6. The Contractor agrees that sixty (60) days shall constitute a reasonable time within which it shall be required to make progress payments or final payment to subcontractors after each subcontractor's satisfactory performance of its work, all as required by Section 573.12 2.b.(2) of the Code of Iowa.
This contract is awarded and executed for completion of the work specified in the contract documents for the bid price tabulated below as proposed by the contractor in its proposal submitted in accordance with notice to bidders and notice of public hearing. All quantities are subject to revision by the Jurisdiction. Quantity changes which amount to twenty (20) percent or less of the amount bid shall not affect the unit bid price of that item.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>UNITS</th>
<th>QUANTITY</th>
<th>UNIT PRICE</th>
<th>AMOUNT</th>
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<tr>
<td>1</td>
<td>Mobilization</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
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<td>2</td>
<td>Construction Staking</td>
<td>LS</td>
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<td>3</td>
<td>Excavation, Class 10/Embarkment</td>
<td>LS</td>
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<td>4</td>
<td>Subbase Preparation, 12-inch</td>
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<td>6,200</td>
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<td>7</td>
<td>Trench Foundation</td>
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<td>Replacement of Unsuitable Backfill</td>
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<td>Water Main, 6-inch</td>
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<td>Pavement Removal</td>
<td>SY</td>
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<td>15</td>
<td>HMA Pavement, 6-inch, Low Traffic</td>
<td>SY</td>
<td>2,100</td>
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<td>16</td>
<td>HMA Pavement, Samples and Testing</td>
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<td>17a</td>
<td>Building Foundation - cast in place wall &amp; foundation system</td>
<td>LS</td>
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<td>17b</td>
<td>Building Foundation - precast concrete block wall &amp; concrete foundation system</td>
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<tr>
<td>18</td>
<td>Bollards</td>
<td>Each</td>
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<td>19</td>
<td>Truss-Supported Tensioned Fabric Enclosure</td>
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<tr>
<td>20</td>
<td>Electrical</td>
<td>LS</td>
<td>1</td>
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</tr>
</tbody>
</table>

**TOTAL BASE BID**

**ADD ALTERNATE 1**
- Sixteen foot bay | LS | 1

**ADD ALTERNATE 2**
- Conveyor and hopper | LS | 1

**TOTAL BASE BID PLUS ADD ALTERNATES**

**TOTAL BASE BID PLUS ANY ADD-ALTERNATES SELECTED BY CITY**

NOTE: It is understood that the above quantities are estimated for the purpose of this bid. All quantities are subject to revision by the City. Quantity changes which amount to twenty (20) percent or less of the total bid shall not affect the unit bid price of that item.
KNOW ALL BY THESE PRESENTS:

That we, ________________________________, as Principal (the "Contractor" or "Principal"), and ________________________________, as Surety, are held and firmly bound unto the City of Des Moines, as Obligee (the "Jurisdiction"), and to all persons who may be injured by any breach of any of the conditions of this Bond in the penal sum of ________________________________ dollars ($ _____________________), lawful money of the United States, for the payment of which sum, well and truly to be made, we bind ourselves, our heirs, legal representatives and assigns, jointly and severally, firmly by these presents.

The conditions of the above obligations are such that whereas the Contractor entered into a contract with the Jurisdiction, bearing the date of ____________________, (the "Contract") wherein the Contractor undertakes and agrees to construct the following described improvements:

Public Works Salt Shed Expansion, 10-2019-010

The improvement includes the construction of a 12,000 ton capacity, pre-engineered hoop truss salt storage building including pavement removal, grading, foundation, electrical, and Hot Mix Asphalt (HMA) pavement; all work in accordance with the contract documents, including Plan File Nos. 584-190/203, located at the Des Moines Public Works Supply Yard, 903 S.E. 22nd Street, Des Moines, Iowa

and to faithfully perform all the terms and requirements of the Contract within the time specified, in a good and workmanlike manner, and in accordance with the Contract Documents. Provided however, that one year after the date of acceptance by the Jurisdiction as complete, of the work under the above referenced Contract, the maintenance portion of this Bond shall continue in force but the penal sum for maintenance shall be reduced to ________________________________ dollars ($ _____________________), which is the cost associated with those items shown on the Proposal and in the Contract which require a maintenance bond period in excess of one year.

It is expressly understood and agreed by the Contractor and Surety that the following provisions are a part of this Bond and are binding upon the Contractor and Surety, to-wit:

1. PERFORMANCE: The Contractor shall well and faithfully observe, perform, fulfill and abide by each and every covenant, condition and part of the Contract and Contract Documents, by reference made a part hereof, and shall indemnify and save harmless the Jurisdiction from all outlay and expense incurred by the Jurisdiction by reason of the Contractor's default or failure to perform as required. The Contractor shall also be responsible for the default or failure to perform as required under the Contract and Contract Documents by all its subcontractors, suppliers, agents, or employees furnishing materials or providing labor in the performance of the Contract.
2. **PAYMENT:** The Contractor and Surety on this bond hereby agree to pay all just claims submitted by persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the performance of the Contract, including but not limited to claims for all amounts due for labor, materials, lubricants, oil, gasoline, repairs on machinery, equipment and tools, consumed or used by the Contractor or any subcontractor, wherein the same are not satisfied out of the portion of the contract price which the Jurisdiction is required to retain until completion of the improvement, but the Contractor and Surety shall not be liable unless the claims have been established as provided by law. The Contractor and Surety hereby bind themselves to the obligations and conditions set forth in Iowa Code Chapter 573.

3. **MAINTENANCE:** The Contractor and the Surety shall, at their own expense:
   
   A. Remedy any and all defects that may develop in or result from work to be performed under the Contract within the period of one (1) year(s) from the date of acceptance of the work under the Contract, by reason of defects in workmanship or materials used in construction of the work;
   
   B. Keep all work in continuous good repair; and
   
   C. Pay the Jurisdiction's reasonable costs of monitoring and inspecting to assure that any defects are remedied, and to repay the Jurisdiction all outlay and expense incurred as a result of Contractor's and Surety's failure to remedy any defect as required by this section.

   Contractor's and Surety's obligation extends to defects in workmanship or materials not discovered or known to the Jurisdiction at the time the work was accepted.

4. **GENERAL:** Every Surety on this Bond shall be deemed and held bound, any contract to the contrary notwithstanding, to the following provisions:

   A. To consent without notice to any extension of time to the Contractor in which to perform the Contract;

   B. To consent without notice to any change in the Contract or Contract Documents, that increases the total contract price and the penal sum of this bond, provided that all such changes do not, in the aggregate, involve an increase of more than twenty percent of the total contract price, and that this Bond shall then be released as to such excess increase; and

   C. To consent without notice that this Bond shall remain in full force and effect until the contract is completed, whether completed within the specified contract period, within an extension thereof, or within a period of time after the contract period has elapsed and liquidated damages are being charged against the Contractor.

   The Contractor and every Surety on this Bond shall be deemed and held bound, any contract to the contrary notwithstanding, to the following provisions:

   A. That no provision of this Bond or of any other contract shall be valid which limits to less than five years after the acceptance of the work under the Contract the right to sue on this Bond.
B. That as used herein, the phrase "all outlay and expense" is not to be limited in any way, but shall include the actual and reasonable costs and expenses incurred by the Jurisdiction including interest, benefits and overhead as applicable. Accordingly, "all outlay and expense" would include but not be limited to all contract or employee expense, all equipment usage or rental, materials, testing, outside experts, attorneys fees (including overhead expenses of the Jurisdiction's staff attorneys), and all costs and expenses of litigation as they are incurred by the Jurisdiction. It is intended the Contractor and Surety will defend and indemnify the Jurisdiction on all claims made against the Jurisdiction on account of Contractor's failure to perform as required in the Contract and Contract Documents, that all agreements and promises set forth in the Contract and Contract Documents, in approved change orders, and in this Bond will be fulfilled, and that the Jurisdiction will be fully indemnified so that it will be put into the position it would have been in had the Contract been performed in the first instance as required.

C. In the event the Jurisdiction incurs any "outlay and expense" in defending itself with respect to any claim as to which the Contractor or Surety should have provided the defense, or in the enforcement of the promises given by the Contractor in the Contract, Contract Documents, or approved change orders, or in the enforcement of the promises given by the Contractor and Surety in this Bond, the Contractor and Surety agree that they will make the Jurisdiction whole for all such outlay and expense, provided that the Surety's obligation under this Bond shall not exceed 125% of the penal sum of this Bond. In the event that any actions or proceedings are initiated with respect to this Bond, the parties agree that the venue thereof shall be Polk County, State of Iowa. If legal action is required by the Jurisdiction to enforce the provisions of this Bond or to collect the monetary obligation accruing to the benefit of the Jurisdiction, the Contractor and Surety agree, jointly and severally, to pay the Jurisdiction all outlay and expense incurred by the Jurisdiction. All rights, powers, and remedies of the Jurisdiction hereunder shall be cumulative and not alternative and shall be in addition to all rights, powers and remedies given to the Jurisdiction, by law. The Jurisdiction may proceed against the Surety for any amount guaranteed hereunder whether action is brought against the Contractor or whether or not the Contractor is joined in the action.

NOW THEREFORE, the condition of this obligation is such that if the Principal shall faithfully perform all of the promises of the Principal, as set forth and provided in the Contract, in the Contract Documents, and in this Bond, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

When a word, term, or phrase is used in this Bond, it shall be interpreted or construed first as defined in this Bond, the Contract, or the Contract Documents; second, if not defined in the Bond, Contract, or Contract Documents, it shall be interpreted or construed as defined in applicable provisions of the Iowa Code; third, if not defined in the Iowa Code, it shall be interpreted or construed according to its generally accepted meaning in the construction industry; and fourth, if it has no generally accepted meaning in the construction industry, it shall be interpreted or construed according to its common or customary usage.
Failure to specify or particularize shall not exclude terms or provisions not mentioned and shall not limit liability hereunder. The Contract and Contract Documents are hereby made a part of this Bond.

Witness our hands, in triplicate, this ______ day of ______________________, 20_____

PRINCIPAL:

__________________________
Contractor

By ________________________
Signature

__________________________
Title

FORM APPROVED BY:

__________________________
Kathleen Vanderpool
Deputy City Attorney

SURETY:

__________________________
Surety Company

By ________________________
Signature Attorney-in-Fact/Officer

__________________________
Name of Attorney-in-Fact/Officer

__________________________
Company Name

__________________________
Company Address

__________________________
City, State Zip Code

__________________________
Company Telephone Number

NOTE:

1. All signatures on this performance, payment & maintenance bond must be original signatures in ink; copies or facsimile of any signature will not be accepted.

2. This bond must be sealed with the Surety’s raised, embossed seal.

3. The Certificate or Power of Attorney accompanying this bond must be valid on its face and sealed with the Surety’s raised, embossing seal.

4. The name and signature of the Surety's Attorney-in-Fact/Officer entered on this bond must be exactly as listed on the Certificate or Power of Attorney accompanying this bond.

5. This bond form must be utilized as printed; no additions/deletions/alterations are permitted, other than providing the required information.
ENGINEERING DEPARTMENT  
CITY OF DES MOINES, IOWA  

SPECIAL PROVISION  
BIDDING REQUIREMENTS  
ON  
PUBLIC WORKS SALT SHED EXPANSION  
ACTIVITY ID 10-2019-010  

1) AWARD OF CONTRACT  

The apparent low Bidder on this project will be required to furnish executed contract; Performance, Payment, and Maintenance Bond; Certificate of Insurance; and NPDES Certification Statements, if required, in substantial compliance with the contract documents to the Engineering Department before 12:00 noon on Friday, March 6, 2020. Completed documents in accordance with the contract documents and acceptable to the City of Des Moines Engineering and Legal Departments will be presented to the City Council for award of this contract on Monday, March 9, 2020. This would allow construction to begin upon issuance of the Notice to Proceed by the City Engineer.  

By submission of a bid, the Bidder agrees that if the Bidder fails to furnish said executed contract; Performance, Payment, and Maintenance Bond; Certificate of Insurance; and NPDES Certification Statements, if required, in substantial compliance with the contract documents to the Engineering Department before 12:00 noon on Friday, March 6, 2020; the amount of the Bidder's bid security may become the property of the City and may be retained—not as a penalty but as liquidated damages. The award of the contract may then, at the discretion of the City, be made to the next-lowest responsible Bidder, or the work may be re-advertised or may be constructed by the City in any legal manner. Notice to Proceed will not be issued until the Contractor’s insurance is in compliance with the specifications.  

The Bidder is reminded that all subcontractors must be approved by the City Council. The Council policy is that subcontractors be approved at the time the contract is awarded, if possible. The Bidder should submit a letter requesting approval of any subcontractors along with the subcontractor’s NPDES Certification Statement, if required, at the time its executed contracts are submitted for approval.  

2) CONTRACT COMPLIANCE PROGRAM  


a. EEO Program – Complaints of discrimination in violation of the Des Moines Human Rights Ordinance, or corresponding state or federal law, should still be filed with the appropriate city, state, or federal agency. If a Contractor is found by one of these agencies to be engaging in illegal discrimination, the Contractor will be in breach of its contract with the City of Des Moines and appropriate action will be taken.  

b. DBE/TSB Program: Certification – The City of Des Moines’ program is a DBE/TSB Program whereby both certified DBEs and certified TSBs are equally eligible under the program. All DBEs shall be certified by the Iowa Department of Transportation (IDOT), and the Certified Directory of DBEs is available at the following website https://secure.iowadot.gov/DBE/Directory/Index/.
All TSBs shall be certified by the Iowa Economic Development Authority, and the Certified Directory of TSBs is available at the following website https://iowaeda.microsoftecmportals.com/tsb-search/. The TSB website allows the user to search by name or other keyword. If the user enters the keyword "CONST" in the space next to Service Description and clicks SEARCH, the database will provide a listing of all TSBs that have identified various forms of construction as their type of work. The Directories will not be printed in the contract documents. Copies of the DBE and TSB Directories are available from the Engineering Department upon request.

c. DBE/TSB Program: Annual and Contract Goals – The City’s overall annual DBE/TSB goal will be based on the IDOT DBE overall annual goal established for the corresponding federal fiscal year as further adjusted and established by the Engineering Department to consider such factors as the current capacity of DBEs/TSBs to perform work, differences in the DBE versus TSB market, etc. By utilizing the IDOT overall annual DBE goal as the City’s overall annual DBE/TSB goal, the goal will be independently reviewed annually and updated regarding the availability of the DBEs that are ready, willing, and able to perform work. Many DBEs are also certified as TSBs and the availability is similar. The City’s overall annual DBE/TSB goal represents a target that the City would like to achieve by including DBE/TSB participation on City contracts; and is not a mandatory goal for this project. The Bidder is encouraged to use its best efforts to meet, and if possible exceed, the City’s overall annual DBE/TSB goal.

3) ALTERNATE SALES AND USE TAX

Section 1020, 1.08, B, of the General Supplemental Specifications shall apply to this contract. The Bidder should not include sales tax in the bid pursuant to Iowa Code. A sales tax exemption certificate will be available for all material purchased for incorporation in the project. Complete information on qualifying materials and supplies can be found at www.state.ia.us/tax, the Iowa Department of Revenue and Finance’s (IDRF) web site. Links are found in the Business Taxes and Local Government categories. Contact the IDRF at idrf@idrf.state.ia.us if you have questions on this requirement.
The City of Des Moines will purchase and maintain Builder’s Risk Insurance on this project as referenced in the General Supplemental Specifications in Section 1070, 3.05A.2 (Builder’s Risk Insurance by the Jurisdiction). The Contractor need not purchase and maintain Builder’s Risk Insurance as referenced in Section 1070, 3.05A.1 (Builder’s Risk Insurance by Contractor) or an Installation Floater as referenced in Section 1070, 3.05A.3 (Installation Floater) in the General Supplemental Specifications.
DEPARTMENT OF ENGINEERING  
CITY OF DES MOINES

TECHNICAL SPECIFICATIONS  
ON  
PUBLIC WORKS SALT SHED EXPANSION  
Activity ID 10-2019-010
# TECHNICAL SPECIFICATIONS

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Geotechnical Engineering Report

Salt Storage Building 12
Des Moines, Iowa
October 11, 2019
Terracon Project No. 08195236-01

Prepared for:
City of Des Moines
Des Moines, Iowa

Prepared by:
Terracon Consultants, Inc.
Des Moines, Iowa
October 11, 2019

City of Des Moines
400 Robert D. Ray Drive
Des Moines, Iowa 50309

Attn: Ms. Jill Tenney, City Architect
P: (515) 283-4032
E: jetenney@dmgov.org

Re: Geotechnical Engineering Report
Salt Storage Building 12
903 SE 22nd Street
Des Moines, Iowa
City of Des Moines Activity ID 21-2020-020
Terracon Project No. 08195236-01

Dear Ms. Tenney:

We have performed geotechnical engineering services for the referenced project in general accordance with Terracon Proposal No. P08195236rev1, dated October 1, 2019. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and grade-supported slabs for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,

Terracon Consultants, Inc.

Brian A. Weiner, E.I.
Staff Engineer

Matthew D. Cushman, P.E.
Senior Engineer
REPORT TOPICS

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Note: This report was originally delivered in a web-based format. Orange Bold text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the GeoReport logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS
EXPLORATION AND TESTING PROCEDURES
SITE LOCATION AND EXPLORATION PLANS
EXPLORATION RESULTS
SUPPORTING INFORMATION

Note: Refer to each individual Attachment for a listing of contents.
INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed salt storage building to be located to the south of the current salt storage building at 903 SE 22nd Street in Des Moines, Iowa. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Foundation design and construction
- Groundwater conditions
- Grade-supported slab construction
- Site preparation and earthwork
- Lateral earth pressures
- Excavation considerations

The geotechnical engineering Scope of Services for this project included the advancement of 6 soil borings (designated SB-1 through SB-6) to depths ranging from approximately 25 to 30 feet below existing site grades (bgs) and 4 cone penetration test (CPT) sounds (designated CPT-1 through CPT-4) to depths ranging from approximately 30 to 40 feet bgs.

Maps showing the site and exploration locations are shown in the Site Location and Exploration Plan section. Results of the laboratory testing performed on samples obtained from the site during the field exploration are included on the boring logs in Exploration Results.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parcel Information</td>
<td>The project is located at 903 SE 22nd Street in Des Moines, Iowa.</td>
</tr>
<tr>
<td></td>
<td>Latitude/Longitude: 41.5776°, -93.5748° (approximate)</td>
</tr>
<tr>
<td></td>
<td>See Site Location</td>
</tr>
</tbody>
</table>
**Item** | **Description**
---|---
**Existing Improvements** | An existing salt storage building (No. 9) is located directly north of the proposed new salt storage building. Site plans show an electrical conduit connecting to the southeast corner of the existing salt storage building and running northwest.

**Current Ground Cover** | Hot mix asphalt (HMA) millings.

**Existing Topography** | Relatively flat, with a total relief of about 5 feet across the site.

### PROJECT DESCRIPTION

Our final understanding of the project conditions is as follows:

<table>
<thead>
<tr>
<th><strong>Item</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Description</strong></td>
<td>A new salt storage building is to be constructed on the Des Moines Public Works yard. The new building will be located immediately to the south of the existing Salt Storage Building 9 on the site.</td>
</tr>
<tr>
<td><strong>Proposed Structure</strong></td>
<td>The salt storage building will have a concrete foundation wall extending 10 feet above final grades with a tensioned fabric top. The building will have dimensions of approximately 88 feet by 224 feet (19,710 square feet). Salt will be stored in the building at 10 feet depths around the perimeter, and up to 37 feet deep in the center of the building. The building will be supported on spread footing foundations, with a grade-supported slab consisting of 8 inches of HMA over 6 inches of HMA millings.</td>
</tr>
<tr>
<td><strong>Finished Floor Elevation</strong></td>
<td>15.4 (City of Des Moines datum)</td>
</tr>
<tr>
<td><strong>Maximum Loads</strong> (estimated by Terracon)</td>
<td>Walls: 1 to 2 klf Grade supported slabs: 1,500 psf (perimeter) to 5,000 psf (center)</td>
</tr>
<tr>
<td><strong>Tolerable Settlement</strong></td>
<td>We understand the planned building will tolerate 1-inch maximum settlement and ½-inch differential settlement</td>
</tr>
<tr>
<td><strong>Grading/Slopes</strong></td>
<td>Final grades are anticipated to match existing grades, with cuts and fills on the order of 1 foot or less.</td>
</tr>
</tbody>
</table>

### GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface soil and groundwater conditions based on our review of the data, geologic setting, and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical recommendations.
Conditions encountered at each exploration point are indicated on the individual logs. The GeoModel and individual logs can be found in Exploration Results.

Stratification boundaries on the GeoModel and logs represent the approximate location of changes in soil types; in situ, the transition between materials may be gradual. As noted in General Comments, the characterizations are based on widely spaced exploration points across the site, and variations are likely.

As part of our review, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

<table>
<thead>
<tr>
<th>Model Layer</th>
<th>Layer Name</th>
<th>General Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fill</td>
<td>Variable ranging from asphalt millings with concrete rubble to sandy lean clay. Dark gray to brown. Encountered to depths of about 8 to 14 feet bgs in the borings.</td>
</tr>
<tr>
<td>2</td>
<td>Alluvial Sand</td>
<td>Sands, fine to coarse grained. Generally gray and very loose to loose.</td>
</tr>
<tr>
<td>3</td>
<td>Alluvial Clay</td>
<td>Lean clays ranging from trace sand to sandy. Generally brown gray to gray and soft to medium stiff.</td>
</tr>
</tbody>
</table>

The boreholes were observed while drilling and the following day for the presence and level of groundwater. The water levels observed in the boreholes can be found on the boring logs in Exploration Results. Groundwater was observed at depths ranging from 7 to 10 feet bgs the day after the borings were drilled.

Groundwater level fluctuations occur due to seasonal variations in the Des Moines River stage, the amount of rainfall, runoff, and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structures may be different than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

GEOTECHNICAL OVERVIEW

Existing fill materials were encountered in the borings to depths ranging from 8 to 14 feet below existing grades (bgs), and consisted primarily of asphalt millings with variable amounts of concrete rubble, and layers of clays and sands. Below the existing fill materials, very loose to loose alluvial sands with clay seams were encountered. The cone penetration test (CPT) soundings encountered refusal on what we anticipate is the underlying bedrock at depths ranging from about 32 to 40 feet bgs.
We understand the existing salt storage building (No. 9) is supported on or above similar existing fill materials and is performing satisfactorily. Support of foundations and slabs on or above existing fill materials is discussed in this report. However, even with the recommended construction procedures, there is an inherent risk for the Owner that compressible fill or unsuitable material within or buried by the fill will not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill, but can be reduced by following the recommendations contained in this report.

Based on the thickness of the underlying loose sands and the planned rock salt stockpile height (up to 37 feet high) to be placed in the salt storage building, we anticipate excessive settlement of the asphalt ‘floor’, which is likely to experience bowing along the storage building’s centerline, with estimated settlement of around 2 to 3 inches after being fully loaded by the rock salt stockpile. We estimate settlement of the salt storage walls will be about one-half the settlement of the grade-supported slab. Densification of the underlying loose sands prior to/during construction would be needed in order to reduce settlement of the salt storage building and grade-supported slab, which could be accomplished by surcharging the area, deep soil mixing, compaction grouting, etc.

EARTHWORK

Site Preparation

Site preparation within planned new construction areas should commence with stripping of all pavements and any unsuitable materials (e.g., debris, desiccated soil, frozen soil, impacted soils scheduled for removal, etc.).

Subsequent to stripping operations, and prior to the placement of new fill, the building area should be proofrolled with heavy, rubber tire construction equipment, to aid in delineating near surface areas of low density, soft, or otherwise unsuitable soil. Proofrolling should be accomplished using a fully loaded, tandem axle dump truck or other equipment providing an equivalent subgrade loading (minimum gross weight of 25 tons is recommended for the proofrolling equipment). Unstable areas identified by proofrolling should be undercut to expose stable material and backfilled with low plasticity structural fill.

Prior to placement of fill in areas below design grade and after completion of rough grading in cut areas of the site, the exposed subgrade should be scarified to a depth of 9 inches, moisture conditioned, and compacted to the density and water content ranges recommended for structural fill.
Terracon should be retained to develop a thorough observation and testing program. The testing should be performed prior to and during construction. Test pits, proofrolling, probing, and additional testing should be performed to better define the support characteristics of the existing fill materials.

**Subgrade Stabilization**

If unsuitable areas are observed, subgrade improvement will be necessary to establish a suitable subgrade support condition. Terracon should be retained to discuss stabilization options. Potential methods of subgrade improvement are described below. The appropriate method of improvement, if required, would be dependent on factors such as schedule, weather, the size and depth of area to be stabilized, and the nature of the instability. More detailed recommendations can be provided during construction as the need for subgrade stabilization occurs.

- **Scarification and Compaction** – Soils can be scarified, moisture condition (i.e., dried or wetted), and compacted. The success of this procedure depends primarily on favorable weather and sufficient time to manipulate the soils.

- **Undercut and Replacement with Crushed Stone/Aggregate** – The use of crushed stone, crushed concrete, and/or gravel could be considered to improve subgrade stability.

**Structural Fill Material Types**

The on-site existing fill materials (asphalt millings) would typically be considered unsuitable, or marginally unsuitable, for use as low plasticity structural fill. However, considering this site is covered by at least 8 feet of asphalt millings, the City of Des Moines could consider to reuse these materials as structural fill on this project.

Imported structural fill should meet the following material property requirements.

<table>
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<th>Soil Type ¹</th>
<th>USCS Classification</th>
<th>Acceptable Location for Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imported low plasticity fine-grained ², ³</td>
<td>CL</td>
<td>Below grade-supported slabs</td>
</tr>
<tr>
<td>Imported coarse-grained (granular) ⁴</td>
<td>GW, GP, GM, GC, SW, SP, SM, SC</td>
<td>Below grade-supported slabs, Below foundations in overexcavations, Backfill adjacent to below grade walls</td>
</tr>
</tbody>
</table>
Soil Type 1

<table>
<thead>
<tr>
<th>USCS Classification</th>
<th>Acceptable Location for Placement</th>
</tr>
</thead>
</table>

1. Structural fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation prior to use on this site.

2. Fine grained material (e.g., clays) can be difficult to compact in relatively small areas (e.g., excavations for foundations).

3. By our definition, low plasticity materials should have a liquid limit of 45 or less and a plasticity index of 23 or less (ASTM D4318).

4. Specific material requirements will need to be satisfied based on intended use.

### Structural Fill Compaction Requirements

Structural fill should meet the following compaction requirements.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum individual lift thickness</strong></td>
<td>9 inches or less in loose thickness when heavy, self-propelled compaction equipment is used</td>
</tr>
<tr>
<td></td>
<td>4 inches or less in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used</td>
</tr>
<tr>
<td><strong>Minimum compaction requirements</strong> 1</td>
<td>Fine-grained soils: 95% of maximum</td>
</tr>
<tr>
<td></td>
<td>Coarse-grained soils: 98% of maximum</td>
</tr>
<tr>
<td></td>
<td>If the material is a coarse sand or gravel, or of a uniform size, or has a low fines content, compaction comparison to relative density may be more appropriate. In this case, coarse-grained soils should be compacted to at least 70% relative density (ASTM D4253 and D4254).</td>
</tr>
<tr>
<td><strong>Water content range</strong> 1</td>
<td>Fine-grained soils: 0 to +4% of optimum</td>
</tr>
<tr>
<td></td>
<td>Coarse-grained soils: Water content should be maintained at levels satisfactory for compaction to be achieved without the coarse-grained material bulking during placement or pumping when proofrolled.</td>
</tr>
</tbody>
</table>

1. Maximum density and optimum water content as determined using standard effort (ASTM D698).

### Utility Trench Backfill

All trench excavations should be made with sufficient working space to permit construction, including backfill placement and compaction. If utility trenches are backfilled with relatively clean coarse-grained material, they should be capped with at least 18 inches of fine-grained structural fill to reduce the infiltration and conveyance of surface water through the trench backfill.
Utility trenches are a common source of water infiltration and migration. Utility trenches constructed in fine-grained soils that penetrate beneath the building should be effectively sealed to restrict water intrusion and flow through the trenches, which could migrate below the building. We recommend constructing an effective clay “trench plug” that consists of low permeability clay soils or flowable fill that extends at least 5 feet out from the face of the building exterior. The trench plug material should be placed to completely surround the utility line and any granular envelope, and be placed and compacted as recommended in this report. Care should be taken to not damage the in-place utilities.

**Grading and Drainage**

During earthwork, the site should be graded to prevent ponding of surface water on the prepared subgrade or in excavations. Surface water should be promptly removed. Water seepage could occur in foundation and utility excavations in other areas of the site during construction. Dewatering of excavations during construction should be anticipated, and could involve a series of sump pits and pumps within excavations in fine-grained soils.

Final surrounding grades should be sloped away from the planned building on all sides to prevent ponding of water next to the structure. Gutters and downspouts (if any) that drain water a minimum of 10 feet beyond the footprint of the proposed building are recommended. This can be accomplished through the use of downspout extensions or flexible pipes that are designed to attach to the end of the downspout. Flexible pipe should only be used if it is daylighted in such a manner that it gravity-drains collected water.

**Earthwork Construction Considerations**

Unstable subgrade conditions could develop during general construction operations, particularly if the soils are allowed to become saturated and/or subjected to repetitive construction traffic. In order to improve subgrade stability and help expedite construction, consideration should be given to performing earthwork in the late summer and fall when groundwater levels are generally lower and weather is conducive to drying. Where soft and wet subgrades are encountered, stabilization measures will be required to help provide a stable working base for construction. The use of low contact pressure, track equipment, or remote excavation equipment may be necessary to assist in earthwork operations.

As a minimum, all temporary excavations should be sloped or braced as required by Occupational Safety and Health Administration (OSHA) regulations to provide stability and safe working conditions. Temporary excavations will be required during grading operations and/or installation of utilities. Contractors, by their contract, are usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required, to maintain stability of both the excavation sides and bottom. All excavations should
comply with applicable local, state and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards.

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of foundation elements and grade-supported slabs. Construction traffic over the completed subgrade should be avoided to the extent practical. If the subgrade should become frozen, desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and compacted prior to floor slab and pavement construction.

Construction Observation and Testing

Terracon’s involvement during the construction phase of the project provides the continuity to maintain the Geotechnical Engineer’s evaluation of subsurface conditions, including assessing variations and associated design changes.

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer, and should include delineation of areas requiring subgrade stabilization, assessment of existing fill materials, and proofrolling.

Each lift of structural fill should be tested, evaluated, and reworked as necessary until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of structural fill should be tested for density and water content at a frequency:

- Subgrade Soils – one test for every 2,500 square feet per lift in the building area. One test for each lift in isolated excavations below foundations due to unsuitable soils.
- Utility Trench Backfill – one test for every 50 linear feet of utility trench length per lift

In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. In the event that unanticipated conditions are encountered, the Geotechnical Engineer should be contacted to prescribe mitigation options.

SHALLOW FOUNDATIONS

If the site has been prepared in accordance with the requirements noted in Earthwork, the following design parameters are applicable for shallow foundations.
Spread Footing Foundation Design Recommendations

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required bearing materials ¹</td>
<td>Existing fill materials that have passed a proofroll</td>
</tr>
<tr>
<td>Maximum net allowable bearing pressure ², ³</td>
<td>1,500 psf</td>
</tr>
<tr>
<td>Minimum foundation dimensions</td>
<td>Continuous footings: 18 inches</td>
</tr>
<tr>
<td>Minimum Embedment below finished grade ⁴</td>
<td>Exterior footings: 42 inches</td>
</tr>
<tr>
<td>Estimated total settlement ³, ⁵</td>
<td>1 to 1½ inches</td>
</tr>
<tr>
<td>Estimated differential settlement ³, ⁵, ⁶</td>
<td>About ⅔ of total settlement</td>
</tr>
</tbody>
</table>

1. Unsuitable or soft soils should be undercut and replaced according to the recommendations presented in the Earthwork section.
2. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation.
3. Values provided are for maximum loads noted in the Project Description section, and consider the salt storage building is fully loaded with rock salt.
4. Embedment necessary to minimize the effects of frost and/or seasonal water content variations.
5. Foundation settlement will depend on the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of structural fill, and the quality of the earthwork operations.
6. Frequent control joints in the structure and sufficiently flexible connections are recommended help to accommodate differential settlement across the length of the building.

Spread Footing Foundation Construction Considerations

As noted in Earthwork, the footing excavations should be evaluated under the direction of the Geotechnical Engineer. Forming of footings should be expected within the existing fill materials. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

If unsuitable bearing soils (i.e., low strength materials) are encountered at the base of the planned footing excavation, corrective measures will be required. The footing excavations should be undercut and widened to allow for structural fill placement below the footings, as shown on the following sketch. The over-excavation should be backfilled up to the footing base elevation with coarse-grained structural fill placed as recommended in the Earthwork section.
GRADE SUPPORTED SLABS

Grade supported Slab Construction Considerations

The floor slab of the salt storage building will consist of 8 inches of HMA pavement over 6 inches of HMA millings. The pavement subgrade should be prepared as described in Earthwork.

Construction scheduling often involves grading and paving by separate contractors and can involve a time lapse between the end of grading operations and the commencement of paving. Disturbance, desiccation or wetting of the subgrade soils between grading and paving can result in deterioration of the previously completed subgrade. A non-uniform subgrade can result in poor pavement performance and local failures relatively soon after pavements are constructed.

The floor slab subgrade should be proofrolled prior to paving operations to help delineate soft or disturbed areas. Proofrolling should be accomplished using a fully loaded, tandem axle dump truck or other equipment providing and equivalent subgrade loading (minimum gross weight of 25 tons is recommended for the proofrolling equipment). Unstable areas identified by proofrolling should be undercut to expose stable material and backfilled with low plasticity structural fill.

Following proofrolling, the water content of the exposed subgrade should be evaluated. Where water contents are outside the range recommended for structural fill, the exposed subgrade should be scarified, moisture conditioned, and compacted as described in Earthwork. If a significant precipitation event occurs after the evaluation, or if the surface becomes disturbed, the subgrade should be reviewed by qualified personnel immediately prior to paving. The subgrade should be in its finished form at the time of the final review.
LATERAL EARTH PRESSURES

Lateral Earth Pressure Design Recommendations

Reinforced concrete walls with unbalanced backfill levels on opposite sides should be designed for pressures at least equal to values indicated in the following table. These pressures will be influenced by structural design of the walls, conditions of wall restraint, final grades or sloping of ground adjacent to the walls, surcharges, methods of construction and/or the strength of the materials being restrained. The recommended design lateral pressures provided in this section are for cast-in-place, reinforced concrete perimeter walls of the planned salt storage building, and are not applicable to other walls.

