ADDENDUM NO.1

ELLENDALE E.M.S. BUILDING
CITY OF ELLENDALE
ELLENDALE, NORTH DAKOTA
EC23-00-083

REGISTERED PROFESSIONAL ENGINEER
WADE SENGER
PE-7127
DATE 12-20-24
NORTH DAKOTA

Date Issued:	December 20, 2024
Bid Opening Date:	January 30, 2025
Bid Opening Time:	3:00 PM (CT)
Bid Opening Place:	Office of City Auditor Ellendale, North Dakota

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The bid opening has been postponed to January 30th to allow contractors and suppliers ample time to prepare their bids.

THE FOLLOWING ADDITIONS, CORRECTIONS AND/ OR CLARIFICATIONS SHALL BE MADE TO THE SPECIFICATION DOCUMENTS:

1. **SECTION 103 Bidder's Proposal:**

   ALTERNATE NO.2 CONCRETE BUILDING is not required to be bid. If this is bid this should include the price difference for a metal building to a concrete building.

2. **SECTION 02 32 00 GEOTECHNICAL ENVESTIGATION**

   Add attached Geotechnical Report

3. **SECTION 13 34 00 – CONCRETE BUILDING SYSTEM**

   Clarification to this section. If a contractor chooses to bid this alternate they must comply to all the requirements of the base bid in regards to exterior finishes, opening dimensions, and interior clear dimensions.

   The concept is to have the roof structure of 40" Double Tee Beams, and the ICF walls will be 12" thick concrete walls. These are to be verified and designed by a professional engineer for the final building system supplied by the contractor.

4. **SECTION 13 34 19 METAL BUILDING SYSTEMS**

   Revise **Section 13.1.03.B.4** to the 2021 International Building Code.

NOTE: THE RECEIPT OF THIS ADDENDUM SHALL BE ACKNOWLEDGED IN THE SPACE PROVIDED ON THE BIDDER'S PROPOSAL FORM AND BID ENVELOPE.

2. **ARCHITECTURAL SHEET A3.1**

   FLOOR PLAN KEYNOTES: 4. 6” X 4’-0” HIGH CONCRETE FILLED STEEL PIPE BOLLARDS – SEE CIVIL. MODIFY NOTE TO READ – 6” X 9’-0” SCH. 80 STEEL PIPE. SEE BOLLARD DETAIL ATTACHED TO THIS ADDENDUM.

3. **ARCHITECTURAL SHEET A8.2**

   DETAIL 11/A8.2 REFER TO BOLLARD DETAIL ATTACHED TO THIS ADDENDUM FOR BOLLARD SIZE. CHANGE DIMENSION OF 4” TO CENTER OF BOLLARD TO 3” TO CENTER OF BOLLARD.

END OF ADDENDUM

NOTE: THE RECEIPT OF THIS ADDENDUM SHALL BE ACKNOWLEDGED IN THE SPACE PROVIDED ON THE BIDDER’S PROPOSAL FORM AND BID ENVELOPE.

Geotechnical Evaluation Report

Ellendale E.M.S. Building
North of 15th St. N and East of U.S. Highway 281
Ellendale, North Dakota

Prepared for

Interstate Engineering

Professional Certification:
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of North Dakota.

Steven P. Nagle, PE
Principal Engineer
Registration Number: PE-3894
December 18, 2024

STEVEN P. NAGLE
REGISTERED
PROFESSIONAL
PE 3894
ENGINEER
NORTH DAKOTA

Project B2409006
Braun Intertec Corporation

BRAUN
INTERTEC
The Science You Build On.

BRAUN INTERTEC
The Science You Build On.

Braun Intertec Corporation
11001 Hampshire Avenue S
Minneapolis, MN 55438

Phone: 952.995.2000
Fax: 952.995.2020
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December 18, 2024

Project B2409006

Interstate Engineering, Inc.
Todd Langbehn
1903 12th Ave SW
PO Box 2035
Jamestown, ND 58401

Re: Geotechnical Evaluation
Ellendale E.M.S Building
U.S. Highway 281 and 15th St. N
Ellendale, ND 58436

Dear Mr. Langbehn:

We are pleased to present this Geotechnical Evaluation Report for the geotechnical evaluation for the proposed E.M.S building at the referenced site.

