GRAND FORKS

COUNTY HIGHWAY DEPARTMENT

BIDDERS PROPOSAL

32’ X 56’ SALT STORAGE
FABRIC BUILDING

PROPOSAL OF:

DATE OF LETTING: April 22, 2024

INIVITATION TO BID
32' X 56' SALT STORAGE FABRIC BUILDING

By the order of the Board of County Commissioners of Grand Forks County, North Dakota, I hereby give notice that sealed bids shall be received by the undersigned at the office of the County Director of Finance & Tax up until 1:00 o'clock p.m., April 22, 2024. Bids shall be publicly opened and read at 1:00 o'clock p.m. for 32' X 56' Salt Storage Fabric Building. Scope of Work: furnish and install a 32'x56' fabric building for storing salt, galvanized metal trusses to be on concrete pier foundations, interior lined with pre-cast concrete "L" bunker panels. The bids shall be considered at the May 7, 2024 regularly scheduled Commission meeting.

Bids shall be submitted on bidding blanks and in accordance with the approved bidder's instructions and specifications prepared by and available at the office of the County Highway Department, 1700 N Columbia Road, Grand Forks ND 58203

In compliance with Section 11-11-28 of the North Dakota Century Code, bids to be opened and considered must be accompanied by a bond. A bid shall be accompanied by a separate envelope containing a bidder's bond in a sum equal to five percent of the full amount of the bid, executed by the bidders as principal and by a surety company authorized to do business in the State as a guaranty that the bidder will enter into the contract if it is awarded to him, and that he will furnish the necessary bond. The bidder's bond envelope must be on the outside of the bid package. Each bid shall contain a copy of the license or certificate of renewal thereof issued by the secretary of state enclosed in the required bid bond envelope. Bidder must be licensed for the full amount of the bid. Each bid shall contain copy of the certificate of insurance.

The Board reserves the right to reject any or all bids, in whole or in part, and to waive any technicalities.

The Board reserves the right to extend the date for receiving and opening of bids for a period of not to exceed five days when unforeseeable events may warrant such extension, at the discretion of the Board.

Bids must be enclosed in a sealed envelope, with a separate envelope for the bidder's bond, both addressed to the County Director of Finance & Tax and marked on the outside what the bid is for. The County Director of Finance & Tax office is located at 151 4th Street South and there mailing address is P.O. Box 5726, Grand Forks, ND 58206.

Dated at Grand Forks, North Dakota, this 26th day of March, 2024.

Debbie Nelson
County Director of Finance & Tax
Grand Forks, North Dakota

(Published April 3, 10 & 17)

LEGAL NOTICE

GRAND FORKS COUNTY HIGHWAY DEPARTMENT

INSTRUCTION TO BIDDERS

I. Proposals are requested for the construction of 32'X56' Salt Storage Fabric Building in accordance with Plans, a n d other Contract Documents prepared by the Grand Forks County Highway Department.

A. Form: Each Proposal shall be made in a form prepared there for by the Engineer and included as one of the Contract Documents. All bids and proposals shall contain a statement showing that the bidder or contractor is dully and regularly licensed in the State of North Dakota. The number and class of the license then held by the contractor shall appear upon each bid or proposal. No contract shall be awarded to any contractor unless he is a holder of a license in the class within which the value of the project shall fall as hereinbefore provided. A contractor must be the holder of a license at least ten days prior to the date set for receiving bids to be qualified bidder. The bid shall be submitted in a sealed envelope upon which there is disclosed the following information:

1. The class of license held by the bidder;
2. The number of the bidder's license;
3. The name of the person, firm or corporation submitting the bid;
4. Date on which license was issued or renewed.
5. Certification of Insurance not less than 1,000,000.00 dollars.

A bid submitted without this information on the envelope shall not be considered and shall be returned to the bidder.

B. Modifications; Proposal shall not contain any recapitulation of the work to be done. Alternate proposals will not be considered unless called for. Oral proposals or modification will not be considered.

C. Examination of Contract Documents and Visit to Site;

Before submitting proposal, Bidder's shall carefully examine the Plans, read the Specification and the other Contract Document, shall visit the site of work, and shall fully inform themselves as to all existing conditions, and limitations, and shall include in the proposal a sum to cover the cost of items included in the Contract Documents.

D. Deliver of Proposal; Proposals shall be delivered by the time and the place stipulated in the Advertisement. It is the sole responsibility of the Bidder to see that his proposal received in proper time. Any proposal received after the scheduled closing time for receipt of proposals shall be returned to the Bidder unopened.

E. Withdrawal; Any Bidder may withdrawal his proposal, either personally or by written request, at any time prior to the scheduled closing time for receipt of proposals.

F. Opening; Proposals will be opened and publicly read aloud at the time and place set forth in the Advertisement.

G. Award or Rejection; The Contract will be awarded to the lowest and/or best qualified responsible Bidder complying with those instructions and with the Advertisement. Grand Forks County reserves the right to reject any or all proposals or to waive any informalities or technicality in any proposal in the interest of Grand Forks County. No bidder may withdraw his proposal for a period of 30 days after the date of opening thereof.

II INTERPRETATION OF DOCUMENTS; If any person contemplating submitting a proposal is in doubt as to the true meaning of a part of the Plans, Specifications or other Contract Documents, or finds discrepancies in or omissions from the Plans or Specifications, he may submit to the Engineer a written request for an interpretation or correction thereof. The person submitting the request will be responsible for its prompt delivery. Any interpretation or correction of the documents will be made only by Addendum duly issued and a copy of the Addendum will be mailed or delivered to each person receiving a set of the Contract Documents. Neither the County nor the Engineer will be responsible for any other explanation or interpretation of the Contract Documents.

III ADDENDA; Any addenda issued during the time of bidding, or forming part of the Contract Documents loaned to the Bidder for the preparation of his proposal, shall be covered in the proposal, and shall be made a part of the Contract. Receipt of each Addendum shall be acknowledged in the proposal.

IV BIDDERS INTERESTED IN MORE THAN ONE PROPOSAL; No person, firm or corporation shall be allowed to make, file or to be interested in more than one proposal for the same work, unless alternate proposals are called for. A person firm or corporation who has submitted a sub-proposal to a Bidder's, or who has quoted prices on materials to a Bidder's is not herby disqualified from submitting a sub-proposal or quoting prices to other Bidder's.

V PROPOSAL GUARANTY; Each bid must be accompanied by a bidder's bond in the amount of 5 percent of the bid, payable to Grand Forks County. All bonds shall comply with the North Dakota Century Code as amended. All such bonds will be returned to the respective unsuccessful Bidder's within ten days after the award is made, except those the County elects to hold until the successful Bidder has executed the Contract. Thereafter all remaining bonds will be returned within ten days.

GRAND FOR COUNTY HIGHWAY DEPARTMENT

CONTRACT

This agreement made and entered into by the Grand Forks County Highway Department, party of the first part,

And

_____

PARTY OF THE SECOND PART (hereinafter called Contractor), WITNESSETH:

1. That, for and in consideration of the payments hereinafter mention to be made by the party of the first part, the Contractor promised and agrees to furnish and deliver all the material and to do and perform all the work and labor required to be furnished and delivered, and to pay or cause to be paid as they become due, all claims for any work or labor performed including that performed repairing machinery and equipment, or renting any equipment and machinery or furnishing any, hand tools, or materials or insurance premiums or supplies used for machinery and equipment, all as done and performed in and about the improvement and construction of a certain portion of the public highway

known as Grand Forks County Highway Department Project No. NA

in Grand Forks County, North Dakota for 32'x56' Salt Storage Fabric Building item. In accordance with item numbers and quantities listed in the proposal and the limits of Projects as shown in the plans approved by the County Engineer of Grand Forks County Highway Dep't. March 27, 2024, in strict and entire conformity with provisions of this contract, and bond and proposal, and the plans and specifications approved by the County Engineer, copies of which are hereto attached, and which said plans and specifications and proposal and bond are hereby made a part of this agreement. As fully and to the same effect as if the same had been set forth in the body of
this agreement.

2. The party of the first part agrees and promised to pay to the Contractor for said work, when completed and accepted in accordance with the provisions of this contract, the price set forth in the said proposal, amounting approximately to

_____

_____Dollars ($_____), payment to be made as provided in said specification upon presentation of the proper certification of the County Engineer of the Grand Forks County Highway Department, or his representatives, and under to terms of this contract.

3. The said work shall be done in accordance with the terms of this agreement and the laws of the State of North Dakota under direct supervision and to the entire satisfaction of the Grand Forks County Highway Department.

4. The decision of said County Engineer upon any question connected with the execution of this agreement or any failure or delay in the prosecution of the work by the said Contractor shall be final and conclusive.

5. The Contractor shall begin construction work when so ordered by the Grand Forks County Highway Department and shall maintain at all times thereon a maximum and effective force.

6. The said work shall be completed by August 16, 2024.
7. Liquidated damages shall be $700 per calendar day.

In Witness Whereof, the parties to this contract have hereunto set their hand and seals this _____day of_____, 2024.

GRAND FORKS COUNTY STATE OF NORTH DAKOTA

_____ _____

Chairman of the Board of Grand Forks County Commissioner, Party of the First Part

Grand Forks County Auditor

Contractor_____

WITNESS TO CONTRACTOR'S SIGNATURE

By_____

_____

Title_____

Party of the Second Part

Grand Forks County

SALT STORAGE FABRIC BUILDING

SPECIFICATIONS

GENERAL SALT STORAGE SCOPE

- Nominal/minimum size 32'-wide x 56'-long, one-end open and one-end enclosed fabric building to store salt.
- Building to have a minimum interior clearance at the center from finished floor to the underside of truss of 21' tall as shown in the drawing including foundation.
- Building to be mounted on cast-in-place concrete pier foundations extending two feet above grade.
- Precast concrete "L" panel bunker, 12-feet tall, 3-sided for salt containment.
    - Precast bunkers installed independently from building foundations.
- Building contractor must provide engineered, stamped drawings for building and foundations by a professional engineer licensed in the state where the project is located.