The "at-rest" wall restraint condition is commonly used for design of walls restrained from movement and assumes no wall movement. The recommended design lateral pressures do not include a factor of safety.

<table>
<thead>
<tr>
<th>Pressure Condition</th>
<th>Coefficient for Backfill Type</th>
<th>Effective Fluid Pressures (psf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rock Salt 6: 0.72</td>
<td>Drained (100)H, Undrained ---</td>
</tr>
<tr>
<td>At-Rest (K_o)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passive (K_p) 1</td>
<td>Existing Fill: 2.37</td>
<td>Drained (285)D, Undrained (200)D</td>
</tr>
</tbody>
</table>

1. For passive earth pressure, wall must move horizontally to mobilize resistance, where D is the depth of foundation embedment below lowest grade at base of wall.
2. Considers a 32° surface inclination uphill of the perimeter walls (i.e., the rock salt has an angle of repose of 32 degrees), and a horizontal ground inclination downhill of the wall.
3. Loading from heavy compaction equipment is not included.
4. No safety factor is included in these values.
5. "Undrained" conditions are recommended when drainage behind walls is not incorporated into the design or where walls will be submerged during heavy rain or flooding events.
6. We’ve considered the rock salt has a total unit weight of 137 pcf, and an angle of repose (friction angle) of 32 degrees.

GENERAL COMMENTS

Our analysis and opinions are based on our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained to review the final design plans and specifications so comments can...
be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon should be retained to provide observation and testing services during grading, excavation, foundation construction, and other earth-related construction phases of the project. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third party beneficiaries intended. Any third party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance on the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.
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.

Matthew D. Cushman, P.E.  
Date: 10/11/2019

My license renewal date is December 31, 2020.
ATTACHMENTS
EXPLORATION AND TESTING PROCEDURES

Field Exploration

<table>
<thead>
<tr>
<th>Boring Numbers</th>
<th>Boring Depths (feet)</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-1 through B-6</td>
<td>25½ to 30½</td>
<td>Building Perimeter</td>
</tr>
<tr>
<td>CPT-1 through CPT-4</td>
<td>32½ to 40</td>
<td>Building Centerline</td>
</tr>
</tbody>
</table>

Layout and Elevations: Exploration locations were staked in the field by FOX Engineering prior to our mobilization to the site. The exploration locations are shown on the Exploration Plan. The coordinates and elevations of the exploration locations were provided by FOX Engineering. Elevations on the logs are rounded to the nearest ½ foot.

Soil Boring Subsurface Exploration Procedures: The borings were drilled with an ATV-mounted drilling rig using continuous hollow stem augers. Soil sampling was performed using thin-walled tube and split-barrel sampling procedures. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge is pushed hydraulically into the soil to obtain a relatively undisturbed sample. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon is driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. The samples were placed in appropriate containers and taken to our laboratory for testing. We observed and recorded groundwater levels during, and up to 1 day after drilling and sampling. The borings were backfilled with auger cuttings after delayed groundwater level observations were obtained.

The drill crew prepared a field log of each boring to record field data including visual descriptions of the materials encountered during drilling as well as the driller’s interpretation of the subsurface conditions between samples. The boring logs included with this report represent an interpretation of the subsurface conditions at each boring location based on field and laboratory data, and observation of the samples.

CPT Exploration Procedures: The cone penetration test (CPT) device consists of a cone shaped sounding tip attached to steel rods with flush joint couplings. The cone tip contains load cells to measure cone tip penetration resistance and sleeve friction resistance. CPT soundings provide relatively continuous in-situ data for the tested soil profile, but do not recover soil samples for physical testing. The data collected from the CPT soundings was reduced and is presented graphically in Exploration Results, including the tip resistance, sleeve resistance, a ratio of sleeve to tip resistance, and pore pressure with depth.
Laboratory Testing

In the laboratory, water content tests were performed on portions of the recovered samples. Hand penetrometer tests were performed to estimate the consistency of select samples of fine-grained soils. Results of the laboratory tests are shown on the boring logs at their corresponding sample depths in Exploration Results.

The samples were described in the laboratory based on visual observation, texture and plasticity, and the laboratory testing described above. The descriptions of the soils indicated on the boring logs are in general accordance with the General Notes and Unified Soil Classification System (USCS), both summarized and included in Supporting Information.
SITE LOCATION AND EXPLORATION PLANS

Contents:
Site Location
Exploration Plan

Note: All attachments are one page unless noted above.
EXPLORATION PLAN
Salt Storage Building 12 ■ Des Moines, Iowa
October 11, 2019 ■ Terracon Project No. 08195236-01

The line at the bottom about the general location is a separate table line. You can edit it as desired, but try to keep to a single line of text to avoid reformatting the page.

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS
EXPLORATION RESULTS

Contents:
GeoModel
Boring Logs (B-1 through B-6)
CPT Logs (CPT-1 through CPT-4)

Note: All attachments are one page unless noted above.
This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

<table>
<thead>
<tr>
<th>Model Layer</th>
<th>Layer Name</th>
<th>General Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fill</td>
<td>Variable ranging from asphalt millings with concrete rubble to sandy lean clay. Dark gray to brown.</td>
</tr>
<tr>
<td>2</td>
<td>Alluvial Sand</td>
<td>Sands, fine to coarse grained. Generally gray and very loose to loose.</td>
</tr>
<tr>
<td>3</td>
<td>Alluvial Clay</td>
<td>Lean clays ranging from trace sand to sandy. Generally brown gray to gray and soft to medium stiff.</td>
</tr>
</tbody>
</table>

**LEGEND**

- Fill
- Poorly-graded Sand with Gravel
- Poorly-graded Sand with Clay
- Lean Clay
- Clayey Sand
- Sandy Lean Clay

**NOTES:**
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.
### BORING LOG NO. 1

**PROJECT:** Salt Storage Building 12  
**SITE:** 903 SE 22nd Street  
**CLIENT:** City Of Des Moines, Iowa

#### GRAPHIC LOG

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>GRAPHIC LOG</th>
<th>LOCATION</th>
<th>Northing:</th>
<th>Easting:</th>
<th>Depth (Ft.)</th>
<th>Elevation (Ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FILL - ASPHALT MILLINGS</td>
<td>See Exploration Plan</td>
<td>1619926.2</td>
<td>574843.4</td>
<td>8.0</td>
<td>1006.5</td>
</tr>
<tr>
<td>2</td>
<td>SAND (SP)</td>
<td>medium to coarse grained, brown, loose</td>
<td>1619926.2</td>
<td>574843.4</td>
<td>12.5</td>
<td>1002</td>
</tr>
<tr>
<td></td>
<td>CLAYEY SAND (SC)</td>
<td>trace gravel, gray, very loose</td>
<td>1619926.2</td>
<td>574843.4</td>
<td>17.5</td>
<td>997</td>
</tr>
<tr>
<td></td>
<td>SAND (SP)</td>
<td>with cobbles, medium to coarse grained, gray to brown, loose</td>
<td>1619926.2</td>
<td>574843.4</td>
<td>30.5</td>
<td>984</td>
</tr>
</tbody>
</table>

**Boring Terminated at 30.5 Feet**

Stratification lines are approximate. In-situ, the transition may be gradual.

---

**ADVANCEMENT METHOD:** Hollow Stem Auger

**ABANDONMENT METHOD:** Boring backfilled with soil cuttings after delayed water levels were measured.

**WATER LEVEL OBSERVATIONS**

- 9' While Sampling
- 13' After Boring
- 7' One Day After Boring

---

**FIELD TEST RESULTS**

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Unconfined Compressive Strength (psf)</th>
<th>Water Content (%)</th>
<th>Dry Unit Weight (pcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5-5-6</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>3000 (HP)</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>14-10-19</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>9-3-3</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>5</td>
<td>3-2-1</td>
<td>5</td>
<td>23</td>
</tr>
<tr>
<td>6</td>
<td>3-4-5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>4-5-2</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>8</td>
<td>4-6-3</td>
<td>8</td>
<td>16</td>
</tr>
</tbody>
</table>

**DRUM SAMPLE:**

Hammer Type: Automatic

---

**NOTES:**

- Project No.: 08195236
- Drill Rig: 709
- Driller: SK
- Boring Started: 10-04-2019
- Boring Completed: 10-04-2019
- 903 SE 22nd Street                    Des Moines, Iowa
- SITE:
- Boring Started: 10-04-2019
- 600 SW 7th St, Ste MDes Moines, IA
- CITY OF DES MOINES, IOWA
- PROJECT: Salt Storage Building 12
- ADVANCEMENT METHOD: Hollow Stem Auger
- ABANDONMENT METHOD: Boring backfilled with soil cuttings after delayed water levels were measured.

---

**TERRACON**

TERRACON, 600 SW 7th St., Ste M, Des Moines, IA

---

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.
PROJECT: Salt Storage Building 12

SITE: 903 SE 22nd Street
Des Moines, Iowa

CLIENT: City Of Des Moines Iowa
Des Moines, Iowa

LOCATION: See Exploration Plan
Northing: 1620031.5  Easting: 574804.4
Surface Elev.: 1015.9 (Ft.)

DEPTH (Ft.) ELEVATION (Ft.)
6.0 1008
12.5 1003.5
17.5 998.5
22.0 994
25.5 990.5

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

TABLE

<table>
<thead>
<tr>
<th>DEPTH (Ft.)</th>
<th>SAMPLE TYPE</th>
<th>FIELD TEST RESULTS</th>
<th>UNCONFINED COMPRESSIVE STRENGTH (psf)</th>
<th>WATER CONTENT (%)</th>
<th>DRY UNIT WEIGHT (pcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>19-19-21</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>8-10-12</td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>7-3-4</td>
<td>3</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>5-13-13</td>
<td>4</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>1-1-1</td>
<td>5</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>13-14-15</td>
<td>6</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>0-0-1</td>
<td>7</td>
<td>22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Boring Terminated at 25.5 Feet

Notes:

Adventement Method: Hollow Stem Auger
Abandonment Method: Boring backfilled with soil cuttings after delayed water levels were measured.
**BORING LOG NO. 3**

**PROJECT:** Salt Storage Building 12  
**SITE:** 903 SE 22nd Street  
**CLIENT:** City Of Des Moines Iowa

### Location Information
- Northing: 1620136.3  
- Easting: 574765.8  
- Surface Elev.: 1016.4 (Ft.)

### Graphical Log

<table>
<thead>
<tr>
<th>Layer</th>
<th>Graph layer</th>
<th>Depth (Ft.)</th>
<th>Elevation (Ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FILL - ASPHALT MILLINGS</td>
<td>2.5</td>
<td>1014</td>
</tr>
<tr>
<td></td>
<td>FILL - LEAN CLAY (CL)</td>
<td>6.0</td>
<td>1008.5</td>
</tr>
<tr>
<td></td>
<td>FILL - SANDY LEAN CLAY (CL)</td>
<td>12.5</td>
<td>1004</td>
</tr>
<tr>
<td>2</td>
<td>SAND (SP)</td>
<td>30.5</td>
<td>988</td>
</tr>
</tbody>
</table>

**Boring Terminated at 30.5 Feet**

**Notes:**
- Advancement Method: Hollow Stem Auger
- Abandonment Method: Boring backfilled with soil cuttings after delayed water levels were measured.

**WATER LEVEL OBSERVATIONS**

<table>
<thead>
<tr>
<th>Layer</th>
<th>Graph layer</th>
<th>Depth (Ft.)</th>
<th>Elevation (Ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2.5</td>
<td>1014</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.0</td>
<td>1008.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12.5</td>
<td>1004</td>
</tr>
</tbody>
</table>

**FIELD TEST RESULTS**

<table>
<thead>
<tr>
<th>Layer</th>
<th>Graph layer</th>
<th>Sample No.</th>
<th>Unconfined Compressive Strength (psf)</th>
<th>Water Content (%)</th>
<th>Dry Unit Weight (pcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>15</td>
<td>14-33-14 N=47</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>15</td>
<td>2-3-4 N=7 8000 (HP)</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>18</td>
<td>4-12-12 N=24 9000+ (HP)</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>18</td>
<td>1-1-1 N=2</td>
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<td>20</td>
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<td>2</td>
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<td>18</td>
<td>0-1-2 N=3</td>
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<td>22</td>
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<td>2</td>
<td></td>
<td>8</td>
<td>0-0-0 N=0</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>8</td>
<td>1-2-3 N=5</td>
<td></td>
<td>17</td>
</tr>
</tbody>
</table>

**Advancement Method:**  
Hollow Stem Auger

**Abandonment Method:**  
Boring backfilled with soil cuttings after delayed water levels were measured.

**Notes:**
- Advancement Method:
- Abandonment Method:
- See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).
- See Supporting Information for explanation of symbols and abbreviations.
- Elevations were provided by others.

**WATER LEVEL OBSERVATIONS**

- V 16' While Drilling
- V 10' One Day After Boring

**Boring Started:** 10-04-2019  
**Boring Completed:** 10-04-2019

**Drill Rig:** 709  
**Driller:** SK

**Project No.:** 08195236
**BORING LOG NO. 4**

**PROJECT:** Salt Storage Building 12  
**CLIENT:** City Of Des Moines Iowa  
**SITE:** 903 SE 22nd Street  
Des Moines, Iowa

**LOCATION:** See Exploration Plan  
Northing: 1619895.7    Easting: 574760.8  
Surface Elev.: 1014.0 (Ft.)

---

**MODEL LAYER**  
**GRAPHIC LOG**

<table>
<thead>
<tr>
<th>DEPTH (Ft.)</th>
<th>ELEVATION (Ft.)</th>
<th>WATER LEVEL OBSERVATIONS</th>
<th>FIELD TEST RESULTS</th>
<th>UNCONFINED COMPRESSION STRENGTH (psf)</th>
<th>WATER CONTENT (%)</th>
<th>DRY UNIT WEIGHT (pcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td>1006</td>
<td>9-23-28</td>
<td>N=51</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>12.5</td>
<td>1001.5</td>
<td>15-13-11</td>
<td>N=24</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>17.0</td>
<td>997</td>
<td>1-2-1</td>
<td>N=3</td>
<td></td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>25.5</td>
<td>988.5</td>
<td>1-1-1</td>
<td>N=2</td>
<td></td>
<td>28</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-1-2</td>
<td>N=3</td>
<td></td>
<td>22</td>
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<td></td>
<td>0-0-1</td>
<td>N=1</td>
<td></td>
<td>19</td>
<td></td>
</tr>
</tbody>
</table>

**FILL - ASPHALT MILLINGS,** with concrete rubble, dark gray

**SAND (SP),** fine to coarse grained, gray, very loose

**LEAN CLAY (CL),** trace organics, gray, soft

**SAND (SP),** fine to coarse grained, gray, very loose

**Boring Terminated at 25.5 Feet**

Stratification lines are approximate. In-situ, the transition may be gradual.  
Hammer Type: Automatic

---

**Advancement Method:** Hollow Stem Auger  
**Abandonment Method:** Boring backfilled with soil cuttings after delayed water levels were measured.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).  
See Supporting Information for explanation of symbols and abbreviations.  
Elevations were provided by others.

---

**WATER LEVEL OBSERVATIONS**

- **9’ While Sampling**
- **15’ After Boring**
- **7.5’ One Day After Boring**

---

**Notes:**

Drill Rig: 709    Driller: SK  
Project No.: 08195236  
600 SW 7th St, Ste M  
Des Moines, IA
**BORING LOG NO. 5**

**PROJECT:** Salt Storage Building 12  
**CLIENT:** City Of Des Moines Iowa  
**SITE:** 903 SE 22nd Street  
Des Moines, Iowa

**LOCATION**  
See Exploration Plan

**Northing:** 1620000.2  
**Easting:** 574721.7  
**Surface Elev.:** 1014.7 (Ft.)

---

**GRAPHIC LOG**

**MODEL LAYER**

<table>
<thead>
<tr>
<th>DEPTH (Ft.)</th>
<th>LOCATION</th>
<th>FIELD TEST RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>23-26-32</td>
<td>FILL - ASPHALT MILLINGS, with concrete rubble, dark gray</td>
<td>18 23-26-32 N=58</td>
</tr>
<tr>
<td>50/6</td>
<td></td>
<td>6 50/6 N=12</td>
</tr>
<tr>
<td>1-1-1</td>
<td></td>
<td>12 5-7-8 N=15 6000 (HP)</td>
</tr>
</tbody>
</table>

**WATER LEVEL OBSERVATIONS**

<table>
<thead>
<tr>
<th>DEPTH (Ft.)</th>
<th>LOCATION</th>
<th>FIELD TEST RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td></td>
<td>18 1-1-1 N=2</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td>18 0-1-2 N=3</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td>18 0-0-1 N=1</td>
</tr>
</tbody>
</table>

**RECOVERY (In.)**

<table>
<thead>
<tr>
<th>DEPTH (Ft.)</th>
<th>LOCATION</th>
<th>FIELD TEST RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td></td>
<td>18 1-2-3 N=5</td>
</tr>
</tbody>
</table>

**UNCONFined COMpressive STRENGTH (psf)**

<table>
<thead>
<tr>
<th>DEPTH (Ft.)</th>
<th>LOCATION</th>
<th>FIELD TEST RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td></td>
<td>18 1-1-1 N=2</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td>18 0-1-2 N=3</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td>18 0-0-1 N=1</td>
</tr>
</tbody>
</table>

**DRY UNIT WEIGHT (pcf)**

<table>
<thead>
<tr>
<th>DEPTH (Ft.)</th>
<th>LOCATION</th>
<th>FIELD TEST RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td></td>
<td>18 1-2-3 N=5</td>
</tr>
</tbody>
</table>

**IN-SITU**

The transition may be gradual.

---

**ELEVATION (Ft.)**

<table>
<thead>
<tr>
<th>DEPTH (Ft.)</th>
<th>LOCATION</th>
<th>FIELD TEST RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1007.5</td>
<td></td>
<td>18 23-26-32 N=58</td>
</tr>
<tr>
<td>1000.5</td>
<td></td>
<td>6 50/6 N=12</td>
</tr>
<tr>
<td>997</td>
<td></td>
<td>12 5-7-8 N=15 6000 (HP)</td>
</tr>
<tr>
<td>997</td>
<td></td>
<td>18 1-1-1 N=2</td>
</tr>
<tr>
<td>987.5</td>
<td></td>
<td>18 0-1-2 N=3</td>
</tr>
<tr>
<td>984</td>
<td></td>
<td>18 0-0-1 N=1</td>
</tr>
<tr>
<td>980</td>
<td></td>
<td>18 1-2-3 N=5</td>
</tr>
</tbody>
</table>

**Notes:**

- **Advancement Method:** Hollow Stem Auger
- **Abandonment Method:** Boring backfilled with soil cuttings after delayed water levels were measured.
- **See Exploration and Testing Procedures** for a description of field and laboratory procedures used and additional data (if any).
- **See Supporting Information** for explanation of symbols and abbreviations.
- **Elevations were provided by others.**

---

**WATER LEVEL OBSERVATIONS**

- **12' While Drilling**
- **8' One Day After Boring**

---

**Hammer Type:** Automatic

---

**PROJECT:** Salt Storage Building 12  
**DRILLER:** SK

**Borelog Started:** 10-04-2019  
**Borelog Completed:** 10-04-2019

**903 SE 22nd Street  
Des Moines, Iowa**

---

**Drill Rig:** 709  
**Driller:** SK

**Project No.: 08195236**
Boring Log No. 6

Project: Salt Storage Building 12

Site: 903 SE 22nd Street
Des Moines, Iowa

Client: City Of Des Moines Iowa
Des Moines, Iowa

Substrate Layers:

1. **Fill - Asphalt Millings**, with concrete rubble, dark gray
   - Depth: 5.0 ft
   - Elevation: 1009.5 ft

2. **Fill - Lean Clay (CL)**, with sand and asphalt millings, dark gray
   - Depth: 6.0 ft
   - Elevation: 1006.5 ft

3. **Sandy Lean Clay (CL)**, trace gravel, brown gray, soft
   - Depth: 12.5 ft
   - Elevation: 1002 ft

Boring Terminated at 25.5 Feet

Water Level Observations

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Field Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Field Test</td>
</tr>
<tr>
<td>10</td>
<td>Test</td>
</tr>
<tr>
<td>15</td>
<td>Test</td>
</tr>
<tr>
<td>20</td>
<td>Test</td>
</tr>
<tr>
<td>25</td>
<td>Test</td>
</tr>
</tbody>
</table>

FIELD TEST RESULTS

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Field Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Test</td>
</tr>
<tr>
<td>2</td>
<td>Test</td>
</tr>
<tr>
<td>3</td>
<td>Test</td>
</tr>
<tr>
<td>4</td>
<td>Test</td>
</tr>
</tbody>
</table>

UNCONFINED COMPRESSION TEST (psf)

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Unconfined Compression Test (psf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Test</td>
</tr>
<tr>
<td>2</td>
<td>Test</td>
</tr>
<tr>
<td>3</td>
<td>Test</td>
</tr>
<tr>
<td>4</td>
<td>Test</td>
</tr>
</tbody>
</table>

Boring Started: 10-04-2019
Boring Completed: 10-04-2019
Drill Rig: 709
Driller: SK
Project No.: 08195236

Notes:
- Advancement Method: Hollow Stem Auger
- Abandonment Method: Boring backfilled with soil cuttings after delayed water levels were measured.

Elevations were provided by others.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any). See Supporting Information for explanation of symbols and abbreviations.

Hammer Type: Automatic

Stratification lines are approximate. In-situ, the transition may be gradual.
CPT LOG NO. CPT-01

PROJECT: Salt Storage Building 12
CLIENT: City Of Des Moines Iowa
TEST LOCATION: See Exploration Plan

SITE: 903 SE 22nd Street
Des Moines, Iowa

Surface Elev.: 1014.5 ft
Northing: 161937.2
Easting: 574792.4

Depth (ft) Tip Resistance, qt (tsf) Sleeve Friction, fs (tsf) Friction Ratio, Fr (%) Pore Pressure, u2 (tsf) Normalized CPT Soil Behavior Type

-7 ft estimated water depth

WATER LEVEL OBSERVATION

Probes no. 3308 with net area ratio of .35 U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 6/3/2019 Tip and sleeve areas of 10 cm² and 150 cm²
Ring friction reducer with O.D. of 1.875 in

CPT Terminated at 32.6 Feet

CPT sensor calibration reports available upon request.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). Elevations were provided by others.

Material Description Normalized CPT Soil Behavior Type

1 2 3 4 5 6 7 8

MATERIALS
1. Silt mixtures - silty clay to silty sand
2. Sand mixtures - silty sand to sandy silt
3. Sands - clean sand to silty sand
4. Gravelly sand to dense sand
5. Very stiff fine grained
6. Very stiff sand to clayey sand
7. Gravelly sand to dense sand
8. Very stiff fine grained

CPT Terminated at 32.6 Feet

Supporting Information
CPT LOG NO. CPT-04

PROJECT: Salt Storage Building 12
CLIENT: City Of Des Moines Iowa
TEST LOCATION: See Exploration Plan

SITE: 903 SE 22nd Street
Des Moines, Iowa

SITE ELEV.: 1015.4 ft
Northing: 1620094.8
Easting: 574734.2

WATER LEVEL OBSERVATION
10 ft estimated water depth
(used in normalizations and correlations; See Supporting Information)

CPT Terminated at 40.1 Feet

Material Description
Normalized CPT

 normalized CPT

Material Description

1 2 3 4 5 6 7 8

1. Sensitive, fine grained
2. Organic soils - clay
3. Clay - silty clay to clay
4. Very stiff fine grained
5. Gravelly sand to dense sand
6. Very stiff sand to clayey sand
7. Gravelly sand to dense sand
8. Very stiff fine grained

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
Elevations were provided by others.

CPT sensor calibration reports available upon request.
SUPPORTING INFORMATION

Contents:
General Notes
CPT General Notes
Unified Soil Classification System

Note: All attachments are one page unless noted above.
**Sampling**

- Shelby Tube
- Standard Penetration Test

**Water Level**

- Water Initially Encountered
- Water Level After a Specified Period of Time
- Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

**Field Tests**

- N: Standard Penetration Test Resistance (Blows/Ft.)
- (HP): Hand Penetrometer
- (T): Torvane
- (DCP): Dynamic Cone Penetrometer
- UC: Unconfined Compressive Strength
- (PID): Photo-Ionization Detector
- (OVA): Organic Vapor Analyzer

---

**General Notes**

- Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of these coordinates was not verified. The accuracy of the coordinate system is referenced to the ellipsoid of the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

---

**Soil Classification**

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their particles retained on the No. 200 sieve and are classified on the basis of their relative density. Fine-grained soils are defined on the basis of their consistency.

**Plasticity Description**

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

**Description of Symbols and Abbreviations**

- N: Standard Penetration Test Resistance (Blows/Ft.)
- (HP): Hand Penetrometer
- (T): Torvane
- (DCP): Dynamic Cone Penetrometer
- UC: Unconfined Compressive Strength
- (PID): Photo-Ionization Detector
- (OVA): Organic Vapor Analyzer

---

**Particle Size**

- Medium: 0.075mm to 4.75mm
- Coarse: 4.75mm to 300mm

**Water Level After a Specified Period of Time**

- Water Level After a Specified Period of Time
- Water Initially Encountered

**STRENGTH TERMS**

<table>
<thead>
<tr>
<th>Descriptive Term (Density)</th>
<th>Standard Penetration or N-Value Blows/Ft.</th>
<th>Descriptive Term (Consistency)</th>
<th>Unconfined Compressive Strength Qu, (psf)</th>
<th>Standard Penetration or N-Value Blows/Ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Loose</td>
<td>0 - 3</td>
<td>Very Soft</td>
<td>less than 500</td>
<td>0 - 1</td>
</tr>
<tr>
<td>Loose</td>
<td>4 - 9</td>
<td>Soft</td>
<td>500 to 1,000</td>
<td>2 - 4</td>
</tr>
<tr>
<td>Medium Dense</td>
<td>10 - 29</td>
<td>Medium Stiff</td>
<td>1,000 to 2,000</td>
<td>4 - 8</td>
</tr>
<tr>
<td>Dense</td>
<td>30 - 50</td>
<td>Stiff</td>
<td>2,000 to 4,000</td>
<td>8 - 15</td>
</tr>
<tr>
<td>Very Dense</td>
<td>&gt; 50</td>
<td>Very Stiff</td>
<td>4,000 to 8,000</td>
<td>15 - 30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hard</td>
<td>&gt; 8,000</td>
<td>&gt; 30</td>
</tr>
</tbody>
</table>

**RELATIVE DENSITY OF COARSE-GRAINED SOILS**

(More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance

**CONSISTENCY OF FINE-GRAINED SOILS**

(50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance.
DESCRIPTION OF MEASUREMENTS AND CALIBRATIONS

To be reported per ASTM D5778:

Uncorrected Tip Resistance, \( q_t \)

Measured force acting on the cone divided by the cone's projected area

Corrected Tip Resistance, \( q_c \)

Cone resistance corrected for porewater and net area ratio effects

\[ q_c = q_t \times \frac{\sigma_v}{\sigma_v}' \]  

where \( a \) is the net area ratio, a lab calibration of the cone typically between 0.70 and 0.85

Pore Pressure, \( u \)

Pore pressure measured during penetration

\( u_e \) - sensor on the cone face

\( u_s \) - sensor on the shoulder (more common)

Sleeve Friction, \( f_s \)

Frictional force acting on the sleeve divided by its surface area

Normalized Friction Ratio, \( F \)

The ratio as a percentage of \( f_s \) to \( q_c \)

normalized porewater pressure, \( u' \)

Pore pressure measured during penetration

\( u' \) - \( u \) plot

Over Consolidation Ratio, OCR

OCR (1) = \( 0.25(Q_{\text{c}} - q_{\text{c}})/(P' - P_{\text{atm}}) \)

OCR (2) = \( 0.33(Q_{\text{c}}) \)

Unit Weight, \( \gamma \)

\[ \gamma = \frac{(q_{\text{c}} - q_{\text{t}})}{1.013 \text{ atm}} \]

Effective Friction Angle, \( \phi' \)

\[ \phi' = \tan^{-1}\left(\frac{0.373\log(q_{\text{c}}/q_{\text{t}}) + 0.29}{2}\right) \]

Reliably FR \[ \phi' = 17.6 + 11\log(\gamma_{\text{c}}) \]

Sleeve Friction Ratio, \( f_{\text{ratio}} \)

Frictional force acting on the sleeve divided by its surface area

Normalized Friction Ratio, \( F \)

The ratio as a percentage of \( f_s \) to \( q_c \)

DESCRIPTION OF GEOTECHNICAL CORRELATIONS

Soil Behavior Type Index, \( I_c \)

\[ I_c = \left[0.347 - \log(Q_{\text{c}})\right] + \left[0.54\log(F_s) + 1.22\right]^{0.5} \]

SPT N_{\text{soil}}

\[ N_{\text{soil}} = \left(\frac{q_{\text{c}}}{\text{atm}}\right)^{10} \]

Elastic Modulus, \( E_s \)

\( E_s \) assumes \( q_{\text{c,soil}} = 0.3 \), i.e. \( F_s = 3 \)

\[ E_s(1) = 2.6 \times P_{\text{atm}} \]

\[ E_s(2) = 0.8 \times P_{\text{atm}} \]

\[ E_s(3) = 0.015 \times P_{\text{atm}} \]

Constrained Modulus, \( M \)

\[ M = q_{\text{c}}(1 - \sigma_{\text{v}}') \]

Hydraulic Conductivity, \( k \)

\[ k = 0.035 \times 10^{-6} \text{ m/s} \]

Relative Density, \( D_r \)

\[ D_r = (Q_{\text{c}}) \times (\gamma_{\text{c}} - \gamma_{\text{atm}})/\gamma_{\text{atm}} \]

\( D_r \) x 100

REPORTED PARAMETERS

CPT logs as provided, at a minimum, report the data as required by ASTM D5778 and ASTM D7400 (if applicable). This minimum data include \( q_c \), \( f_s \), and \( u \). Other correlated parameters may also be provided. These other correlated parameters are interpretations of the measured data based upon published and reliable references, but they do not necessarily represent the actual values that would be derived from direct testing to determine the various parameters. To this end, more than one correlation to a given parameter may be provided. The following chart illustrates estimates of reliability associated with correlated parameters based upon the literature referenced below.

RELATIVE RELIABILITY OF CPT CORRELATIONS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Low Reliability</th>
<th>High Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over Consolidation Ratio, OCR</td>
<td>Sand</td>
<td>Clay and Silt</td>
</tr>
<tr>
<td>Small Strain Modulus, ( G_s ) and Elastic Modulus, ( E_s )</td>
<td>Clay and Silt</td>
<td>Sand</td>
</tr>
<tr>
<td>Unit Weight, ( \gamma )</td>
<td>Sand</td>
<td>Clay and Silt</td>
</tr>
<tr>
<td>Effective Friction Angle, ( \phi' )</td>
<td>Sand</td>
<td>Clay and Silt</td>
</tr>
<tr>
<td>Sensitivity, ( S_s )</td>
<td>Clay and Silt</td>
<td>Sand</td>
</tr>
<tr>
<td>Undrained Shear Strength, ( S_u )</td>
<td>Sand</td>
<td>Clay and Silt</td>
</tr>
<tr>
<td>Relative Density, ( D_r )</td>
<td>Sand</td>
<td>Clay and Silt</td>
</tr>
</tbody>
</table>

WATER LEVEL

The groundwater level at the CPT location is used to normalize the measurements for vertical overburden pressures and as a result influences the normalized soil behavior type classification and correlated soil parameters. The water level may either be "measured" or "estimated:"

- **Measured**: Depth to water directly measured in the field
- **Estimated**: Depth to water interpolated by the practitioner using pore pressure measurements in coarse grained soils and known site conditions

While groundwater levels displayed as "measured" more accurately represent site conditions at the time of testing than those "estimated", in either case the groundwater should be further defined prior to construction as groundwater level variations will occur over time.

CONC PENETRATION SOIL BEHAVIOR TYPE

The estimated stratigraphic profiles included in the CPT logs are based on relationships between corrected tip resistance \( (q_c) \), friction resistance \( (f_s) \), and porewater pressure \( (u) \). The normalized friction ratio \( (F_s) \) is used to classify the soil behavior type.

Typically, silts and clays have high \( F_s \) values and generate large excess penetration porewater pressures; sands have lower \( F_s \) and do not generate excess penetration porewater pressures. The adjacent graph (Roberson et al.) presents the soil behavior type correlation used for the logs. This normalized SBT chart, generally considered the most reliable, does not use pore pressure to determine SBT due to its lack of repeatability in onshore CPTs.