Thank you for making Braun Intertec your geotechnical consultant for this project. If you have questions about this report, or if there are other services that we can provide in support of our work to date, please contact Kathleen Dragos at 701-446-6403 (kdragos@braunintertec.com).

Sincerely,

BRAUN INTERTEC CORPORATION

Kathleen Dragos
Staff Engineer

Steven P. Nagle, PE
Principal Engineer

AA/EOE

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BRAUN
INTERTEC

A. Introduction

A.1. Project Description

This Geotechnical Evaluation Report addresses the proposed design and construction of the new E.M.S. facility, located on the north side of Ellendale, North Dakota. The project will include the construction of a single story, slab-on-grade building, approximately 6,000 square feet in size. Current design for the footing and foundation is 24 inches by 12 inches continuous footings with 8-inch-wide foundation walls, at a depth of 6 feet below grade. A gravel parking lot and drive lanes will be located on the west and north sides of the building, and a concrete driveway will be on the south side of the building. Access to the ambulance bay will be from the north and south side of the building. Tables 1 and 2 provide project details.

Table 1. Building Description

Aspect	Description
Above grade levels	Single Story with ambulance bay
Lowest level floor elevation	1,455 feet
Column loads (kips)	100 kips (Assumed)
Wall loads (kips)	5 kips (Assumed)
Cuts or fills for buildings	Less than 4 feet of fill
Tolerable building settlement	1 1/2 inch Assumed

Table 2. Site Aspects and Grading Description

Aspect	Description
Pavement types	Concrete ambulance driveway Gravel parking lot
Assumed pavement loads	Medum-Duty: 75,000 ESALs*
Grade Elevation	1,455 feet

*Equivalent 18,000-lb single axle loads based on 35-year design.

The figure below shows an illustration of the proposed site layout.

Figure 1. Site Layout

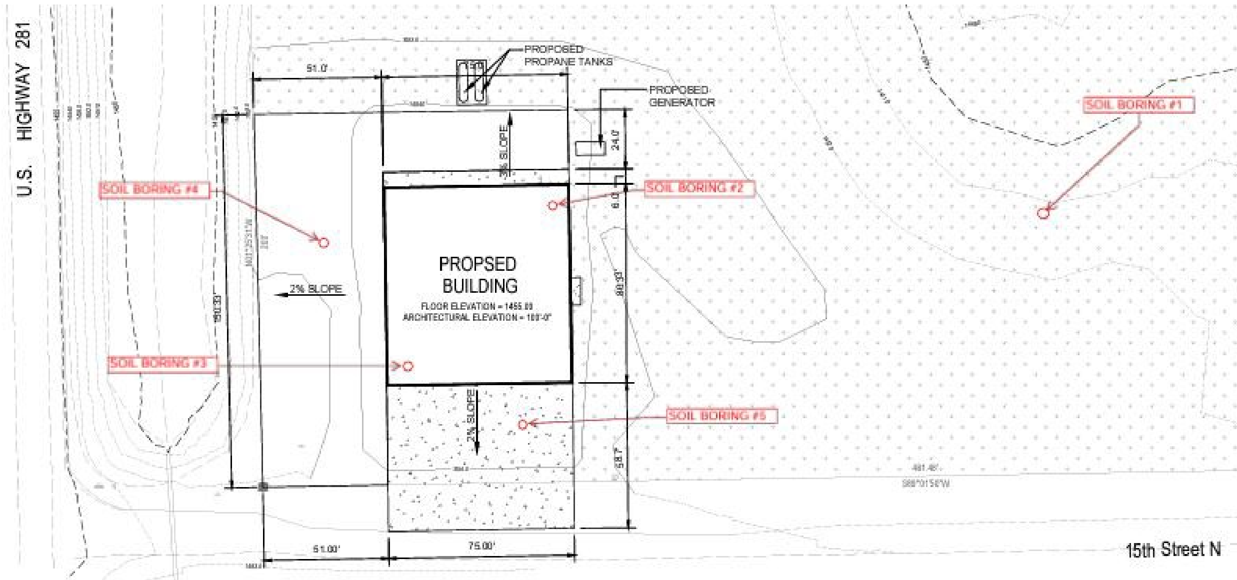


Figure is clipped from project plans C-2, provided on August 9, 2024, by Interstate Engineering and dated June 2024.