WORK BY OTHERS

- Aggregate base under pavement and bunker panels
- Excavation and Backfill
- Bituminous paving
- Electrical
- Geotechnical Report – (included)

GENERAL CONDITIONS

- All bidders required to provide bid bond in the amount of 5% of bid (or certified check)
- All applicable state and local taxes to be included in bid amount
- Contractor to procure all required permits, (City Building Permit) – permit fees paid by owner
- Owner to obtain 3rd party testing agency to complete all required testing and special inspections
    - Contractor to coordinate schedule
- The County reserves the right to reject any or all proposals or any part thereof, and to waive any minor technicalities.

1. SCOPE:

   Furnish and install 32'x 56' fabric covered galvanized steel frame building on concrete pier foundations with pre-cast concrete bunker panels (L-panels) as indicated on the drawings and hereinafter specified. Includes bunker panels, shipping, placement, installation of strap ties and base screw anchors if required.

2. SUBMITTALS:

   The contractor shall submit shop drawings of the bunker panels to the architect/engineer and owner prior to fabrication of the panels and engineered, stamped drawings for building and foundations by a professional engineer licensed in the state where the project is located.

3. MATERIALS:

   A. Bunker panels shall be reinforced cast concrete as manufactured by Keystone Precast, Hanson Silo Co, Wieser Concrete, or approved equivalent. Units shall conform to size, layout, and jointing as detailed on the Plan sheets. Units shall be neat, straight, and precisely formed in the best possible manner. Concrete shall have a minimum compressive stress of 4,000 psi, air entraining of 5%, and a maximum allowable slump of 2 inches, and type MN 3A cement or NDDOT AE3, or as designed by.

   B. Panels shall be provided with steel reinforcing.

4. ANCHORAGE:

   Connector threaded rods, washers and bolts, etc. provide the necessary engineered anchors.

5. CURING:

   Curing of the present concrete bunker panels shall be under controlled moisture conditions for a minimum of seven days or the compression strength reaches 3,000 psi.

6. ADMIXTURES:

   A. Provide corrosion inhibitor concrete panel mix. Corrosion inhibitor shall be "WR Grace DCI corrosion inhibitor ASTM C494 Type C" or approved equivalent.

   B. Corrosion inhibitor admixture shall be mixed at a ratio which is compliant with manufacturer's instructions.

7. PREPARATION:

   A. The contractor shall coordinate delivery and erection of precast bunker panels, provide clear site, provide and maintain access to roads to allow crane and trucks to reach work areas under their own power.

   B. Care shall be taken to protect the work and material of other trades during installation of the bunker panels.

8. INSTALLATIONS:

A. Precast bunker panels shall be installed according to drawings and details by workmen experienced in bunker panel erection.

B. Units shall be erected tight and at right angles to bearing surfaces unless shown otherwise. Align and level precast concrete slabs using granular fill.

C. Caulking or Sealing between joints shall be at manufacturer's recommendations.

D. After erection and caulking is complete the general contractor shall be responsible for the protection of the bunker panels until the project is accepted as completed by the Owner.

CAST-IN-PLACE CONCRETE

1. SCOPE:

A. Furnish and install 2' high above grade cast-in-place concrete piers, including formwork, reinforcement, concrete materials, and all related items necessary and incidental to placing of all cast-in-place concrete work.

B. Furnish and install hot dipped galvanized column anchor bolts.

1.1 SUBMITTALS:

A. Submit design mixtures: For each concrete mixture.

B. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement.

2.0 FORM-FACING MATERIALS

A. Concrete not exposed to view may be formed with wood, steel or fiberglass forms. Forming of exposed concrete shall be done with particular care in order to provide the finish concrete work. Forms shall be thoroughly wet down before pouring.

B. Form Releasing Agent: Provide colorless non-staining oil which shall not impair bonding or interfere with adhesion of applied finishes.

2.1 STEEL REINFORCEMENT

A. All steel for reinforcement shall be new stock free of rust, free from mill scale and delivered without rust other than what may have occurred in prompt transportation to the job site.

B. Reinforcing bars shall be deformed bars.

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

1. Supports for reinforcing bars in footings and slabs on grade shall be of sufficient strength to adequately support the bars,
2. Bars in footings shall be supported on precast concrete blocks or chairs.
3. Tie wire shall be No. 16 American wire gauge or heavier, black annealed.

2.2 CONCRETE MATERIALS

A. Cement –Portland Cement. Use cementitious materials, of the same type, brand and source throughout project.

1. Acceptable Substitutions:
    a. Fly Ash, ASTM C 618, Class F or C
    b. Pozzolan
    c. Silica Fume

B. Aggregates for concrete –Maximum nominal size shall be as follows:

1. Footings – 1-1/2"
2. All other concrete – 3/4"

C. Water – Clear and free from deleterious amounts of acids, alkali's or organic material.

2.4 ADMIXTURES

A. Air-Entraining Admixture Acceptable Manufacturers:
1. Darex
2. Protex
3. Sika
4. GRT

B. Other Admixtures may be used only with the prior approval of Structural Engineer of Record.

2.5 CONCRETE MIX DESIGN

A. Concrete mix design specified by Engineer of Record, minimum properties for concrete mix design follow.

B. F'c denotes Minimum Compressive Strength at 28 days.

C. The Mix Design for cast in place concrete shall be as listed below:

1. Cementitious Materials: Limit percentage, by weight, of Cementitious materials other than Portland cement in concrete as follows:
2. Fly Ash: 15 percent
3. Combined Fly Ash and Pozzolan: 20 percent
4. Silica Fume: 10 percent
5. Combined Fly Ash, Pozzolans and Silica Fume: 20 percent with fly ash or pozzolans not exceeding 15 percent, and silica fume not exceeding 10 percent.

D. Footings F'c = 3000 psi @ 28 days
1. Maximum aggregate: 1½"
2. Maximum Water-Cementitious Material Ratio: 0.55

E. Piers, curbs, precast toe extensions: F'c = 4000 psi @ 28 days
3. Maximum aggregate: 3/4"
4. Maximum Water-Cementitious Material Ratio: 0.45
5. Air entrained (6% +/- 1.5% for 3/4" maximum aggregate size)

F. Structural Concrete F'c = 4000 psi @ 28 days
1. Maximum aggregate: 3/4"
2. Maximum Water-Cementitious Material Ratio: 0.45
3. Air entrained (6% +/- 1.5% for 3/4" maximum aggregate size)
   a. 7% +/- 1/5% for 1/2" maximum aggregate size
   b. 7.5% +/- 1.5% for 3/8" maximum aggregate size

3.0 STEEL REINFORCEMENT

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

B. Store reinforcement up on timbers out of mud or dirt. Avoid excessive rusting or coating with grease, oil, dirt, or other materials that may reduce bond to concrete.

C. Reinforcement shall be accurately placed in accordance with shop drawings and securely tied at intersections with 16 gauge black annealed wire, and shall be maintained in proper position by chairs, bar supports, or other approved devices.
1. Reinforcing shall not be supported by wire tied to the formwork.

D. Clear distance between bars shall be not less than 1-1/2", 1.5 times bar diameter, nor less than 1.5 times the maximum size of coarse aggregate.

E. Concrete protection of reinforcing shall be not less than the following:
1. 3" where concrete is poured against soils.
2. 3" where concrete is poured against forms but may be in contact with soils.
3. 3" minimum in exterior face of exterior walls (exposed to weather but not in contact with soils).
4. 3" clear to stirrups in concrete piers exposed to earth or weather.

F. Bars shall lap 48 diameters at splices unless otherwise indicated.
1. Splices in adjoining horizontal bars shall be staggered wherever possible.
2. Horizontal bars shall be hooked around corners not less than 32 diameters, with a minimum of 20" as per typical details.

3.1 MIXING OF CONCRETE

A. The Concrete shall be mixed until there is a uniform distribution of materials and the mixture is uniform in composition and consistency. Each batch shall be completely discharged before the mixer is recharged.

3.2 Not Used

3.3 CONCRETE PLACEMENT

A. When concreting is once started, it shall be carried on as a continuous operation until the placing of the panel, pier or section is complete. The concreting shall be carried on at such a rate that the concrete is at all times plastic and flows readily into the forms and around the reinforcing.

1. If a section cannot be placed continuously, provide construction joints as indicated.

B. Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent separation or loss of material.

1. Equipment for chuting, pumping and pneumatically conveying concrete shall be of such size and design as to insure a practically continuous flow of concrete at the delivery end without separation of materials.
2. Concrete shall be deposited as neatly as practicable in its final position to avoid segregation due to re-handling.
    a. Limit free-fall distance to 4 ft. Use hoppers, trunks or drop chutes as needed to meet maximum free-fall requirement.
3. No concrete that is partially hardened or been contaminated by foreign material shall be deposited in the work.

C. All concrete shall be thoroughly compacted by suitable means during the operation of placing, and shall be thoroughly worked around reinforcement and embedded fixtures and into the corners of the forms,

1. The concrete shall be compacted by mechanical vibration. Use sufficient number of vibrators to properly consolidate concrete within twenty minutes after depositing concrete in forms.
2. Do not vibrate forms or reinforcement. Avoid applying vibrating element to reinforcement extending into hardened or partially hardened concrete.
3. The top surface shall be level or as indicated on drawings.

3.4 REMOVAL OF FORMS

A. Forms for Footings - may be removed after 18 hours from completion of pour, provided the concrete is sufficiently hard.