REFERENCES


### Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests

<table>
<thead>
<tr>
<th>Group Symbol</th>
<th>Group Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>GW</td>
<td>Well-graded gravel</td>
</tr>
<tr>
<td>GP</td>
<td>Poorly graded gravel</td>
</tr>
<tr>
<td>GM</td>
<td>Silty gravel</td>
</tr>
<tr>
<td>GC</td>
<td>Clayey gravel</td>
</tr>
<tr>
<td>SW</td>
<td>Well-graded sand</td>
</tr>
<tr>
<td>SP</td>
<td>Poorly graded sand</td>
</tr>
<tr>
<td>SM</td>
<td>Silty sand</td>
</tr>
<tr>
<td>SC</td>
<td>Clayey sand</td>
</tr>
<tr>
<td>CL</td>
<td>Lean clay</td>
</tr>
<tr>
<td>ML</td>
<td>Silt</td>
</tr>
<tr>
<td>OL</td>
<td>Organic silt</td>
</tr>
<tr>
<td>CH</td>
<td>Fat clay</td>
</tr>
<tr>
<td>MH</td>
<td>Elastic silt</td>
</tr>
<tr>
<td>PT</td>
<td>Peat</td>
</tr>
</tbody>
</table>

#### Coarse-Grained Soils: More than 50% retained on No. 200 sieve

**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve

- **Clean Gravels:** Less than 5% fines
  - $Cu \geq 4$ and $1 \leq Cc \leq 3$
  - GW (Well-graded gravel)
- **Gravels with Fines:** More than 12% fines
  - $Cu < 4$ and/or $[Cc < 1$ or $Cc > 3.0]$
  - GP (Poorly graded gravel)
- **Clean Sands:** Less than 5% fines
  - $Cu \geq 6$ and $1 \leq Cc \leq 3$
  - SW (Well-graded sand)
- **Sands with Fines:** More than 12% fines
  - $Cu < 6$ and/or $[Cc < 1$ or $Cc > 3.0]$
  - SP (Poorly graded sand)

#### Fine-Grained Soils: 50% or more passes the No. 200 sieve

**Sands:** 50% or more of coarse fraction passes No. 4 sieve

- **Clean Sands:** Less than 5% fines
  - $Cu \geq 6$ and $1 \leq Cc \leq 3$
  - SW (Well-graded sand)
- **Sands with Fines:** More than 12% fines
  - $Cu < 6$ and/or $[Cc < 1$ or $Cc > 3.0]$
  - SP (Poorly graded sand)

**Silty and Clays:** Liquid limit less than 50

- **Silt:** Liquid limit - oven dried
  - $< 0.75$
  - OL (Organic silt)
- **Clay:** Liquid limit - not dried
  - $< 0.75$
  - OH (Organic clay)

**Silty and Clays:** Liquid limit 50 or more

- **Organic:** Liquid limit - oven dried
  - $< 0.75$
  - OL (Organic silt)
- **Inorganic:** Liquid limit - not dried
  - $< 0.75$
  - OH (Organic clay)

**Highly organic soils:**

- Primarily organic matter, dark in color, and organic odor
- PT (Peat)

---

**Notes:**

- **A** Based on the material passing the 3-inch (75-mm) sieve.
- **B** If field sample contained cobbles or boulders, or both, add “with cobbles or boulders, or both” to group name.
- **C** Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
- **D** Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.
- **E** $Cu = \frac{D_{30}}{D_{10}}$  
  $Cc = \left(\frac{D_{30}}{D_{10}}\right)^2 \times D_{60}$
- **F** If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
- **H** If fines are organic, add “with organic fines” to group name.
- **I** If soil contains ≥ 15% gravel, add “with gravel” to group name.
- **J** If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
- **K** If soil contains 15 to 29% plus No. 200, add “with sand” or “with gravel,” whichever is predominant.
- **L** If soil contains 30% plus No. 200, predominantly sand, add “sandy” to group name.
- **M** If soil contains 30% plus No. 200, predominantly gravel, add “gravelly” to group name.
- **N** If Atterberg limits plot below “A” line.
- **O** If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
- **P** If soils contain 15 to 29% plus No. 200, predominantly gravel, add “gravelly” to group name.
- **Q** If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

---

**Graph:**

- For classification of fine-grained soils and fine-grained fraction of coarse-grained soils
- Equation of “A” line
  - Horizontal at $\text{PL}=4$ to $\text{LL}=25.5$; then $\text{PL}=0.73$ (LL-20)
- Equation of “U” line
  - Vertical at $\text{LL}=16$ to $\text{PL}=7$; then $\text{PL}=0.9$ (LL-8)

---

**Formulae:**

- $Cu = \frac{D_{30}}{D_{10}}$
- $Cc = \left(\frac{D_{30}}{D_{10}}\right)^2 \times D_{60}$

---

**Legend:**

- **CL** Lean clay
- **ML** Silt
- **OL** Organic silt
- **CH** Fat clay
- **MH** Elastic silt
- **PT** Peat

---

**Diagram:**

- For classification of fine-grained soils and fine-grained fraction of coarse-grained soils
- Equation of “A” line
  - Horizontal at $\text{PL}=4$ to $\text{LL}=25.5$; then $\text{PL}=0.73$ (LL-20)
- Equation of “U” line
  - Vertical at $\text{LL}=16$ to $\text{PL}=7$; then $\text{PL}=0.9$ (LL-8)
PART 1 GENERAL

1.1 SUMMARY

A. Contract Conditions: The Iowa Statewide Urban Design and Specifications (SUDAS) for Public Improvements 2019 editions, current City of Des Moines General Supplemental Specifications, Special Provisions, technical specifications and accompanying drawings apply to construction work on this project. All of these documents comprise the Contract Documents.


C. Project Summary: Improvements include the construction of a new 12,000 ton capacity pre-engineered hoop truss salt storage building including pavement removal, grading, foundation, electrical, and HMA pavement; all work in accordance with the contract documents including Plan File Nos. 584-190/203, located at the Des Moines Public Works Supply Yard, 903 S.E. 22nd Street, Des Moines, Iowa.

D. Project Requirements:
   1. Public Works Yard Occupancy:
      a. Public Works personnel will continue operations in all areas except for the existing salt storage building 9, the area designated for construction staging, and the limits of construction for the new salt storage building 12.
      b. A construction traffic route will be established to the construction site and staging area for the safe passage of construction personnel, equipment and materials.
   2. Contractor's use of existing facilities:
      a. Restrooms in existing building are not available for contractor use.
      b. Contractor may use site available water and power.
         (a) Contractor to provide construction lighting if needed.
      c. Contractor shall not store hazardous materials outside of the construction staging area.

E. Security and Protection: Provide security and protection requirements including the following.
   1. Fire extinguishers.
   2. Environmental protection.

F. Permits and Fees
   1. Contractor shall apply for and obtain the Building Permit.
   2. The building permit fee will be paid by the City.
   3. Apply for, obtain, and pay for all other permits, fees, and utility company charges required to perform the work.

1.2 SUBSTITUTIONS

A. Requests
   1. Request for substitution must be in writing.
   2. Requests shall be submitted prior to award of contract, unless otherwise acceptable to the Owner.
3. Requests must be submitted no later than seven (7) calendar days prior to the bid date.

4. Substitution Request Form attached to the end of this section.

5. Conditions for substitution include:
   a. An ‘or equal’ phrase in the specifications.
   b. Specified material cannot be coordinated with other work.
   c. Specified material is not acceptable to authorities having jurisdiction.
   d. Substantial advantage is offered to the Owner in terms of cost, time, or other valuable consideration.

1.3 CONTRACT MODIFICATION PROCEDURES

A. Proposal Requests, either Owner or Contractor initiated, are not instructions either to stop work in progress or to execute the proposed changes.

B. Owner initiated Proposal Requests: Engineer will issue a detailed description of proposed change in the Work that may require adjustment to the Contract Sum or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

C. Contractor initiated Work Change Proposal: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to the Engineer.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Provide administrative requirements for the proper coordination and completion of Work including the following:

1. Supervisory personnel

2. Pre-construction conference

3. Project meetings involving the Contractor’s superintendent, Project Consultants, City representatives, and appropriate subcontractors to discuss construction progress and upcoming schedule of work.

4. Schedule: Submit progress schedule, updated as each construction area is substantially complete.

5. Submittals for review as listed in individual sections: Provide product data, shop drawings, samples, inspection and test reports, warranties, and close-out documents.

6. Record Documents: Submit as-built record drawings and specifications; to be maintained and annotated by Contractor as work progresses; and to be submitted to Owner at Close-out.

1.5 EXECUTION

A. Existing Conditions

1. Notify Engineer of existing conditions differing from those indicated on the drawings.
2. The existence and location of underground and other utilities and the construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

   a. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, water service, underground electrical service, and other utilities.

   b. Furnish location data for work related to the Project that must be performed by public utilities serving the Project site.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurement before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.6 CLOSE-OUT PROCEDURES

A. Substantial Completion

1. Contractor’s Punch List: Prepare and submit a list of items to be completed and corrected.

2. Submit close-out submittals and maintenance materials specified in individual Divisions 03 through 33, including tools, spare parts, extra materials, specific warranties, workmanship bonds, final certifications, and similar documents.

3. Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests.

B. Repair of the Work: repair or remove and replace defective construction before requesting inspection.

C. Final Completion

1. Prior to requesting final inspection for determining completion, complete the following:

   a. Submit a final Application for Payment

   b. Complete the City supplied Certificate of Disadvantage Business Enterprise (DBE) Accomplishment.

   c. Provide a list of incomplete items

   d. Provide verification that all permit inspections are complete.

   e. Instruct Owner’s personnel in operation, adjustment, and maintenance of products, equipment, and systems.

   f. Submit warranty documents.

   g. Submit Certificate of Occupancy.

D. Final Cleaning: Perform final cleaning and waste removal operations to include the project site, yard, grounds and building. Leave Project clean and ready for occupancy.

END OF SECTION 01 00 00
Project: PW Salt Storage Building No. 12

Bid Date: February 25, 2020

Due Date for Requests: February 18, 2020

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

Drawings/Specifications:

Drawing Number: ____________________________

Drawing Name: ____________________________

Spec Section/Name: ____________________________

Paragraph: ____________________________

Specified Item: ____________________________

Proposed Substitution: ____________________________

Attach complete information on changes to Drawings and/or Specifications which proposed substitution will require for its proper installation. Failure to fully complete this form is basis to not accept this Substitution Request.

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

CERTIFICATION OF EQUAL PERFORMANCE AND ASSUMPTION OF LIABILITY FOR EQUAL PERFORMANCE

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

Submitted by:

__________________________  ____________________________
Signature                        Title

__________________________
Firm

__________________________
Address

Telephone  E-mail  Date
PW Salt Storage Building No. 12  Substitution Request Form
Activity ID 10-2019-010  01 60 00 - 1
Signature shall be by person having authority to legally bind his firm to the above terms. Failure to provide legally binding signature will result in retraction of approval.

For Use by Owner's Representative or Owner:

☐ Accepted    ☐ Accepted as Noted    ☐ Not Accepted    ☐ Received Too Late

By ________________________________

Date ________________________________
Fill in blanks below:

A. Does the substitution affect dimensions shown on Drawings?  Yes _____ No _____
   If yes, clearly indicate changes: _____________________________________________

B. Will the undersigned pay for changes to the building design, including engineering and
costs caused by the request submission?  Yes _____ No _________
   If no, fully explain: _______________________________________________________

C. What effect does substitution have on other Contracts or other trades?
   _________________________________________________________________
   _________________________________________________________________

D. What effect does substitution have on construction schedule?
   _________________________________________________________________
   _________________________________________________________________

E. Manufacturer’s warranties of the proposed and specified items are:
   _____ Same _____ Different (Explain on Attachment)

F. Reason for Request: _______________________________________________________
   _________________________________________________________________
   _________________________________________________________________

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

H. Accurate cost data comparing proposed substitution with product specified:
   _________________________________________________________________
   _________________________________________________________________

I. Designation of maintenance services and sources:
   _________________________________________________________________

(ATTACH ADDITIONAL SHEETS IF REQUIRED)
NOTE TO BIDDER: REFERENCE THIS SPECIFICATION SECTION FOR BID ITEM NO. 17a

SECTION 03 10 00 - CONCRETE FORMWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Design, construction and treatment of formwork and related accessories to confine and shape concrete to the required dimensions.

B. Structural notes indicated on the drawings regarding concrete formwork shall be considered a part of this specification.

1.2 RELATED WORK

A. Pertinent Sections of Division 01.
B. Section 03 20 00 - Concrete Reinforcement.
C. Section 03 30 00 - Cast-in-Place Concrete.

1.3 REFERENCES

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards except where more stringent requirements are shown or specified. Where provisions of the pertinent codes and standards conflict with this specification, the more stringent provision shall govern.

2. ACI 301 - Specifications for Structural Concrete.
3. ACI 318 - Building Code Requirements for Structural Concrete.
4. ACI 347 - Guide to Formwork for Concrete.
5. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
7. NIST - PS 1: Structural Plywood

1.4 TESTING AND INSPECTION

A. Special Inspection and Testing:

1. In accordance with Chapter 17 of the International Building Code, the Owner shall employ a Special Inspection Agency to perform the duties and responsibilities specified in Section 1704.0.

2. Refer to architectural, civil, and electrical specifications for testing and inspection requirements of non-structural components.

3. Work performed on the premises of a fabricator approved by the building official need not be tested and inspected per the table below. The fabricator shall submit a certificate of compliance that the work has been performed in accordance with the approved plans and specification to the building official and the Architect and Engineer of Record.

4. Duties of the Special Inspection Agency:

a. Perform all testing and inspection required per the Testing and Inspection Schedule indicated below.
b. Furnish inspection reports to the building official, the Owner, the Architect, the Engineer of Record, and the General Contractor. The reports shall be completed and furnished within 48 hours of inspected work.

c. Submit a final signed report stating whether the work requiring special inspection was, to the best of the Special Inspection Agency’s knowledge in conformance with the approved plans and specifications.

5. Structural Component Testing and Inspection Schedule for Section 03 10 00 is as follows:

<table>
<thead>
<tr>
<th>Concrete and Concrete Placement</th>
<th>Continuous</th>
<th>Periodic</th>
<th>Referenced Standard</th>
<th>IBC Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspect formwork for shape, location and dimensions of the concrete member being formed.</td>
<td>X</td>
<td></td>
<td>ACI 318:</td>
<td>26.11.1.2 (b)</td>
</tr>
</tbody>
</table>

1.5 DESIGN REQUIREMENTS

A. Design and engineering of formwork is the responsibility of the Contractor. Design, engineer and construct formwork, shoring, and bracing to conform to Contract Documents and in accordance with building code requirements. Design for construction loads, lateral pressure, and requirements of the applicable building code to conform to the required shape, line and dimensions.

B. Foundation concrete may be placed directly into neat excavations, provided the foundation trench walls are stable as determined by the Geotechnical Engineer. In such case, the minimum formwork indicated on the drawings is mandatory to ensure clean excavations immediately prior to and during the placing of concrete.

C. Drawings show the design requirements and dimensions for structural strength, but structural drawings do not show all detail dimensions to fit intricate architectural detail. Contractor shall so construct the concrete work that it will conform to the clearance required by the architectural and electrical design.

D. Maximum deflection of facing materials forming concrete surfaces exposed to view shall be 1/240 of the center-to-center span between structural members of the formwork.

E. Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained adequate strength for that purpose. Where adequate foundations for shores and struts cannot be secured, provide trussed supports.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer’s product data, installation instructions and specifications for each of the following:

1. Form sealer
2. Form release agent(s), including certification that agent is compatible with finish
3. Form ties and spreaders

B. Testing for Formwork Removal: When methods other than cylinder tests are proposed for determining time for formwork removal, submit data on methods for approval.
PART 2 - PRODUCTS

2.1 MATERIALS AND ACCESSORIES

A. Formwork Accessories: Use commercially manufactured accessories for formwork accessories that are partially or completely embedded in concrete, including ties and hangers.

B. Sealer: Clear, penetrating, synthetic resin sealer.

C. Formwork Release Agent: Use commercially manufactured form release agents that will prevent formwork absorption of moisture, prevent bond with concrete, and will not stain the concrete surface. Reapply to cleaned forms before each reuse. Formwork release agent shall be compatible with paint or any other finish applied to the concrete; submit data indicating compatibility.

D. Form Material:
   1. No aluminum shall be allowed in the concrete work unless coated to prevent aluminum-concrete reaction.
   2. Concrete form materials must be used in a manner to provide the surface finish specified.
   3. Design formwork in accordance with the provisions of the building code or the following standards if not covered in the building code:
      a. Wood - AF & PA “National Design Specification”.
      b. Plywood - American Plywood Association “Plywood Design Specification”.
      e. Concrete - ACI 318.
      f. Other materials - as directed by manufacturer.

E. Chamfer Strips:
   1. Chamfer strips shall be 3/4-inch, unless noted otherwise. Provide in maximum possible lengths.

2.2 FORM FINISHES

A. Rough Form Finish:
   1. Concrete surfaces not exposed to view in the finished work shall have a rough-form finish. No form-facing material is specified for rough-form finish.
   2. Set and maintain forms so finished concrete dimensions shall conform to the tolerances. Rough form finish is Designated Surface Finish-1.0 from ACI 301, except that surface tolerance Class C is required as specified in ACI 117.

B. Smooth Form Finish:
   1. Concrete surfaces exposed to view in the finished work or surfaces to receive finishes of any type (paint, textured paint, etc.) shall have a smooth form finish. Form-facing material shall be plywood, tempered concrete-form-grade hardboard, metal, plastic, paper, or other acceptable material capable of producing the desired finish. Form-facing material shall produce a smooth, uniform texture on the concrete. Do not use form facing material with raised grain, torn surfaces, worn edges, patches, dents, or other defects that might impair the texture of the concrete surfaces.
2. Set and maintain forms so finished concrete dimensions shall conform to the
tolerances. Smooth form finish is Designated Surface Finish-3.0 from ACI 301,
including surface tolerance Class A as specified in ACI 117.

C. Patching and repairing concrete finishes are specified under Section 03 30 00.

2.3 FABRICATION AND MANUFACTURE

A. Form Ties and Spreaders: Factory-fabricated, removable or snap-off metal or glass-fiber-
reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms,
hold inner and outer forms for vertical concrete together, and to prevent spalling of
concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1-1/2 inch to the plane
of the exposed concrete surface.

2. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter
in concrete surface.

3. At horizontal pour lines, locate ties not more than 6” below the pour lines. Tighten
after concrete has set and before the next pour is made.

4. For exposed concrete surfaces, provide form ties of removable type with
permanent plugs and a system approved by the Engineer for fixing the plugs in
place.

PART 3 - EXECUTION

3.1 CONSTRUCTION OF TEMPORARY FORMWORK

A. In accordance with ACI 301, construct formwork:

1. Design, erect, shore, brace, and maintain formwork to support vertical, lateral,
static, and dynamic loads, and construction loads that might be applied, until
concrete structure can support such loads.

2. Obtain approval before framing openings in structural members that are not
indicated on the drawings.

B. Fabricate forms for easy removal without hammering or prying against concrete surfaces.

1. Provide crush or wrecking plates where stripping may damage cast concrete
surfaces.

2. Chamfer wood inserts for forming recesses and the like to allow wood to swell
without spalling concrete and to ensure easy removal.

C. Falsework:

1. Provide positive means of adjustment (wedges or jacks) of shores and struts. Do
not adjust formwork after concrete has taken its initial set. Brace formwork
securely against lateral deflection and lateral instability.

2. Verify lines, levels, and centers before proceeding with formwork. Ensure that
dimensions agree with the drawings.

3. Fasten form wedges in place after final adjustment of forms and prior to concrete
placement.
4. Anchor formwork to shores, supporting surfaces, or members to prevent upward or lateral movement of the formwork system during concrete placement.

5. Securely brace and shore forms to prevent displacement and to safely support construction loads.

6. Construct forms plumb and straight to conform to slopes, lines, and dimensions shown.

7. 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.

8. Provide runways for moving equipment and support runways directly on formwork or structural member without resting on the reinforcing steel.

D. Where end-of-work sequence requires a joint in the concrete, provide adequately designed additional formwork. Extend reinforcement through formwork as indicated on the drawings. Location of the construction joint is subject to approval by the Architect and the SEOR.

E. Construct formwork for wall openings to facilitate removal and to counteract swelling of wood formwork. Keep wood forms wet as necessary to prevent shrinkage.

F. Do not use rust-stained steel form-facing material.

G. Provide temporary openings at the base of pier and wall formwork and at other points where necessary to facilitate cleaning and inspection.

H. Provisions for Other Trades:

1. Place sleeves, inserts, anchors, and embedded items required for adjoining work or for support of adjoining work prior to concrete placement.

2. Position and support expansion joint material and other embedded items to prevent displacement. Fill voids in sleeves, inserts, and anchor slots temporarily with readily removable material to prevent entry of concrete into voids.

I. Projecting corners of walls and piers shall be formed with a 3/4-inch chamfer, unless noted otherwise on drawings.

J. Cleaning:

1. Clean surfaces of formwork and embedded materials of mortar, grout, and foreign material before concrete is placed.

2. Cover surfaces of formwork with acceptable formwork release agent. Apply form release agent before placing reinforcing steel and concrete according to manufacturer’s written instructions. Do not allow formwork release agent to puddle in forms. Do not allow formwork release agent to contact reinforcing steel or hardened concrete against which fresh concrete is to be placed. Do not apply form release agent to concrete surfaces receiving special finishes or applied coverings affected by the agent.

3. Clean and inspect formwork immediately before concrete is placed.

K. Provide forms for concrete work adjacent to earth banks including sides of footings, except where footing excavation is vertical rock cut.
3.2 COORDINATION

A. Install all required pipe sleeves, cavities or slots. Notify appropriate trades in due time so that they may furnish information and make necessary installations. Check sizes, location and alignment of all openings, frames and other work, which are to be built-in including electrical boxes and conduit.

B. Layout the run of partitions and establish location of openings so that other trades may properly locate their work.

C. Core drilling concrete is not permitted unless noted otherwise or approved in writing by the Engineer. Notify the Engineer in advance of conditions not shown on the drawings.

3.3 INSTALLATION OF EMBEDDED ITEMS

A. Built-In Items:
   1. Confirm with Engineer that all materials to be embedded are suitable for embedment in concrete.
   2. Build in anchors, inserts, and other devices indicated or required for various portions of work.
   3. Build in sleeves, thimbles, and other items furnished or set in place by other trades.
   4. Accurately position and support all embedded items prior to concrete placement. Secure embedded items against displacement during concrete placement operations.
   5. Fill voids with readily removable material to prevent entry of concrete into voids.
   6. Electrical shall provide and set required sleeves.
   7. Coordinate setting of all embedded items.

3.4 TOLERANCES

A. Construction formwork to maintain tolerances required by ACI 301 and ACI 117.

3.5 REMOVAL OF FORMS

A. When removal of formwork is based on concrete reaching a specified compressive strength, concrete will be presumed to have reached this strength when either of the following requirements has been met:
   1. Test cylinders, molded and cured under the same conditions for moisture and temperature as used for the concrete they represent, have reached the specified compressive strength.
   2. Concrete has been cured in accordance with the specifications for the same length of time as laboratory-cured cylinders, which have reached the specified strength. Determine the length of time concrete has been cured in the structure by the cumulative number of days or fractions thereof, not necessarily consecutive, during which the temperature of the air in contact with the concrete is above 50°F and the concrete has been damp or thoroughly sealed from evaporation and loss of moisture.
B. Forms shall remain in place for the following periods of time. These periods represent cumulative number days or hours, not necessarily consecutive, during which the temperature of the air surrounding the concrete is above 50°F:

1. Walls and Footings: 67% specified compressive strength or minimum 24 hours.

C. When finishing is required, remove forms as soon as removal operations will not damage concrete.

D. Loosen wood formwork for wall openings when this can be accomplished without causing damage to concrete.

E. Do not allow removal of formwork to damage the fresh concrete for walls and other parts supporting the weight of the concrete. Perform needed repair and treatment required on vertical surfaces at once and follow immediately with specified curing.

3.6 FASTENER REMOVAL

A. Remove all protruding fasteners left as a result of securing inserts to forms by Contractor responsible for insert.

B. Cutting flush with surface is not acceptable.

C. Patch exposed concrete surfaces if damaged during fastener removal process.

3.7 REMOVING AND REUSING FORMS

A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

B. 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 Engineer.

END OF SECTION
NOTE TO BIDDER: REFERENCE THIS SPECIFICATION SECTION FOR BID ITEM NO. 17a

SECTION 03 20 00 - CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fabrication and placement of reinforcing steel for concrete, and all related accessories.

B. Structural notes indicated on the drawings regarding concrete reinforcement shall be considered a part of this specification.

1.2 RELATED WORK

A. Pertinent Sections of Division 01.
B. Section 03 10 00 - Concrete Formwork.
C. Section 03 30 00 - Cast-in-Place Concrete.

1.3 REFERENCES

A. Codes and Standards: Comply with the provisions of the following codes, specifications and standards, except where more stringent requirements are shown or specified. Where provisions of other pertinent codes and standards conflict with this specification, the more stringent provision shall govern.

2. ACI 301 - Specifications for Structural Concrete.
3. ACI 318 - Building Code Requirements for Structural Concrete.
5. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

1.4 TESTING AND INSPECTION

A. Special Inspection and Testing:

1. In accordance with Chapter 17 of the International Building Code, the Owner shall employ a Special Inspection Agency to perform the duties and responsibilities specified in Section 1704.0.

2. Refer to architectural, civil, and electrical specifications for testing and inspection requirements of non-structural components.

3. Work performed on the premises of a fabricator approved by the building official need not be tested and inspected per the table below. The fabricator shall submit a certificate of compliance that the work has been performed in accordance with the approved plans and specification to the building official and the Architect and Engineer of Record.

4. Duties of the Special Inspection Agency:

a. Perform all testing and inspection required per the Testing and Inspection Schedule indicated below.
b. Furnish inspection reports to the building official, the Owner, the Architect, the Engineer of Record, and the General Contractor. The reports shall be completed and furnished within 48 hours of inspected work.

c. Submit a final signed report stating whether the work requiring special inspection was, to the best of the Special Inspection Agency’s knowledge in conformance with the approved plans and specifications.

5. Structural Component Testing and Inspection Schedule for Section 03 20 00 is as follows:

<table>
<thead>
<tr>
<th>Concrete and Concrete Placement</th>
<th>Continuous</th>
<th>Periodic</th>
<th>Referenced Standard</th>
<th>IBC Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspection of fabricators and during fabrication.</td>
<td>X</td>
<td></td>
<td>ACI 318 Ch. 20, 25.2, 25.3, 26.6.1-26.6.3</td>
<td>1704.2</td>
</tr>
<tr>
<td>Inspection of reinforcing steel and placement.</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.5 SUBMITTALS

A. Placing Drawings: Submit placing drawings showing fabrication dimensions and locations for placement of reinforcement and reinforcement accessories. Indicate bar sizes, spacing, locations, and quantities of reinforcing steel, bending and cutting diagrams, anchors, and supporting and spacing devices. Dowels shall be shown in placing drawings for the element that is to be placed first. Reinforcing steel descriptions or shop drawings shall be inch-pound sizes.

B. Splices: Submit request for splices not indicated in the Contract Documents. Request shall indicate locations, types, and lengths of splices for approval.

C. Field Bending: Submit requests and procedure for field bending or straightening of reinforcement partially embedded in concrete not described in the Contract Documents.

D. Reinforcement Relocation: Submit requests to adjust reinforcement spacing necessitated by conflicts with other reinforcement, conduits, etc. for approval.

E. Epoxy Coating: Submit product data for the proposed coating material.

F. Supports for Coated Reinforcement: Submit description of reinforcement supports and material for fastening coated reinforcement.

1.6 COORDINATION

A. Coordinate reinforcement installation with the placement of formwork and other embedded items such as inserts, conduit, pipe sleeves, drains, metal supports, anchor rods, etc.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcement to the jobsite in bundles sorted and labeled with durable tags indicating bar size, length, and shop drawing mark. Bundles shall also bear testing laboratory tags indicating identified steel.

B. Store elevated clear of ground and protect at all times from contamination and deterioration.
C. Prevent bending, coating with earth, oil, or other material, or otherwise damaging the reinforcement.

D. For handling coated reinforcement, use equipment having contact areas padded to avoid damaging the coating. Lift bundles of coated reinforcement at multiple pick points to prevent bar-to-bar abrasion from sags in the bundles.

E. Do not drop or drag coated reinforcement. Take all necessary steps to minimize damage to coating. Damaged coatings shall be patched.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Bar Deformations: Bars used for reinforcement shall be deformed.

B. Reinforcing Steel: Reinforcing steel shall conform to the ASTM standard and grade indicated in the General Notes on the drawings.

C. Epoxy-Coated Reinforcing Bars: Steel for epoxy-coated reinforcing bars shall conform to the ASTM standard listed in the General Notes on the drawings.

1. Acceptable Manufacturers for epoxy coating materials are:
   e. Mobil Chemical Company - Mobilox 1004-R-2.
   f. 3M - ScotchKote 213.

D. Epoxy Patching Material: Use only patching material approved by epoxy coating manufacturer, compatible with epoxy coating and inert in fresh and hardened concrete. The maximum amount of repaired damaged areas shall not exceed 2 percent of the surface area in each lineal foot of each bar. Bars with damaged epoxy-coating areas exceeding this limit are to be rejected.

E. Joint Dowel Bars: Plain-steel bars. Cut bars true to length with square ends and free of burrs.

F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete 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 or CRSI Class 2 stainless-steel bar supports.

2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

3. Concrete cast against earth: Bars may be supported by precast concrete bricks or approved prefabricated wire bar supports complying with CRSI recommendations with footpads large enough to support the weight of the bars and construction traffic without being pushed into underlying grade. Precast concrete blocks shall have a minimum compressive strength of 6,000 psi.
2.2 FABRICATION

A. Fabrication Tolerances: Reinforcing steel shall be shop fabricated within tolerances according to ACI 117 and other applicable codes, and shall conform in size, shape, quantity, dimensions, etc. to the construction drawings and approved shop drawings.

B. Bar Condition: Bars shall be free from mill scale, excessive rust and other coatings, which would reduce or destroy the bond with the concrete. Wipe oil from forms before reinforcement is placed on or adjacent to so that oil will not be tracked over or in any way come into contact with the reinforcement.

C. Bars Bending: Bars shall be bent cold, and no method of fabrication shall be used which would be injurious to the material. Heating of bars for bending is not permitted.

D. Identification: After fabrication, bars shall be sorted, bundled and tagged with metal tags bearing the bar mark before delivery to the jobsite.

E. Corner Bars: Provide corner bars to make reinforcing continuous at all times, including intersections at footings, walls, beams or caps. Such bars shall be the same size and spacing as the horizontal reinforcing and each leg shall have a length of at least 30 inches.

F. Splicing:
   1. Locate reinforcing splices not indicated on drawings at point of minimum stress. Review location of splices with the SEOR and obtain written approval prior to proceeding.

G. Dowels between footings and walls or piers shall be the same grade, size and spacing or number as the vertical reinforcing respectively, unless noted otherwise.

H. Bending of Epoxy-Coated Bars: Bending of epoxy coated reinforcing bars shall conform to the epoxy manufacturer’s specified requirements.

I. Epoxy Coating Applications: Prepare bar in accordance with requirements of epoxy manufacturer. Coating shall be applied to the cleaned surface as soon as possible after cleaning and before visible oxidation of the surface occurs, but in no case shall more than eight hours elapse.

J. Epoxy Coating Thickness: Electrostatically apply coating as specified by powder coating supplier.
   1. Thickness after curing: 7 mils with a tolerance of plus 3 mils and minus 2 mils.
   2. Check coating visually after cure for continuity. It shall be free from holes, voids, contamination, cracks, and damaged areas. Patch defects in accordance with manufacturer’s recommendations.

PART 3 - EXECUTION

3.1 PLACING

A. Reinforcement Relocation: When necessary to move reinforcement beyond the specified spacing to avoid interference with other reinforcement, or embedded items, submit resulting arrangement of reinforcement to SEOR for approval.

B. Reinforcement Cutting: Cutting of reinforcement which conflicts with embedded objects is not acceptable.

C. Wire Tie Orientation: Set wire ties so that ends are directed away from concrete surface.
D. Support for Reinforcement: Unless noted otherwise, supports for reinforcement shall have Class 2 protection as defined in the CRSI Manual of Standard Practice. Submit data on supports indicating class of protection at all different locations for approval. Supports shall not be used as bases for runways for concrete-conveying equipment and similar construction loads. Do not place reinforcing bars more than 2” beyond last leg of any continuous bar support.

E. Support for Bars in Concrete Cast on Ground: Bar supports for footings and all other concrete cast directly onto grade shall be supported at an average spacing of 4 feet or less in each direction.

F. Support for Coated Reinforcement: Supports for coated reinforcement shall have Class 1 protection as defined in the CRSI Manual of Standard Practice. Submit data on supports and coatings for approval.

G. Securing Reinforcing Bars: All bars must be placed, spaced, secured and supported prior to casting concrete. Bars embedded in hardened or partially hardened concrete shall not be bent unless approved in writing prior to placement by the SEOR.

H. Pumping Concrete: When using a pump to place concrete, pump hose shall be supported directly on forms. Do not allow hose to rest on reinforcing bars if doing so could cause displacement of bars.

END OF SECTION
NOTE TO BIDDER: REFERENCE THIS SPECIFICATION SECTION FOR BID ITEM NO. 17a

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. All items required for executing and completing the cast-in-place concrete work and related work shown on the drawings or specified herein. Work shall include installation of items furnished in other sections of these specifications.

B. Concrete paving, walks, and curbs are specified in Division 3 or 32.

C. Structural notes indicated on the drawings regarding cast-in-place concrete shall be considered a part of this specification.

1.2 RELATED WORK

A. Pertinent Sections of Division 01.
B. Section 03 10 00 - Concrete Formwork.
C. Section 03 20 00 - Concrete Reinforcement.

1.3 REFERENCES

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified. Where any provision of other pertinent codes and standards conflict with this specification, the more stringent provision shall govern.

2. ACI 301 - Specifications for Structural Concrete.
6. ACI 308R - Guide to External Curing of Concrete.
7. ACI 309R - Guide for Consolidation of Concrete.
8. ACI 318 - Building Code Requirements for Structural Concrete.
10. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
15. ASTM C138 - Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
20. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
22. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting.
Concrete Reinforcing Steel Institute (CRSI) - Manual of Standard Practice.

1.4 TESTING AND INSPECTION

A. Special Inspection and Testing:

1. In accordance with Chapter 17 of the International Building Code, the Owner shall employ a Special Inspection Agency to perform the duties and responsibilities specified in Section 1704.0.

2. Refer to architectural, civil, and electrical specifications for testing and inspection requirements of non-structural components.

3. Work performed on the premises of a fabricator approved by the building official need not be tested and inspected per the table below. The fabricator shall submit a certificate of compliance that the work has been performed in accordance with the approved plans and specification to the building official and the Architect and Engineer of Record.

4. Duties of the Special Inspection Agency:

   a. Perform all testing and inspection required per the Testing and Inspection Schedule indicated below.

   b. Furnish inspection reports to the building official, the Owner, the Architect, the Engineer of Record, and the General Contractor. The reports shall be completed and furnished within 48 hours of inspected work.

   c. Submit a final signed report stating whether the work requiring special inspection was, to the best of the Special Inspection Agency’s knowledge in conformance with the approved plans and specifications.
5. Structural Component Testing and Inspection Schedule for Section 03 30 00 is as follows:

<table>
<thead>
<tr>
<th>Concrete and Concrete Placement</th>
<th>Continuous</th>
<th>Periodic</th>
<th>Referenced Standard</th>
<th>IBC Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review of proposed mix design and supporting test results</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect anchors cast in concrete</td>
<td>X</td>
<td>ACI 318: 17.8.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect anchors post-installed in hardened concrete members.</td>
<td>X</td>
<td>ACI 318: 17.8.2.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads.</td>
<td>X</td>
<td>ACI 318: 17.8.2.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Mechanical anchors and adhesive anchors not defined in row above.</td>
<td>X</td>
<td>ACI 318: 17.8.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verify use of required design mix</td>
<td>X</td>
<td>ACI 318: Ch. 19, 26.4.3, 26.4.4 1904.1, 1904.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.</td>
<td>X</td>
<td>ASTM C172, ASTM C31, ACI 318: 26.4, 26.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection of concrete placement for proper application techniques</td>
<td>X</td>
<td>ACI 318: 26.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verify maintenance of specified curing temperature and techniques.</td>
<td>X</td>
<td>ACI 318: 26.5.3-26.5.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Sampling and testing requirements:

1. Maintain records verifying materials used are of the specified and accepted types and sizes and are in conformance with the requirements of the Contract Documents.