A.2. Site Conditions and History

The site currently exists as an open field with a drainage pond to the north, and historically utilized as an agricultural field prior to 1997. Current grades range from 1,451 to 1,454 feet. Generally, the site is flat with a slight slope to the north.

Photograph 1: Aerial Photograph of the Existing Site

A.3. Purpose

The purpose of our geotechnical evaluation is to characterize subsurface geological conditions at selected exploration locations, evaluate their impact on the project, and provide geotechnical recommendations for the design and construction of an E.M.S. facility.

A.4. Background Information and Reference Documents

We reviewed the following information:

- Grading plan prepared by Interstate Engineering and dated June 2024.
- Surficial Geological Map, *Geology of Dickey and La Moure Counties [North Dakota]*, Bluemle, J. P., North Dakota Geological Survey, 1979, map scale 1:126,000.
- Communications with you regarding project scope.

We have described our understanding of the proposed construction and site to the extent others reported it to us. Depending on the extent of available information, we may have made assumptions based on our experience with similar projects. If we have not correctly recorded or interpreted the project details, the project team should notify us. New or changed information could require additional evaluation, analyses and/or recommendations.

A.5. Scope of Services

We performed our scope of services for the project in accordance with our Proposal QTB201926, dated August 19, 2024, and authorized on September 27, 2024. The following list describes the geotechnical tasks completed in accordance with our authorized scope of services.

- Reviewing the background information and reference documents previously cited.
- Staking and clearing the exploration location of underground utilities. Interstate Engineering selected, while we staked the new exploration locations. We acquired the surface elevations and locations with our Trimble GPS technology. The Soil Boring Location Sketch included in the Appendix shows the approximate locations of the borings.
- Performing 5 standard penetration test (SPT) borings, denoted as ST-01 to ST-05, to nominal depths of 15 to 25 feet below grade across the site.
- Performing laboratory testing on select samples to aid in soil classification and engineering analysis.
- Preparing this report containing a boring location sketch, logs of soil borings, a summary of the soils encountered, results of laboratory tests, and recommendations for structure and pavement subgrade preparation and the design of foundations, floor slabs, exterior slabs, and utilities.

Our scope of services did not include environmental services or testing and our geotechnical personnel performing this evaluation are not trained to provide environmental services or testing. We can provide environmental services or testing at your request.

B. Results

B.1. Geologic Overview

Dickey County is in the central east portion of North Dakota, just north of the South Dakota border. Most of the county is covered in a ground moraine from the Wisconsin stage of the Pleistocene Era. Glacial stream deposits border most existing streams. Surficial geology is predominantly glacial till, relief generally less than 10 feet in thickness overtop the glacial-smoothed bedrock. Sediments are generally unsorted, unbedded, with variable angularity of rocks, gravel, and sand. A stiff matrix of silt and clay contains the discontinuous lenses of gravel and sand. Collapsed ground moraines are found northwest of Ellendale.

We based the geologic origins used in this report on the soil types, in-situ and laboratory testing, and available common knowledge of the geological history of the site. Because of the complex depositional history, geologic origins can be difficult to ascertain. We did not perform a detailed investigation of the geologic history for the site.

B.2. Boring Results

Table 3 provides a summary of the soil boring results, in the general order we encountered the strata. Please refer to the Log of Boring sheets in the Appendix for additional details. The Descriptive Terminology sheets in the Appendix include definitions of abbreviations used in Table 3. For simplicity in this report, we define existing fill to mean existing, uncontrolled or undocumented fill.