B. Forms shall be removed in such a manner as to insure the complete safety of the structure.

C. Forms for concrete piers shall be left in place for at least 48 hours after completion of pour.

3.6 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports as required by Local Building Code and IBC Chapter 17.

TRUSS ARCH FABRIC COVERED STEEL FRAME BUILDING

1. PART 1

1.1 INTENT OF SPECIFICATION

1.1.1 This specification covers the design, manufacture, shipping, handling and erection of a prefabricated membrane covered structure.

1.1.2 The specification as heretofore set forth is general in nature and scope and shall not be construed as to limit the work other than the requirement that the building shall match or exceed the specifications in materials, appearance, configuration and details.

1.1.3 It is the intent of this specification that the bidder shall include all labor, materials, equipment services and transportation to locate the building on the site designated with all other work.

1.1.4 Buildings shall be complete and operating and shall include all exterior and interior materials and systems as shown or indicated in contract documents.

1.1.5 All workmen shall be skilled and qualified for the work they perform. All material used, unless otherwise specified, shall be new and of the types and grades specified. The contractor shall certify that no asbestos containing materials that exceed Federal mandated safe asbestos levels have been used in the construction of the membrane covered structure.

1.1.6 Work shall be performed as necessary and required for the construction of the project as indicated. Such work includes the supply and installation of a membrane-covered structure complete with exterior and interior finishes. The building shall be as dimensioned with all features and quantities as per specification.

1.2 APPROVAL OF PLANS

1.2.1 Upon award of this contract, the contractor shall furnish detailed drawings for all structural work stamped by an engineer certified by the state of where the project is located to verify compliance to local building code.

1.2.2 All work to be performed under the conditions of this specification shall comply with the rules and regulations of all agencies having jurisdiction for this classification of construction and design and shall conform to the applicable live loads due to wind, rain and snow.

1.2.3 Manufacturer 's Qualification: The fabricator of the building or building components shall be regularly engaged in the fabrication of this type of building. They must meet the requirements of this Section and shall show evidence of having an adequate manufacturing facility, equipment, and a quality control system. A reference list of 5 equivalent salt buildings shall be provided upon request. The fabricator shall be subject to the County's approval.

1.2.4 Fabric Warranty: All membranes used are to be water and mildew resistant, insect proof, and UV stabilized. They are to withstand extreme climatic variations and contain ultra-violet inhibitors to reduce degradation by the sun's rays. Manufacturer is to provide a minimum 20-year pro-rata warranty on fabric according to the standard manufacturer's warranty.

1.2.5 Steel Truss Warranty: Truss Framework tubing must be Hot Dip Galvanized inside and out of tubing. The manufacturer is to provide a minimum 20-year pro-rata warranty on the trusses according to the standard manufacturer's warranty.

1.2.6 Building Erectors: The building erector shall be regularly engaged in the erection of fabric *covered* buildings, meeting the requirements of this Section. The erectors must provide evidence that they have constructed a minimum of 5 such structures in a US Municipal contract setting in the past 24 months before acceptance of this contract – provide references and contact information for these structures. The erectors shall be subject to the approval of the County.

1.3 WORKMANSHIP

1.3.1 The workmanship of all materials and components of the structure shall be commensurate with the functional requirements of the item.

1.3.2 Building manufacturer shall fabricate such structure under factory conditions in a plant specifically arranged for this type of work. Fabricator 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.

1.3.3 Welding: Truss fabricator must be an approved welding fabricator to standards listed herein.

1.3.4 On site welding: If welding is required on site, no welding shall commence until the AWS welding inspector has inspected and approved the materials, joint preparation, equipment and qualifications of the welders in accordance with the standards herein.

1.4 DIMENSIONS

1.4.1 The structure shall be arched shaped in profile

1.4.2 The structure shall occupy an area of at nominally 32 feet in width and 56 feet in length, +/- 1-foot.

1.4.3 The structure shall provide for a minimum interior clearance of 21’ from finished floor to underside of truss system in center of building for unobstructed loading and unloading of material into the bunker as shown in the drawing.

1.4.4 Structure shall have one end enclosed (north end)

1.4.4.1 Front endwall to be open (south end)

1.4.5 Bunkers shall be 3-sided, constructed of precast sectional concrete bunker panels, “L”-shaped, 12’ tall with corrosion inhibitor (subject to approval by director).

1.4.6 Britespan Atlas 32’ 18.1 or approved equal.

1.5 SCOPE OF WORK

1.5.1 Provide design and construction for a permanent rectangular shape tension membrane covered truss type building. The structure shall meet or exceed the performance criteria of this specification.

a. Building shall be mounted on contractor supplied, cast-in-place concrete pier foundation:
    i. Piers shall be 2 feet above grade
b. Truss spacing shall be a maximum 14 feet on center
    i. All excavation and backfill shall be performed by the owner
c. One endwall (north wall)
d. Fabric terminated approximately 12” above the top of the concrete foundation.
e. Fabric color shall be white.
f. Precast concrete bunker walls set interior to the building, separate from the foundation.
    i. 12-feet tall “L”- style walls per the floor plan drawing
    ii. Exact distance between panel walls TBD once final profile has identified with apparent low bidder
    iii. Salt Inhibitor application to be approved by County prior to execution of contract
g. The interior of the structure below the main trusses shall be clear span free of any structural support members.
h. No exterior purlins, guy ropes or cables shall be used for anchoring the structure.

1.5.2 Building design and foundation design to be stamped by an engineer certified by the state where the project is located to verify compliance to local building code and installed by contractor.

1.5.3 Delivery of all materials to site by contractor

1.5.4 All lifts and equipment for installation of all items by contractor

1.5.5 Complete Structure & Accessory installation by contractor

PART 2

2.1 GENERAL DESIGN REQUIREMENTS

2.1.1 SCOPE

1. The membrane shall be tensioned over the framework. The structure shall be rectangular in shape with one endwall open. The interior of the structure 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.

2.1.2 DESIGN REQUIREMENTS – STRUCTURAL FRAME

1. Structure shall be engineered so it is capable of withstanding the loads specified in ASCE 7-16, and the IBC 2021 code year edition without failure or damage. Design must incorporate both balanced and unbalanced loads. Additional rain on snow surcharge loading must also be added to gable shaped (non-arch) buildings per ASCE 7-16.
2. The main structure shall consist of a welded truss arches comprised of parallel tubes separated apart by tubular webs. The truss cords must be made from round tubular steel with a continuous round tubular web separating the inner and outer chords. Exact chord and tubular web diameter and gauge to be called out by the manufactures engineering requirements.

3. Structure must be capable of maintaining structural integrity in the event of a tear propagating in the fabric, without endangering occupants.

4. Truss framework tubing shall be Hot Dipped Galvanized as per Building Product requirements stated herein. The Hot Dip Galvanizing must meet ASTM 123-12 as per the building code. Acceptable products:

    a. Hot Dip Galvanized Product, galvanized inside and out.
    b. Aluminum coated

5. All purlins used in the building must be attached directly to the welding dog bone or kingpin of the truss on each end. Saddle brackets are not suitable attachment as they allow rotational movement to occur. Cross “X” purlins will not be accepted as they tend to hold snow due to how they mount to the truss at the top chord. Purlins are required to be Hot Dip Galvanized, post manufacturing – no exceptions.

6. Building must utilize cross cables in each end bay to prevent racking. Cables must be galvanized and must be secured to structural welded truss member using a solid bolted or clevis connection and they must be adjustable for proper tensioning with a galvanized, lockable turnbuckle. Cable assemblies attached with open hooks or loops will not be allowed. Cables are to be assembled using a press swedged connection, clamps will not be allowed as they can slide. Cables must terminate at every bay to prevent the removal of galvanizing at wear points causing rust.

7. All tie down pipe that is used to fasten the cover to the building must be secured by a lashing winch at every truss located on the outside of the structure. This ensures the attachment hardware will not be exposed to the corrosive salt material diminishing the useful life of the hardware. Ratchet strap attachment to the tie down pipe will not be accepted as a main cover tensioning system. Tension pipe used for the main cover shall be oval or rectangular and installed in a vertical manner to minimize deflection when bay spacing exceeds 12’ on center.

8. All bearing plates and other structural members must be hot dipped galvanized.

9. All anchor bolts, bolts and washers etc., shall be Hot Dip Galvanized.

2.1.3 ENGINEERING DESIGN CRITERIA – (Minimum, or per latest code, whichever is greater)

1. IBC 2015	ASCE 7 – 16
2. SNOW LOAD	60 PSF ground snow load
3. COLLATERAL LOAD	0.25 pounds per square foot projected over entire roof
4. WIND LOAD	102 V-ult
5. Exposure	C
6. OCCUPANCY CATEGORY	CAT I – Low Human Occupancy
7. RAINFALL	4" per hour, for at least 2 hours
8. USE GROUP	S-2
9. CONSTRUCTION TYPE	II-B
10. FLAMMABILITY	ASTM E84
11. WIND IMPORTANCE FACTOR	1.0
12. SNOW IMPORTANCE FACTOR	0.8
13. SEISMIC DESIGN CATEGORY	B

D=Dead Load + Collateral Load
S=Symmetrical Snow or Live Load (Balanced or Unbalanced)
Ws = Wind Internal Suction
Wp = Wind With Internal Pressure
E = Earthquake

2.1.4 Structure shall be capable of being assembled, operated and dismantled in all ambient temperatures between -20F and 120F

2.2 MATERIALS

2.2.1 Membrane Performance Minimum Standards

Coated Weight	12 oz/yd (407 gsm)+/-5%
Coating Thickness	4 mils average, each side +/-2%
Finished Thickness	23 mils (ASTM D1777)
Grab Tensile Strength, lbs	345 lbs Weft (ASTM -D5304)
	370 lbs Warp (ASTM -D5035)
Tongue Tear Strength, lbs	100 lbs Weft (ASTM -D2261)
	110 lbs Warp (ASTM -D2261)
Mullen Burst	650 psi (4428 kPa)
Cold Crack Resistance	-55ºC (ASTM –D2136)
Resistance to UV & Weathering	90% retention after 2000 hr.
Low Temperature Bend	-60 Degrees Celsius ASTM D2136
FR Performance	ASTM E84

2.2.2 The stressed membrane structure must be designed to shed snow before the design load is exceeded, or alternatively provide structural capacity to meet or exceed required roof snow load requirements of specified site. The architectural membrane shall be continuous from the base of the structure to the peak and manufactured in such a way that no eave will exist.