2. Use of testing services will not relieve the Contractor of the responsibility to furnish materials and construction in full compliance with the Contract Documents.

3. Take samples of fresh concrete at the job site for each mix design placed each day. Sampling and testing shall be done after the final addition and proper mixing of any water or admixtures that are added on site.

   a. Personnel and testing equipment shall meet the requirements of ASTM E329.

   b. Testing Frequency: Obtain at least one composite sample for each 150 cu. yd. or 5,000 sq. ft. of surface area, whichever is less or fraction thereof of each concrete mixture placed each day.

      1) On a given project, if the total volume of concrete is such that the frequency of testing required above would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.
c. A strength test shall be the average of the strengths of two 6x12 inch or three 4x8 inch cylinders made from the same sample of concrete and tested at 28 days.

4. For each sample of fresh concrete, perform the following duties:
   
a. Measure and record slump in accordance with ASTM C143.
   
b. Measure and record temperature in accordance with ASTM C1064.
      
1) Provide one test hourly when air temperature is 40°F and below and when 80°F and above, and one test for each composite sample.

   c. Measure and record air content by volume in accordance with either ASTM C231 or ASTM C173.
   
d. Mold two 6x12 inch or three 4x8 inch cylinders (laboratory cylinders) in accordance with ASTM C31 to be laboratory-cured. Protect from moisture loss and maintain at 60°F to 80°F for 24 to 48 hours before moving. Deliver cylinders to testing laboratory for curing and testing.
   
e. Mold one cylinder (field cylinder) in accordance with ASTM C31 to be field-cured. Field cylinder shall be placed as near as possible to the in-place concrete from which it was taken, protected, and cured in the same manner. Deliver field-cured cylinder to testing laboratory, and measure and record compressive strength in accordance with ASTM C39. Field cylinder shall be used to determine if concrete footings, walls, or piers have reached the required compressive strength for steel erection to begin.

5. Measure and record compressive strength in accordance with ASTM C39 for laboratory cylinders. Test one laboratory cylinder at 7 days and all other cylinders at 28 days. Acceptance is based on the average of the two 6x12 inch or three 4x8 inch laboratory cured 28-day tests. Notify Engineer in the event strength levels do not meet the acceptance requirements of ACI 318.
   
a. Any additional cylinders molded for Contractor to have a compressive strength test done before seven days shall be at the Contractor's expense.

6. Prepare and submit test reports to the Architect, Engineer, Contractor, and Supplier. Reports shall be completed and furnished within 48 hours of testing. Refer to description in Submittals.

7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

8. Should the strength of any grade of concrete for any portion of work, as indicated by molded test cylinders, fall below the minimum 28-day compressive strength specified on the drawings, upon approval of the Structural Engineer of Record (SEOR), the concrete supplier shall adjust the concrete mix for remaining portion of construction so that the resulting concrete meets the minimum strength requirements.

1.5 SUBMITTALS

A. Concrete submittals shall be separated into concrete submittals for structural concrete as specified by this specification and civil concrete as specified by the Civil Engineer.
B. Concrete Materials: Submit information on concrete materials as listed below.

1. Cementitious materials: Submit type, class, producer name, and certification not more than 90 days old of compliance with applicable ASTM standard.

2. Aggregates: Submit type, pit or quarry location, producer name, gradations, specific gravity, water content, and certification not more than 90 days old.

3. Admixtures: Submit product data sheet. Product data shall include: dosages and performance data, brand names, producers, chloride ion concentrations, and certifications of compliance with applicable ASTM standard. Certifications shall not be more than 90 days old.

4. Water: Submit name of source.

C. Product Data: Prepare and submit product and performance data for materials and accessories, including patching compounds, joint systems, curing compounds, finish materials and other concrete related items.

D. Testing Agency Qualifications: When requested, the proposed testing agencies shall submit data on qualifications for acceptance.

E. Concrete Mix Design:

1. Concrete mix design submittals shall be submitted to the SEOR for review and approval at least 14 days prior to placing concrete.

2. Submit concrete mixture proportions and characteristics for each concrete mix. Include standard deviation analysis or trial batch data with mix design. Submit historical field test data to demonstrate the average compressive strength for approval. Concrete mix proportions, materials, and handling methods for field test data or trial batches shall be the same as used for the work. Include the following information for each mix design:
   a. Water/cementitious materials ratio.
   b. Slump per ASTM C143
   c. Air content per ASTM C231 or ASTM C173
   d. Unit weight of concrete per ASTM C138
   e. Compressive strength at 28 days per ASTM C39

3. If trial batches are used, submit representative samples of each proposed ingredient to independent testing laboratory for use in preparation of mix design.

4. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Indicate amounts of mix water to be withheld for later addition at Project site.

5. Provide a record copy of the final mix designs and test results to the testing agency prior to commencement of the concrete work.

F. Test Reports: Submit laboratory test reports for concrete materials, mix design, compressive strength, slump, air content, and temperature. Each report shall indicate date of sampling, date of test, mix design, and location of concrete in structure.

G. Repair Methods: When stains, rust, efflorescence, and surface deposits must be removed, submit the proposed method of removal.

H. Certificates: Submit written certification regarding the design mix from the ready-mix supplier and the admixture manufacturer stating all concrete and admixtures do not contain chloride ions in excess of concentrations specified herein.
I. Placement Notification: Notify the Engineer at least 24 hours in advance of concrete placement.

J. Adjustments: Submit any adjustments to mixture proportions or changes in materials, suppliers, or sources, along with supporting documentation, during the course of the work.

K. Cold Weather Procedure Submittal: Refer to Cold Weather Concreting article in Part 3 for more information.

L. Record Documents: Accurately record actual locations of embedded utilities and components that are concealed from view.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Cementitious materials: Store cementitious materials in dry weather tight buildings, bins, or silos that exclude contaminants.

B. Aggregates: Store and handle aggregate in a manner that will avoid segregation and prevent contamination with other materials or other sizes of aggregates. Store aggregates so as to drain freely.

C. Admixtures: Protect stored admixtures against contamination, evaporation, or damage. Protect liquid admixtures from freezing and temperature changes, which would adversely affect their performance. Handle chemical admixtures in accordance with manufacturer’s instructions.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Portland Cement: Portland cement shall conform to Iowa DOT 4101, Materials I.M. 401, and ASTM C150, Type I Normal, and be a standard brand of Portland cement. Use one brand of cement throughout project, unless approved in writing by the Engineer. Cement, which conforms to ASTM C150 Type II, may be used if it also meets the requirements of ASTM C150 Type I. Cement used in concrete shall be of the same brand and type as the cement used in the concrete represented by the submitted field test data or used in the trial mixtures. Maintain consistent cement color throughout project unless directed otherwise by architectural requirements.

1. Total replacement of Portland cement by supplementary cementitious materials in design mixture shall not exceed 50% (by weight).

B. Supplementary Cementitious Materials


2. Fly Ash: Fly ash shall conform to Iowa DOT Section 4018 and ASTM C618, Class C or Class F. Replacement of Portland cement by fly ash shall not exceed the following (percentages are by weight):

   a. Concrete Flatwork: 20 percent.
   b. Mass Concrete (more than two feet thick): 50 percent.
   c. All other concrete: 25 percent.
   d. Concrete to be placed in cold weather as defined herein: No fly ash allowed unless the cold weather procedure submitted has compensated for the increased setting time and decreased rate of strength gain due to cold weather and fly ash.
3. Slag Cement: ASTM C989, Grade 100 or 120.
   a. Ground Granulated Blast-Furnace Slag Limit: 50% by weight of total cementitious materials.
   b. In mass concrete more than 2 feet thick, the usage rate may be 80% by weight of total cementitious materials.

4. Combined Fly Ash and Ground Granulated Blast-Furnace Slag:
   a. Supplementary Cementitious Materials Limit: 50% with fly ash not exceeding 25% by weight of total cementitious materials.
   b. In mass concrete more than 2 feet thick: 80% with fly ash not exceeding 50% by weight of total cementitious materials.

C. Coarse Aggregate for Normal Weight Concrete: Comply with ASTM C33 and Iowa DOT Section 4115 and Materials I.M. 409, Source Approvals for Aggregates. Provide coarse aggregate from a single source for exposed concrete. Gradations shall be similar to that described in the following table:

<table>
<thead>
<tr>
<th>COARSE AGGREGATE GRADATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIEVE SIZE - PERCENT PASSING</td>
</tr>
<tr>
<td>Grade No.</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>Note 1</td>
</tr>
<tr>
<td>57</td>
</tr>
<tr>
<td>67</td>
</tr>
</tbody>
</table>

1. Shall be 100 percent passing the 2" sieve.

D. Fine Aggregate for Normal Weight Concrete: Comply with ASTM C33 and Iowa DOT Section 4110 and Materials I.M. 409 Source Approvals for Aggregates. Provide fine aggregate from a single source for exposed concrete. Fine aggregate shall consist of washed sand. Gradations shall be similar to that described in the following table:

<table>
<thead>
<tr>
<th>FINE AGGREGATE GRADATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIEVE SIZE - PERCENT PASSING</td>
</tr>
<tr>
<td>Grade No.</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>FA</td>
</tr>
</tbody>
</table>

E. Do not use aggregates containing deleterious substances that could cause spalling on any exterior exposed surface. Use imported sand. These include, but are not limited to the following:

1. Organic impurities.
2. Ferrous metals.
3. Soluble salts.
4. Coal, lignite, or other lightweight materials.
5. Soft particles.
7. Cherts of less than 2.40 specific gravity.
F. Water: Mixing water for concrete shall meet the requirements of ASTM C94. Water shall be clean and free from injurious amounts of acids, alkalis, organic materials, chloride ions and oils deleterious to concrete or reinforcing steel.

G. Testing agency shall be given access to plants and stockpiles to obtain samples for testing for compliance with the Contract Documents.

2.2 ADMIXTURES

A. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures. Calcium chloride thiocyanates or admixtures containing intentionally added chlorides are not permitted.

B. Water Reducing Admixture: Material shall comply with ASTM C494, Type A. Acceptable manufacturers and products include:

1. BASF Corporation - MasterPozzolith Series or MasterPolyheed Series.
2. Euclid Chemical Company - Eucon WR Series.
3. Sika Chemical Corp. - Plastocrete 161.
4. GRT – Polychem 400 NC.
5. Grace Construction Products - WRDA 82.

C. High Range Water Reducing Admixture (superplasticizer): Material shall comply with ASTM C494, Type F or Type G. Acceptable manufacturers and products include:

1. BASF Corporation - MasterRheobuild 1000 or MasterGlenium Series.
2. Euclid Chemical Company - Eucon 37 or Plastol Series.
4. GRT – Melchem.
5. Grace Construction Products - Mira 110.

D. High Range Water Reducing, Slump Retaining Admixture: Material shall comply with ASTM C494, Type F or Type G. Acceptable manufacturers and products include:

1. BASF Corporation - MasterGlenium 7700.
2. Euclid Chemical Company - Eucon 537, Eucon 1037, or Plastol Series.
4. GRT – Melchem – M.
5. Grace Construction Products – ADVA FLEX.

E. Non-Chloride Accelerator: Material shall comply with ASTM C494, Type C or Type E, and not contain a higher chloride ion concentration than municipal drinking water. Acceptable manufacturers and products include:

1. BASF Corporation - MasterSet FP 20 or MasterSet AC 534.
2. Euclid Chemical Company - Accelguard Series.
3. Sika Chemical Corp. - Sika Rapid-1.
4. GRT – Polychem HE.
5. Grace Construction Products – Lubricon NCA.

F. Air Entraining Admixture: Air entraining admixture shall comply with ASTM C260, and be certified by the manufacturer to be compatible with other admixtures to be used. Acceptable manufacturers and products include:

1. BASF Corporation - MasterAir Series.
2. Euclid Chemical Company - Air-Mix or AEA Series.
3. Sika Chemical Corporation - Sika-Aer.
4. GRT – Polychem VR.
5. Grace Construction Products - Darex II or Daravair 1000.
G. Admixtures used in concrete shall be the same brand, type, and dosage used in concrete represented by field test data or used in trial mixes.

2.3 CURING PRODUCTS

A. Moisture Retaining Cover:
   1. Plastic Film: Use 6 mil polyethylene film sheet materials that meet the requirements of ASTM C171.
   2. White burlap-polyethylene sheet meeting ASTM C171.
   4. Moisture Retaining Fabric: A naturally colored, non-woven, polypropylene fabric with a 4-mil, non-perforated reflective (white) polyethylene coating containing stabilizers to resist degradation from ultraviolet light. Fabric shall exhibit low permeability and high moisture retention. Acceptable manufacturers and products include:
      a. PNA Construction Technologies, Inc.: Hydracure S16.
      b. PNA Construction Technologies, Inc.: Hydracure M5.
      c. Reef Industries Incorporated: Transguard 4000.

B. Dissipating Resin Curing Compound: Clear, waterborne, membrane-forming curing compound complying with ASTM C309, Type 1, Class B shall be composed of hydrocarbon resins and dissipating agents that begin to break down upon exposure to ultraviolet light and traffic approximately 4 to 6 weeks after application, providing a film that is removably with standard degreasing agents, and mechanized scrubbing actions so as to not impair the later addition of applied finishes.
   1. Curing compounds used on interior enclosed environments shall be a water-borne product and VOC compliant as required by the U.S. EPA Architectural Coating Rule.

C. Non-dissipating Curing Compound: Clear, membrane-forming curing compound complying with ASTM C309, Type 1, Class B.
   1. Curing compounds used on interior enclosed environments shall be a water-borne product and VOC compliant as required by the U.S. EPA Architectural Coating Rule.

D. Curing and Sealing Compound: Clear, membrane-forming curing and sealing compound complying with ASTM C309, Type 1, and ASTM C1315, Type 1, Class A. Compound shall dry to a clear finish, resist yellowing due to ultraviolet degradation and provide a long-lasting finish that has high resistance to chemicals, oil, grease, deicing salts, and abrasion.
   1. Curing and sealing compounds used on interior enclosed environments shall be a water-borne product and VOC compliant as required by the U.S. EPA Architectural Coating Rule.

2.4 MISCELLANEOUS MATERIALS

A. Patching Mortar: Non-shrink, non-slump, non-metallic, quick setting. Acceptable manufacturers and products:
   1. Euclid Chemical Company - Eucospeed.
   2. BASF Corporation - MasterEmaco N 424.
   3. Adhesive Technologies - Hard Rok Vertipatch.
   5. Dayton Superior - Re-Crete 20 minute.
B. **Cement Grout:** Mix 1 part Portland cement, 2-1/2 to 3 parts fine aggregate, and enough water for required consistency. Depending on use, consistency may range from mortar consistency to a mixture that will flow under its own weight. Do not mix more than the amount that can be used within 30 minutes. Retempering is not permitted. Use for leveling, preparing setting pads, beds, construction joints (with liquid bonding admixture) and similar uses. Do not use for grouting under bearing plates or structural members in place.

C. **Dry-Pack:** Mix 1 part Portland cement, 2 parts fine aggregate, and enough water to hydrate cement and provide a mixture that can be molded with the hands into a stable ball (a stiff mix). Do not mix more than the amount that can be used within 30 minutes.

D. **Expansion Joint Material:** Preformed, resilient, non-extruding asphalt-impregnated fiber conforming to ASTM D1751. Thickness of expansion joint material shall be 1/2” unless noted otherwise on the drawings.

E. **Control Joint Filler:** Flexible, non-sag, single-component polyurethane sealant with backer rod compliant with ASTM C 920, Type S, Grade P, Class 25. Apply sealant per manufacturers written recommendations. Acceptable manufacturers and products:

1. Euclid Chemical Company – Eucolastic 1NS
2. W.R. Meadows – Pourthane NS
3. SIKA – Sikasil 728 NS

### 2.5 STRENGTH AND PROPERTIES

A. **Concrete Mix Designs:** Refer to drawings for specified compressive strength. Proportion concrete mixes according to the properties in the following tables. The concrete supplier may produce a mix at a lower water-cement ratio to allow for adjustment of slump at the site by adding water. The addition of site water shall be in accordance with ASTM C94, and the total water-cement ratio shall not exceed the value specified below.

<table>
<thead>
<tr>
<th>Class</th>
<th>Coarse Aggregate Gradation</th>
<th>Fine Aggregate Gradation</th>
<th>Range of Slump</th>
<th>Max. w/c</th>
<th>Air Content</th>
<th>Other Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>57 or 67 FA</td>
<td>FA</td>
<td>1” to 4”</td>
<td>0.40</td>
<td>5% to 8%</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>4 or 57 FA</td>
<td>FA</td>
<td>1” to 4”</td>
<td>0.50</td>
<td>—</td>
<td></td>
</tr>
</tbody>
</table>

Note: w/c = water-cementitious materials ratio.

B. **Schedule of Concrete Classes:** Provide concrete of the specified class according to the following schedule.

1. Footings: Class E
2. Walls: Class A

C. **Slump of Superplasticized Concrete:** Concrete containing high-range water reducing admixtures (superplasticizer) shall have 8” maximum slump, unless otherwise approved by Structural Engineer.

D. **Accelerators:** Add non-chloride accelerator to all concrete slabs placed at air temperatures below 50°F only when approved in the mix design. Use of admixtures will not relax cold weather placement requirements.

E. **Water Reducer:** Add water reducing admixture or high range water reducing admixtures (superplasticizers) as follows:

1. All pumped concrete.
2. As required for placement or workability.
3. As required by high temperatures, low humidity, or other adverse placement conditions.
4. Concrete with water-cementitious materials ratio below 0.50.

F. No other admixtures shall be used unless approved by SEOR.

G. Chlorides: Admixtures or other ingredients including aggregates containing calcium chloride or more than 0.05% chloride ions by weight shall not be used.

H. Workability: Concrete shall have a workability such that it will fill the forms without voids, honeycombs, or rock pockets with proper vibration without permitting materials to separate or excess water to collect on the surface.

I. Concrete Temperatures: Minimum concrete temperature of fresh concrete varies in relation to average air temperature over a 24-hour period as follows:

1. Air temperature below 0°F  Concrete temperature 70°F min.
2. Air temperature 0°F to 30°F  Concrete temperature 65°F min.
3. Air temperature 30°F to 50°F  Concrete temperature 50°F min.
4. Air temperature above 50°F  No minimum temperature

The maximum temperature of concrete at the time of delivery shall be 90°F. When concrete temperature exceeds 90°F, concrete supplier shall attempt to reduce temperature by shading aggregates and cement and cooling mix water. When these methods fail to reduce concrete temperature below 90°F, supplier shall use ice in the water to reduce the concrete temperature. Use set retarding admixtures only when approved in the mix design.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify requirements for concrete cover over reinforcement.

B. Verify that anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

C. Do not place concrete until data on materials and mix designs have been approved, Engineer has been notified, and all other affected trades have coordinated their work.

D. Remove snow, ice, frost, water, mud, and other foreign material from surfaces, reinforcing bars and embedded items against which concrete will be placed.

E. Prepare previously placed concrete by cleaning with sandblasting, steel brush, or water blast to expose aggregate to minimum 1/4” amplitude.

3.2 CONSTRUCTION JOINTS

A. Vertical: Locate vertical construction joints in walls not farther than a maximum of 48 feet on center. 48 hours shall be allowed between placement of adjacent wall sections.

B. Horizontal: Locate horizontal joints in walls and piers at the top of footings unless otherwise indicated.

C. Wall Control Joints: Locate vertical control joints in exposed walls at a minimum uniform spacing not to exceed 16 feet-0 inches.

D. Expansion Joints: Locate wall expansion joints as indicated on drawings.
3.3 CONCRETE PLACEMENT

A. Place concrete as continuously as possible until placement is complete. Do not place against concrete that has attained initial set, except at authorized joints. If, for any reason, concrete pour is delayed for more than 45 minutes, bulkhead off pour at last acceptable construction joint. Immediately remove excess concrete and clean forms.

B. Do not begin to place concrete during periods of rain, sleet or snow unless adequate protection is provided.

C. No concrete shall be cast onto or against sub-grades containing free water, frost, ice or snow. If earth at bottom of forms has dried out, rewet so the soil is moist, but free of standing water and mud.

D. Notify the Engineer in advance if concrete is to be pumped.

E. Do not place concrete until all reinforcement is in place, forms have been thoroughly cleaned and approval has been given.

F. Do not accept concrete delivered to the job site more than 90 minutes after initial mixing.

G. Concrete from its point of release to mixers, hoppers, or conveyances, shall not be permitted to drop more than 5 feet (10 feet for concrete containing high range water reducers). Deposit concrete directly into conveyances and directly from conveyances to final points of deposit. Sufficient transportation equipment in good working order shall be on hand before work begins. All conveying equipment must be clean and kept clean during concreting operations. Take every possible precaution to prevent segregation or loss of ingredients.

H. Regulate rate of placement so concrete surface is kept level throughout; a minimum being permitted to flow from one area to another. Use tremie heads spaced at approximately 10-foot intervals for placing concrete in walls. Control rate of placement consistent with form design.

I. Deposit concrete in one continuous operation until section being placed has been completed. For slab thicknesses greater than 12 inches, prevent excessive segregation of aggregate and high temperatures in accordance with ACI 304 and ACI 308. Place concrete in wall forms in layers not greater than 12 inches in depth, each layer being compacted by internal vibration before succeeding layer is placed.

J. Place concrete as near as possible to its final position to prevent segregation or loss of materials. Do not use vibrators to transport concrete within forms. Consolidate concrete in walls, columns, beams and slabs or joist construction thicker than 8" with internal vibrators (8,000 to 12,000 VPM). Slabs less than 8" thick may be consolidated with internal vibrators (9,000 to 13,500 VPM) or vibrating screeds supported on forms, boards or rails, approved by SEOR, supplement vibration by forking or spading by hand along surfaces adjacent to forms and construction joints. Be sure an adequate number of operating vibrator units are on hand to properly consolidate quantity of concrete to be placed, including spares for emergency use.

1. Vertically insert and remove handheld vibrators at constant intervals 18 to 30 inches apart. Vibrate concrete the maximum amount and time required for complete consolidation, without segregation, and release of entrapped air bubbles, but in no instance exceed 15 seconds per square foot of exposed surface.

K. Re-tempering of concrete shall not be permitted. Concrete that has stood more than 15 minutes after leaving the mixer shall be discarded.

L. Exercise care in placing concrete over waterproof membranes, rigid insulation and/or protection boards to avoid damaging those materials. Report damage immediately, and do not proceed until damage is repaired.
M. Remove loose debris from hardened surfaces of previous pours, thoroughly wet and slush with a neat cement grout immediately before placing new concrete or apply bonding compound to surface and let dry before placing new concrete.

N. Protect existing concrete work to be exposed to view and other finished materials from damage and staining resulting from concreting operations. Handle concrete carefully to avoid dripping and spillage. Remove spilled concrete from existing surfaces immediately. Covering sills, ledges, and other surfaces with protective coverings may be necessary to protect the work.

O. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

P. Concrete piers for fabric building columns: Fabric building columns are installed without grout pad. Concrete Contractor shall modify top of piers as required to get concrete piers to the correct elevation. Contractor to submit modification procedures to Engineer of Record for review.

3.4 CONCRETE FINISHES AND TOLERANCES

A. Exposed Smooth Formed Surfaces: Remove forms and perform necessary repairs and patch to produce surface finish-3.0 as specified in ACI 301. Apply the following to smooth-formed finished concrete exposed to view in the finished work. Confirm finishes with architect prior to concrete placement by submitting shop drawings indicating locations of all types of finishes.

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

B. 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.

3.5 CONCRETE CURING

A. Freshly placed concrete shall be protected from premature drying and excessively hot temperatures.

B. Concrete other than high-early strength shall be maintained above 50°F and in a moist condition for at least the first 7 days after placement, except when special curing is used. Special curing procedures shall not be used without written permission from the SEOR.

C. Formed surfaces shall be cured by leaving the formwork in place during the curing period.

D. Protect concrete from excessive changes in temperature during the curing period and at the termination of the curing process. Changes in the temperature of the concrete shall be as uniform as possible and shall not exceed 5°F in any one hour or 50°F in any 24-hour period.

E. Protect concrete from injury from the elements until full strength is developed. Protect from mechanical injury.

F. During cold weather construction, all footings shall be protected from frost penetration until the building is enclosed and temporary heat is provided.
3.6 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer’s written instructions.

B. Remove dirt, debris, saw cutting, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install non-sag joint filler in control joints and expansion joints.

3.7 COLD WEATHER CONCRETING

A. Definition: Cold weather shall be defined as a period when for more than three successive days the average daily outdoor temperature drops below 40°F. The average daily temperature is the average of the highest and lowest temperature during the period from midnight to midnight. When temperatures above 50°F occur during more than half of any 24-hour duration, the period shall not be regarded as cold weather.

B. All cast-in-place concrete work occurring during cold weather shall conform to all requirements of ACI 306.1, "Standard Specification for Cold Weather Concreting", published by the American Concrete Institute, Detroit, Michigan, except as modified by the contract documents or this specification.

C. Planning: The General Contractor, concrete contractor, concrete supplier and the Engineer shall have a pre-construction conference to outline the cold weather concreting operations concerning the placing, finishing, curing and protection of the concrete during cold weather. Pre-construction conference shall occur before cold weather is expected to occur.

D. Detailed procedure submittal: Concrete contractor shall prepare and submit for review detailed procedures for the production, transportation placement, protection, curing and temperature monitoring of concrete during cold weather. Include procedures to be implemented upon abrupt changes in weather conditions. Do not begin cold weather concreting until these procedures have been reviewed and approved.

E. Mixing: Concrete flatwork poured in cold weather shall be proportioned to obtain a lower slump to minimize the amount of bleed water during finishing. All bleed water should be skimmed off flatwork prior to troweling. Concrete that will be exposed to cycles of freezing and thawing while saturated should be properly air entrained as outlined in this specification.

F. Protection of Concrete: Cure and protect concrete against damage from freezing for a minimum period of 72 hours, unless approved by the structural engineer. The protection period may be reduced according to ACI 306.1 requirements. Concrete contractor shall submit a letter of request to reduce the protection period, by outlining the method used to achieve the reduction per ACI 306.1.

1. When practical for the construction schedule, formwork shall be insulated and remain in place for at least the required protection period.
G. Concrete Temperatures: The minimum temperature of concrete immediately after placement shall be as specified in the following table.

<table>
<thead>
<tr>
<th>Section Size</th>
<th>Minimum temperature of concrete as placed and maintained during the protection period</th>
<th>Maximum gradual decrease in surface temperature during any 24 hours after the end of the protection.</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 12 in</td>
<td>55°F</td>
<td>60°F</td>
</tr>
<tr>
<td>12-36 in</td>
<td>50°F</td>
<td>55°F</td>
</tr>
<tr>
<td>36-72 in</td>
<td>50°F</td>
<td>55°F</td>
</tr>
<tr>
<td>&gt; 72 in</td>
<td>50°F</td>
<td>55°F</td>
</tr>
</tbody>
</table>

H. Mixing Temperatures: As the ambient air temperature decreases the concrete mixing temperature shall be increased to compensate for the heat lost in the period between mixing and placement. The concrete supplier shall use one or both of the following methods for increasing the concrete temperature.

1. Heating the mixing water to a temperature necessary to offset the temperature losses during transport. Supplier shall not heat water to temperatures in excess of 140°F, without taking special precautions as outlined in ACI 306.

2. Heating the aggregate with a circulated steam piping system.

I. Temperature measurements: The Contractor shall be responsible for monitoring and recording the concrete temperatures during placement and throughout the protection period.

1. Inspection personnel shall keep a record of the date, time, outside air temperature, temperature of concrete as placed, and weather conditions.

2. Temperature of the concrete and the outside air shall be recorded at regular intervals but not less than twice in a 24-hour period. The record shall include temperatures at several points within the enclosure and on the concrete surface of sufficient frequency to determine a range of temperatures.

3. Inspection agency shall submit the temperature logs to the Engineer for permanent job records.

3.8 HOT WEATHER PROTECTION

A. Definition: Hot weather shall be defined as any combination of high ambient temperature, low relative humidity, high winds and intense solar radiation that leads to higher than usual evaporation. The table below defines low relative humidity based on air temperature. For a given air temperature, if the relative humidity is equal to or less than the specified minimum, provisions for hot weather concreting shall be as follows:

<table>
<thead>
<tr>
<th>Air Temperature</th>
<th>Minimum Relative Humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>105°F</td>
<td>90%</td>
</tr>
<tr>
<td>100°F</td>
<td>80%</td>
</tr>
<tr>
<td>95°F</td>
<td>70%</td>
</tr>
<tr>
<td>90°F</td>
<td>60%</td>
</tr>
<tr>
<td>Air Temperature</td>
<td>Minimum Relative Humidity</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>85°F</td>
<td>50%</td>
</tr>
<tr>
<td>80°F</td>
<td>40%</td>
</tr>
<tr>
<td>75°F</td>
<td>30%</td>
</tr>
</tbody>
</table>

B. Scheduling: When hot weather is expected, adjust concrete placement schedules to avoid placing or finishing during the period from noon until 3:00 pm. When possible, slab pours should be delayed until the building is enclosed to protect the concrete from wind and direct sunlight. Construction schedule shall account for 7-day moist curing period.

C. Mixing: Concrete supplier shall adjust mix designs and admixtures to minimize slump loss. Concrete shall be mixed at a water-cement, which is lower than the specified maximum to allow for the adjustment of slump by addition of water in the field. Water reduction shall be accomplished without reducing initial slump by increasing dosage of water reducing admixture.

D. Preparation: Do not order concrete earlier than is required to avoid delays. Cool forms, subgrades and reinforcing bars with water spray from fog nozzle prior to concrete placement.

E. Delivery: Site traffic shall be coordinated, and delivery times scheduled to minimize waiting times for concrete trucks.

F. Placement: Preparations shall be made to place and consolidate the concrete at the fastest possible rate. Maintain a continuous flow of concrete to the job site to avoid development of cold joints, during placement of slabs, apply fog spray to prevent moisture loss without causing surplus water to stand on concrete surface.

G. Finishing: Finish concrete as fast as practical. Continue fogging concrete during finishing. Where fogging is not possible, apply sprayable moisture-retaining film between finishing passes.

H. Curing: Formed concrete shall be covered with a waterproof material to retain moisture. Flat work shall be moisture cured as described in this specification. Moist curing shall continue for at least 7 days.

3.9 FIELD QUALITY ASSURANCE

A. Independent Testing Agency and Special Inspector shall each perform their prescribed inspection, sampling, and testing services as described in Part 1 of this specification section.

B. In cases where samples have not been taken or tests conducted as specified or strength of laboratory test cylinders for a particular portion of the structure fails to meet requirements of ACI 301, for evaluation of concrete strength, Structural Engineer shall have the right to order compressive or flexural test specimens or both be taken from the hardened concrete according to ASTM C42, load tests according to ACI 318, or such other tests as may be necessary to clearly establish the strength of the in situ concrete, and such tests shall be paid for by the Contractor. Where cores have been cut from work, Contractor shall fill void with dry-pack and patch the finish the match the adjacent existing surfaces.

3.10 REPAIR OF DEFECTIVE AREAS

A. All repair of defective areas shall be made, with prior approval of Architect and SEOR as to method and procedure, in accordance with Section 5 of ACI 301, except specified bonding compound must be used. Cosmetic repairs of minor defects in exposed concrete
surfaces shall be in a manner acceptable to the Architect. Defective areas shall be deemed when:

1. Tests on core or prism specimens fail to show specified strengths.
2. Not formed as indicated or detailed.
3. Not plumb or level where so indicated or required to receive subsequent work.
4. Not true to intended grades and levels.
5. Cut, filled, or resurfaces, unless under direction of the SEOR.
6. Debris is embedded therein.
8. Damaged by hot or cold weather conditions.
9. Mixing time exceeds 90 minutes from ready-mix plant to the time of deposit.

B. Patch form tie holes at the following locations:

1. Unfinished exposed concrete (not scheduled for painting, plus at board formed concrete finish).
2. All other areas: Prime voids with bonding compound and fill with patching mortar. Strike flush without overlap, float to uniform texture to match adjacent surfaces.
3. Exposed areas:
   a. Remove projections, ridges and other protrusions not conforming to requirements specified under Section 03 10 00.
   b. Fill voids and pin holes not conforming to requirements specified under Section 03 10 00.

C. All structural repairs shall be made, with prior approval of the Architect/Engineer, as to method and procedure, using the specified epoxy adhesive and/or epoxy mortar.

D. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.

E. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

3.11 CEMENT GROUT AND DRY-PACK

A. Cement Grout: Thoroughly mix sufficient quantities to avoid combining different batches of grout mix. Ensure that grout completely fills all spaces and voids. Level, screed, or cut flush excess grout to produce smooth, neat, even exposed surfaces.

B. Dry-Pack: Thoroughly blend dry ingredients prior to mixing with water. Forcibly pack mixture to complete fill voids and spaces.

3.12 CLEANING

A. Clean exposed concrete to remove laitance, efflorescence and stains.

END OF SECTION
SECTION 03 20 00 - CONCRETE REINFORCING

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. Steel reinforcement bars.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, location of splices, lengths of lap splices, and supports for concrete reinforcement.

B. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

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

1.4 DELIVERY, STORAGE, AND HANDLING

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

1. Store reinforcement to avoid contact with earth.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

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

2.2 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

B. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.

2.3 FABRICATING REINFORCEMENT

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

NOTE TO BIDDER: THIS SPECIFICATION SECTION APPLIES TO UNIT BID ITEM NO. 17b ONLY.
PART 3 - EXECUTION

3.1 PREPARATION

A. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

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

B. Accurately position, support, and secure reinforcement against displacement.
   1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
   2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318.

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

F. Splices: Lap splices as indicated on Shop Drawings.
   1. Bars indicated to be continuous, and all vertical bars shall be lapped not less than 36 bar diameters at splices, 24 inches, or as required for a Class B splice, whichever is greater.
   2. Stagger splices in accordance with ACI 318.