Table 3. Subsurface Profile Summary*

Strata	Soil Type - ASTM Classification	Range of Penetration Resistances	Commentary and Details
Topsoil Fill	CL	Not Applicable	▪ Apparent native topsoil observed at ST-01. ▪ Brown to dark brown. ▪ Variable thickness, not present at all borings. ▪ Thicknesses at boring locations varied from 0.7 to 0.8 feet. ▪ Moisture condition generally moist.
Fill	CLWS, CL	7 BPF to 12 blows for 6 inch of penetration	▪ Thicknesses at boring locations varied from 3.2 to 4.8 feet. ▪ Occasional lenses of slightly organic with roots. ▪ Moisture condition generally moist.

Strata	Soil Type - ASTM Classification	Range of Penetration Resistances	Commentary and Details
Glacial Deposits	SP-SC, SC, CLWS, CL	5 to 23 BPF	▪ General penetration resistance of 10 to 12 BPF. ▪ Intermixed layers of glacial outwash and till in ST-04. ▪ Variable amounts of gravel; may contain cobbles and boulders at ST-02 from 14 to 19 feet, and at ST-04 below 10 1/2 feet. ▪ Moisture condition generally moist.

*Abbreviations defined in the attached Descriptive Terminology sheets.

B.3. Groundwater

At the time of our observation, the groundwater surface elevation appeared to be about elevation 1,442 feet, 10 1/2 feet below existing grade, only observed in ST-04. In cohesive soils like those encountered on site, groundwater may take days or longer to reach equilibrium in the boreholes and we immediately backfilled the boreholes, in accordance with our scope of work. We anticipate that groundwater may have been encountered within the remaining borings they been able to be left open for longer and allowed to reach hydrostatic levels. The soil borings indicate a layered soil profile that is conducive for encountering perched water conditions, as wet sand was observed while drilling in ST-04 between 7 to 7 1/2 feet below existing grade. Project planning should expect groundwater will fluctuate in relation to seasonal meltwaters and heavy rainfall.

B.4. Laboratory Test Results

B.4.a. Moisture Contents

We performed moisture content (MC) tests (per ASTM D2216) on selected penetration test samples to aid in our classifications and estimations of the materials' engineering properties. The moisture contents of the lean clay with sand and sandy lean clay material ranged from 11 to 21 percent, and 16 percent in the poorly graded sand with clay material. The moisture contents of the lean clay material were at or below their anticipated optimum moisture contents, while the sand material was near to wet the anticipated optimum moisture content. The results of the moisture content tests are listed in the "MC" column of the Log of Boring Sheets attached in the Appendix.

B.4.b. Percent Passing the #200 Sieve

Percent passing the #200 sieve analysis tests (P200) (per ASTM D1140) were performed on a selected penetration test samples to assist in the classification at the transition between poorly graded sand with clay layer and lean clay with sand at 7 1/2 feet in ST-04, and in the sandy lean clay in the upper 6 feet. The result of the P200 test is listed in the “Test or Remarks” column on the attached Log of Boring sheets.

B.4.c. Atterberg Limits Tests

We performed Atterberg limits tests (per ASTM D4318) on selected penetration test and thin-walled tube samples for classification, evaluation of the soils’ plasticity, and estimation of engineering parameters. The tests indicate the selected samples had liquid limits (LL) ranging from 28 to 42 percent, plastic limits (PL) ranging from 13 to 16 percent, and plasticity indices (PI) ranging from 15 to 26 percent, indicating the materials tested were classified as lean clay (CL) and have low to moderate potential for shrinking/swelling with changes in their moisture content. The results of the Atterberg Limits test are listed in the “Tests or Remarks” column on the attached Log of Boring sheets.

B.4.d. Standard Proctor

We performed a standard proctor test (per ASTM D698) on selected bulk sample to determine the maximum dry density and optimum moisture content of the soil. The results of the test indicate the material have a dry density (DD) of 111.3 pounds per cubic foot (pcf) and an optimum moisture of 14.5 percent. The results of the standard proctor test are listed in the “Tests or Remarks” column on the attached Log of Boring sheets.

C. Recommendations

C.1. Design and Construction Discussion

C.1.a. Estimated Settlement

We anticipate the weight of new fill combined with the new structural loads to foundation would cause minor building settlement of less than 1 inch post-construction.