A. To reduce premature wear points, at no time may the fabric come in contact with the steel truss arch.

2.2.3 Membrane used in the building design shall be designed to withstand the corrosive UV light according to the manufacturer warranty.

2.2.4 Base tensioning system: The membrane cladding shall be provided with a mechanical tensioning system that allows the membrane to be fully tensioned around the structure perimeter each panel. The system will be designed such that the membrane can be tightly and neatly secured over the structural frame and that the system has a remaining range of adjustment.

2.6 Converting raw fabric to finished membrane cover; To ensure quality control:

A. Conversion plant/personnel must be CSA S367 Certified.
B. Fabric welding and construction of fabric covers shall be completed in a dedicated production plant, with full environmental controls via HVAC system throughout the plant.
C. Fabric conversion systems will include "inline vision systems" for 100% testing of weld parameters, continuously monitoring weld temperatures throughout the entire process. "Spot checking" will not be acceptable practice.
D. Testing of raw fabric and new welds shall be completed to ensure quality assurance.

2.3 METAL SPECIFICATIONS

2.3.1 All steel tubing used in the structure must have the following minimum structural and mechanical properties (ASTM A-500):

2.3.2 All steel flat bar, truss components shall be fabricated and hot dipped galvanized to ASTM A123-12 meeting ASTM Standard B6 zinc coatings.

PART 3

3.1 REFERENCES AND STANDARDS

3.1.1 Except where more stringent requirements are specified, comply with the applicable requirements of the following organizations and standards, for products, materials, and construction methods:

- American Institute of Steel Construction (AISC)
- American Iron and Steel Institute (AISI)
- American Society of Civil Engineers (ASCE 7-10 Minimum Design Loads for Buildings and Other Structures)
- American Welding Society (AWS)

3.1.2 The following publications are for the standards listed below but referred to thereafter by basic letter designation only. They form a part of this specification to the extent referenced thereto: American Institute of Steel Construction (AISC):

A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers; 2011.
B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.
C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2012.
E. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2010.
F. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2013.
G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010a.
H. NFPA 701 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a.
I. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010 or CWB Canadian Welding Bureau.
J. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; National Fire Protection Association; 2010.

K. SSPC-SP 6 - Commercial Blast Cleaning; Society for Protective Coatings; 2007.
L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).
M. SSPC-Paint 22 - Epoxy-Polyamide Paints (Primer, Intermediate, and Topcoat); Society for Protective Coatings; 1982 (Ed.2004).

3.1.3 PAINTING OR COLD GALVINIZING: Painting or cold galvanizing of steel components shall only be utilized if necessary for field repairs and shall not be employed as a factory finish. Should field repair be necessary, a zinc rich field coat shall be used.

3.1.4 FIELD WELDING: In-Field fabric welding is accepted as a standard method of joining panels, rounding corners, repairing minor cuts or abrasions**.**

3.1.5 COLORS: As selected by the Director's Representative from standard Manufacturer's Color charts

3.1.6 ADJUSTING: Repair cut, welded, and/or abraded galvanized surfaces with a minimum 2 mil thick coating of cold galvanizing compound (containing 93 percent zinc) applied in accordance with manufacturer's instructions.

3.1.7 APPROVED MANUFACTURERS:

1. The following manufacturers are preapproved and meets or exceeds this Specification.

Britespan Building Systems Inc.
688 Josephine Street North, RR#1
Wingham, Ontario N0G 2W0
Phone No. 1-800–407–5846

Rubb USA
1 Rubb Lane
Sanford, ME 04073
Phone No. 1-207-324-2877

Big Top Manufacturing
3255 US-19
Perry, FL 32347
Phone No. 1-850-584-7786

1. Equal manufacturer must be approved by the County prior to bidding.

END OF SECTION

BID FORM

SALT SHED STORAGE BUILDING LUM SUM TOTAL $_____

Addendums Acknowledged:_____

Enclosed herewith find (certified check) (bidder's bond) in the amount of _____

_____Dollars ($_____)

Being at least 5% of the amount of the proposal, made payable to the Grand Forks County as a proposal guarantee which is agreed by the undersigned will be forfeited in the event the Form of Contract and Bond is not executed, if awarded to the undersigned.

This proposal dated the _____day of_____, 2024____

Signed:_____as an individual

Name:_____Address:_____

_____

or

Signed:_____for_____a partnership

Name:_____Address:_____

_____

Name:_____Address:_____

_____

or

Signed:_____for_____a corporation,

incorporated under the laws of the State of_____

Name of President:_____

Business Address:_____

AWARD OF CONTRACT/PROJECT SCHEDULE

AWARD OF CONTRACT

Award to the lowest responsive, responsible or bidder meeting specifications. No bidder may withdraw the bid within thirty (30) days after the scheduled closing time and date for receipt of bids. The County reserves the right to reject any or all bids and to waive informalities and award to the best interest of Grand Forks County

Bids received until April 22nd 2024, 1:00 pm, addressed to Grand Forks County, Attn "Salt Storage Bid".