3.3 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations as approved by Engineer.
   1. Place joints perpendicular to main reinforcement.
   2. Continue reinforcement across construction joints unless otherwise indicated.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

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

B. Inspections:
   1. Steel-reinforcement placement.

END OF SECTION 03 20 00
SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

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. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

1.3 DEFINITIONS
   A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, other pozzolans, and materials subject to compliance with requirements.
   B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.4 ACTION SUBMITTALS
   A. Product Data: For each of the following.
      1. Portland cement.
      2. Fly ash.
      4. Aggregates.
      5. Admixtures:
         a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
   B. Design Mixtures: For each concrete mixture, include the following:
      1. Mixture identification.
      2. Minimum 28-day compressive strength.
      3. Durability exposure class.
      4. Maximum w/cm.
      5. Calculated equilibrium unit weight, for lightweight concrete.
      7. Air content.
      8. Nominal maximum aggregate size.
      9. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.

1.5 INFORMATIONAL SUBMITTALS
   A. Material Certificates: For each of the following, signed by manufacturers:
      1. Cementitious materials.
2. Admixtures.
3. Curing compounds.

B. Field quality-control reports.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.7 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.
1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. 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.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
5. 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 ACI 305.1, and as follows:
1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
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 ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Cementitious Materials:
1. Portland Cement: ASTM C150/C150M.
2. Fly Ash: ASTM C618, Class C or F.

B. Normal-Weight Aggregates: ASTM C33/C33M, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source.
1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

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

D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.

2.3 CURING MATERIALS

A. Water: Potable or complying with ASTM C1602/C1602M.

B. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.
2.4 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, in accordance with ACI 301.
      1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
   B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
      1. Fly Ash or Other Pozzolans: 25 percent by mass.
   C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

2.5 CONCRETE MIXTURES
   A. Class A: Normal-weight concrete used for footings.
      1. Exposure Class: ACI 318 F0.
      2. Minimum Compressive Strength: 4000 psi at 28 days.
      3. Maximum w/cm: 0.44.
      4. Slump Limit: 4 inches, plus or minus 1 inch.

2.6 CONCRETE MIXING
   A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.

PART 3 - EXECUTION
3.1 EXAMINATION
   A. Verification of Conditions:
      1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
      2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION
   A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
      1. Daily access to the Work.
      2. Incidental labor and facilities necessary to facilitate tests and inspections.
      3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
      4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF EMBEDDED ITEMS
   A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
      1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
      2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
3.4 JOINTS
A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
   a. Continue reinforcement across construction joints unless otherwise indicated.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

3.5 CONCRETE PLACEMENT
A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
   1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
   2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
B. Notify Engineer and testing and inspection agencies 24 hours prior to commencement of concrete placement.
C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer in writing, but not to exceed the amount indicated on the concrete delivery ticket.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
E. 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.
   1. If a section cannot be placed continuously, provide construction joints as indicated.
   2. Deposit concrete to avoid segregation.
   3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
   4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
      a. Do not use vibrators to transport concrete inside forms.
      b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
      c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
      d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

3.6 CONCRETE CURING
A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
   1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
   2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
B. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
   1. Begin curing immediately after finishing concrete.

3.7 TOLERANCES
A. Conform to ACI 117.

3.8 FIELD QUALITY CONTROL
A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
   1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
   2. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
   3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
      a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
         1) Project name.
         2) Name of testing agency.
         3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
         4) Name of concrete manufacturer.
         5) Date and time of inspection, sampling, and field testing.
         6) Date and time of concrete placement.
         7) Location in Work of concrete represented by samples.
         8) Date and time sample was obtained.
         9) Truck and batch ticket numbers.
        10) Design compressive strength at 28 days.
        11) Concrete mixture designation, proportions, and materials.
        12) Field test results.
        13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
        14) Type of fracture and compressive break strengths at seven days and 28 days.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:
   1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143/C143M:
   a. 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.
   b. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete:
   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C1064/C1064M:
   a. 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 C31/C31M:
   a. Cast and laboratory cure two sets of two 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.

   a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.
   b. 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. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.

8. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

9. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 033000
SECTION 03 41 00 - PRECAST STRUCTURAL CONCRETE

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. Precast structural concrete.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Design Mixtures: For each precast concrete mixture. Include compressive strength and, if required, water-absorption tests.
   C. Shop Drawings:
      1. Detail fabrication and installation of precast structural concrete units, including connections at member ends and to adjoining construction.
      2. Indicate joints, reveals, drips, chamfers, and extent and location of each surface finish.
      3. Indicate type, size, and length of welded connections by AWS standard symbols.
      4. Detail loose and cast-in hardware, lifting and erection inserts, connections, and joints.

1.4 INFORMATIONAL SUBMITTALS
   A. Source quality-control reports.
   B. Field quality-control reports.

1.5 QUALITY ASSURANCE
   A. Fabricator Qualifications: A firm that assumes responsibility for engineering precast structural concrete units to comply with performance requirements. Responsibility includes preparation of Shop Drawings and comprehensive engineering analysis.
   B. Mockups: After sample panel approval but before production of precast structural concrete units with, construct full-sized mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
      1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.
      2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 COORDINATION
   A. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.
1.7 DELIVERY, STORAGE, AND HANDLING

A. Support units during shipment on nonstaining shock-absorbing material in same position as during storage.

B. Store units with adequate bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.
   1. Store units with dunnage across full width of each bearing point unless otherwise indicated.
   2. Place adequate dunnage of even thickness between each unit.
   3. Place stored units so identification marks are clearly visible, and units can be inspected.

C. Handle and transport units in a manner that avoids excessive stresses that cause cracking or damage.

D. Lift and support units only at designated points indicated on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Design Standards: Comply with ACI 318 and with design recommendations in PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of precast structural concrete units indicated.

2.2 MOLD MATERIALS

A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides continuous precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.
   1. Mold-Release Agent: Commercially produced form-release agent that does not bond with, stain, or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.

2.3 REINFORCING MATERIALS

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

2.4 CONCRETE MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type III, gray, unless otherwise indicated.
   1. For surfaces exposed to view in finished structure, use gray or white cement, of same type, brand, and mill source.

B. Supplementary Cementitious Materials:
   1. Fly Ash: ASTM C618, Class C or F, with maximum loss on ignition of 3 percent.

C. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.

D. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.

E. Carbon-Steel Bolts and Studs: ASTM F1554, GR 36; carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A563; and flat steel plate washers, ASTM A36.

F. Zinc-Coated Finish: For exterior steel tie rods and plate washer items and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A123/A123M or ASTM A153/A153M.
1. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035B or SSPC-Paint 20.

G. Precast Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install precast structural concrete units.

2.5 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C150/C150M, Type I, and clean, natural sand, ASTM C144 or ASTM C404. Mix at ratio of 1 part cement to 2-1/2 to 3 parts sand, by volume, with minimum water required for placement and hydration. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C1218/C1218M.

2.6 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.

B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator’s option.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 116 when tested according to ASTM C1218/C1218M.

D. Normal-Weight Concrete Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
   2. Maximum Water-Cementitious Materials Ratio: 0.45.

E. Add air-entraining admixture at manufacturer’s prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.

F. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer’s written instructions.

2.7 MOLD FABRICATION

A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

B. Maintain molds to provide completed precast structural concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

2.8 FABRICATION

A. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.

   1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcement exceeds limits specified in ASTM A775/A775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.

   2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
3. Place reinforcing steel and prestressing strand to maintain at least 3/4-inch minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and secure tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.

4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

B. Reinforce precast structural concrete units to resist handling, transportation, and erection stresses and specified in-place loads.

C. Thoroughly consolidate placed concrete by vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 116.

D. Comply with PCI MNL 116 procedures for hot- and cold-weather concrete placement.

E. Identify pickup points of precast structural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast structural concrete unit on a surface that does not show in finished structure.

F. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

G. Discard and replace precast structural concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 116 and meet Engineer's approval.

2.9 FABRICATION TOLERANCES

A. Fabricate precast structural concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 116 product dimension tolerances as well as position tolerances for cast-in items.

2.10 COMMERCIAL FINISHES

A. Commercial Grade: Remove fins and protrusions larger than 1/8 inch and fill holes larger than 1/2 inch. Rub or grind ragged edges. Faces must have true, well-defined surfaces. Air holes, water marks, and color variations are permitted. Limit form joint offsets to 3/16 inch.

2.11 SOURCE QUALITY CONTROL

A. Testing: Test and inspect precast structural concrete according to PCI MNL 116 requirements and ASTM C1610/C1610M, ASTM C1611/C1611M, ASTM C1621/C1621M, and ASTM C1712/C1712M.

B. Strength of precast structural concrete units is considered deficient if units fail to comply with ACI 318 requirements for concrete strength.

C. Defective Units: Discard and replace precast structural concrete units that do not comply with requirements, including strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to reject precast units that do not match approved samples, sample panels, and mockups. Replace unacceptable units with precast concrete units that comply with requirements.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting structural foundation and conditions for compliance with requirements for installation tolerances, bearing surface tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Erect precast structural concrete level, plumb, and square within specified allowable tolerances. Provide temporary structural framing, shoring, and bracing as required to maintain position, stability, and alignment of units until permanent connections are complete.

B. Connect precast structural concrete units in position by bolting, welding, grouting, or as otherwise indicated on Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

C. Field cutting of precast units is not permitted without approval of Engineer.

3.3 ERECTION TOLERANCES

A. Erect precast structural concrete units level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135.

B. Minimize variations between adjacent slab members by jacking, loading, or other method recommended by fabricator and approved by Architect.

3.4 REPAIRS

A. Repair precast structural concrete units if permitted by Engineer.
   1. Repairs may be permitted if structural adequacy, serviceability, durability, and appearance of units have not been impaired.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A780/A780M.

END OF SECTION
SECTION 13 31 23 – TENSIONED FABRIC STRUCTURES

PART I - GENERAL

1.01 SCOPE OF WORK:

A. Pre-engineered building and components, including the following:

1. Structural Steel Frame, Connections and Anchors
2. Polyethylene Fabric Covering

B. Allied Work Specified Elsewhere

1. Division 3 – Concrete
2. Division 26 – Electrical
3. Division 31 - Earthwork

1.02 SUBMITTALS

A. Shop Drawings

1. Complete Shop Drawings showing all dimensions necessary for fabrication and placing of embedded items shall be submitted.
2. Structural calculations certified by a structural engineer licensed in the state of Iowa.
3. Fabrication shall not start until final approval is obtained.

1.03 GENERAL DESCRIPTION

A. Enclosure Type - The enclosure shall consist of a durable, weatherproof polyethylene membrane, which shall be tensioned over an underlying self-supporting steel truss framework. The interior of the enclosure below the main trusses shall be clear span, free of any structural support members, and shall provide unobstructed floor space. No exterior purlins, guy ropes or cables shall be used for anchoring the structure.

B. Structure Size –

1. This section is for structure as shown on the drawings and listed below.
2. Footprint - The enclosure shall be rectangular in shape, 88 feet wide (measured at outside of base plates to outside of base plates) and 240 feet long (256 feet long if Alternate#1 is accepted) (measured center of base plate to center of base plate).
3. Height – The building center shall be a minimum of 38.25 feet inside height (measured from interior paving to bottom of inside cord of rafter in the building center).
4. Truss Spacing – The building truss spacing shall be a maximum of 16 feet (measure from center of base plate to center of base plate).

C. Accessories - The structure shall include accessories to the extent shown on the project drawings, as required for the scope and intended use for/with:

1. Electrical connections.

1.04 REFERENCES AND STANDARDS

A. The following publications are for the standards listed below. They form a part of this specification to the extent referenced thereto:

1. American Institute of Steel Construction (AISC):
   S326-78 Design, Fabrication and Erection of Structural Steel Buildings
   S329-85 Structural Joints Using ASTM A325 or A490 Bolts
1.05 DESIGN CRITERIA/REQUIREMENTS

A. GENERAL REQUIREMENTS

1. Concrete Foundation

   a. Concrete foundation wall shall be constructed as shown on drawings and as indicated in the project specifications.

2. Structural Frame

   a. Roof and Wall Surfaces: The structure shall be designed such that roof and wall surfaces have flat planes, to provide for maximum compatibility with standard door, window, ventilation and other accessory and cladding systems.

   b. Purlin Spacing: To provide for structural stability and to support the installation of accessory items, the main structural trusses shall be laterally braced by tubular purlins at intervals specified by the truss design.

   c. Wind and Frame Bracing: The structure shall be appropriately stabilized with wind bracing cables, as well as any required secondary node restraint assemblies, so as to efficiently transfer wind, snow and seismic induced stresses to the foundation/anchoring system. Cable diameter for main wind bracing shall be a minimum of 5/16” diameter, larger if so required. The end bays of the structure shall be designed to be X – braced early during installation to allow for permanent stability of the frame during installation.

   d. Connecting Joints: Connections between structural elements shall be designed so as to transfer the compressive and tensile forces present in a given joint. A minimum of Grade 5 bolts shall be used at each truss chord joint. Primary axial steel, secondary purlins, and end wall frame connections shall be made with a minimum of Grade 5 hex bolts, carriage bolts and self drilling screws.

   e. The structure shall be capable of accepting penetrations through the membrane for access doors and mechanical services with minimal modification.

   f. Ancillary Systems: The structure shall be designed such that it can be readily retrofitted with insulation systems and other ancillary systems such as lighting, sprinklers or HVAC, provided that collateral load factors are taken into account.
g. Shipping: The main structural trusses shall be two-dimensional planar trusses which nest tightly together, in order to minimize shipping and storage volume.

h. Extra Corrosion Protection: The lower 18-inches of structural framing and base plates shall be coated with “Black-Max” as supplied by Rhomar Industries. Follow manufacturer application instructions.

3. Membrane Cladding System

a. Membrane: The roof membrane shall form a weather-tight shell over the structural frame. In order to provide for a good finished appearance and to insure weather tightness, the membrane shall be assembled and tensioned in a manner which minimizes wrinkles in both hot and cold temperatures.

b. Roof membrane horizontal stretch shall be maintained with horizontal purlins requiring no ongoing maintenance.

c. Overlap Seams: The membrane system shall be designed such that the membrane cladding panels can be supplied with Keder (or equal) channel joints to allow adjacent panels to be attached together. Membrane welded seams shall maintain a minimum of 175 lbs. / inch.

d. Base Tensioning System: The membrane cladding will be provided with a mechanical tensioning system that allows the membrane to be fully tensioned around the structure perimeter. The system will be designed such that the membrane can be tightly and neatly secured over the structural frame and such that the system has a remaining range of adjustment.

e. Membrane Seal at Openings and Base: The Dealer supplying the structure will provide all materials and methods necessary to fully tension and seal the membrane material around all doors, ventilation and other openings, as well as around the structure perimeter below the main tensioning system. This seal shall provide a neat and finished appearance and eliminate any loose membrane cladding that would otherwise be damaged by flapping or abrasion. A membrane base skirt is required, this shall be supplied and attached at the base perimeter to create a seal against air and water intrusion. This building is designed with open end walls. The membrane shall extend around the structural frame at both end walls so as to hide the end structural frame completely from view when observing from the exterior of the structure.

f. The membrane shall not be designed to function as a structural member, such that should any damage to or penetrations of the membrane occur, the integrity of the structural framework shall not be affected.

g. The Contractor shall provide drawings and calculations acceptable to the Engineer of the Record meeting the provisions of the applicable Local and State Building Codes. The Contractor shall bear all costs for production of drawings and associated structural calculations. Contractor shall make all revisions and corrections to those documents required for approval, and shall revise and resubmit as required to obtain approvals.

B. ENGINEERING DESIGN CRITERIA

1. Building plans shall be sealed by a Licensed Professional Engineer in the State of Iowa. The sealed building plans are to be site location specific. All base plate reactions are to be listed on the sealed building plans.
2. The structure shall be designed to meet or exceed the Adopted Construction Codes of the City of Des Moines as of the date of the project bid opening. Where conflicts occur between the listed values below and the Adopted Construction Codes of the City of Des Moines, the more conservative value shall be utilized.

3. The structure shall be designed using methodology as per the 2015 International Building Code and ASCE 7 standard referenced from the applicable local and state building code. Primary and secondary framing shall comply with current issues of ISC, AISI, NEMA and ASTM specifications, as applicable. Structural members shall be designed using Allowable Stress Design (ASD) or Load Resistance Factored Design (LRFD) for the design loads given below. Appropriate safety factors to yield and ultimate shall be maintained. Wind load factors and coefficients used in design of structural members must be in accordance with the applicable ASCE 7 guidelines.

4. Snow Loads: The structure shall be designed based upon a minimum ground snow load of 30 pounds per square foot (psf).

5. Wind Loads: The structure shall be capable of withstanding a basic wind speed (3-second gust) from any direction of 115 miles per hour. The design wind pressure shall be based on an exposure category of "B" and appropriate wind load factors and coefficients in accordance with the applicable referenced ASCE 7 guidelines. In no event shall the wind load used in the design of the main wind force resisting system be less than 10 pounds per square foot multiplied by the area of the building or structure projected on a vertical plane that is normal to the wind direction.

6. Rainfall: The structure shall be capable of withstanding the effects of rainfall up to 4 inches per hour for at least 2 hours.

7. Deflection: The maximum allowable deflection of structural members shall be no more than 1/180 of the clear span of that member when subjected to the design loads described herein.

8. Design Loads: The design shall be based as a minimum on the following design loads. Each member shall be designed to withstand stresses resulting from combinations of design loads that produce maximum percentage of actual to allowable stress in that member as per referenced ASCE 7 standard from applicable building code.

   \[ D = \text{Dead Load} + \text{Collateral Load} \]
   \[ S = \text{Symmetrical Snow or Live Load (Balanced or Unbalanced)} \]
   \[ W_s = \text{Wind with internal suction} \]
   \[ W_p = \text{Wind with internal pressure} \]
   \[ E = \text{Earthquake} \]

C. OPERATION AND USE

1. The main structural frame shall be designed to provide a minimum of 20-year operational use period with appropriate inspections and maintenance.

2. The structure shall be capable of being assembled, operated, and dismantled in all ambient temperatures between -20°F and 120°F.

3. The structure shall be capable of being erected on concrete and of accepting differential settlement of up to 1.5% between truss positions.

1.06 MANUFACTURER REQUIREMENTS

A. The manufacturer of the enclosure shall be a well-established entity with a minimum of ten (10) years of experience in the design, fabrication and erection of tensioned-fabric structures, specifically structures of a similar size as the enclosure proposed herein.
B. Companies with less than ten (10) years of comparable experience in the design, fabrication and erection of truss-supported tensioned-membrane structures will not be considered.

C. Possible Manufacturers: Contractor is responsible to confirm that all specified requirements are met. The manufacturers listed below may need to upgrade specific components of their structure in order to meet the requirements of these specifications.

1. Accu-Steel, Inc.
2. Clearspan
3. Bulk Storage

1.07 WARRANTIES

A. GENERAL

1. A 20 year warranty shall be included for all building components and the completed structure. The warranty start date for all components shall be the date that the products are complete-in-place and accepted by the owner, in accordance with the plans and manufacturer’s instructions.

2. Warranties shall cover the cost of the replacement item as well as all shipping and handling associated with the repair or replacement of defective components. The warranty shall cover labor and equipment necessary to replace the defective component as well as disposal of the defective component.

3. All replacement components furnished in response to a warranty-covered failure of any component shall be new, identical in all respects to the original component, and shall be installed in accordance with these specifications.

4. Warranties shall also be provided on all replacement components furnished and installed in response to a warranty-covered failure of a component; the terms of such replacement component warranties shall match the terms of the original component warranties, and the start date of same shall be the date that the replacement products are installed, complete-in-place and ready for use.

B. STRUCTURAL MEMBERS

1. The structural frame, including but not limited to all trusses, support cables, anchors, etc., shall be provided with a uniformly pro-rated limited 20 year warranty on materials and workmanship.

C. MEMBRANE CLADDING FABRIC

1. The polyethylene membrane shall be provided with a uniformly pro-rated 20 year warranty on materials and workmanship.

PART II - PRODUCTS

2.01 GENERAL

A. All materials used in the structure shall be new, without defects and free of repairs. The quality of the materials used shall be such that the structure is in conformance with the performance requirements specified herein.

B. The enclosure (trusses, connections, membrane, etc.) shall be furnished as a single integral system, wherein the individual parts are specifically designed and manufactured for use within the specified enclosure system. Enclosures shall not be composed of individual “off-the-shelf” parts or components which are not specifically fabricated for use in the enclosure.
C. Piece marking and Identification: All individual parts or bundles and packages of identical parts are to be clearly marked for identification. Bolts, nuts, washers and fasteners shall be packaged according to type, size and length. Shipping documentation shall include a list showing the description, quantity and piece mark of the various parts, components and elements.

2.02 METALS

A. STRUCTURAL MEMBERS

1. The main structure shall consist of welded truss arches with parallel tube chords separated apart by webbing. Parallel tube cords shall be fabricated from steel tubing, cold-formed and induction welded of modified grade carbon steel, providing a finished tubular product with exceptional mechanical and corrosion resistant properties.

   a. Tolerances: All dimensional tubing tolerances shall be in accordance with ASTM A500, Section 10.
   b. Structural Fasteners – bolts, nuts, and washers shall be in accordance with ASTM A325 and all connections must use a locking washer or locking compound.
   c. Tubing shall be manufactured using steel conforming to ASTM A568 and ASTM A1011. Minimum tubing thickness of 14 gauge or 0.083 inches. Finished steel tubing used in the structure must have the following minimum structural and mechanical properties based on standard ASTM A500:
      i. Tensile Strength:
         (a) Ultimate - 55 KSI
         (b) Yield - 50 KSI
   d. All steel flat bar, cross rods and other steel components shall be fabricated from hot dipped galvanized material, meet the stated standards and have the following minimum structural and mechanical properties (ASTM A36):
      i. Tensile Strength:
         (a) Ultimate - 50 KSI
         (b) Yield - 44 KSI

B. HARDWARE:

1. Bolts: Bolts subject to extreme stress and wear shall be structural bolts of Grade 5 and plated/galvanized that has been upgraded with a corrosion resistant topcoat finish. All bolts shall be installed and securely torqued so as to prevent change in tightness. Those subject to removal or adjustment shall not be swaged, pinned, staked or otherwise installed.

2. Anchoring bolts or rods which connect the structural members to the concrete footing/foundation walls shall be as specified on the structural plans and division 3 specifications.

3. Membrane Tensioning Hardware: The fabric membrane shall be tensioned with load rated hardware which is plate/hot dip galvanized so as to prevent corrosion. Hardware shall allow full and free rotation at the foundation connection to avoid fatigue of threaded assemblies.

4. Membrane Tensioning Webbing: The membrane shall be tensioned with load-tested tie-downs.

5. Cable Assemblies: Main and wind bracing cable assemblies shall be manufactured to the required lengths and press swaged with metal sleeves. The cables are manufactured using performed galvanized cables, sized with appropriate safety factors.

   \[ \frac{3}{16} \text{" dia.} \quad = \quad 4,200 \text{ lbs.} \]
1/4" dia. = 7,000 lbs.  
5/16" dia. = 9,800 lbs.  
3/8" dia. = 14,400 lbs.  
1/2" dia. = 22,800 lbs.

6. Other Fasteners: Non-structural fasteners such as wood screws, Tek screws, etc., shall be standard commercial quality.

7. Exterior Trim: The aluminum alloy used in the extrusion shall meet or exceed 6063-T5.

C. CORROSION PROTECTION:
1. Hot Dipped Galvanized meeting ASTM A123 (or 3.9 mil zinc coating) On All Manufactured Building Components. In-line galvanized components, not meeting ASTM A123 standards, will not be accepted.
   a. All Manufactured Steel Component Surfaces (Exterior and Interior) are to have a Minimum of 2.2 oz./ft² (+/- 5%) Continuous
      i. Zinc Coating to be Applied after Steel Framework Fabrication
      ii. Zinc Coating Includes Exterior Welds and Interior Weld Burns
      iii. Visible vent holes must be present to ensure coating on inside of tubing.
      iv. 1 oz. of zinc/ft² (320g/m²) of surface = to 1.7mil (43um)
   b. Written Certification Verifying from the Source of the Zinc Application that the Coating Meets the Minimum 2.2 oz./ft² (+/- 5%) of Zinc on all Manufactured Component Surfaces
2. Structural Bolts, Nuts, and Washers must be hot dip galvanized to meet ASTM A153.
3. Non-Structural bolts, nuts, washers, cables and other accessories must have a zinc finish.
4. Materials field Welded, Cut, or with Exposed bare Metal shall have 3 coats of Zinc Enriched Galvanizing Paint Applied at time of Installation – Min. 97% Pure Zinc
5. In-Line Pre-Galvanized Mechanical Steel Tubing as Steel Corrosion Protection
   a. Does Not meet ASTM A123 Standards for Zinc on Exterior or Interior Surfaces
   b. Does Not Provide Post Fabricated Steel Corrosion Protection on Exterior or Interior Weld Connections
6. See Section 13 31 23, 1.05 A 2 h for additional corrosion protection requirements.

2.03 CLADDING MEMBRANE:
A. The structure shall be clad with a polyethylene fabric with demonstrated long-term performance and manufactured by an approved and reputable supplier.
B. The polyethylene membrane fabric shall be waterproof and free from defects, and all roofs, walls, end walls and connecting sections shall be weather tight once installed.
C. The minimum fabric specification is as follows:

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<tr>
<th>Property</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fabric Weight</td>
<td>14.0 oz/yd² (407 g/m²) +/- 5%</td>
</tr>
<tr>
<td>Coating Thickness</td>
<td>5 mils average, each side</td>
</tr>
<tr>
<td>Finished Thickness</td>
<td>23 mils (ASTM D5199)</td>
</tr>
<tr>
<td>Grab Tensile Strength</td>
<td>350 lbs (ASTM D5034)</td>
</tr>
<tr>
<td>Strip Tensile Strength</td>
<td>240 lbs/in (ASTM D5035)</td>
</tr>
<tr>
<td>Tongue Tear Strength</td>
<td>110 lbs (ASTM D2261)</td>
</tr>
<tr>
<td>Trapezoidal Tear</td>
<td>90 lbs (ASTM D-4533)</td>
</tr>
<tr>
<td>Mullen Burst</td>
<td>675 psi (ASTM D3786)</td>
</tr>
<tr>
<td>Cold Crack Resistance</td>
<td>-60 °C (ASTM D2136)</td>
</tr>
<tr>
<td>UV Resistance &amp; Weathering</td>
<td>90% retention after 2000 hrs. (ASTM G151)</td>
</tr>
<tr>
<td>Performance</td>
<td>0.038 (grains/h/ft²/in Hg) (ASTM E96)</td>
</tr>
</tbody>
</table>

D. The material scrim and coating must be UV stabilized, and must carry a minimum 20-year manufacturer’s warranty.
E. The material color shall be selected by the Owner from the manufacturer’s standard colors. Up to 2 (two) different colors may be selected by the Owner. Contractor shall provide the Owner with color samples of the membrane for selection prior to ordering the membrane.

PART 3 – EXECUTION

3.01 GENERAL

A. The workmanship of all materials and components of the structure shall commensurate with the functional requirements of the item.

B. Contractor shall employ workers in the various required trades who are trained and fully experienced in their respective trades, and who have specific experience in the fabrication and/or installation of the building system described herein.

3.02 OFF-SITE WORK & DELIVERY TO SITE

A. Building prefabrication shall be performed under factory conditions in a plant specifically arranged for this type of work. Contractor shall provide adequate space, equipment, personnel, and technical ability to coordinate the assembly and factory prefabrication of all major components of the work and all necessary operations in the packing, shipping and installation procedures. No fabrication shall be done unless the materials have been tested and approved.

B. Material Delivery: The building system materials shall be delivered to the project site during normal working hours on weekdays. Installation contractor will provide adequate workmen and equipment to promptly unload, inspect and accept material delivery.

D. Handling: The installation contractor shall be responsible for unloading, field storage, protection and transfer to the work area of all materials and equipment required to perform the work. At no time shall materials be dropped, thrown or dragged over the transport equipment or the ground. Damage to any piece under its own or superimposed weight shall be cause for repair or replacement.

D. Short, Damaged or Excess Materials: Installation contractor shall inspect, count and verify quantities based on the shipping documents.

3.03 INSTALLATION

A. EXAMINATION

1. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper and or timely completion.
   a. Verify that surface material is graded to correct elevations and prepared within acceptable tolerances.
   b. Verify location of covered or built-in work.

2. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. PREPARATION

1. Provide for structure erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as required by manufacturer.

C. CONCRETE FOUNDATION

1. Foundation shall be constructed in strict accordance with the engineered foundation design.
2. Refer to Division 3 of the Specifications for additional requirements for either cast-in-place or precast block foundations.

D. ERECTION OF FRAME

1. Install in strict accordance with manufacturer’s instructions and recommendations.
2. Do not erect frames without complete installation of tie beams and anchorages.
3. Set column base plates with non-shrink grout to full plate bearing if required by the building manufacturer.
4. Welding: Welding shall be employed only when specified in the original design. Welding shall be in accordance with AWS D1.1 and AWS S1.3 and AISI-truss. As per Section 1704.2 of IBC, the truss fabricator must be AWS Approved Fabricator as per B5.17 and QC17 or have a field inspection complete after erection. Contractor shall supply AWS certificate of approval or certificate of field inspection.
5. On Site Welding: If welding is required on site, no welding shall be started until the AWS welding inspector has inspected and approved the materials, joint preparation, equipment and the qualifications of the welders. Welders doing unsatisfactory work will be removed and required to pass qualification tests again before returning to work.
6. Do not field cut or alter structural members without written approval by the manufacturer’s engineer.
7. After erection, prime bolts, welds, abrasions, and unprimed surfaces with primer used in shop painting.

E. INSTALLATION OF WALL AND ROOF MEMBRANE

1. Install in strict accordance with manufacturer’s instructions and recommendations.
2. Exercise care when handling and installing membrane to avoid warping, stretching or puncturing of the membrane.
3. Attach membrane sections to structural support members; make all joints between membrane sections weathertight.
4. Apply adequate tension to membrane sections to eliminate wrinkles in membrane; take care not to over-tension membrane or otherwise cause tearing or excessive stretching.

F. Seal wall and roof accessories watertight and weathertight with sealant in compliance with enclosure manufacturer's standard procedures.

3.04 FIELD QUALITY CONTROL

A. Inspections by Contractor:
1. Concrete foundation inspection by structural engineering designer of record and/or his authorized designee.
2. Structural system and polyethylene membrane inspections by manufacturer's representative, as required by warranty provisions.
3. Welded Connections: AWS. Perform visual inspection of 100 percent of welds and ultrasonic inspection of 50 percent of full and partial penetration welds. A rejection rate greater than 5 percent will increase the ultrasonic inspection to 100 percent of all welds.
B. Reporting: Contractor shall provide copies of all inspection and/or testing reports to Owner. Owner shall reserve the right to accept or reject inspected or tested items based on inspections and testing results; Contractor shall make good any flaws or defects observed during inspections or discovered by testing at no additional expense to the Owner.

END OF SECTION
PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements applicable to all Division 26 Sections. Also refer to Division 1 - General Requirements.

B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced herein and within each specification section.

1.2 REFERENCES

A. NFPA 70 - National Electrical Code (NEC)

1.3 SCOPE OF WORK

A. This Specification and the associated drawings govern furnishing, installing, testing and placing into satisfactory operation the Electrical Systems.

B. The Contractor shall furnish and install all new materials as indicated on the drawings, and/or in these specifications, and all items required to make his portion of the Electrical Work a finished and working system.

C. Description of Systems shall be as follows:
   1. Electrical power system to and including receptacles.

1.4 QUALITY ASSURANCE

A. Contractor’s Responsibility Prior to Submitting Pricing/Bid Data:
   1. The Contractor is responsible for constructing complete and operating systems. The Contractor acknowledges and understands that the Contract Documents are a two-dimensional representation of a three-dimensional object, subject to human interpretation. This representation may include imperfect data, interpreted codes, utility guides, three-dimensional conflicts, and required field coordination items. Such deficiencies can be corrected when identified prior to ordering material and starting installation. The Contractor agrees to carefully study and compare the individual Contract Documents and report at once in writing to the Engineer any deficiencies the Contractor may discover. The Contractor further agrees to require each subcontractor to likewise study the documents and report at once any deficiencies discovered.

   2. The Contractor shall resolve all reported deficiencies with the Engineer prior to awarding any subcontracts, ordering material, or starting any work with the Contractor’s own employees. Any work performed prior to receipt of instructions from the Engineer will be done at the Contractor’s risk.

B. Qualifications:
   1. Only products of reputable manufacturers as determined by the Engineer are acceptable.

   2. All Contractors and subcontractors shall employ only workmen who are skilled in their trades. At all times, the number of apprentices at the job site shall be less than or equal to the number of journeymen at the job site.
C. Compliance with Codes, Laws, Ordinances:

1. Conform to all requirements of the City of Des Moines, Iowa Codes, Laws, Ordinances and other regulations having jurisdiction.

2. If there is a discrepancy between the codes and regulations and these specifications, the Engineer shall determine the method or equipment used.

3. If the Contractor notes, at the time of bidding, any parts of the drawings or specifications that do not comply with the codes or regulations, he shall inform the Engineer in writing, requesting a clarification. If there is insufficient time for this procedure, he shall submit with his proposal a separate price to make the system comply with the codes and regulations.

4. All changes to the system made after the letting of the contract to comply with codes or the requirements of the Inspector, shall be made by the Contractor without cost to the Owner.

5. If there is a discrepancy between manufacturer's recommendations and these specifications, the manufacturer's recommendations shall govern.

6. If there are no local codes having jurisdiction, the current issue of the NEC shall be followed.

D. Permits, Fees, Taxes, Inspections:

1. Procure all applicable permits and licenses.

2. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.

3. Pay all charges for permits or licenses.

4. Pay all fees and taxes imposed by State, Municipal, and other regulatory bodies.

5. Pay all charges arising out of required inspections by an authorized body.

6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.

7. Where applicable, all fixtures, equipment and materials shall be listed by Underwriter's Laboratories, Inc. or a nationally recognized testing organization.

E. Examination of Drawings:

1. The drawings for the electrical work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.

2. Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of raceways to best fit the layout of the job. Conduit entry points for electrical equipment shall be determined by the Contractor unless noted in the contract documents.

3. Scaling of the drawings will not be sufficient or accurate for determining these locations.

4. Where job conditions require reasonable changes in arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
5. Because of the scale of the drawings, certain basic items, such as junction boxes, pull boxes, conduit fittings, etc., may not be shown, but where required by other sections of the specifications or required for proper installation of the work, such items shall be furnished and installed.