C.1.b. Existing Fill

All the soil borings except for ST-01 encountered fill and possible fill ranging in depths from 4 to 5 1/2 feet. The existing native materials mainly were classified as lean clay with sand or sandy lean clay. Native poorly graded sand with clay and clayey sand layers were observed in the upper 11 1/2 feet of ST-04 as well. Lean clays may be used as backfill material, but should not be considered suitable for support of the structure's floor slabs or foundations and will need to be partially removed from the building footprint. A geotechnical engineer or a technician working under the direction of a geotechnical engineer should assist in identifying existing fill that should be overexcavated and recompacted.

C.1.c. Reuse of On-Site Soils

The surface vegetation, root zones, topsoils, and soils with an organic content greater than 3 percent should not be used as backfill or fill below the structure footprint or within the upper 3 feet of the pavement area. These materials should be used in landscaped areas or hauled off-site. It should be anticipated that these soils will require moisture conditioning prior to compaction, which may be difficult depending upon the time of year that construction takes place.

The soils on this site are slightly to moderately sensitive to moisture and construction related disturbances, in part due to the higher concentrations of silt present. Generally, in central North Dakota, the months of May through September are best suited for grading operations, particularly if the clayey soils required moisture conditioning. Cooler temperatures and wet weather conditions in the early spring, winter, and late fall tend to slow and delay grading and construction operations. Clayey soils that become saturated during spring, winter, or fall will not likely become adequately dry, and will provide limited support to heavy construction equipment. These soil conditions can cause heavy tracked dozers and rubber-tire equipment to disturb building and pavement subgrades, requiring additional excavation earthwork.

The moisture condition of the on-site soils located within the upper 4 to 6 feet of the ground surface during the spring months will be dependent upon the weather conditions leading up to and during construction. The moisture condition of the in-site soils below 4 to 6 feet will likely be wet of their optimum moisture contents and will likely require drying regardless of the season or weather. During excavations, soils should be exposed for a limited time or quickly compacted and covered to prevent loss of moisture or oversaturation from rain events.

C.1.d. Groundwater

A perched water table was found in ST-04 at 10 1/2 feet while drilling. Construction excavations are not anticipated to be that deep, but there may be water bearing lenses and seams that we did not encounter during our evaluation. It is unlikely that these will be an issue during earthwork operations. During seasonal melts and rainy periods in the spring and fall, it may be necessary to periodically use a water pump to drain excess groundwater from water bearing lenses and seams in the excavation.

C.2. Site Grading and Subgrade Preparation

C.2.a. Building Subgrade Excavations

We recommend removing unsuitable materials from below the building footprint, exterior concrete slab, and the gravel parking lot. We define unsuitable materials as existing fill, frozen materials, organic soils, existing structures, existing utilities, vegetation, soft/loose soils and "dry" soils ("dry" defined as clays that are more than 1 percentage point below the soil's optimum moisture content). Based on the borings, we anticipate these removals will range in depth from 4 to 5 1/2 feet below existing grades. To provide lateral support to replacement backfill, additional required fill and the structural loads they will support, we recommend oversizing (widening) the excavations 1 foot horizontally beyond the outer edges of the foundations for each foot the excavations extend below bottom-of-footing elevations.

Excavation depths will vary between the borings. Portions of the excavations may also extend deeper than indicated by the borings. A geotechnical representative should observe the excavations to make the necessary field judgments regarding the suitability of the exposed soils.

The contractor should use equipment and techniques to minimize soil disturbance. If soils become disturbed or are wet, we recommend excavation and scarification, mixing, and recompaction.