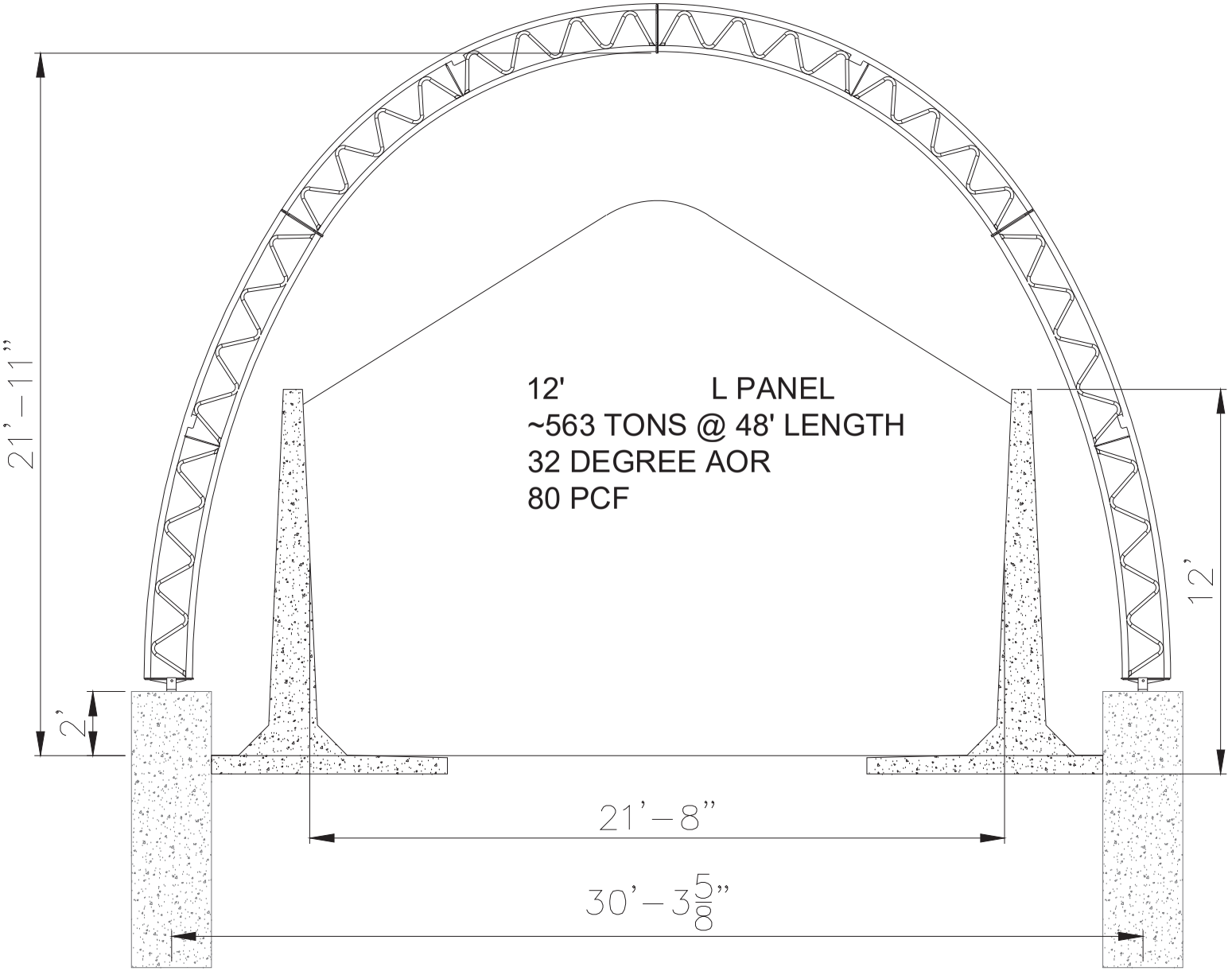
PROJECT SCHEDULE

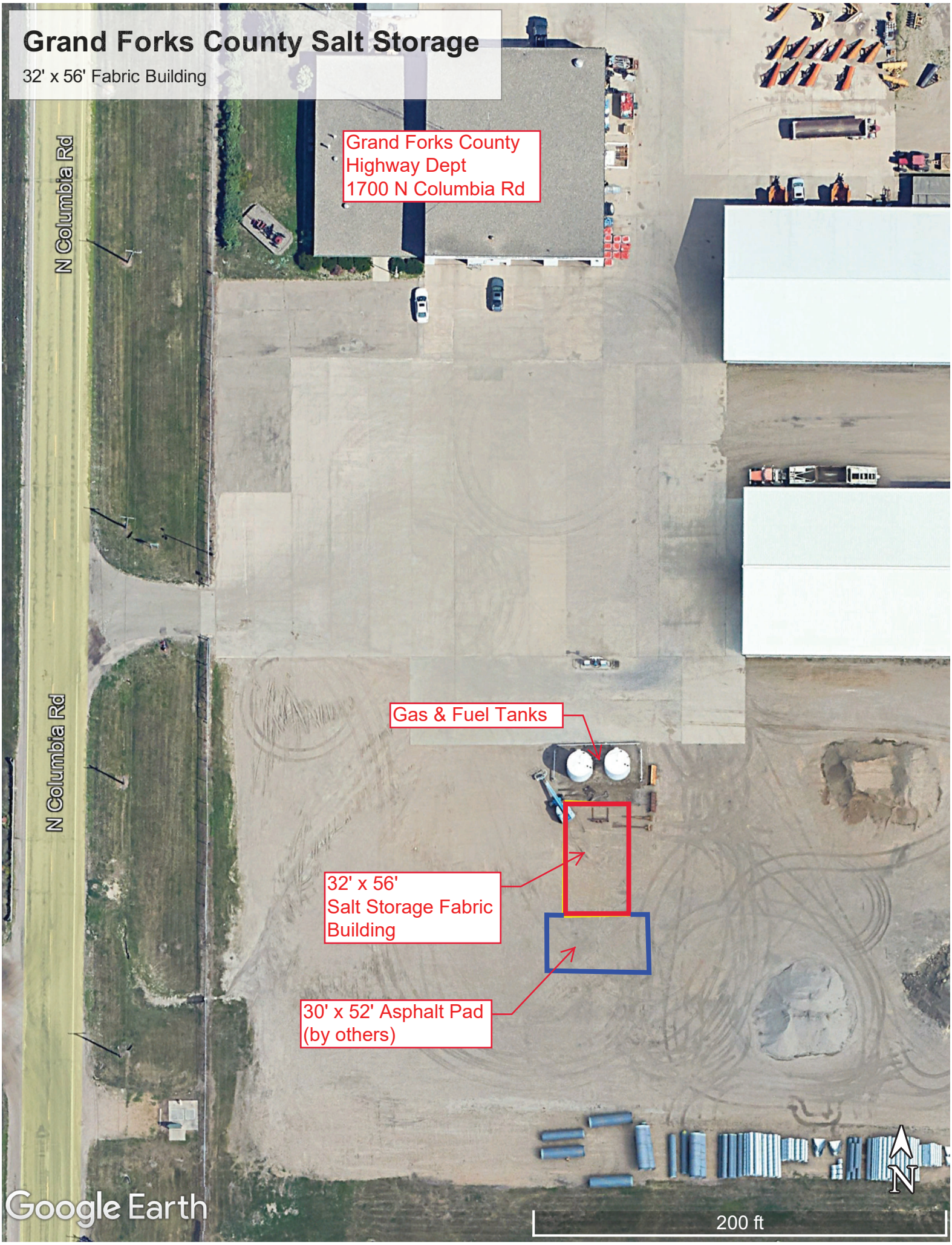
Once the contractor is notified of bid award results and received "written notice to proceed" and work has begun it shall be completed without delay in its entirety.

Completion of all work shall be on or before August 16, 2024.

Example of Similar Salt Storage Building

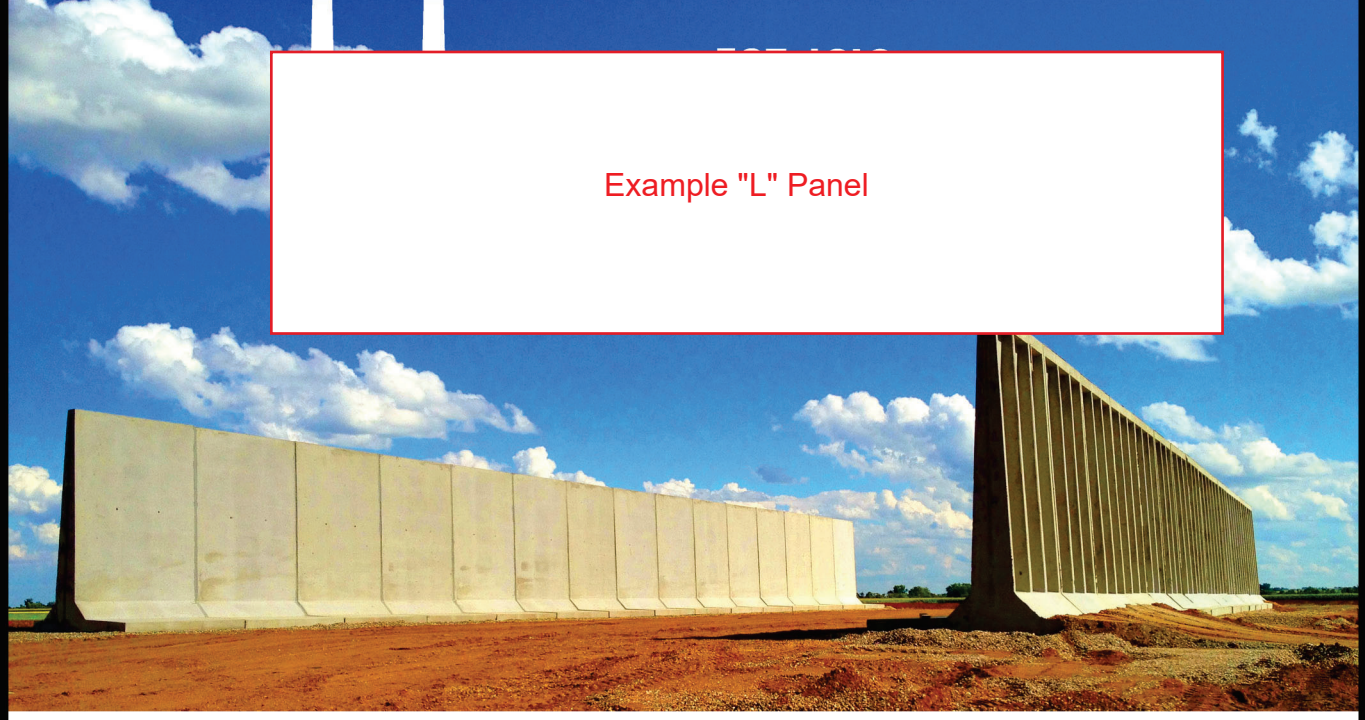
Example Typical Section View



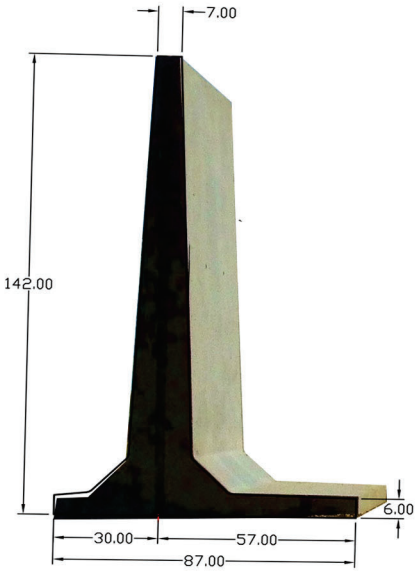

Grand Forks County Salt Storage
32' x 56' Fabric Building
Grand Forks County
Highway Dept
1700 N Columbia Rd
N Columbia Rd
N Columbia Rd
Gas & Fuel Tanks
32' x 56'
Salt Storage Fabric
Building
30' x 52' Asphalt Pad
(by others)
N
200 ft
Google Earth

www.hansonsilo.com

1-800-THE-SILO



Example "L" Panel



12'L
9600 LBS.
12' TALL
8' LONG
7' WIDE

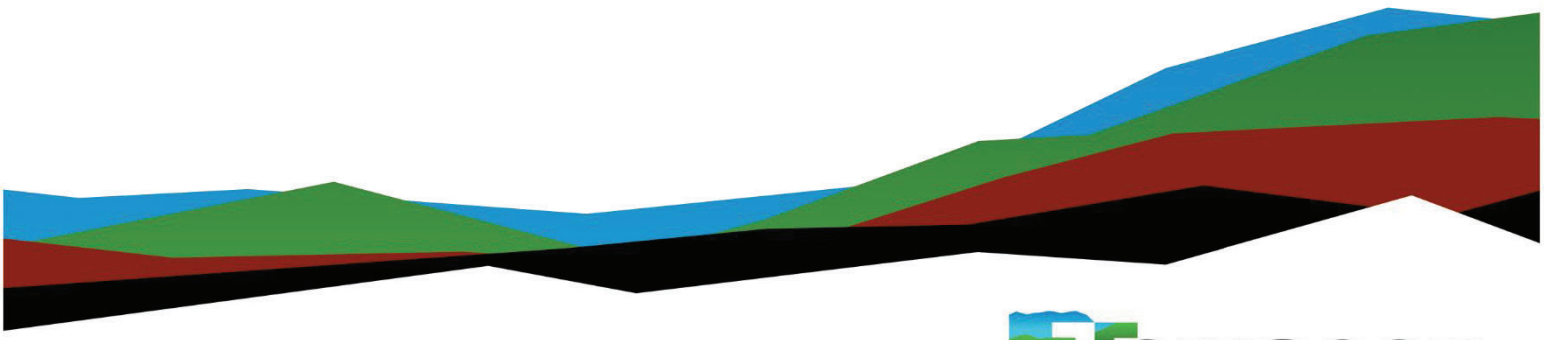
Proposed Salt Storage Building

Geotechnical Engineering Report

March 19, 2024 | Terracon Project No. M5245002

Prepared for:

Grand Forks County Highway Department
1700 North Columbia Road
Grand Forks, North Dakota 58201



Terracon
Explore with us

Nationwide
Terracon.com

- Facilities
- Environmental
- Geotechnical
- Materials

1555 N 42nd Street – Unit B
Grand Forks, ND 58203
P (701) 772-2832
Terracon.com

March 19, 2024

Grand Forks County Highway Department
1700 North Columbia Road
Grand Forks, North Dakota 58201

Attn: Nick West, P.E.
P: (701) 780-8248
E: Nick.West@gfcounty.org

Re: Geotechnical Engineering Report
Proposed Salt Storage Building
1700 North Columbia Road
Grand Forks, North Dakota
Terracon Project No. M5245002

Dear Mr. West:

We have completed the scope of Geotechnical Engineering services for the above referenced project in general accordance with Terracon Proposal No. PM5245002 dated January 25, 2024. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and floor areas 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

Mike Tuel, EIT
Senior Staff Engineer

William R. Olson, P.E.
Geotechnical Department Manager

Table of Contents

Figures

Attachments

Note: This report was originally delivered in a web-based format. **Blue 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 Terracon logo will bring you back to this page. For more interactive features, please view your project online at **client.terracon.com**.

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 at 1700 North Columbia Road in Grand Forks, North Dakota. The purpose of these services was to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Seismic site classification per IBC
- Site preparation and earthwork
- Foundation design and construction
- Bituminous paved floor considerations
- Frost considerations

The geotechnical engineering Scope of Services for this project included the advancement of test borings, laboratory testing, engineering analysis, and preparation of this report.

Drawings showing the site and boring locations are shown on the **Site Location** and **Exploration Plan**, respectively. The results of the laboratory testing performed on soil samples obtained from the site during our field exploration are included on the boring logs in the **Exploration and Laboratory Results** section.

Project Description

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	An email request for proposal was provided by Mr. West on January 11, 2024. Supplemental information including an architectural drawing of the proposed building was provided by email on January 16, 2024.
Project Description	The project includes construction of a salt storage building and will be supported on shallow drilled piers.
Building Construction	The building will have concrete bunker walls that will be approximately 8 feet in height with a fabric roof and a bituminous paved floor. Exact building dimensions were not provided; for our analysis we anticipate the building will be 48 feet by 75 feet in plan dimension with a peak height of 23 feet.

Item	Description
Finished Floor Elevation	Not provided; for our analysis we assume the floor will be no more than 2 feet above the existing grade.
Maximum Loads	Not provided; based our experience with similar projects, we used the following loads in our analysis. Floors: ■ 640 to 1840 pounds per square foot (psf) Piers: ■ 50 kips vertical ■ 20 kips uplift ■ 20 kips lateral
Grading/Slopes	Cuts/fills of 2 feet or less. We anticipate final slope angles of as steep as 3H:1V (Horizontal: Vertical) are expected.
Below-Grade Structures	None

Terracon should be notified if any of the above information is inconsistent with the planned construction, as modifications to our recommendations may be necessary.

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.

Item	Description
Parcel Information	The project is located at 1700 North Columbia Road in Grand Forks, North Dakota. Latitude/Longitude (approximate) 47.9352° N, 97.0654° W See **Site Location**.
Current Ground Cover	Gravel surfaced lot
Existing Topography	Relatively flat

Geotechnical Characterization

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of the site. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration and Laboratory Results** and the GeoModel can be found in the **Figures** attachment of this report.

As part of our analyses, 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.

Model Layer	Layer Name	General Description
1	**Existing Fill**	Clayey sand - trace gravel, dark brown
2	**Lean Clay**	Lean Clay (CL) – grayish brown, soft to stiff consistency
3	**Fat Clay**	Fat Clay (CH) – gray, grayish brown, or dark grayish brown, occasional silt lenses, medium stiff to stiff consistency

The borings were advanced using an air rotary drilling technique that allows short-term groundwater observations to be made while drilling. Groundwater was encountered within Boring B-1 at a depth of 23 feet below grade. Due to the low permeability of the soils encountered in the borings, a relatively long period of time would be needed for a groundwater level to develop and stabilize in a borehole in these materials. Based on the moisture conditions of the samples and our experience in the area, we estimate groundwater would be encountered within 8 to 12 feet of the ground surface. Groundwater conditions may be different at the time of construction. Groundwater conditions may change because of seasonal variations in rainfall, runoff, and other conditions not apparent at the time of drilling. Long-term groundwater monitoring was outside the scope of services for this project.

Seismic Site Class

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC). Based on the soil properties observed at the site and as described on the exploration logs and results, our professional opinion is for that a **Seismic Site Classification of D** be considered for the project. Subsurface explorations at this site were extended to a maximum depth of 25 feet. The site

properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depth.

Geotechnical Overview

The site appears suitable for the proposed construction based upon geotechnical conditions encountered in the test borings, provided that the recommendations in this report are implemented in the design and construction phases of this project. The primary areas of geotechnical concern include:

- **Settlement**. Based on the anticipated floor loads stated in the **Project Description,** the bituminous paved floor area should be expected to settle several inches below the center of the salt pile and about 1 to 2 inches around the perimeter. Settlement of drilled pier foundations caused by the floor loads should be expected to be on the order of 1 to 2 inches.

- **Frost-susceptible soils.** The on-site clays are considered frost-susceptible and can affect the performance of pavements. Recommendations to reduce the effects of frost heave are discussed in the **Frost Considerations** section of this report.

- **Site Grading.** The near surface clayey soils could become unstable with typical earthwork and construction traffic, especially after precipitation events. The effective drainage should be completed early in the construction sequence and maintained after construction to avoid potential issues. If possible, the grading should be performed during the warmer and drier times of the year. If grading is performed during the winter months, an increased risk for possible undercutting and replacement of unstable subgrade will persist. Additional site preparation recommendations, including subgrade improvement and fill placement, are provided in the **Earthwork** section.

The recommendations contained in this report are based upon the results of field and laboratory testing (presented in the **Exploration and Laboratory Results**), engineering analyses, and our current understanding of the proposed project. The **General Comments** section provides an understanding of the report limitations.

Earthwork

Earthwork is anticipated to include excavations and engineered fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria, as necessary, to render the site in the state considered in our geotechnical engineering evaluation for foundations, and pavements.

Subgrade Preparation

As noted in **Geotechnical Characterization**, the borings encountered previously placed fill to depths ranging from about 6 inches to 1.5 feet. Support of the bituminous paved floor on or above existing fill soils is discussed in this report. However, even with the recommended construction procedures, inherent risk exists 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.

If the owner elects to construct pavements on the existing fill, the following protocol should be followed. Once the planned subgrade elevation has been reached, the entire pavement area should be surface compacted with a large vibratory roller and proofrolled. Proofrolling should be accomplished with an adequately loaded vehicle such as a fully-loaded tandem-axle dump truck. The proofrolling should be performed under the observation of the Geotechnical Engineer or representative. Areas excessively deflecting under the proofroll should be delineated and subsequently addressed by the Geotechnical Engineer. Areas of soft or otherwise unsuitable material should be undercut and replaced with either new structural fill or suitable, existing on-site materials.

All exposed areas which will receive fill, once properly cleared and benched where necessary, should be scarified to a minimum depth of 10 inches, moisture conditioned as necessary, and compacted per the compaction requirements in this report. Compacted structural fill soils should then be placed to the proposed design grade and the moisture content and compaction of subgrade soils should be maintained until foundation or pavement construction.

Based upon the subsurface conditions determined from the geotechnical exploration, subgrade soils exposed during construction are anticipated to be relatively workable; however, the workability of the subgrade may be affected by precipitation, repetitive construction traffic or other factors. If unworkable conditions develop, workability may be improved by scarifying and drying.

Fill Material Types

Fill required to achieve design grade should be classified as structural fill and general fill. Structural fill is material used below, or within 10 feet of structures and pavements. General fill is material used to achieve grade outside of these areas.

Reuse of On-Site Soil: Excavated on-site soil may be selectively reused as fill below the proposed structure. The on-site soils will be sensitive to moisture conditions (particularly during seasonally wet periods) and may not be suitable for reuse when above optimum moisture content.

Material property requirements for on-site soil for use as general fill and structural fill are noted in the table below:

Property	General Fill	Structural Fill
Composition	Free of deleterious material	Free of deleterious material
Maximum particle size	6 inches (or 2/3 of the lift thickness)	3 inches
Fines content	Not limited	Not limited
Plasticity	Not limited	Liquid limit less than 50
GeoModel Layer Expected to be Suitable [1]	Any	2, portions of 1

1. Based on subsurface exploration. Actual material suitability should be determined in the field at time of construction.

Imported Fill Materials: Imported fill materials should meet the following material property requirements. Regardless of its source, compacted 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.

Soil Type [1]	USCS Classification	Acceptable Parameters (for Structural Fill)
Low Plasticity Cohesive	CL	Liquid Limit less than 50 Organic content less than 3% 100% passing the 3-inch sieve
Granular	GW, GP, GM, GC, SW, SP, SM, SC	Organic content less than 3% 100% passing the 3-inch sieve

1. Structural and general fill should consist of approved materials 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.

Fill Placement and Compaction Requirements

Structural and general fill should meet the following compaction requirements.