6. If an item is either shown on the drawings or called for in the specifications, it shall be included in this contract.

7. The Contractor shall determine quantities and quality of material and equipment required from the documents. Where discrepancies arise between drawings, schedules and/or specifications, the greater and better-quality number shall govern.

8. Where used in electrical documents the word “furnish” shall mean supply for use, the word “install” shall mean connect up complete and ready for operation, and the word “provide” shall mean to supply for use and connect up complete and ready for operation.

9. Any item listed as furnished shall also be installed unless otherwise noted.

10. Any item listed as installed shall also be furnished unless otherwise noted.

F. Electronic Media/Files:

1. Construction drawings for this project have been prepared utilizing Revit.

2. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.

3. Upon request for electronic media, the Contractor shall complete and return a signed “Electronic File Transmittal” form provided by IMEG.

4. If the information requested includes floor plans prepared by others, the Contractor will be responsible for obtaining approval from the appropriate Design Professional for use of that part of the document.

5. The electronic contract documents can be used for preparation of shop drawings and as-built drawings only. The information may not be used in whole or in part for any other project.

6. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.

7. The information is provided to expedite the project and assist the Contractor with no guarantee by IMEG as to the accuracy or correctness of the information provided. IMEG accepts no responsibility or liability for the Contractor’s use of these documents.

G. Field Measurements:

1. Verify all pertinent dimensions at the job site before ordering any conduit, conductors, fittings, etc.
1.5 SUBMITTALS

A. Submittals shall be required for the following items, and for additional items where required elsewhere in the specifications or on the drawings.

1. Submittals list:

<table>
<thead>
<tr>
<th>Specification Reference</th>
<th>Submittal Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 05 33</td>
<td>Conduit and Boxes</td>
</tr>
<tr>
<td>26 27 26</td>
<td>Wiring Devices</td>
</tr>
</tbody>
</table>

B. General Submittal Procedures: In addition to the provisions of Division 1, the following are required:

1. Transmittal: Each transmittal shall include the following:
   a. Date
   b. Project title and number
   c. Contractor's name and address
   d. Division of work (e.g., electrical, plumbing, heating, ventilating, etc.)
   e. Description of items submitted and relevant specification number
   f. Notations of deviations from the contract documents
   g. Other pertinent data

2. Submittal Cover Sheet: Each submittal shall include a cover sheet containing:
   a. Date
   b. Project title and number
   c. Engineer
   d. Contractor and subcontractors’ names and addresses
   e. Supplier and manufacturer’s names and addresses
   f. Division of work (e.g., electrical, plumbing, heating, ventilating, etc.)
   g. Description of item submitted (using project nomenclature) and relevant specification number
   h. Notations of deviations from the contract documents
   i. Other pertinent data
   j. Provide space for Contractor’s review stamps

3. Composition:
   a. Submittals shall be submitted using specification sections and the project nomenclature for each item.
   b. Individual submittal packages shall be prepared for items in each specification section. All items within a single specification section shall be packaged together where possible. An individual submittal may contain items from multiple specifications sections if the items are intimately linked (e.g., pumps and motors).
   c. All sets shall contain an index of the items enclosed with a general topic description on the cover.

4. Content: Submittals shall include all fabrication, erection, layout, and setting drawings; manufacturers’ standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; wiring and control diagrams; dimensions; shipping and operating weights; shipping splits; service clearances; and all other drawings and descriptive data of materials of construction as may
be required to show that the materials, equipment or systems and the location thereof conform to the requirements of the contract documents.

5. Contractor's Approval Stamp:
   a. The Contractor shall thoroughly review and approve all shop drawings before submitting them to the Engineer. The Contractor shall stamp, date and sign each submittal certifying it has been reviewed.
   b. Unstamped submittals will be rejected.
   c. The Contractor’s review shall include, but not be limited to, verification of the following:
      1) Only approved manufacturers are used.
      2) Addenda items have been incorporated.
      3) Catalog numbers and options match those specified.
      4) Performance data matches that specified.
      5) Electrical characteristics and loads match those specified.
      6) Equipment connection locations, sizes, capacities, etc. have been coordinated with other affected trades.
      7) Dimensions and service clearances are suitable for the intended location.
      8) Constructability issues are resolved (e.g., weights and dimensions are suitable for getting the item into the building and into place, sinks fit into countertops, etc.).
   d. The Contractor shall review, stamp and approve all subcontractors' submittals as described above.
   e. **The Contractor’s approval stamp is required on all submittals. Approval will indicate the Contractor’s review of all material and a complete understanding of exactly what is to be furnished. Contractor shall clearly mark all deviations from the contract documents on all submittals. If deviations are not marked by the Contractor, then the item shall be required to meet all drawing and specification requirements.**

6. Submittal Identification and Markings:
   a. The Contractor shall clearly mark each item with the same nomenclature applied on the drawings or in the specifications.
   b. The Contractor shall clearly indicate the size, finish, material, etc.
   c. Where more than one model is shown on a manufacturer’s sheet, the Contractor shall clearly indicate exactly which item and which data is intended.
   d. All marks and identifications on the submittals shall be unambiguous.

7. Schedule submittals to expedite the project. Coordinate submission of related items.

8. Identify variations from the contract documents and product or system limitations that may be detrimental to the successful performance of the completed work.

9. Reproduction of contract documents alone is not acceptable for submittals.

10. Incomplete submittals will be rejected without review. Partial submittals will only be reviewed with prior approval from the Engineer.
11. Submittals not required by the contract documents may be returned without review.

12. The Engineer's responsibility shall be to review one set of shop drawing submittals for each product. If the first submittal is incomplete or does not comply with the drawings and/or specifications, the Contractor shall be responsible to bear the cost for the Engineer to recheck and handle the additional shop drawing submittals.

13. Submittals shall be reviewed and approved by the Engineer before releasing any equipment for manufacture or shipment.

14. Contractor's responsibility for errors, omissions or deviation from the contract documents in submittals is not relieved by the Engineer's approval.

C. Electronic Submittal Procedures:

1. Distribution: Email submittals as attachments to all parties designated by the Engineer, unless a web-based submittal program is used.

2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.

3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.

4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.
   
   a. Submittal file name: 26 XX XX.description.YYYYMMDD
   b. Transmittal file name: 26 XX XX.description.YYYYMMDD

5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.

1.6 SCHEDULE OF VALUES

A. The requirements herein are in addition to the provisions of Division 1.

B. Format:

1. Use AIA Document Continuation Sheets G703 or another similar form approved by the Owner and Engineer.

2. Submit in Excel format.

3. Support values given with substantiating data.

C. Preparation:

1. Itemize work required by each specification section and list all providers. All work provided by subcontractors and major suppliers shall be listed on the Schedule of Values. List each subcontractor and supplier by company name.

2. Break down all costs into:

   a. Material: Delivered cost of product with taxes paid.
   b. Labor: Labor cost, excluding overhead and profit.
D. Update Schedule of Values when:

1. Indicated by Engineer.
2. Change of subcontractor or supplier occurs.
3. Change of product or equipment occurs.

1.7 CHANGE ORDERS

A. A detailed material and labor takeoff shall be prepared for each change order, along with labor rates and markup percentages. Change orders with inadequate breakdown will be rejected.

B. Change order work shall not proceed until authorized.

1.8 PRODUCT DELIVERY, STORAGE, HANDLING AND MAINTENANCE

A. Exercise care in transporting and handling to avoid damage to materials. Store materials on the site to prevent damage.

B. Keep all materials clean, dry and free from damaging environments.

C. Contractor is responsible for moving equipment into the building and/or site. Contractor shall review site prior to bid for path locations and any required building modifications to allow movement of equipment. Contractor shall coordinate his/her work with other trades.

1.9 WARRANTY

A. Provide one-year warranty for all devices, materials, and workmanship.

B. The warranty period for all work in this specification Division shall commence on the date of Substantial Completion or successful system performance whichever occurs later. The warranty may also commence if a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization of the Owner. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner.

C. Warranty requirements extend to correction, without cost to the Owner, of all work found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage due to defects or nonconformance with contract documents excluding repairs required as a result of improper maintenance or operation, or of normal wear as determined by the Engineer.

1.10 INSURANCE

A. This Contractor shall maintain insurance coverage as set forth in Division 1 of these specifications.

PART 2 - EXECUTION

2.1 JOBSITE SAFETY

A. Neither the professional activities of the Engineer, nor the presence of the Engineer or his or her employees and subconsultants at a construction site, shall relieve the Contractor and any other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Engineer and his or her personnel have no authority to
exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Engineer and the Engineer’s consultants shall be indemnified and shall be made additional insureds under the Contractor’s general liability insurance policy.

2.2 EXCAVATION, FILL, BACKFILL, COMPACTION

A. General:

1. Prior to the commencement of any excavation or digging, the Contractor shall verify all underground utilities with the regional utility locator. Provide prior notice to the locator before excavations. Contact information for most regional utility locaters can be found by calling 811.

2. The Contractor shall do all excavating, filling, backfilling, compacting, and restoration in connection with his work.

B. Excavation:

1. Make all excavations to accurate, solid, undisturbed earth, and to proper dimensions.

2. If excavations are carried in error below indicated levels, concrete of same strength as specified for the foundations or thoroughly compacted sand-gravel fill, as determined by the Engineer shall be placed in such excess excavations under the foundation. Place thoroughly compacted, clean, stable fill in excess excavations under slabs on grade, at the Contractor's expense.

3. Trim bottom and sides of excavations to grades required for foundations.

4. Protect excavations against frost and freezing.

5. Take care in excavating not to damage surrounding structures, equipment or buried pipe. Do not undermine footing or foundation.

6. Perform all trenching in a manner to prevent cave-ins and risk to workmen.

7. Where original surface is pavement or concrete, the surface shall be saw cut to provide clean edges and assist in the surface restoration.

8. If satisfactory bearing soil is not found at the indicated levels, immediately notify the Engineer or their representative, and do no further work until the Engineer or their representative gives further instructions.

9. Excavation shall be performed in all ground conditions, including rock, if encountered. Bidders shall visit the premises and determine the soil conditions by actual observations, borings, or other means. The cost of all such inspections, borings, etc., shall be borne by the bidder.

10. If a trench is excavated in rock, a compacted bed with a depth of 3” (minimum) of sand and gravel shall be used to support the conduit unless masonry cradles or encasements are used.

11. Mechanical excavation of the trench to line and grade of the conduit or to the bottom level of masonry cradles or encasements is permitted, unless otherwise indicated on the electrical drawings.

12. Mechanical excavation of the trench to line and grade where direct burial cables are to be installed is permitted provided the excavation is made to a depth to permit installation of the cable on a fine sand bed at least 3 inches deep.
C. Dewatering:

1. Furnish, install, operate and remove all dewatering pumps and pipes needed to keep trenches and pits free of water.

D. Underground Obstructions:

1. Known underground piping, conduit, feeders, foundations, and other obstructions in the vicinity of construction are shown on the drawings. Review all Bid Documents for all trades on the project to determine obstructions indicated. Take great care in making installations near underground obstructions.

2. If objects not shown on the drawings are encountered, remove, relocate, or perform extra work as directed by the Engineer.

E. Fill and Backfilling:

1. No rubbish or waste material is permitted for fill or backfill.

2. Furnish all necessary sand for backfilling.

3. Dispose of the excess excavated earth as directed.

4. Backfill materials shall be suitable for required compaction, clean and free of perishable materials, frozen earth, debris, earth with a high void content, and stones greater than 4 inches in diameter. Water is not permitted to rise in unbackfilled trenches.

5. Backfill all trenches and excavations immediately after installing of conduit, or removing forms, unless other protection is directed.

6. Around piers and isolated foundations and structures, backfill and fill shall be placed and consolidated simultaneously on all sides to prevent wedge action and displacement. Spread fill and backfill materials in 6” uniform horizontal layers with each layer compacted separately to required density.

7. For conduits that are not concrete encased, lay all conduits on a compacted bed of sand at least 3” deep. Backfill around conduits with sand, in 6” layers and compact each layer.

8. Backfill with sand up to grade for all conduits under slabs or paved areas. All other conduits shall have sand backfill to 6” above the top of the conduit.

9. Place all backfill above the sand in uniform layers not exceeding 6” deep. Place then carefully and uniformly tamp each layer to eliminate lateral or vertical displacement.

10. Where the fill and backfill will ultimately be under a building, floor or paving, each layer of fill shall be compacted to 95% of the maximum density as determined by AASHTO Designation T-99 or ASTM Designation D-698. Moisture content of soil at time of compaction shall not exceed plus or minus 2% of optimum moisture content as determined by AASHTO T-99 or ASTM D-698 test.

11. After backfilling of trenches, no superficial loads shall be placed on the exposed surface of the backfill until a period of 48 hours has elapsed.
F. Surface Restoration:

1. Where trenches are cut through graded, planted or landscaped areas, the areas shall be restored to the original condition. Replace all planting and landscaping features removed or damaged to its original condition. At least 6” of topsoil shall be applied where disturbed areas are to be seeded or sodded. All lawn areas shall be sodded unless seeding is called out in the drawings or specifications.

2. Concrete or asphalt type pavement, seal coat, rock, gravel or earth surfaces removed or damaged shall be replaced with comparable materials and restored to original condition. Broken edges shall be saw cut and repaired as directed by Engineer.

2.3 PROJECT CLOSEOUT

A. The following paragraphs supplement the requirements of Division 1.

B. Final Jobsite Observation:

1. To prevent the Final Jobsite Observation from occurring too early, the Contractor shall review the completion status of the project and certify that the job is ready for the final jobsite observation.

2. Attached to the end of this section is a typical list of items that represent the degree of job completeness expected prior to requesting a review. The Contractor shall sign the attached certification and return it to the Engineer so that the final observation can be scheduled.

3. It is understood that if the Engineer finds the job not ready for the final observation and additional trips and observations are required to bring the project to completion, the cost of the additional time and expenses incurred by the Engineer will be deducted from the Contractor's final payment.

C. The following must be submitted before Engineer recommends final payment:

1. Operation and maintenance manuals with copies of approved shop drawings.

2. Record documents including marked-up drawings and specifications.

3. A report documenting the instructions given to the Owner's representatives complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of this Contractor and shall be signed by the Owner's representatives.

2.4 RECORD DOCUMENTS

A. The following paragraphs supplement the requirements of Division 1.

B. Maintain at the job site a separate and complete set of electrical drawings and specifications with all changes made to the systems clearly and permanently marked in complete detail.

C. Mark drawings and specifications to indicate approved substitutions; Change Orders, and actual equipment and materials used. All Change Orders, RFI responses, Clarifications and other supplemental instructions shall be marked on the documents. Record documents that merely reference the existence of the above items are not acceptable. Should this Contractor fail to complete Record Documents as required by this contract, this Contractor shall reimburse Engineer for all costs to develop record documents that comply with this requirement. Reimbursement shall be made at the Engineer's hourly rates in effect at the time of work.
D. Record changes daily and keep the marked drawings available for the Engineer's examination at any normal work time.

E. Upon completing the job, and before final payment is made, give the marked-up drawings to the Engineer.

F. Record actual routing of conduits exceeding 2 inches.

2.5 ADJUST AND CLEAN

A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project.

B. Clean all foreign paint, grease, oil, dirt, labels, stickers, etc. from all equipment.

C. Remove all rubbish, debris, etc., accumulated during construction from the premises.

2.6 SPECIAL REQUIREMENTS

A. Installation of equipment or devices without regard to coordination of access requirements and confirmation with the Owner's representative will result in removal and reinstallation of the equipment at the Contractor's expense.

2.7 FIELD QUALITY CONTROL

A. General:

1. All cables and wires shall be tested for shorts and grounds following installation and connection to devices. Replace shorted or grounded wires and cables.

2. Any wiring device, electrical apparatus or luminaire, if grounded or shorted on any integral "live" part, shall have all defective parts or materials replaced.

3. If the results obtained in the tests are not satisfactory, make adjustments, replacements, and changes as needed. Then repeat the tests, and make additional tests, as the Engineer or authority having jurisdiction deems necessary.

B. Other Equipment:

1. Give other equipment furnished and installed by the Contractor all standard tests normally made to assure that the equipment is electrically sound, all connections properly made, phase rotation correct, fuses and thermal elements suitable for protection against overloads, voltage complies with equipment nameplate rating, and full load amperes are within equipment rating.

C. If any test results are not satisfactory, make adjustments, replacements and changes as needed and repeat the tests and make additional tests as the Engineer or authority having jurisdiction deem necessary.

D. Report shall include color printouts, in binder, of pictures taken to use as a baseline reading after building is occupied.

E. Upon completion of the project, the Contractor shall provide amperage readings for all panelboards and switchboards and turn the results over to the Owner for “benchmark” amperages.

END OF SECTION
READINESS CERTIFICATION PRIOR TO FINAL JOBSITE OBSERVATION

To prevent the final job observation from occurring too early, we require that the Contractor review the completion status of the project and, by copy of this document, certify that the job is indeed ready for the final job observation. The following is a typical list of items that represent the degree of job completeness expected prior to your requesting a final job observation.

1. Bound copies of approved shop drawings have been submitted as per Section 26 05 00.

Accepted by:

Prime Contractor ________________________________

By ___________________________________ Date ___________________

Upon Contractor certification that the project is complete and ready for a final job observation, we require the Contractor to sign this agreement and return it to the Engineer so that the final observation can be scheduled.

It is understood that if the Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Engineers for additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

* * * * *
SECTION 26 05 05 - ELECTRICAL DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Electrical demolition

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work shall be as specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. THE DRAWINGS ARE INTENDED TO INDICATE THE SCOPE OF WORK REQUIRED AND DO NOT INDICATE EVERY BOX, CONDUIT, OR WIRE THAT MUST BE REMOVED. THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO SUBMITTING A BID AND VERIFY EXISTING CONDITIONS.

B. Coordinate scope of work with all other Contractors and the Owner at the project site. Schedule removal of equipment and electrical service to avoid conflicts.

C. Bid submittal shall mean the Contractor has visited the project site and has verified existing conditions and scope of work.

3.2 PREPARATION

A. The Contractor shall obtain approval from the Owner before turning off power to circuits, feeders, panels, etc. Coordinate all outages with Owner.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Demolish and extend existing electrical work under provisions of Division 1 of Specifications and this Section.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Repair adjacent construction and finishes damaged during demolition and extension work. Patch openings to match existing surrounding finishes.

D. Maintain access to existing electrical installations that remain active. Modify installation or provide junction boxes and access panel as appropriate.

E. This Contractor is responsible for all costs incurred in repair, relocations, or replacement of any cables, conduits, or other services if damaged without proper investigation.
3.4 CLEANSING AND REPAIR

A. Clean and repair existing materials and equipment that remain or are to be reused.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

3.5 INSTALLATION

A. Install relocated materials and equipment under the provisions of Division 1 of Specifications.

END OF SECTION
SECTION 26 05 13 - WIRE AND CABLE

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Building wire

1.2 RELATED WORK
A. Section 26 05 53 – Electrical Identification: Refer to electrical identification for color and identification labeling requirements.

1.3 REFERENCES
A. NEMA WC 70 - Power Cables Rated 2,000V or Less for the Distribution of Electrical Energy
B. NFPA 70 - National Electrical Code (NEC)
C. UL 44 – Thermoset-Insulated Wires and Cables
D. UL 83 – Thermoplastic-Insulated Wires and Cables
E. UL 1581 – Standard for Electrical Wires, Cables, and Flexible Cords

PART 2 - PRODUCTS

2.1 BUILDING WIRE
A. Branch Circuits Larger Than 6 AWG in Underground Conduit: Copper, stranded conductor, 600-volt insulation or XHHW-2.
B. Branch Circuits 6 AWG and Smaller: Copper conductor, 600-volt insulation, THHN/THWN. 6 and 8 AWG, stranded conductor; smaller than 8 AWG, solid or stranded conductor, unless otherwise noted on the drawings.
C. Each 120-volt branch circuit shall have a dedicated neutral conductor. Neutral conductors shall be considered current-carrying conductors for wire derating.

PART 3 - EXECUTION

3.1 WIRE AND CABLE INSTALLATION SCHEDULE
A. All Locations: Building wire in raceway.
B. Above Grade: All conductors installed above grade shall be type “THHN”.
C. Underground or In Slab: All conductors shall be type “THWN”.

3.2 GENERAL WIRING METHODS
A. Use no wire smaller than 12 AWG for power circuits.
B. Use 10 AWG conductor for 20 ampere, 120-volt branch circuit home runs longer than 75 feet.
C. Splice only in junction or outlet boxes.
D. Neatly train and lace wiring inside boxes, equipment, and panelboards.
E. All conductors shall be continuous in conduit from last outlet to their termination.
F. Cables or wires shall not be laid out on the ground before pulling.

G. Cables or wires shall not be dragged over earth or paving.

H. Care shall be taken so as not to subject the cable or wire to high mechanical stresses that would cause damage to the wire and cable.

I. At least six (6)-inch loops or ends shall be left at each outlet for installation connection of devices.

J. All wires in outlet boxes not connected to fixtures or other devices shall be rolled up, spliced if continuity of circuit is required, and insulated.

3.3 WIRING INSTALLATION IN RACEWAYS

A. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricant for pulling 4 AWG and larger wires.

B. Pulling shall be continuous without unnecessary stops and starts with wire or cable only partially through raceway.

C. Where reels of cable or wire are used, they shall be set up on jacks close to the point where the wire or cable enters the conduit or duct so that the cable or wire may be unreeled and run into the conduit or duct with a minimum of change in the direction of the bend.

D. Conductors shall not be pulled through conduits until plastering or masonry work is completed and conduits are free from moisture. Care shall be taken so that long pulls of wire or pulls around several bends are not made where the wire may be permanently stretched and the insulation damaged.

E. Only nylon rope shall be permitted to pull cables into conduit and ducts.

F. Completely and thoroughly swab raceway system before installing conductors.

3.4 WIRING CONNECTIONS AND TERMINATIONS

A. Splice and tap only in accessible junction boxes.

B. Use solderless, tin-plated copper, compression terminals (lugs) applied with circumferential crimp for conductor terminations, 8 AWG and larger.

C. Use solderless, tin-plated, compression terminals (lugs) applied with indenter crimp for copper conductor terminations, 10 AWG and smaller.

D. Use solderless pressure connectors with insulating covers for copper wire splices and taps, 8 AWG and smaller. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps.

E. Use compression connectors applied with circumferential crimp for conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor. Cold shrink connector insulator with 1kV rating shall be used in damp and wet locations.

F. Thoroughly clean wires before installing lugs and connectors.

G. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.
3.5 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1.

B. Building Wire and Power Cable Testing: Perform an insulation-resistance test on each conductor with respect to ground and adjacent conductors. Test shall be made by means of a low-resistance ohmmeter, such as a “Megger”. The applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable. The test duration shall be one minute. Insulation resistance must be greater than 100 mega-ohm for 600 volt and 25 mega-ohm for 300 volt rated cables per NETA Acceptance Testing Standard. Verify uniform resistance of parallel conductors.

C. Inspect wire and cable for physical damage and proper connection.

D. Torque test conductor connections and terminations to manufacturer's recommended values.

E. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

F. Protection of wire and cable from foreign materials:

   1. It is the Contractor’s responsibility to provide adequate physical protection to prevent foreign material application or contact with any wire or cable type. Foreign material is defined as any material that would negatively impact the validity of the manufacturer's performance warranty. This includes, but is not limited to, overspray of paint (accidental or otherwise), drywall compound, or any other surface chemical, liquid, or compound that could come in contact with the cable, cable jacket, or cable termination components.

G. Overspray of paint on any wire or cable will not be accepted. It shall be the Contractor’s responsibility to replace any component containing overspray, in its entirety, at no additional cost to the project. Cleaning of the cables with harsh chemicals is not allowed.

END OF SECTION
SECTION 26 05 33 - CONDUIT AND BOXES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Rigid metallic conduit and fittings (RMC)
B. Rigid polyvinyl chloride conduit and fittings (PVC)
C. Wall and ceiling outlet boxes
D. Electrical connection
E. Pull and junction boxes
F. Rough-ins
G. Accessories

1.2 RELATED WORK

A. Section 26 05 53 – Electrical Identification: Refer to electrical identification for color and identification labeling requirements.

1.3 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated
   2. ANSI C80.4 - Fittings for Rigid Metal Conduit and Electrical Metallic Tubing
   3. ANSI/NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports

B. Federal Specifications (FS):
   1. A–A–50553A – Fittings for Conduit, Metal, Rigid, (Thick-Wall and Thin-Wall (EMT) Type

C. NECA “Standards of Installation”

D. National Electrical Manufacturers Association (NEMA):
   1. ANSI/NEMA FB 1 – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable
   2. TC 2 – Electrical Polyvinyl Chloride (PVC) Conduit
   3. TC 9 – Fittings for PVC Plastic Utilities Duct for Underground Installation

E. NFPA 70 – National Electrical Code (NEC)

F. Underwriters Laboratories (UL): Applicable Listings
   1. UL 6 – Rigid Metal Conduit
   2. UL514-B – Conduit Tubing and Cable Fittings
   3. UL651-A – Type EB and a PVC Conduit and HDPE Conduit

   1. ASTM D 570 - Standard Test Method for Water Absorption of Plastics
   4. ASTM D 2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedule 80, Based on Outside Diameter
5. ASTM D 3350 - Standard Specification for Polyethylene Plastic Pipe and Fittings Material

H. Definitions:

1. Fittings: Conduit connection or coupling.

2. Body: Enlarged fittings with opening allowing access to the conductors for pulling purposes only.

PART 2 - PRODUCTS

2.1 RIGID METALLIC CONDUIT (RMC) AND FITTINGS

A. Acceptable Manufacturers:


B. Minimum Size Galvanized Steel: 3/4 inch (19mm), unless otherwise noted.

C. Fittings and Conduit Bodies:

1. End Bell Fittings: Malleable iron, hot dip galvanized, threaded flare type with provisions for mounting to form.

2. Expansion Joints: Malleable iron and hot dip galvanized providing a minimum of 4 inches of movement. Fitting shall be watertight with an insulating bushing and a bonding jumper.

3. Expansion Joint for Concrete Encased Conduit: Neoprene sleeve with bronze end coupling, stainless steel bands and tinned copper braid bonding jumper. Fittings shall be watertight and concrete-tight.

4. Conduit End Bushings: Malleable iron type with molded-on high impact phenolic thermosetting insulation. Where required elsewhere in the contract documents, bushing shall be complete with ground conductor saddle and clamp. **High impact phenolic threaded type bushings are not acceptable.**

5. All other fittings and conduit bodies shall be of malleable iron construction and hot dip galvanized.

2.2 RIGID NON-METALLIC CONDUIT (PVC) AND FITTINGS

A. Minimum Size Rigid Smooth-Wall Nonmetallic Conduit: 3/4 inch, unless otherwise noted.

B. Acceptable Manufacturers: Carlon (Lamson & Sessions) Type 80, Cantex, J.M. Mfg., or approved equal.

C. Construction: Schedule 80 rigid polyvinyl chloride (PVC), UL labeled for 90°C.

D. Fittings and Conduit Bodies: NEMA TC 3; sleeve type suitable for and manufactured especially for use with the conduit by the conduit manufacturer.

E. Plastic cement for joining conduit and fittings shall be provided as recommended by the manufacturer.
2.3 OUTLET BOXES

A. Nonmetallic Outlet Boxes: ANSI/NEMA OS 2.

B. Cast Boxes: NEMA FB1, Type FD, stainless steel deep type, gasketed cover, threaded hubs.

PART 3 - EXECUTION

3.1 CONDUIT INSTALLATION SCHEDULE AND SIZING

A. In the event the location of conduit installation represents conflicting installation requirements as specified in the following schedule, a clarification shall be obtained from the Architect/Engineer. If this Contractor is unable to obtain a clarification as outlined above, concealed rigid galvanized steel conduit installed per these specifications and the NEC shall be required.

B. The following schedule shall be adhered to unless they constitute a violation of applicable codes or are noted otherwise on the drawings.

<table>
<thead>
<tr>
<th>Installation Type</th>
<th>RMC</th>
<th>PVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Branch Circuits: Receptacles, etc.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Wet and Damp Locations: (conduit, boxes, fittings, installed and equipped to prevent water entry)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Corrosive Locations</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

1. Underground / Slabs on Grade:
   a. In or Under Slabs on Grade:
      1) Within 5' from the perimeter of the building: PVC

C. Size conduit as shown on the drawings and specifications. Where not indicated in the contract documents, conduit size shall be according to NEC. Conduit and conductor sizing shall be coordinated to limit conductor fill to less than 40%, maintain conductor ampere capacity as required by the NEC (to include enlarged conductors due to temperature and quantity derating values) and to prevent excessive voltage drop and pulling tension due to long conduit/conductor lengths.

D. Minimum Conduit Size (Unless Noted Otherwise):
   1. Above Grade: 3/4 inch.
   2. Below Grade 5' or less from Building Foundation: 3/4 inch.

3.2 CONDUIT INSTALLATION

A. Conduit Connections:
   1. Metallic conduit connections in slab on grade installation shall be sealed and one coat of rust inhibitor primer applied after the connection is made.
   2. Where conduits with tapered threads cannot be coupled with standard couplings, then approved split or Erickson couplings shall be used. Running threads will not be permitted.
B. Conduit Bends:

1. All bends of rigid polyvinyl chloride conduit (PVC) shall be made with the manufacturer's approved bending equipment. The use of spot heating devices will not be permitted (i.e. blow torches).

2. A run of conduit shall not contain more than the equivalent of four (4) quarter bends (360°), including those bends located immediately at the outlet or body.

3. Rigid polyvinyl chloride conduit (PVC) runs longer than 100 feet or runs which have more than two 90° equivalent bends (regardless of length) shall use rigid metal or RTRC factory elbows for bends.

4. Use conduit bodies to make sharp changes in direction.

C. Conduit Placement:

1. Conduit shall be mechanically continuous from source of current to all outlets. Conduit shall be electrically continuous from source of current to all outlets, unless a properly sized grounding conductor is routed within the conduit. All metallic conduits shall be bonded per the NEC.

2. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OPENINGS REQUIRED IN MASONRY OR EXTERIOR WALLS UNDER THIS DIVISION. A QUALIFIED MASON AT THE EXPENSE OF THIS CONTRACTOR SHALL REPAIR ALL OPENINGS TO MATCH EXISTING CONDITIONS.

3. Horizontal conduit routing through slabs above grade
   a. No conduits are allowed in concrete on metal deck unless expressly approved in writing by the Structural Engineer.
   b. No conduits are allowed to be routed horizontally through slabs above grade.

4. Do not route conduits across each other in slabs on grade.

5. Rigid polyvinyl chloride conduit (PVC) shall be installed when material surface temperatures and ambient temperature are greater than 40°F.

6. Contractor shall provide a polypropylene pull cord with 2000 lbs. tensile strength in each empty conduit (indoor and outdoor), except in sleeves and nipples.

3.3 CONDUIT TERMINATIONS

A. Where conduit bonding is indicated or required in the contract documents, the bushings shall be a grounding type sized for the conduit and ground bonding conductor as manufactured by O-Z/Gedney, Appleton, Thomas & Betts, Burndy, Regal, Orbit Industries or approved equal.

B. Conduits with termination fittings shall be threaded for one (1) lock nut on the outside and one (1) lock nut and bushing on the inside of each box.

C. Where conduits terminate in boxes with knockouts, they shall be secured to the boxes with lock nuts and provided with approved screw type tinned iron bushings or fittings with plastic inserts.

D. Where conduits terminate in boxes, fittings, or bodies with threaded openings, they shall be tightly screwed against the shoulder portion of the threaded openings.
E. Rigid polyvinyl chloride conduit (PVC) shall be terminated using fittings and bodies produced by the manufacturer of the conduit, unless noted otherwise. Prepare conduit as per manufacturer’s recommendations before joining. All joints shall be solvent welded by applying full even coat of plastic cement to the entire areas that will be joined. Turn the conduit at least a quarter to one half turn in the fitting and let the joint cure for 1-hour minimum or as per the manufacturer’s recommendations.

F. All conduit ends shall be sealed with plastic immediately after installation to prevent the entrance of any foreign matter during construction. The seals shall be removed and the conduits blown clear of all foreign matter prior to any wires or pull cords being installed.

3.4 UNDERGROUND CONDUIT INSTALLATION

A. Conduit Connections:
   1. Conduit joints in a multiple conduit run shall be staggered at least one foot apart.

B. Conduit Bends (Lateral):
   1. Conduits shall have long sweep radius elbows instead of standard elbows wherever special bends are indicated and noted on the drawings, or as required by the manufacturer of the equipment or system being served.

C. Conduit Elbows (vertical):
   1. Minimum metal or RTRC elbow radiuses shall be 30 inches for primary conduits (>600V) and 18 inches for secondary conduits (<600V). Increase radius, as required, based on pulling tension calculation requirements.

D. Conduit Placement:
   1. Conduit runs shall be pitched a minimum of 4” per 100 feet to drain toward the terminations. Duct runs shall be installed deeper than the minimum wherever required to avoid any conflicts with existing or new piping, tunnels, etc.
   2. Where concrete is required, the materials for concreting shall be thoroughly mixed to a minimum f’c = 2500 and immediately placed in the trench around the conduits. No concrete that has been allowed to partially set shall be used.
   3. Before the Contractor pulls any cables into the conduit he shall have a mandrel 1/4" smaller than the conduit inside diameter pulled through each conduit and if any concrete or obstructions are found, the Contractor shall remove them and clear the conduit. Spare conduit shall also be cleared of all obstructions.
   4. All spare conduits not terminated in a covered enclosure shall have its terminations plugged as described above.
   5. All non-metallic conduit installed underground outside of a slab shall be rigid.

3.5 BOX INSTALLATION SCHEDULE

A. Cast boxes shall be used in:
   1. Exterior locations.
   2. Direct contact with earth.
   3. Wet locations.

3.6 COORDINATION OF BOX LOCATIONS

A. Provide electrical boxes as shown on the drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.
B. Electrical box locations shown on the Contract Drawings are approximate, unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.

C. Locate and install to maintain headroom and to present a neat appearance.

3.7 OUTLET BOX INSTALLATION

A. Mount at heights shown or noted on the drawings or as generally accepted if not specifically noted.

B. Support boxes independently of conduit.

C. Provide thermoplastic outlet boxes in exterior locations and wet locations, and where exposed PVC conduit is used.

3.8 PULL AND JUNCTION BOX INSTALLATION

A. Locate pull boxes and junction boxes in unfinished areas.

B. Support pull and junction boxes independent of conduit.

3.9 EXPOSED BOX INSTALLATION

A. Boxes shall be secured to the building structure with proper size screws, bolts, hanger rods, or structural steel elements.

B. On brick, block and concrete walls or ceilings, exposed boxes shall be supported with no less than two (2) Ackerman-Johnson, Paine, Phillips, or approved equal screw anchors or expansion shields and round head machine screws. Cast boxes shall not be drilled.

C. On steel structures, exposed boxes shall be supported to the steel member by drilling and tapping the member and fastening the boxes by means of round head machine screws.

D. Boxes may be supported on steel members by APPROVED beam clamps if conduit is supported by beam clamps.

E. Wood, plastic, or fiber plugs shall not be used for fastenings.

END OF SECTION
SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Device plates and box covers
B. Receptacles

1.2 QUALITY ASSURANCE
A. Provide similar devices from a single manufacturer.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the NEC Article 100, by a testing agency to Authorities Having Jurisdiction and marked for intended use.
C. Comply with the NEC.

1.3 REFERENCES
A. DSCC W-C-896F – General Specification for Electrical Power Connector
B. FS W-C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet
C. NEMA WD 1 – General Color Requirements for Wiring Devices
D. NEMA WD 6 – Wiring Devices – Dimensional Requirements
E. NFPA 70 - National Electrical Code (NEC)
F. UL 943 – Standard for Ground Fault Circuit Interrupters

1.4 SUBMITTALS
A. Submit product data under provisions of Section 26 05 00.
B. Provide product data showing configurations, finishes, dimensions, and manufacturer’s instructions.

PART 2 - PRODUCTS

2.1 DEVICE COLOR
A. All receptacle, outlet, and coverplate colors shall be gray, unless indicated otherwise.

2.2 COVERPLATES
A. All receptacles shall be complete with the following:
   1. Corrosion resistant thermoplastic coverplates in unfinished spaces for surface mounted boxes.
B. Plate securing screws shall be metal with head color matching the wall plate finish.

2.3 RECEPTACLES
A. Refer to Electrical Symbols List for device type.
B. [REC-DUP-WP]: NEMA 5-20R Weatherproof Ground Fault Duplex Receptacle:
   1. 125-volt, 20 amp, 3-wire grounding type with test and reset buttons in impact resistant thermoplastic face. Provide NEMA 3R rated thermoplastic box with a gray thermoplastic vertical FS/FD box mount cover.
2. Device shall perform self-test of GFCI circuitry in accordance with UL 943.

3. Approved Manufacturers: Hubbell GF5362SG/HBL5221 or approved manufacturer.

C. Back wired devices shall be complete with eight holes that are screw activated with metal clamps for connection to #12 or #10 copper conductors.

D. Side wired devices shall have four binding screws that are undercut for positive wire retention.

E. Ground fault circuit interrupter (GFCI) receptacles shall comply with UL 943 requiring increased surge immunity, improved corrosion resistance, improved resistance to false tripping and diagnostic indication for miswiring if the line and load conductors are reversed during installation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install convenience receptacles at elevations indicated in the General Installation Notes on the contract drawings.

B. Install receptacles vertically with ground slot up or where indicated on the drawings, horizontally with ground slot to the left.

C. Install devices and wall plates flush and level.

D. Test receptacles for proper polarity, ground continuity and compliance with requirements.

END OF SECTION
SECTION 31 23 00 - FOUNDATION EXCAVATING AND BACKFILLING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Foundation, excavating, and backfilling within five feet of the building perimeter. Work shall include, but not be limited to, the following items:
   1. Removal of all unacceptable soil.
   2. Furnish and install acceptable fill.
   3. Prepare subgrade for footings.

B. The following items are not a part of this specification:
   1. Utility trenching and related backfilling outside the building footprint.
   2. Subgrade for exterior paving.

C. Structural notes indicated on the drawings regarding foundation excavating and backfilling shall be considered part of this specification.

1.2 RELATED WORK

A. Pertinent Section of Division 01.
B. Pertinent Sections of Division 31.

1.3 REFERENCES

A. Codes and Standards: Comply with the provisions of the following codes, specifications and standards, except where more stringent requirements are shown or specified. Where any provisions of other pertinent codes and standards conflict with this specification, the more stringent provision shall govern.
   5. ASTM D2940 - Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports.
   6. ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
   9. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.4 TESTING AND INSPECTION

A. Special Inspection and Testing:
   1. In accordance with Chapter 17 of the International Building Code, the Owner shall employ a Special Inspection Agency to perform the duties and responsibilities specified in Section 1704.0.
2. Refer to architectural, civil, and electrical specifications for testing and inspection requirements of non-structural components.

3. Duties of the Special Inspection Agency:
   a. Perform all testing and inspection required per the Testing and Inspection Schedule indicated below.
   b. Furnish inspection reports to the building official, the Owner, the Architect, the Engineer of Record, and the General Contractor. The reports shall be completed and furnished within 48 hours of inspected work.
   c. Submit a final signed report stating whether the work requiring special inspection was, to the best of the Special Inspection Agency's knowledge in conformance with the approved plans and specifications.

4. Structural Component Testing and Inspection Schedule for Section 31 23 00 is as follows:

<table>
<thead>
<tr>
<th>Foundation Preparation</th>
<th>Continuous</th>
<th>Periodic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify materials below shallow footings are adequate to achieve the design bearing capacity.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Verify excavations are extended to proper depth and have reached proper material.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Perform classification and testing of compacted fill materials.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Verify use of proper materials, densities, and lift thicknesses during placement and compaction of compacted fill.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly.</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

   B. Minimum testing frequency and locations:

   1. Laboratory Testing:
      a. Granular fill: One representative gradation test for each type of material.
      b. Cohesive soils: One representative set of Atterberg limits and moisture density test for each type of material used.
      c. Non-cohesive soils: One representative moisture density test for each type of material used.

   2. Field Testing:
      a. The Special Inspector shall determine the location of testing.
      b. Testing of final utility trench backfill shall begin at a depth of 2 feet above the top of the pipe.
      c. In-place field density test and moisture content tests shall be performed as follows:
         1) Fills not within the influence of building foundations: Per civil specifications.
2) Fills within the influence of building foundations, the following criteria shall apply: One test for each 8-inch vertical lift of compacted fill placed per 2,500 square feet of fill area (minimum of two tests per lift per structure for areas smaller than 5,000 square feet).

d. Additional testing may be required by the Special Inspector if noncompliance or a change in conditions occurs.

e. If a test fails, the Contractor shall rework the material, recompact and retest as necessary until specific compaction is achieved in all areas of the trench. All costs associated with this work, including retesting, shall be the responsibility of the Contractor.

1.5 SUBMITTALS

A. Material Test Reports: Provide the Owner and Engineer with the on-site material test reports from the Special Inspection Agency indicating the interpreting test results for compliance with this specification.

1.6 PROTECTION

A. Contractor shall provide for design, permits and installation of all cribbing, bracing, shoring and other methods required to safely retain earth banks and excavations.

B. Notify the Engineer immediately and discontinue work in affected area if adjacent existing footings are encountered during excavation. Underpin other adjacent structures that may be damaged by excavation work, including service utilities and pipe chases.

C. Notify the Engineer of unexpected subsurface conditions and discontinue work in affected areas until notification to resume.

D. Protect benchmarks, existing structures, fences, sidewalks, paving, curbing, etc., from excavation equipment and vehicular traffic.

E. Maintain and protect above and below grade utilities that are to remain.

F. Provide temporary heating or protective insulating materials to protect subgrades and foundations soils against freezing temperatures or frost during cold weather conditions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide borrow soil materials when sufficient acceptable soil materials are not available from excavations.

B. Acceptable soils shall comply with the following:

1. Meet ASTM D2487 soil classification groups GW, GP, GM, SW, SP, SM, SC or a combination of these group symbols;

2. Be free of rock or gravel larger than 3 inches in any dimension;

3. Be free of debris, waste, frozen materials, vegetation and other deleterious materials;

4. Have a liquid limit less than 45 and a plasticity index less than 23.

5. Be approved by the Special Inspection Agency.
C. Unacceptable soils shall be defined as following:
   1. ASTM D2487 soil classification groups GC, ML, MH, CL, CH, OL, OH, PT or a combination of these group symbols.
   2. Unacceptable soils also to include acceptable soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Free-Draining Granular Fill: Free-draining granular fill shall comply with the following:
   1. Be a naturally or artificially graded mixture of natural or crushed gravel, crushed stone.
   2. Be clean and free of fines.
   3. Comply with ASTM D2940.
   4. Be uniformly graded as follows:

<table>
<thead>
<tr>
<th>COARSE AGGREGATE GRADATIONS</th>
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<tr>
<td>SIEVE SIZE - PERCENT PASSING</td>
</tr>
<tr>
<td>Grade No.</td>
</tr>
<tr>
<td>CA7</td>
</tr>
</tbody>
</table>
   5. Be approved by the Special Inspection Agency.

E. Engineered Fill and Utility Base Course shall comply with the following:
   1. Be a naturally or artificially graded mixture of natural or crushed gravel, crushed stone, natural or crushed sand;
   2. Comply with ASTM D2940;
   3. Be uniformly graded as follows:

<table>
<thead>
<tr>
<th>COARSE AGGREGATE GRADATIONS</th>
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<tr>
<td>SIEVE SIZE - PERCENT PASSING</td>
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<tr>
<td>Grade No.</td>
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<tr>
<td>CA6</td>
</tr>
</tbody>
</table>
   4. Be approved by the Special Inspection Agency.

F. Material Applications: Provide and install material meeting with the above requirements as follows:
   2. Backfill at over-excavated areas beneath footings: Engineered fill.
PART 3 - EXECUTION

3.1 PREPARATION

A. Identify and verify required lines, levels, contours and benchmark elevations for the work are as indicated.

B. Protect plant life, lawns, other features and vegetation to remain as a portion of the final landscaping.

C. Free groundwater is expected during excavation. Contractor shall provide for de-watering of excavations from surface water, ground water or seepage. Where ground water occurs during excavation, special procedures shall be implemented as recommended by the Geotechnical Engineer of Record.

D. Identify known underground utility locations with stakes and flags.

3.2 EXCAVATION

A. All excavations shall be safely and properly backfilled.

B. All abandoned footings, utilities and other structures that interfere with new construction shall be removed.

C. All unacceptable material and organic material shall be removed from below all proposed foundations and the exposed natural soil shall be proof rolled and the compaction verified by the soils testing firm prior to placing fill. Proof-roll with a loaded tandem dump truck, loaded ready-mix truck, roller, or equivalent weight vehicle. Materials exhibiting weakness, such as those exhibiting rutting or pumping, shall be removed and replaced with acceptable compacted fill material.

D. Do not excavate within the 45-degree bearing splay of any adjacent foundations.

E. Remove lumped subsoil, boulders and rock up to 1/3 cubic yard (measured by volume). Provide Owner with unit price per cubic yard for obstructions larger than 1/3 cubic yard.

F. Outside 45-degree bearing splay of foundations, correct areas over excavated with aggregate at no additional cost to the Owner.

G. Within the 45-degree bearing splay of foundations, correct areas over excavated with 2000 psi concrete fill at no additional cost to the Owner. Notify the Engineer prior to performing such work.

H. Hand trim final excavation to remove all loose material.

I. Contractor shall form all dams and perform other work necessary for keeping the excavation clear of water during the progress of the work and, at his own expense, shall pump or otherwise remove all surface and perched water which accumulates in the excavations. Perched water that cannot be de-watered in 48 hours of continuous pumping at a minimum rate of 60 gpm in dry weather shall be considered ground water.

J. Stockpile excavated material in the area designated and remove excess material not being used, from the site.

3.3 BACKFILLING

A. Support pipe and conduit during placement and compaction of bedding fill.

B. Systematically backfill to allow necessary time for natural settlement. Do not backfill over porous, wet, spongy or frozen subgrade surfaces.
C. Backfill areas to contours and elevations with unfrozen materials.

D. Unless noted otherwise on the drawings, make grade changes gradual.

E. Contractor shall procure the approval of the subgrade from the Special Inspection Agency prior to the start of any filling or bedding operations.

F. Do not begin any backfill operations against any concrete walls until the concrete has achieved its specified strength.

G. Place and mechanically compact granular fill in continuous layers not to exceed 6 inches compacted depth.

H. Employ a placement method that does not disturb or damage adjacent utilities.

I. All surplus fill materials are to be removed from the site.

J. Fill material stockpiles shall be free of unacceptable soil materials.

K. After work is complete, remove all excess stockpile material and repair stockpile area to its original condition.

3.4 COMPACTION

A. Compact all fill that will support building footings to 98 percent of the maximum dry density in accordance with ASTM D698. For relative cohesionless fill materials, where the percent passing the #200 sieve is less than 10 and the moisture density curve indicates only slight sensitivity to changing moisture content, compaction requirements should be changed to 75 percent relative density in accordance with ASTM D4253 and ASTM D4254.

B. Compact all fills that support paving and landscape per civil specifications.

3.5 FOUNDATIONS

A. Each footing excavation should be cleared of all obstructions and other organic or deleterious materials.

B. Localized areas of unstable or unacceptable material may be discovered during the stripping and excavation operation and may require over-excavation and backfilling. The Special Inspection Agency shall be present during the proof rolling to evaluate any localized areas and make recommendations regarding over-excavation, backfilling and recompaction of these areas. Fill placement and compaction shall be inspected and tested by the Special Inspection Agency.

C. Footing elevations shown on the drawings designate a minimum depth of footing where an appropriate soil bearing pressure is expected. Footings, piers and/or walls shall be lowered or extended as required to reach soil meeting the design bearing pressure. This work shall be performed per the recommendations of the Special Inspection Agency.

D. All footing excavations shall be recompacted by hand-operated, vibratory compaction equipment, except where compaction will degrade the integrity of subgrade soils. In these instances, bottom of footing excavations should be hand-trimmed to remove loosened material.

E. All excavation and recompacted surfaces shall be inspected and tested to a depth of 2.0 feet below the excavated elevation by the Special Inspection Agency. Additional field density tests should be performed for each one foot of fill material placed. Any areas not in compliance with the compaction requirements should be corrected and re-tested prior to placement of fill material.
F. For foundation areas where over excavation is performed, place and mechanically compact Engineered fill material in continuous layers not to exceed 6 inches compacted depth.

3.6 TOLERANCES

A. Top surface of backfilling under paved areas: Plus or minus ½ inch from required elevation.

B. Top surface of general backfilling: Plus or minus 1 inch from required elevation.

END OF SECTION
This project will be constructed in accordance with the SUDAS Standard Specifications, 2019 Edition, which were adopted by the City of Des Moines on April 22, 2019, under Roll Call No. 19-0621, as amended by these City of Des Moines General Supplemental Specifications.

The SUDAS Standard Specifications, 2019 Edition, may be viewed at the Iowa SUDAS website https://iowasudas.org/manuals/specifications-manual/, or can be purchased online from the Iowa SUDAS website at: https://iowasudas.org/order-the-manuals/.

Said SUDAS Standard Specifications are hereby amended as follows:

SECTION 1010 – DEFINITIONS

1010, 1.03 DEFINITIONS AND TERMS. Add the following new definition:

PRIVATE CONSTRUCTION CONTRACT. A contract awarded by a private agency or individual for construction of a publicly owned or privately-owned improvement, which by agreement of the parties is subject to these specifications.

SECTION 1020 – PROPOSAL REQUIREMENTS AND CONDITIONS

1020, 1.01 QUALIFICATION OF THE BIDDERS: Add the following new E.

*E. The City of Des Moines may disqualify a Contractor from bidding on future work or from participating as a subcontractor for a period of up to 3 years in accordance with Section 94-198 of the Municipal Code of the City of Des Moines.

1020, 1.03 QUANTITIES AND UNIT PRICES: Delete B. and replace with the following new B.

B. When unit prices are requested in the proposal form, the quantities indicated on the proposal form are approximate only, and do not constitute a warranty or guarantee by the Jurisdiction as to the actual quantities involved in the work. Such quantities are to be used for the purpose of comparison of bids and determining the amount of bid security, contract, and performance, payment, and maintenance bond. In the event of discrepancies between unit prices and unit price extensions listed in a bidder’s proposal, unit prices shall govern and unit price extensions shall be corrected, as necessary, for agreement with unit prices; except in the case of an obvious, serious, clerical error where the Engineer is able to determine the bidder’s intent from the proposal; in which case, the Jurisdiction may waive irregularities that are in best interest of the Jurisdiction, as long as the integrity of the bid process can be maintained. The Jurisdiction expressly reserves the right to increase or decrease the quantities during construction as outlined in Section 1040, 1.06 - Increase or Decrease of Work, and to make reasonable changes in design, provided such changes do not materially change the intent of the contract. The amount of work to be paid for shall be based upon the actual quantities performed.

*This highlighted language and Section 94-198 of the Municipal Code of the City of Des Moines are not the current law of the State of Iowa and not applicable to the City’s current bidding process.
1020, 1.09 PREPARATION OF THE PROPOSAL: Delete D. and replace with the following D:

D. When unit prices are requested, they shall be submitted on each and every item of work included for which bids are requested. The format for unit prices will be in dollars and whole cents only. In the case of discrepancy, the unit price shall govern; except in the case of an obvious, serious, clerical error where the Engineer is able to determine the bidder’s intent from the proposal; in which case, the Jurisdiction may waive irregularities that are in best interest of the Jurisdiction, as long as the integrity of the bid process can be maintained.

1020, 1.15 LIMITATION ON WITHDRAWAL OF PROPOSALS AFTER OPENING OF PROPOSALS:
Add the following new C:

C. After bids are opened, if the low bidder claims that it has made a serious error in the preparation of its bid, and can support such a claim with evidence satisfactory to the Jurisdiction, said bidder shall be allowed to withdraw its bid and its bid security shall be returned; *provided however, as a condition for return of its bid security, said bidder shall be required to agree that it will not be allowed to again bid on the project, either as a prime bidder or as a subcontractor, if the project, or a substantial portion of the project, is rebid within six months of the first bid opening. Under no circumstances should said bidder be permitted to alter or adjust its bid, as this would undermine the entire system of competitive bidding and be an open invitation to abuse.

SECTION 1040 – SCOPE OF WORK

1040, 1.05 PLANS: Delete the 2nd paragraph and replace with the following:

Electronic support files, will not be provided prior to letting and may be provided to the low bidder and are for information only. Should there be a discrepancy between an electronic support file and a contract document, the contract documents shall govern. No guarantee is made that the data systems used by the Engineer will be directly compatible with the systems the Contractor uses.

1040, 1.07 CHANGE ORDERS, B. Written Orders: Add the following to the end of the section:

Formal approval by the Jurisdiction shall be defined as follows:
The authority of the Des Moines City Manager and the Engineer to approve change orders shall be limited to those change orders which will cost $50,000 or less. Change orders for work to cost more than $50,000 shall be approved by the City Council prior to the payment of the work provided for under the change order.

*This highlighted language is not the current law of the State of Iowa and not applicable to the City’s current bidding process.

1040, 1.09 CHANGED SITE CONDITIONS, A. Latent or Subsurface Conditions: Delete 1.and 2. in their entirety and replace with the following 1. and 2.; and add the following new 3.

1. If the Contractor encounters latent or subsurface conditions differing materially from those indicated in the contract documents which the Contractor could not have discovered by a reasonable site investigation and examination of the type customarily undertaken by prudent and competent contractors, and if these changed conditions are considered by the Contractor as a basis for compensation in addition to the contract price, the Contractor shall within three working days after discovery thereof notify the Engineer of its claim by written notice as sent forth herein. Before disturbing the site at which the latent or subsurface condition is alleged to exist, the Contractor shall give the Engineer the opportunity to inspect the same.
a. For claims greater than $50,000 the Contractor shall notify the Engineer by written notice
either (i) personally delivered, (ii) sent by certified mail, return receipt requested, or (iii)
delivered by a nationally recognized prepaid overnight courier service (receipt requested),
to the address below:

City of Des Moines
Engineering Department
400 Robert D. Ray Drive
Des Moines, IA  50309-1891
Attention:   Steve Naber, P.E., City Engineer

Under no circumstance will an email, text message, verbal communication or any other
informal communication, be considered acceptable or satisfactory written notice required
by this section. The written notice shall:

1) Expressly state that it is a request for a contract change under Section 1040, 1.09;
2) Expressly identify the latent or subsurface conditions that the Contractor alleges
differ materially from those indicated in the contract documents which the
Contractor could not have discovered by a reasonable site investigation and
examination of the type customarily undertaken by prudent and competent
contractors;
3) Expressly state the reason the Contractor believes extra compensation is due;
4) Identify work that Contractor alleges will be impacted.

b. For claims less than $50,000 the Contractor shall notify the Project Engineer by written
notice sent as set forth above or sent by email providing the same detail as identified in
a.1) through 4) above. Under no circumstances will a text message, verbal
communication or any other informal communication be considered acceptable or
satisfactory written notice required by this section.

2. After inspection by the Engineer, the Jurisdiction may, in its discretion, authorize the Contractor
to proceed with or abandon the work. The Contractor shall resume construction operations
pending a decision regarding its claim by the Jurisdiction. Failure of the Contractor to give
written notice within three working days of discovering the conditions and to give the Engineer
full opportunity to inspect the condition before disturbing the site shall be deemed a waiver by
the Contractor of all claims for extra compensation arising out of the alleged condition.

3. Latent or subsurface conditions that do not materially differ from those shown on the plans shall
not form the basis for additional compensation. No additional compensation or extension of
time shall be provided for conditions that do not materially differ, regardless of the nature of
the condition encountered.

1040, 1.10 DISPUTED CLAIMS FOR EXTRA COMPENSATION: Delete 1.10 in its entirety and replace
with the following:

A. Basis of Claim for Extra Compensation:

1. In any case where the Contractor believes extra compensation is due for work or material
beyond the scope of the Work under the contract and not ordered by the Engineer as Extra Work
as defined in Section 1010, 1.03, the Contractor shall provide written notice to the Engineer,
as set forth herein, of its intention to make claim for such extra compensation within thirty (30)
days of discovering the circumstances regarding the claim and before beginning the work on
which the claim is based (hereinafter referred to as a “Claim”).

a. For claims greater than $50,000 the Contractor shall notify the Engineer by written notice
either (i) personally delivered, (ii) sent by certified mail, return receipt requested, or (iii)
delivered by a nationally recognized prepaid overnight courier service (receipt requested)
to the address below:

City of Des Moines
Engineering Department
400 Robert D. Ray Drive
Des Moines, IA 50309-1891
Attention: Steve Naber, P.E., City Engineer

Under no circumstance will an email, text message, verbal communication or any other
informal communication, be considered acceptable or satisfactory written notice
required by this section. The written notice shall:

1) Expressly state that it is a request for a contract change under Section 1040, 1.10;
2) Expressly state the reason the Contractor believes extra compensation is due;
3) Identify the underlying work or material that Contractor claims is beyond the
   scope of the Work under the contract and not ordered by the Engineer as Extra
   Work as defined in Section 1010, 1.03;
4) Identify any work that will be impacted.

b. For claims less than $50,000 the Contractor shall notify the Project Engineer by
   written notice sent as set forth above or sent by email providing the same detail as
   identified in a.1) through 4) above. Under no circumstances will a text message,
   verbal communication or any other informal communication be considered acceptable
   or satisfactory written notice required by this section.

   The Contractor shall not proceed with that work until the Contractor and the
   Jurisdiction have executed a change order with respect to the Claim. The Contractor
   shall have no right to submit a Claim for any matter which is exclusively reserved to
   authority of the Engineer under the Contract Documents.

2. The Jurisdiction shall not be responsible for damages attributable to the performance,
   nonperformance, or delay, of any other contractor, governmental agency, utility agency, firm,
   corporation, or individual authorized to do work on the project, except if such damages result
   from negligence on the part of the Jurisdiction, its Engineer, or any of its officers or
   employees.

3. For any Claim, if such written notification is not given, or if after such written notification is
   given the Engineer is not allowed facilities for keeping strict account of actual costs as
   defined for force-account construction, the Contractor thereby agrees to waive the Claim for
   extra compensation for such work. Such written notice by the Contractor, and the fact the
   Engineer has kept account of the cost as aforesaid, shall not be construed as establishing the
   validity of the Claim.

4. The Claim, when filed, shall be in writing and in sufficient detail to permit auditing and an
   evaluation by the Jurisdiction. The Claim shall be supported by such documentary evidence
   as the Contractor has available and shall be verified by affidavit of the Contractor or other
   person having knowledge of the facts.

B. Presentation and Consideration of Claim: If the Contractor wishes an opportunity to present
   its Claim in person, the Claim shall be accompanied by a written request to do so. Where the
   Contractor asks an opportunity to present its Claim in person, the Jurisdiction, within thirty (30)
   calendar days of the filing of the Claim, shall fix a time and place for a meeting between the
   Contractor and the Jurisdiction or its designated representatives or representative. The
   Jurisdiction shall, within a reasonable time after the filing of the Claim or the meeting above
   referred to, whichever is later, rule upon the validity of the Claim and notify the Contractor, in
   writing, of its ruling together with the reasons therefore. In case the Claim is found to be just, in
   whole or in part, it shall be allowed and paid to the extent so found.
Request for Claim Review: In the event a Contractor’s Claim as outlined in the above procedure in Sections 1040, 1.10(A) and (B) has been disallowed, in whole or in part, the Contractor may, within thirty (30) calendar days from the date the ruling of the Jurisdiction is mailed, make a written request to the Jurisdiction that its Claim or Claims be submitted to a board of review. The written request shall be either (i) personally delivered, (ii) sent by certified mail, return receipt requested, or (iii) delivered by a nationally recognized prepaid overnight courier service (receipt requested) addressed as follows:

City of Des Moines  
Engineering Department  
400 Robert D. Ray Drive  
Des Moines, IA  50309-1891  
Attention: City Engineer

The Jurisdiction shall decide if the matter is subject to further review and shall, within thirty (30) calendar days of the receipt of the request for review, grant or deny the request for review. The Jurisdiction’s decision shall be final. In the event the Contractor fails to make a timely written demand for review of its Claim as provided by this Section 1040, 1.10(C), the decision of the Jurisdiction shall be deemed to be final and the Contractor shall have no right to pursue arbitration of its Claim.

C. Board of Review:

1. The Board shall have jurisdiction to pass upon questions involving compensation to the Contractor for work actually performed or materials furnished and upon claims for extra compensation that have not been allowed by the Jurisdiction. The Board’s jurisdiction shall not extend to matters exclusively reserved to the Engineer, to a determination of quality of workmanship or materials furnished, or to an interpretation of the intent of the Plans and Specifications except as to matters of compensation. Jurisdiction of the Board shall not extend to setting aside or modifying the terms or requirements of the contract.

2. Following the timely written demand for review of the Claim and the decision of the Jurisdiction to grant the request, a board of review shall be appointed to review the Claim. The board of review shall consist of three (3) members as follows: the Engineer, or designated representative; and two persons to be appointed by the Engineer (hereinafter the “Board”).

3. The Board shall set a date for the Contractor to present its Claim for review within sixty (60) days of the date the Jurisdiction issued its decision granting the Contractor’s request for review. The presentation before the Board shall not be in accordance with the Iowa rules of civil procedure and the Contractor shall not have the right to conduct discovery or compel the testimony of witnesses as part of the presentation. The Contractor shall submit three (3) copies of a written Claim summary and all documents it considers to be relevant to its Claim at least fourteen (14) days prior to the date set for the presentation before the Board. The presentation before the Board is intended to be an informal process to allow the Contractor to further explain its Claim and why it believes it is entitled to additional compensation. The Board reserves the right to impose such rules as it deems reasonably necessary to allow for a fair and efficient presentation.

4. Following the presentation before the Board, the Board shall render a written decision regarding the Claim within ten (10) days of the presentation. In the event the Board renders a decision in favor of the Contractor for some or all of the Claim, the Contractor and the Jurisdiction shall promptly proceed in good faith to prepare a change order consistent with the decision of the Board. If the Board denies the Claim, in part or in full, the Contractor’s sole and exclusive remedy is to demand final resolution of the Claim that has been denied subject to the procedure provided below.
E. Final Resolution by Binding Arbitration or Litigation: For any Claim denied by the Board, the Jurisdiction shall have the sole and exclusive right to determine whether final resolution of the Claim shall be through Binding Arbitration or litigation. The Contractor shall not have the right to pursue final resolution of any Claim that the Contractor did not submit to the Board. The Contractor must make a written demand for final resolution of the Claim upon the Jurisdiction within thirty (30) days of the date when the Board rendered its decision or it will be deemed to have waived this right and the decision of the Board will be final. The written demand shall be either (i) personally delivered, (ii) sent by certified mail, return receipt requested, or (iii) delivered by a nationally recognized prepaid overnight courier service (receipt requested) addressed as follows:

City of Des Moines
Engineering Department
400 Robert D. Ray Drive
Des Moines, IA 50309-1891
Attention: Steve Naber, P.E., City Engineer

The Jurisdiction shall notify the Contractor within thirty (30) days of the date of receiving the Contractor’s written demand for final resolution of the Claim, whether the Jurisdiction will elect to use binding arbitration or litigation to reach a final resolution of the Claim. The decision to pursue binding arbitration or litigation, shall be the sole and exclusive decision of the Jurisdiction. The decision of the Jurisdiction on whether to pursue binding arbitration or litigation is final.

1. Arbitration.

(a) If the Jurisdiction elects to use binding arbitration for final resolution of the Claim, the sole and exclusive remedy for final resolution of the Claim shall be binding arbitration (the “Arbitration”). The Arbitration shall be submitted to a single arbitrator as is mutually agreed upon by the Contractor and Jurisdiction. If the Contractor and Jurisdiction cannot agree upon a single arbitrator within twenty-one (21) days of the date of the Jurisdiction’s notification to the Contractor of the Jurisdiction’s decision to pursue binding arbitration, the Arbitration shall be submitted to a three (3) member panel appointed as follows: the Contractor shall appoint one arbitrator; the Jurisdiction shall appoint one arbitrator; and the third arbitrator shall be chosen by the first two appointed arbitrators (for the sake of convenience, the arbitrator, or arbitrators as the case may be, shall be referred to hereinafter as the “Arbitrator”). The parties agree to work toward appointment of a three (3) member Arbitration panel within twenty-one (21) days after not being able to agree on a single arbitrator. The Arbitration shall be conducted in general accord with the Construction Industry Arbitration Rules of the American Arbitration Association then in effect. The parties reserve the right to alter and amend the rules for the Arbitration as they may mutually agree in writing.

(b) The Arbitrator shall have jurisdiction to pass upon questions involving compensation to the Contractor for work actually performed or materials furnished and upon claims for extra compensation that have not been allowed by the Jurisdiction. The Arbitrator’s jurisdiction shall not extend to matters exclusively reserved to the Engineer, to a determination of quality of workmanship or materials furnished, or to an interpretation of the intent of the Plans and Specifications, except as to matters of compensation. Jurisdiction of the Arbitrator shall not extend to setting aside or modifying the terms or requirements of the contract.

(c) Subject to agreement of the parties and the Arbitrator, the parties shall work in good faith to schedule the Arbitration and allow for the decision of the Arbitrator within two hundred forty (240) days after appointment of the Arbitrator.
(d) The Arbitrator shall render a written decision within twenty (20) days after the Claim has been fully submitted. For Arbitrations before more than one arbitrator, the decision of a majority of the panel shall govern. The Arbitrator’s decision shall provide a basis for the findings and legal conclusions and shall determine how the cost of the proceedings shall be borne by the parties.

(e) The decision of the Arbitrator shall be binding and final. There shall be no further appeal or judicial review, except under the limited circumstances as allowed by Iowa law.

2. Litigation. If the Jurisdiction elects not to use arbitration as the means to reach final resolution of the claim, then the sole and exclusive remedy for final resolution of the Claim shall be litigation which must be brought in Iowa District Court in and for the County where the Jurisdiction is located or in the United Stated District Court in and for the District where the Jurisdiction is located.

SECTION 1050 – CONTROL OF WORK

1050, 1.10 PROTECTION OF LINE AND GRADE STAKES: Add the following new D.

D. The Jurisdiction shall provide all construction survey staking on projects funded by the Jurisdiction unless otherwise indicated on the plans or in the Contract Documents. On Private Construction Contracts, the Owner, in accordance with the Private Constructio Contract, shall hire a Licensed Surveyor for all survey work.

SECTION 1060 – CONTROL OF MATERIALS

1060, 1.03 SAMPLES AND TESTING: Add the following new D.

D. All on-site inspection and testing, as well as testing of materials, will be provided by the Jurisdiction unless otherwise indicated on the plans or by special provisions.

SECTION 1070 – LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

1070, 1.03 PERMITS AND LICENSES: Delete and replace with the following:

The Contractor shall procure and pay for all necessary permits and licenses for the construction of the work and for temporary excavations, obstructions, enclosures, and street openings arising from the construction and completion of the work described in the Contract Documents. The Contractor shall be responsible for all violations of the law for any cause in connection with the construction of the work or caused by the obstruction of roads, streets, highways or sidewalks, and shall give all requisite notices to the Jurisdiction or other public authorities in connection therewith.

1070, 2.02 CONVENIENCE AND SAFETY: E. Project Area or Work Site Safety: Add the following new 6.

6. The City of Des Moines, Engineering Department, Master Construction Safety Packet is available at http://www.dmgov.org/Departments/Engineering/PDF/MasterConstructionSafetyPacket.pdf and is also available upon request from the Engineering Department. The Engineering Department will make available a copy of the City of Des Moines Master Construction Safety Plan to the Contractor when the contract is awarded. Said Safety Plan is for the Contractor’s information only and it is the Contractor’s sole responsibility to provide, or make available, this safety information to all its Subcontractors.
1070, 1.12, CONSENT TO JURISDICTION OF IOWA DISTRICT COURT OR FEDERAL DISTRICT COURT: Delete 1.12 in its entirety and replace with the following new 1.12:

1070, 1.12 DISPUTE RESOLUTION AND CONSENT TO JURISDICTION OF IOWA DISTRICT COURT OR FEDERAL DISTRICT COURT IN IOWA

A. The Contractor agrees any claims, disputes, causes of action that accrue to it, or which by subrogation or assignment accrue to its sureties or insurers, arising out of or connected with this contract, and that the Jurisdiction has determined in writing is not subject to Section 1040, 1.10, shall be resolved by arbitration or litigation as elected by the Jurisdiction. As to any such causes of action, Contractor shall provide written notice to Jurisdiction requesting that Jurisdiction make its election as to whether the dispute shall be settled by arbitration or litigation. The written notice shall be either (i) personally delivered, (ii) sent by certified mail, return receipt requested, or (iii) delivered by a nationally recognized prepaid overnight courier service (receipt requested) addressed as follows:

City of Des Moines
Engineering Department
400 Robert D. Ray Drive
Des Moines, IA 50309-1891
Attention: Steve Naber, P.E., City Engineer

Jurisdiction shall notify Contractor in writing as to its election within thirty (30) days of receipt of Contractor’s written notice requesting a determination by Jurisdiction.