Item	Structural Fill	General Fill
Maximum Lift Thickness	9 inches or less in loose thickness when heavy, self-propelled compaction equipment is used 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used	Same as structural fill
Minimum Compaction Requirements [1, 2]	98% of maximum within 1 foot of finished floor subgrade 95% of maximum more than 1 foot below finished floor subgrade	90% of maximum
Water Content Range [1]	Low plasticity cohesive: -2% to +3% of optimum Granular: -3% to +3% of optimum	As required to achieve minimum compaction requirements

1. Maximum density and optimum water content as determined by the standard Proctor test (ASTM D 698).
2. We recommend structural fill be tested for moisture content and compaction during placement. Should the results of the in-place density test indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.

Grading and Drainage

All grades must provide effective drainage away from the building during and after construction and should be maintained throughout the life of the structure. Water retained next to the building can result in soil movements greater than those discussed in this report.

Exposed ground should be sloped and maintained at a minimum 5% away from the building for at least 10 feet beyond the perimeter of the building. Grades around the structure should also be periodically inspected and adjusted, as necessary, as part of the structure's maintenance program. Where paving or flatwork abuts the structure, a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

Consideration should be given to providing drainage for any generally granular materials placed over the on-site slow-draining native soils. Drain tile wrapped in a filter sock should be placed at the base of the sand and tied into catch basins or daylighted to a low area.

Earthwork Construction Considerations

Shallow excavations for the proposed structure are anticipated to be accomplished with conventional construction equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

Excavations or other activities resulting in ground disturbance have the potential to affect adjoining properties and structures. Our scope of services does not include review of available final grading information or consider potential temporary grading performed by the contractor for potential effects such as ground movement beyond the project limits. A preconstruction/precondition survey should be conducted to document nearby property/infrastructure prior to any site development activity. Excavation or ground disturbance activities adjacent or near property lines should be monitored or instrumented for potential ground movements that could negatively affect adjoining property and/or structures.

Construction Observation and Testing

The earthwork efforts should be observed by the Geotechnical Engineer (or others under their direction). Observation should include documentation of adequate removal of surficial materials (vegetation, topsoil, and pavements), evaluation and remediation of existing fill materials, as well as proofrolling and mitigation of unsuitable areas delineated by the proofroll.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, as recommended by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill. Where not specified by local

ordinance, one density and water content test should be performed for every 100 linear feet of compacted utility trench backfill and a minimum of one test performed for every 12 vertical inches of compacted backfill.

In areas of foundation excavations, the bearing subgrade should be evaluated by the Geotechnical Engineer. If unanticipated conditions are observed, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into 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.

Drilled Shaft Foundations

Drilled Shaft Design Parameters

Soil design parameters are provided below in the **Drilled Shaft Design Summary** table for the design of drilled shaft foundations. The values presented for allowable side friction and end bearing include a factor of safety of 2 and 3, respectively.

Drilled Shaft Design Summary [1]

Depth (feet)	Material Type [2]	Allowable Skin Friction (psf) [1, 3, 5]	Allowable End Bearing Pressure (psf) [1, 4, 5]
0 to 6	Existing Fill/Lean Clay	---	---
6 to 12	Lean Clay/Fat Clay	200	---
12 to 19	Fat Clay	290	2,500
19 to 23	Fat Clay	210	2,250
23 to 26	Fat Clay	210	2,250

1. Design capacities are dependent upon the method of installation and quality control parameters. The values provided are estimates and should be verified when installation protocol have been finalized.
2. See Subsurface Profile in **Geotechnical Characterization** for more details on stratigraphy.
3. Applicable for compressive loading only. Reduce to 2/3 of values shown for uplift loading. The effective weight of the shaft can be added to uplift load resistance to the extent permitted by IBC.
4. Shafts should extend a minimum depth of 12 feet below finished grade and at least one diameter into the bearing stratum (or to a depth equal to the bell diameter for belled shafts) for end bearing to be considered.
5. The upper 6 feet should be ignored due to the softening that occurs during spring thaw.

Shafts should be adequately reinforced as designed by the Structural Engineer for both tension and shear to sufficient depths. Buoyant unit weights of the soil and concrete should be used in the calculations below the highest anticipated groundwater elevation.

Drilled shaft should have a minimum (center-to-center) spacing of 3 diameters. Closer spacing may require a reduction in axial load capacity. Axial capacity reduction can be determined by comparing the allowable axial capacity determined from the sum of individual piles in a group versus the capacity calculated using the perimeter and base of the pile group acting as a unit. The lesser of the two capacities should be used in design.

Drilled shafts should have a minimum length of 12 feet and should extend into the bearing strata at least 1 shaft diameter for the allowable end-bearing pressures listed in the above table.

Post-construction settlements of drilled shafts designed and constructed as described in this report are estimated to range from about 1 to 2 inches. Differential settlement between individual shafts is expected to be ½ to ⅔ of the total settlement.

Drilled Shaft Lateral Loading

The following table lists input values for use in LPILE analyses. Such analysis should be considered if lateral loads exceeds 10 kips. Modern versions of LPILE provide estimated default values of k_h and E_{50} based on strength and are recommended for the project. Since deflection or a service limit criterion will most likely control lateral capacity design, no safety/resistance factor is included with the parameters.

Depth (feet)	L-Pile Soil Model	S_u (psf) [1]	ϕ [1]	γ' (pcf) [1]	ε_{50}	K (pci)	
						Static	Cyclic
0 to 6	Stiff Clay w/o Free Water	750		110			
6 to 12	Stiff Clay w/o Free Water	600		110			
12 to 19	Stiff Clay w/o Free Water	1,000	---	55	Use Default Value		
19 to 23	Stiff Clay w/o Free Water	750		50			
23 to 26	Stiff Clay w/o Free Water	750		50			

1. Definition of Terms:
   S_u: Undrained shear strength
   ϕ: Internal friction angle
   γ': Effective unit weight

Drilled Shaft Construction Considerations

The drilling contractor should be experienced in the subsurface conditions observed at the site, and the excavations should be performed with equipment capable of providing a clean bearing surface. The drilled straight-shaft foundation system should be installed in general accordance with the procedures presented in "Standard Specification for the Construction of Drilled Piers", ACI Publication No. 336.1-01.

The contractor is generally expected to use conventional “dry” techniques for installation of the drilled shaft; however, groundwater was encountered at a depth of 23 feet below grade in Boring B-1. Any groundwater or accumulated water should be removed from the drilled shaft excavation prior to concrete placement, or as an alternative, concrete placement should include the use of a tremie. Subsurface water levels are influenced by seasonal and climatic conditions, which result in fluctuations in subsurface water elevations. Additionally, it is common for water to be present after periods of significant rainfall.

The drilling contractor should remove all soft and disturbed soils from the base of the drilled pier prior to placing concrete. The drilled shaft installation process should be performed under the observation of the Geotechnical Engineer. The Geotechnical Engineer should document the shaft installation process including soil/rock and groundwater conditions observed, consistency with expected conditions, and details of the installed shaft.

Bituminous Paved Floor

Pavement Subgrade Support Characteristics

Sufficient information is not available for us to provide an opinion of minimum pavement thickness for the project. For pavement design by others, we recommend that a subgrade California Bearing Ratio, CBR, of 2 be used for the asphaltic concrete pavement designs. This value was empirically derived based upon our experience with the clay subgrade soils and our expectation of the quality of the subgrade as prescribed by the **Site Preparation** conditions as outlined in the **Earthwork** section.

Due to the anticipated loads and the compressible nature of the natural soils, the pavement will be subject to immediate and long-term consolidation settlement. Based on our analysis, we estimate total long-term settlement of storage area would be on the order of 4 to 6 inches at the center and approximately 1 to 2 inches around the perimeter. Maintenance of the pavement including crack sealing and overlaying will likely be needed over the life of the structure.

Frost Considerations

The soils on this site are frost susceptible, and small amounts of water can affect the performance of the slabs and pavements. Bituminous pavements should be anticipated to heave during winter months. The following recommendations are provided to help reduce potential frost heave:

- Provide surface drainage away from the building, and toward the site drainage system.
- Install drains around the perimeter of the building, and pavements and connect them to the site drainage system.
- Grade clayey subgrades so groundwater potentially perched in overlying fill or aggregate base, slope toward a site drainage system.

General Comments

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. 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 as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services onsite, 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 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 upon 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 effect 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. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. 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.