1. Arbitration

(a) If the Jurisdiction elects to use binding arbitration for final resolution, the sole and exclusive remedy for final resolution of the dispute shall be binding arbitration (the “Arbitration”). The Arbitration shall be submitted to a single arbitrator as is mutually agreed upon by the Contractor and Jurisdiction. If the Contractor and Jurisdiction cannot agree upon a single arbitrator within twenty-one (21) days of the date of the Jurisdiction’s notification to the Contractor of the Jurisdiction’s decision to pursue binding arbitration, the Arbitration shall be submitted to a three (3) member panel appointed as follows: the Contractor shall appoint one arbitrator; the Jurisdiction shall appoint one arbitrator; and the third arbitrator shall be chosen by the first two appointed arbitrators (for the sake of convenience, the arbitrator, or arbitrators as the case may be, shall be referred to hereinafter as the “Arbitrator”). The parties agree to work toward appointment of a three (3) member Arbitration panel within twenty-one (21) days after not being able to agree on a single arbitrator. The Arbitration shall be conducted in general accord with the Construction Industry Arbitration Rules of the American Arbitration Association then in effect. The parties reserve the right to alter and amend the rules for the Arbitration as they may mutually agree in writing.

(b) Jurisdiction of the Arbitrator shall not extend to setting aside or modifying the terms or requirements of the contract.

(c) Subject to agreement of the parties and the Arbitrator, the parties shall work in good faith to schedule the Arbitration and allow for the decision of the Arbitrator within two hundred forty (240) days after appointment of the Arbitrator.

(d) The Arbitrator shall render a written decision within twenty (20) days after the matter has been fully submitted. For Arbitrations before more than one
arbitrator, the decision of a majority of the panel shall govern. The Arbitrator’s decision shall provide a basis for the findings and legal conclusions and shall determine how the cost of the proceedings shall be borne by the parties.

(e) The decision of the Arbitrator shall be binding and final. There shall be no further appeal or judicial review, except under the limited circumstances as allowed by Iowa law.

2. Litigation. If the Jurisdiction elects not to use arbitration as the means to reach final resolution of the claim or fails to notify Contractor in writing within thirty (30) days of its election, then the sole and exclusive remedy for final resolution of the Claim shall be litigation which must be brought in Iowa District Court in and for the County where the Jurisdiction is located or in the United Stated District Court in and for the District where the Jurisdiction is located.

B. Contractor further consents that it will require its subrogees and assigns to enter into an agreement to comply with the terms of Section, 1.12, and consent to the jurisdiction of either the Iowa District Court in and for the County where the Jurisdiction is located or the United States District Court in and for the District where the Jurisdiction is located, as to any causes of action brought against it arising out of this contract or any work performed under it by Contractor or its subcontractors, and further agrees, on behalf of itself, its subrogees and assigns, to waive any and all objections to the jurisdiction of said court as to any such cause of action. Contractor shall make such consent a condition of the retention of subrogees and assigns.

1070, 2.10 DUST CONTROL: Add the following paragraph:

The Contractor shall be responsible to remove any project-related construction materials deposited on a public street as well as related dust control measures. The Contractor shall employ all means necessary to prevent tracking soil, or loss of material, onto public streets; including but not limited to, rocking private access roads and removing excess material from equipment before leaving the construction site.

The Contractor shall promptly remove any material deposited on a public street utilizing mechanical scraping and street sweeping, or other means as required by the Jurisdictional Engineer.

1070, 2.16 READY MIX CONCRETE WASTE: New Section - Add the following 2.16:

2.16 READY MIX CONCRETE WASTE

Concrete trucks will be allowed to washout or discharge excess concrete only in specifically designated areas which have been prepared to minimize contact between the concrete and storm water discharge from the site. The hardened product from the concrete washout areas will be disposed of by the Contractor as other non-hazardous waste materials or may be broken up and used on the site for other appropriate uses.

1070, 3.02 INSURANCE REQUIREMENTS, A: Delete A and replace them with the following A.

A. The contractor shall not purchase liability insurance in the name of the jurisdiction unless such purchase is allowed by special provision.
1070, 3.02 INSURANCE REQUIREMENTS, 2. Commercial General Liability Insurance: Revise the following limits on the Commercial General Liability Insurance:

- The Each Occurrence Limit shall be changed from $1,000,000 to $2,000,000.
- The Personal and Advertising Injury Limit, under Commercial General Liability, changed from $1,000,000 to $2,000,000.
- All other limits shall remain unchanged.

1070, 3.02 INSURANCE REQUIREMENTS, 3. Automobile Liability Insurance: Revise the following limits on the Automobile Liability Insurance:

- Minimum combined single limit per accident shall be changed from $1,000,000 to $2,000,000.

1070, 3.02 INSURANCE REQUIREMENTS, C: Add the following sentence at the end of 1, 2, 3, and 5: “Waiver of Subrogation in favor of Jurisdiction is required.”

1070, 3.02 INSURANCE REQUIREMENTS, C, 6. Additional Insured Endorsements: Replace “Except for Workers Compensation, the insurance specified shall:”, with “Except for Workers Compensation and Railroad Protective Liability Insurance, the insurance specified shall:”.

1070, 3.02 INSURANCE REQUIREMENTS, C: Add the following new 8.

8. WAIVER OF SUBROGATION: To the fullest extent permitted by law, Contractor hereby releases the Jurisdiction, including their respective elected and appointed officials, agents, employees and volunteers and others working on their behalf from and against any and all liability or responsibility to the Contractor or anyone claiming through or under the Contractor by way of subrogation or otherwise, for any loss arising out of liability or occupational injury without regard to the fault of the Jurisdiction or the type of loss involved. This provision shall be applicable and in full force and effect only with respect to loss or damage occurring during the time of this Agreement. The Contractor’s policies of insurance shall contain a clause or endorsement to the effect that such releases shall not adversely affect or impair such policies or prejudice the right of the Contractor to recover thereunder.

1070, 3.03 CONTRACTOR’S INDEMNITY – CONTRACTUAL LIABILITY INSURANCE: Delete B; and replace with the following B.

B. Except to the extent caused by or resulting from the negligent act or omission of the Jurisdiction or the Jurisdiction’s employees, consultants, agents or other for whom the Jurisdiction is responsible, to the fullest extent permitted by law, the Contractor shall defend, indemnify, and hold harmless the Jurisdiction and its officers, agents, employees, and consultants from and against all claims, damages, losses, and expenses, including but not limited to, attorney's fees, arising out of or resulting from the performance or prosecution of the work by the Contractor, its subcontractors, agents, or employees; or arising from any neglect, default, or mismanagement or omissions by the Contractor, its subcontractors or consultants, suppliers, third parties, or the agents, officers, or employees of any of them in the performance of any duties imposed by the contract or by law; provided any such claim, damage, loss, or expense:

1. is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) including economic damages and the loss of use resulting therefrom, and

2. is caused in whole or in part by any act or omission of the Contractor, its subcontractors or consultants, suppliers, third parties, or the agents, officers, or employees of any of them, or anyone for whose acts any of them may be liable.
Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity that would otherwise exist as to any party or person described in this subsection.

1070, 3.04 CONTRACTORS INSURANCE FOR OTHER LOSSES; WAIVER OF SUBROGATION, B: Delete B and replace with the following B.

B. Contractor shall cause each of its subcontractors, consultants, suppliers, third parties, or the agents of any of them, to carry insurance sufficient to cover all loss to such materials, tools, motor vehicles, and equipment. All insurance carried by the Contractor, or its subcontractors, consultants, suppliers, third parties or the agents of any of them, covering risk of loss or damage to materials, tools, motor vehicles, and equipment used in the performance of the Work, shall provide a waiver of subrogation against the Jurisdiction, as specified in Section 1070, 3.02 Insurance Requirements, C.8. To the extent that any subcontractors, consultants, suppliers, third parties or the agents of any of them, do not provide such coverage, any uninsured loss shall be the sole responsibility of the Contractor.

1070, 3.05 PROPERTY INSURANCE: Delete A, D, and M; and replace them with the following A, D, and M.

A. Property Insurance Required: The Contractor shall purchase and maintain property insurance, being either Builder’s Risk Insurance or an Installation Floater, for the period of the contract until final acceptance of the work by the Jurisdiction, on all construction contracts where a building, electrical, mechanical, or plumbing permit is required by the permitting entity.

1. Builder’s Risk Insurance by Contractor: On contracts for construction of new buildings or on contracts when Builder’s Risk Insurance is applicable to the contract by definition, the Contractor shall purchase and maintain Builder’s Risk Insurance for the duration of the contract; unless the Jurisdiction states by special provision that the Jurisdiction shall purchase and maintain the Builder’s Risk Insurance. This property insurance, Builder's Risk Insurance, provided by the Contractor shall be in the amount of the initial bid amount, or in an amount equal to the estimated value of actual building construction, whichever is less, as well as applicable modifications thereto for the entire work at the site on a replacement cost basis. Such property insurance shall be maintained, unless otherwise provided in the contract documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final acceptance of the work by the Jurisdiction. The insurance shall include interests of the Jurisdiction, the Contractor, subcontractors, and sub-subcontractors in the work. If the Contractor’s property insurance covering the work has any deductible, the Contractor shall be responsible to pay the cost associated with the deductible. Flood and Earthquake Insurance shall be required as part of the Builder’s Risk Policy, and the minimum required policy limits shall be not less than 10% of the full amount of the contract. If Boiler and Machinery Insurance is required by the contract documents or by law, the Contractor shall purchase the Boiler and Machinery Insurance if the Contractor is required to purchase the Builder’s Risk Insurance. If Boiler and Machinery Insurance coverage is included in the Contractor’s Builder's Risk Insurance policy, it may be used to satisfy the Boiler and Machinery Insurance requirement to the extent such coverage specifically covers such objects during installation, testing, and until final acceptance by the Jurisdiction.

2. Builder’s Risk Insurance by the Jurisdiction: When stated in the special provisions, the Jurisdiction shall purchase and maintain property insurance, a.k.a. Builder's Risk Insurance in the amount of the initial bid amount, or in an amount equal to the estimated value of actual building construction, whichever is less, as well as applicable modifications thereto for the entire work at the site on a replacement cost basis. Such property insurance shall be maintained, unless otherwise provided in the contract documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final acceptance of the work by the Jurisdiction. The insurance shall include interests of the Jurisdiction, the Contractor, subcontractors, and sub-subcontractors in the work. This property insurance covering the work will have a deductible of $5,000 for each occurrence, or as stated in the special provisions, which will be the responsibility of the Contractor. Flood
and Earthquake Insurance shall be required as part of the Builder’s Risk Policy, and the minimum required policy limits shall be not less than 10% of the full amount of the contract. If Boiler and Machinery Insurance is required by the contract documents or by law, the Jurisdiction shall purchase the Boiler and Machinery Insurance if the Jurisdiction is required to purchase the Builder’s Risk Insurance. If Boiler and Machinery Insurance coverage is included in the Jurisdiction’s Builders Risk Insurance policy, it may be used to satisfy the Boiler and Machinery Insurance requirement to the extent such coverage specifically covers such objects during installation, testing, and until final acceptance by the Jurisdiction.

3. Installation Floater: On the remainder of these contracts where Builder’s Risk Insurance is not applicable to a contract by definition and an Installation Floater is applicable by definition, the Contractor shall purchase and maintain an Installation Floater for the duration of the contract. This Installation Floater shall cover all materials, fixtures, equipment, and supplies provided for the job. Such insurance shall be on an “all risk” form in an amount equal to the maximum value of such materials, equipment, or supplies covered on the job site, off-premises at any temporary storage location, or in transit, and shall include coverage for hoisting and rigging. The Installation Floater shall be maintained until final acceptance of the work by the Jurisdiction. If the Contractor’s Installation Floater covering the equipment and work has any deductible, the Contractor shall be responsible to pay the cost associated with the deductible. If Boiler and Machinery Insurance is required by the contract or by law, the Contractor shall purchase the Boiler and Machinery Insurance; the Installation Floater may be used to satisfy this requirement to the extent the Boiler and Machinery Insurance coverage specifically covers such objects during installation, testing, and until final acceptance by the Jurisdiction.

D. Boiler and Machinery Insurance: When required by the contract documents or by law, Boiler and Machinery Insurance shall specifically cover such insured objects during installation, testing, and until final acceptance by the Jurisdiction; this insurance shall include interest of the Jurisdiction, Contractor, subcontractors, and sub-subcontractors in the work, and the Jurisdiction and Contractor shall be named insureds. A Builders Risk Insurance policy or an Installation Floater, when also required by the contract documents or by law, may satisfy this requirement as indicated in 1070, 3.05 A.1, 2. and 3. above. If Boiler and Machinery Insurance is required by the contract documents or by law, the Contractor shall purchase the Boiler and Machinery Insurance. However, if the contract, requires the Jurisdiction to purchase the Builder’s Risk Insurance, the Jurisdiction shall also purchase the Boiler and Machinery Insurance.

M. Installation Floater: See Section 1070, 3.05, A.3 above.

1070, 3.06 ENDORSEMENT NAMING JURISDICTION AS AN ADDITIONAL INSURED / CANCELLATION AND MATERIAL CHANGE/ GOVERNMENTAL IMMUNITIES ENDORSEMENT: Under C. delete the first full paragraph regarding the Cancelation and Material Change Endorsement language and replace it with the following:

Thirty (30) days Advance Written Notice of Cancellation, ten (10) days Written Notification of Cancellation due to non-payment of premium and forty-five (45) days Advance Written Notification of Non-Renewal shall be sent to the Jurisdiction at the office and attention of the Certificate Holder. This endorsement supersedes the standard cancellation statement on the Certificate of Insurance to which this endorsement is attached.

1070, 3.06 ENDORSEMENT NAMING JURISDICTION AS AN ADDITIONAL INSURED / CANCELLATION AND MATERIAL CHANGE/ GOVERNMENTAL IMMUNITIES ENDORSEMENT: Replace first sentence under E. with the following: If allowed, as specified in Section 1070, 3.02 Insurance Requirements A., all liability policies purchased in the Jurisdiction’s name shall include a Governmental Immunities Endorsement, pursuant to Iowa Code Section 670.4, which endorsement shall include the following provisions:
1070, 3.07 PROOF OF INSURANCE: Add the following sentence at the end of A: “Mail Certificate of Insurance to: Engineering Department, City of Des Moines, City Hall, 400 Robert D. Ray Drive, Des Moines, Iowa 50309.”

SECTION 1080 – PROSECUTION AND PROGRESS

1080, 1.03 WORK PROGRESS AND SCHEDULE: Add the following new D:

D. No person shall operate or permit the operation of any tools or equipment in construction, drilling or demolition work or in preventive maintenance work for public service utilities between the hours of 10:00 p.m. and 7:00 a.m. without the written permission of the Engineer.

1080, 1.09 EXTENSION OF TIME, B. – Request for Extension of Time: Add the following sentence before the last sentence in the first paragraph: “The request for an extension of time is the sole and exclusive remedy of the Contractor for the events listed below.”

SECTION 1090 – MEASUREMENT AND PAYMENT

1090, 1.04 PAYMENT FOR CHANGE ORDERS, B: Add the following new 4:

4. Extra Work Performed by the Subcontractor: The percentage markup to be allowed to the Contractor for extra performed by a Subcontractor shall be a maximum of 10%.

1090, 1.05 PROGRESS PAYMENTS, B. Retainage: Delete B. in its entirety and replace with the following B.

B. Retainage: The Jurisdiction shall retain from each monthly progress payment 3% of the amount determined to be due according to the estimate of the Engineer. Early release of retained funds may be requested by the Contractor according to Iowa Code Section 573.28.

SECTION 2010 – EARTHWORK, SUBGRADE, AND SUBBASE

2010, 3.06 SUBGRADE PREPARATION, A. Uniform Composition: 1. Subgrade Compaction in Fill Sections: Add the following new c.

   c. Proof roll subgrade as specified in Section 3.06, B to locate soft or yielding areas prior to placement of top six-inch lift.

2010, 3.06 SUBGRADE PREPARATION, A. Uniform Composition: 2. Subgrade Compaction in Cut Sections: Add the following new d.

   d. Prior to scarify, mix, and re-compact the bottom six inches of subgrade (paragraph 2.b above), proof roll subgrade as specified in Section 3.06, B to locate soft or yielding areas.

2010, 3.06 SUBGRADE PREPARATION, B. Subgrade Stability: Delete 1. in its entirety and replace with the following 1.

   1. Perform proof rolling with a fully loaded single axle or tandem axle truck. Operate trucks at less than 10 mph. Make multiple passes for every lane. The subgrade will be considered to be unstable if, under the operation of the loaded truck, the surface shows yielding (soil wave in front of the loaded tires) or rutting of more than 2 inches, measured from the top to the bottom of the rut at the outside edges.
SECTION 3010 – TRENCH EXCAVATION AND BACKFILL

3010, 3.02 ROCK OR UNSTABLE SOILS IN TRENCH BOTTOM: Delete B. and replace with the following new B.
   B. The Engineer will review the contractor’s request for the need for over-excavation and trench foundation stabilization and authorize the work prior to installation of pipes and structures.

3010, 3.05 PIPE BEDDING AND BACKFILL, E. Final Trench Backfill: 3. Class I and Class II Backfill Material: Delete a. and replace with the following new a.
   a. Compact to at least 65% relative density within right-of-way or under any paved surface or within two feet thereof.

3010, 3.05 PIPE BEDDING AND BACKFILL, E. Final Trench Backfill: 4. Class III and Class IVA Backfill Material: Delete a. and replace with the following new a.
   a. Compact to at least 95% of Standard Proctor Density within right-of-way or under any paved surface or within two feet thereof.

SECTION 4010 – SANITARY SEWERS

4010, 3.06 SANITARY SEWER SERVICE STUBS, C: Add the following new 7:
   7. Mark the location of all sanitary sewer service stubs at the time of installation by a two-inch wide detectable marking tape installed at a depth of 18 inches to 24 inches below finished grade, directly over the service stub, for its entire length and brought up to the surface at the end of the service stub adjacent to the post marking the stub location. The tape shall be green in color and marked “Sanitary Sewer Service Stub Buried Below”.

4010, 3.10 SANITARY SEWER CLEANOUT: Delete in its entirety and replace with the following:
   Cleanouts are not allowed on sanitary sewer mains in the City of Des Moines. Figure 4010.203 shall apply to services only.

SECTION 4020 – STORM SEWERS

4020, 2.01 STORM SEWERS, Parts A-L: Reinforced Concrete Pipe shall be required for storm sewer construction in the Right-Of-Way or Public Easement areas. Minimum size of storm sewer pipe in the Right-Of-Way and Public Easement areas shall be 15-inch minimum diameter.

SECTION 4030 – PIPE CULVERTS

4030, 2.01 Pipe Culverts, Parts A-D: Reinforced Concrete Pipe shall be required for pipe culvert construction in the Right-Of-Way or Public Easement areas. Minimum size of pipe culverts in the Right-Of-Way and Public Easement areas shall be 15-inch minimum diameter.

SECTION 4040 – SUBDRAINS AND FOOTING DRAIN COLLECTORS

4040, 2.01 FOOTING DRAIN COLLECTORS: Use material for pipe and fittings complying with the current Adopted Edition of the Uniform Plumbing Code (UPC). In addition to the materials identified in the UPC, the pipe shall comply with ASTM D 3034, SDR 23.5 pipe will be allowed.
4040, 2.02 TYPE 1 SUBDRAINS (LONGITUDINAL SUBDRAIN), C. Corrugated Polyethylene Tubing and Fittings (Corrugated PE): Delete Type C and Type CP. Only Type S or Type SP are allowed in the City of Des Moines.

4040, 2.03 TYPE 2 SUBDRAINS (COMBINATION SUBDRAIN/FOOTING DRAIN COLLECTOR), B.3. HDPE Pipe: Delete Type CP. Only Type SP is allowed in the City of Des Moines.

4040, 2.09 FOOTING DRAIN SERVICE STUBS - Add this new 2.09 and the following note: Use material for pipe and fittings complying with the current Adopted Edition of the Uniform Plumbing Code (UPC). In addition to the materials identified in the UPC, the use of SDR 23.5 pipe will be allowed.

4040, 3.02 FOOTING DRAIN COLLECTORS, C: Add the following new 3:

3. Type B cleanouts should be used for footing drain collectors less than 5 feet in depth in the City of Des Moines. Footing drain collectors greater than 5 feet deep, a Type A cleanout shall be used.

4040, 3.03 FOOTING DRAIN SERVICE STUBS: Add the following new D and E.

D. Mark the location of all footing drain service stubs at the time of installation by a two-inch wide detectable marking tape installed at a depth of 18 inches to 24 inches below finished grade, directly over the service stub, for its entire length and brought up to the surface at the end of the service stub adjacent to the post marking the stub location. The tape shall be green in color and marked “Footing Drain Service Stub Buried Below”.

E. ABS, PVC and SDR 23.5 pipe shall be installed with a minimum bedding of 4” below and up all side with 3/8” clean smooth gravel or a bedding product approved by the Engineer.

4040, FIGURE 4040.232, SUBDRAIN CLEANOUTS: Add the following new Note 7 to Figure 4040.232.

7. Type B cleanouts should be used for footing drain collectors or combination subdrain/footing drain collectors less than 5 feet in depth in the City of Des Moines. Footing drain collectors greater than 5 feet deep, a Type A cleanout shall be used.

SECTION 4060 – CLEANING, INSPECTION, AND TESTING OF SEWERS

4060, 3.03 VIDEO INSPECTION, A. General: Delete 1. and replace with the following new 1.

1. Conduct video inspection of all new and rehabilitated sanitary sewers, storm sewers, pipe culverts, and footing drain collectors after all backfill and compaction operations are completed, but prior to paving, unless otherwise specified in the contract documents.

SECTION 6010 – STRUCTURES FOR SANITARY AND STORM SEWERS

6010, PARTS 1, 2, 3, and Figures: Delete all references in this entire section to “precast rectangular intakes”. Only circular precast intakes and manholes are allowed in the City of Des Moines. All square or rectangular shaped intakes and manholes shall be cast-in-place.

6010, 2.03, B. REINFORCEMENT: Add the following second sentence: All reinforcement for cast-in-place structures shall be epoxy coated.

6010, 2.09 MANHOLE OR INTAKE ADJUSTMENT RINGS (Grade Rings): Add the following new C.

C. Manhole adjustment rings are not required to have pre-formed or pre-drilled holes for the anchor bolts.
6010, 2.10 CASTINGS (Ring, Cover, Grate, and Extensions), D. Casting Types: 2. - Intakes: Delete b. and replace it with the following b.

b. Castings shall include design shown in this General Supplemental for lids on Type E, F, and G storm sewer castings shown for Figure 6101.602.

6010, 2.13 STEPS: Delete entire Section as manhole steps are not allowed in the City of Des Moines.

6010, 2.15 ANCHOR BOLTS AND WASHERS, B. Diameter: Delete B. and replace it with the following B.:

B. Provide bolts and washers 1/8 inch smaller than hole or slot in the casting frame but no less than 7/8 inch diameter.

6010, 3.01 GENERAL REQUIREMENTS FOR INSTALLATION OF MANHOLES AND INTAKES, J. Castings: Delete J. and replace with the following J.: Install the type of casting specified in the contract documents and adjust to proper grade. Where a manhole or intake is to be in a paved area, adjust the casting to match the slope of the finished surface. When castings with a bolt down cover (Type C or D) are specified, attach casting frame to the structure with four anchor bolts.

SECTION 7010 – PORTLAND CEMENT CONCRETE PAVEMENT

7010, 3.02 PAVEMENT CONSTRUCTION, E. Bar and Reinforcement Placement, 1. Tie Bars: Delete a. and replace it with the following a. 

a. Place bars prior to vibration. Bars shall be supported by approved chairs. Placement in position by a machine is not allowed.

7010, 3.02 PAVEMENT CONSTRUCTION, E. Bar and Reinforcement Placement: Add the following new 5:

5. PCC pavement slabs with manhole castings, with or without boxouts, shall have reinforcement similar to PV-103 around the castings.

7010, 3.02 PAVEMENT CONSTRUCTION, F. Concrete Pavement Placement: Delete 1. and replace it with the following 1.

1. Use paving machine for all full-width paving, pavement widening, and pavement reconstruction 100 feet or more in length.

7010, 3.07 CURB AND GUTTER CONSTRUCTION: Delete B. and replace it with the following B.

B. Use curb and gutter machine for all curb and gutter construction 100 feet or more in length.

7010, 3.07 QUALITY CONTROL, D. Pavement Thickness: Add the following as the first sentences under 1: Coring of pavement will not be required by the City of Des Moines if depth checks of the plastic thickness of the pavement are within one-half inch of the design thickness. If the variance exceeds one-half inch this section shall apply.

7010, FIGURE 7010.101, JOINTS: On Sheet 2 of 8 under ‘C’ Joint in Curb add the following: The entire curb shall be sealed with Joint Sealant Material.

7010, FIGURE 7010.101, JOINTS: On Sheet 3 of 8 delete Note 11 and replace with the following Note 11.

11. Sawing and sealing of the joint is required. See Detail D-2.

On Sheet 3 of 8 Joint Types KT-1, KT-2, and KT-3 shall not be used.
7010, FIGURE 7010.901, PCC PAVEMENT JOINTING: Add Note 6 with the following:

6. All new roadway pavements shall be a minimum width of 27 feet back to back with parking on one side and 33 feet with parking on two sides.

SECTION 7020 – HOT MIX ASPHALT PAVEMENT

7020, 3.01 HMA PAVEMENT, Add the following new H.:

H. The paver shall be capable of paving a minimum continuous width of twenty (20) foot wide strip without seam. Pavers in tandem will be acceptable; however, an adequate number of personnel shall be available to operate both pavers simultaneously.

7020, FIGURE 7020.901, HMA PAVEMENT: Add Note 3 with the following:

3. All new roadway pavements shall be a minimum width of 27 feet back to back with parking on one side and 33 feet with parking on two sides.

SECTION 7030 – SIDEWALKS, SHARED USE PATHS, AND DRIVEWAYS

7030, 2.07 DETECTABLE WARNINGS: Add the following sentence at the end: Only cast iron detectable warnings are allowed in the City of Des Moines.

7030, 3.04 PCC SIDEWALKS, SHARED USE PATHS, AND DRIVEWAYS, A. Form Setting: Add the following new 6:

6. The turning space for a sidewalk or shared use path shall be formed separately from the adjoining ramps and sidewalk or shared use path.

7030, 3.04 PCC SIDEWALKS, SHARED USE PATHS, AND DRIVEWAYS, B. Concrete Pavement Placement, 1. Shared Use Path: Add the following sentence at the end: “When the Portland Cement Concrete is delivered to the project on the prepared subgrade or subbase, the loads shall be limited to 5 tons for single axle vehicles or 10 tons for tandem axle or larger vehicles.”

7030, 3.04 PCC, SIDEWALKS, SHARED USE PATHS, AND DRIVEWAYS, B. Concrete Pavement Placement, 2. Sidewalk: Add the following new g:

g. The turning space for a sidewalk or shared use path shall be placed separately from the adjoining ramps and sidewalk or shared use path.

7030, 3.04 PCC SIDEWALKS, SHARED USE PATHS, AND DRIVEWAYS, F. Jointing: 4. Isolation Joints: Delete b. and replace it with the following new b.

b. For a sidewalk constructed with a driveway, install a ½” expansion joint on the property side of the sidewalk and a ½” expansion joint on the street side of the sidewalk.

7030, 3.05 HMA SHARED USE PATHS AND DRIVEWAYS: Add the following second sentence: When Hot Mix Asphalt is delivered to the project on the prepared subgrade or subbase, the loads shall be limited to 5 tons for single axle vehicles or 10 tons for tandem axle or larger vehicles.

7030, FIGURE 7030.101, CONCRETE DRIVEWAY, TYPE A: Delete the references to “E Joint” on the property side of the sidewalk and “C or E Joint” on the street side of the sidewalk, and replace with “install a ½” expansion joint on the property side of the sidewalk and a ½” expansion joint on the street side of the sidewalk.” In addition, install a ½” expansion joint in the sidewalk at the extension of both edges of the driveway. Delete 7 and replace with the following 7; “Install a ½” expansion joint at the back of curb.”
7030, FIGURE 7030.102, CONCRETE DRIVEWAY, TYPE B: Delete the references to “E Joint” on the property side of the sidewalk and “C or E Joint” on the street side of the sidewalk, and replace with “install a ½” expansion joint on the property side of the sidewalk and a ½” expansion joint on the street side of the sidewalk”. In addition, install a ½” expansion joint in the sidewalk at the extension of both edges of the driveway.

7030, FIGURE 7030.201, CLASSES OF SIDEWALKS: The detail for CLASS A SIDEWALK shall be revised to delete the “4” min.” thickness dimension of the sidewalk and replace with “5” min.”.

7030, FIGURE 7030.202, CURB DETAILS FOR CLASS A SIDEWALK: On Detail 3 delete the note “Sealed ‘E’ joint” and replace it with the following note “Sealed ‘B’ joint”. On Detail 1, 2, and 3 delete the “4 min.” thickness dimension of the sidewalk and replace with “5” min.”.

SECTION 9020 – SODDING

9020, 3.03 – SOD INSTALLATION: Delete A. and replace it with the following new A.
A. Do not install sod between the dates of June 1 and August 31, unless authorized by the Engineer.

SECTION 9040 – EROSION AND SEDIMENT CONTROL

9040, 1.03 – SUBMITTALS: Add the following sentences: The Jurisdiction will not approve the contractor’s Stormwater Pollution Prevention Plan (SWPPP) or revisions to the SWPPP; instead, the Jurisdiction will only review and comment on the SWPPP and any revisions. The contractor shall submit to the Engineer a copy of the Iowa Department of Natural Resources authorization prior to the Jurisdiction’s issuance of the Notice to Proceed for the work.

9040, 1.08 – MEASUREMENT FOR PAYMENT, A. Stormwater Pollution Prevention Plan (SWPPP): Delete A. in its entirety and replace with the following A.

A. Stormwater Pollution Prevention: Item will be paid for as a lump sum for the project based on the following formula: 30% of the bid amount after review of the SWPPP by the Engineer and filing a Notice of Intent by the contractor, an additional 20% of the bid amount when 25% of the total original contract amount is earned, an additional 20% of the bid amount when 50% of the total original contract amount is earned, an additional 20% of the bid amount when 75% of the total original contract amount is earned, and the remaining 10% of the bid amount upon filing the Notice of Discontinuation by the contractor. Item shall include the following activities and work:

1. Stormwater Pollution Prevention Plan (SWPPP) Preparation: Item includes reviewing and preparation of any modifications necessary to the general SWPPP provided by the Jurisdiction based on the Contractor’s proposed scheduling and construction methods, filing a Notice of Intent for coverage of the project under the Iowa DNR NPDES General Permit No. 2, and payment of associated NPDES permit fees. The Jurisdiction will publish the Public Notice of Storm Water Discharge and provide an affidavit of publication to the contractor.

2. Management: Item includes all work required to comply with the administrative provisions of the Iowa DNR NPDES General Permit No. 2; including record keeping, documentation, updating the SWPPP, filing the Notice of Discontinuation, etc. Item also includes weekly inspections required to satisfy the provisions of General Permit No. 2, unless otherwise stated in the contract documents.

3. Inspection: Item includes inspection of the disturbed areas, and erosion and sediment control measures performed by the contractor, at least once every seven (7) calendar days until the disturbed areas have been stabilized with a perennial vegetative cover of sufficient density to preclude erosion.
4. **Additional Erosion and Sediment Control Measures:** Item includes the cost of erosion and sediment control measures included in the contractor’s modifications to the general SWPPP provided by the Jurisdiction that are either not included as bid items on the proposal or exceed 20% of the proposal unit quantity for the measure, as well as replacement of these measures if needed. The contractor will be paid at the unit bid price for additional erosion and sediment control measures constructed that are included in the contractor’s modifications to the general SWPPP provided by the Jurisdiction when the quantity of these additional measures is less than or equal to 20% of the contract quantity for the measure.

**9040, 3.01 – SWPPP PREPARATION:** Delete in its entirety and replace with the following.

A. Review and prepare any modifications necessary to the general SWPPP provided by the Jurisdiction based on the Contractor’s proposed scheduling and construction methods. Prepare a Stormwater Pollution Prevention Plan (SWPPP) according to the requirements of the Iowa DNR NPDES General Permit No. 2.

B. Have the SWPPP prepared by an individual experienced in erosion and sediment control.

C. Ensure that controls utilized in the SWPPP conform to the type and quantity of erosion and sediment controls shown in the contract documents. See 9040, 1.08, 4 above for measurement for payment of any erosion and sediment control measure used that is not shown in the contract documents or exceeds 20% of the contract quantity for the measure.

D. Submit the completed SWPPP to the Engineer for review and comment prior to filing the Notice of Intent.

E. The Jurisdiction will publish the Public Notice of Storm Water Discharge, as required by the NPDES General Permit No. 2 and provide an affidavit of publication to the contractor.

F. File the Notice of Intent and fee, as required by the NPDES General Permit No. 2.

G. Prior to beginning grading, excavation, or clearing and grubbing operations, all erosion and sediment control measures identified in the SWPPP shall be installed or constructed.

**9040, 3.02 – SWPPP MANAGEMENT:** Delete C. in its entirety and replace with the following C.

C. Submit all SWPPP revisions to the Engineer for review and comment.

**SECTION 9080 – CONCRETE STEPS AND HANDRAIL**

**9080, 2.01 – MATERIALS, B. Reinforcing Steel:** Add the following sentence at the end: “All reinforcement shall be epoxy coated.”
LID SHALL BE USED FOR TYPE F, TYPE G, AND TYPE H APPLICATIONS AS REFERENCED BY SUDAS FIGURE 001.002.

MATERIAL: CAST IRON ASTM A-48, CLASS 358
FINISH: NO PAINT

FOR THE CITY OF DES MOINES, IOWA

STORM SEWER LID

IN OUR HANDS

LETTERED "USA" OR "MADE IN USA"

PICKHOLES

OUR WATER

RAISED LETTERS FLUSH WITH TOP SURFACE

IT IS ILS PROTECT IN OUR HANDS

RAISED LETTERS FLUSH WITH TOP SURFACE