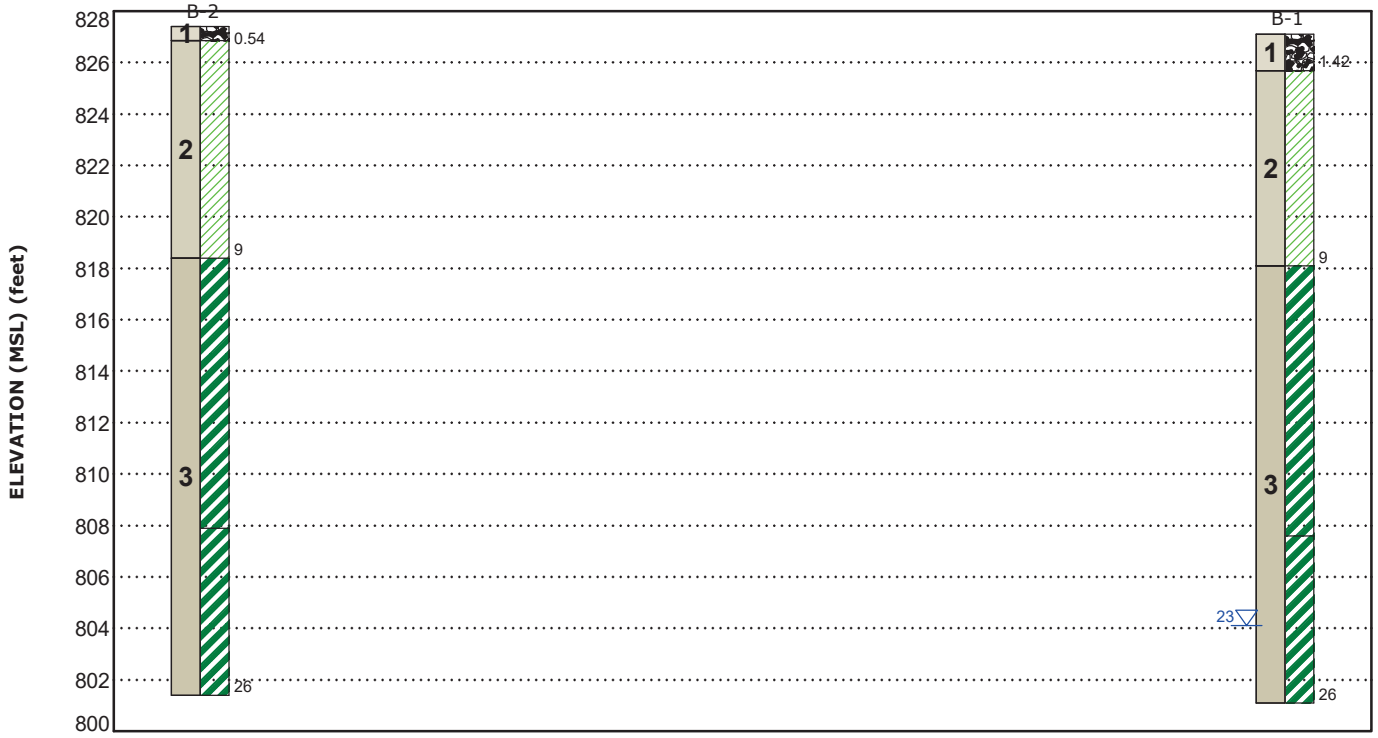
Figures

Contents:

Proposed Salt Storage Building
North Columbia Road | Grand Forks, North Dakota
Terracon Project No. M5245002

Terracon
1555 N 42nd St, Unit B
Grand Forks, ND

GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	**Existing Fill**	Clayey sand - trace gavel, dark brown
2	**Lean Clay**	Lean Clay (CL) - grayish brown, soft to stiff consistency
3	**Fat Clay**	Fat Clay (CH) - gray, grayish brown, or dark grayish brown, occasional silt lenses, medium stiff to stiff consistency

Legend

Fill
Lean Clay
Fat Clay

▽ First Water Observation

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.

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.

Attachments

Exploration and Testing Procedures

Field Exploration

Number of Borings	Approximate Boring Depth (feet)	Location
2	26	Building area

Boring Layout and Elevations: Terracon personnel provided the boring layout using handheld GPS equipment (estimated horizontal accuracy of about ±10 feet) and referencing existing site features. Approximate ground surface elevations were obtained by the drill crew using a level and grade rod referenced to the operating nut on the hydrant located on the west side of the site near the gate. We understand this benchmark is at elevation 830.8. If elevations and a more precise boring layout are desired, we recommend borings be surveyed.

Subsurface Exploration Procedures: We advanced the borings with a track-mounted drill rig using continuous flight hollow stem augers. Samples were obtained at 2 ½ foot intervals in the upper 15 feet of each boring and at intervals of 5 feet thereafter. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge was 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 was 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. We observed and recorded groundwater levels during drilling and sampling. For safety purposes, all borings were backfilled with auger cuttings after their completion.

We also observed the boreholes while drilling and at the completion of drilling for the presence of groundwater. The groundwater levels are shown on the attached boring logs.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials observed during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests. The laboratory testing program included the following types of tests:

- Moisture Content
- Dry Unit Weight
- Unconfined Compression
- Atterberg Limits

The laboratory testing program often included examination of soil samples by an engineer. Based on the results of our field and laboratory programs, we described and classified the soil samples in accordance with the Unified Soil Classification System.

Site Location and Exploration Plans

Contents:

Note: All attachments are one page unless noted above.

Site Location

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

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES MAP PROVIDED BY MICROSOFT BING MAPS

Exploration and Laboratory Results

Contents:

Boring Logs (B-1 & B-2)

Note: All attachments are one page unless noted above.

Proposed Salt Storage Building
North Columbia Road | Grand Forks, North Dakota
Terracon Project No. M5245002

Terracon
1555 N 42nd St, Unit B
Grand Forks, ND

Boring Log No. B-1

Location: See Exploration Plan

Latitude: 47.9353° Longitude: -97.0656°

Depth (Ft.) Elevation: 827.1 (Ft.) +/-

Model Layer	Graphic Log	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Unconfined Compressive Strength (psf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI
1		**FILL - CLAYEY SAND**, trace gravel, dark brown, frozen 1.4 825.68								
2		**LEAN CLAY (CL)**, grayish brown, frozen to 2', medium stiff			18	2-2-3 N=5		34.5		
					18	2-2-2 N=4		36.5		
		5					1600	32.4	81	47-24-23
		9.0 818.1								
3		**FAT CLAY (CH)**, occasional silt lenses, dark grayish brown, medium stiff			18	1-1-3 N=4		39.4		
		10			18	2-3-5 N=8		43.2		
		15			18	2-3-3 N=6		40.4		
		19.5 807.6								
		FAT CLAY (CH), occasional silt lenses, gray, stiff to medium stiff					2190	47.6	73	80-27-53
		20	▽							
		25			18	1-2-3 N=5		42.2		
		26.0 801.1								
		Boring Terminated at 26 Feet								

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.

Elevation Reference: Elevations were measured in the field using an engineer's level and grade rod.

Water Level Observations
▽ While drilling

Drill Rig
D-70

Hammer Type
Automatic

Driller
JZ

Notes
2' - N-values influenced by frost

Advancement Method
3 ¼" Hollow stem auger

Abandonment Method
Boring backfilled with auger cuttings

Logged by
MS

Boring Started
02-02-2024

Boring Completed
02-02-2024

Proposed Salt Storage Building
North Columbia Road | Grand Forks, North Dakota
Terracon Project No. M5245002

Terracon
1555 N 42nd St, Unit B
Grand Forks, ND

Boring Log No. B-2

Location: See Exploration Plan

Latitude: 47.9352° Longitude: -97.0655°

Depth (Ft.) Elevation: 827.4 (Ft.) +/-

Model Layer	Graphic Log	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Unconfined Compressive Strength (psf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI
1		0.5 **FILL - CLAYEY SAND**, trace gravel, dark brown, frozen 826.86								
2		**LEAN CLAY (CL)**, grayish brown, frozen to 3', stiff to soft			18	10-9-5 N=14		28.3		
					18	2-1-2 N=3		35.9		
					18	1-2-2 N=4		37.6		
		9.0 818.4								
3		**FAT CLAY (CH)**, occasional silt lenses, grayish brown to dark grayish brown, medium stiff to stiff			18	1-2-3 N=5		40.3		
							3050	41.4	80	66-25-41
					18	1-3-3 N=6		44.4		
		19.5 807.9								
		FAT CLAY (CH), occasional silt lenses, gray, medium stiff			18	2-2-3 N=5		50.0		
					18	1-2-3 N=5		43.9		
		26.0 801.4								
		Boring Terminated at 26 Feet								

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.

Elevation Reference: Elevations were measured in the field using an engineer's level and grade rod.

Water Level Observations
No free water observed

Drill Rig
D-70

Hammer Type
Automatic

Driller
JZ

Notes
2' - N-values influenced by frost

Advancement Method
3 ¼" Hollow stem auger

Abandonment Method
Boring backfilled with auger cuttings

Logged by
MS

Boring Started
02-02-2024

Boring Completed
02-02-2024

Supporting Information

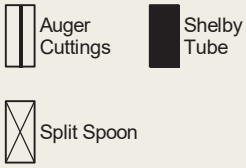
Contents:

Note: All attachments are one page unless noted above.

Terracon
1555 N 42nd St, Unit B
Grand Forks, ND

General Notes

Sampling



Water Level

Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

Cave In Encountered

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

Descriptive Soil Classification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

Strength Terms

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

Relative Density	Standard Penetration or N-Value (Blows/Ft.)	Consistency	Unconfined Compressive Strength Qu (psf)	Standard Penetration or N-Value (Blows/Ft.)
Very Loose	0 - 3	Very Soft	less than 500	0 - 1
Loose	4 - 9	Soft	500 to 1,000	2 - 4
Medium Dense	10 - 29	Medium Stiff	1,000 to 2,000	4 - 8
Dense	30 - 50	Stiff	2,000 to 4,000	8 - 15
Very Dense	> 50	Very Stiff	4,000 to 8,000	15 - 30
		Hard	> 8,000	> 30

Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

Unified Soil Classification System

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification	
				Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 4 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu≥4 and 1≤Cc≤3 [E]	GW	Well-graded gravel [F]
			Cu<4 and/or [Cc<1 or Cc>3.0] [E]	GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F, G, H]
			Fines classify as CL or CH	GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu≥6 and 1≤Cc≤3 [E]	SW	Well-graded sand [I]
			Cu<6 and/or [Cc<1 or Cc>3.0] [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G, H, I]
			Fines classify as CL or CH	SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots above "A" line [J]	CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OL	Organic clay [K, L, M, N]
					Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line	CH	Fat clay [K, L, M]
			PI plots below "A" line	MH	Elastic silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OH	Organic clay [K, L, M, P]
					Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

[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] $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
[F] If soil contains ≥ 15% sand, add "with sand" to group name.
[G] 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] PI ≥ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.