In order to provide a subgrade with relatively uniform support, we recommend the following steps:

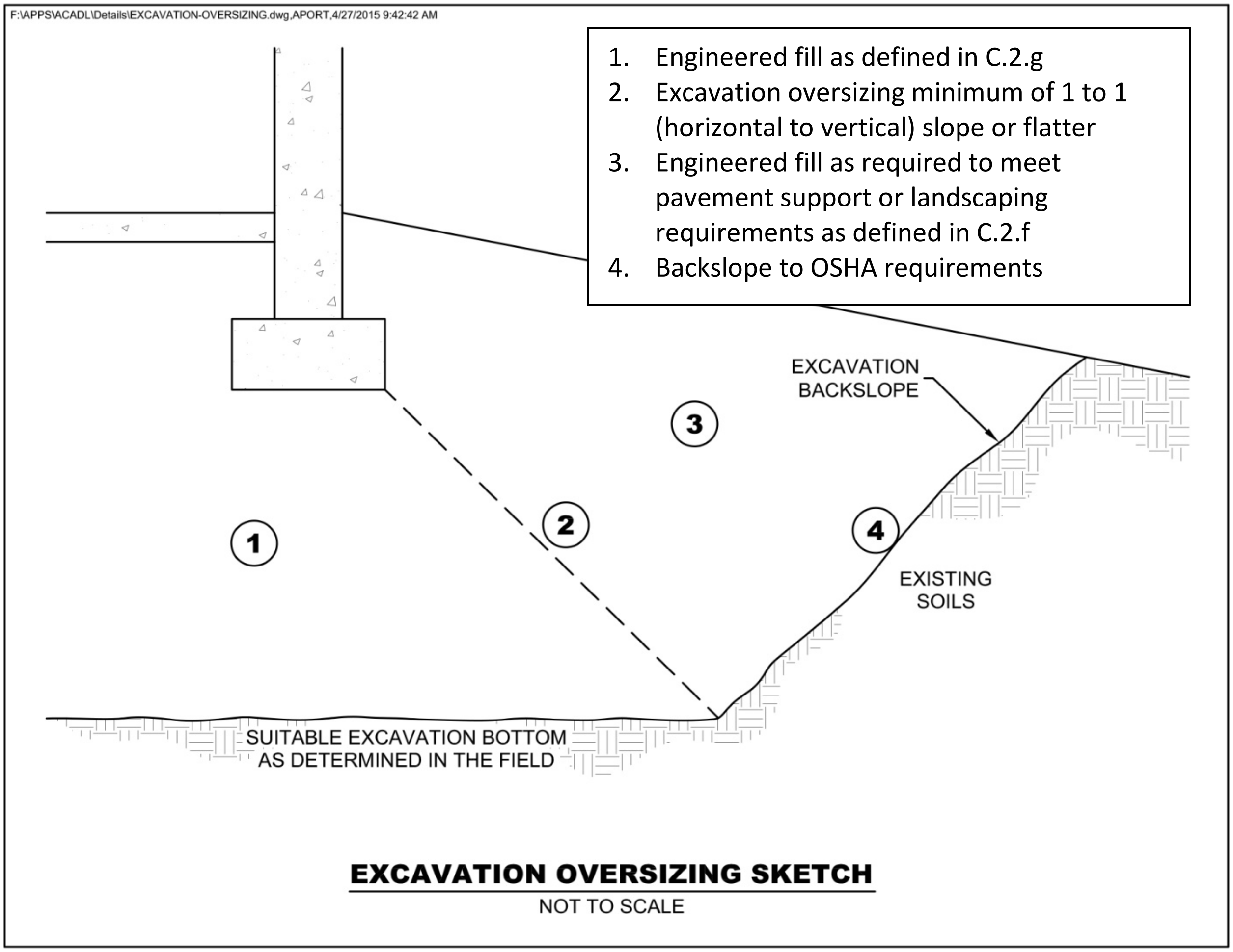
1. Scarify the building-pad-excavation-bottom to a depth of at least 6 inches.

2. Moisture condition the exposed subgrade soils meeting the requirements of Table 4.

C.2.b. Excavation Oversizing

When removing unsuitable materials below structures or pavements, we recommend the excavation extend outward and downward at a slope of 1H:1V (horizontal:vertical) or flatter. See Figure 2 for an illustration of excavation oversizing.

Figure 2. Generalized Illustration of Oversizing



C.2.c. Excavated Slopes

Based on the borings, we anticipate on-site soils in excavations will mainly consist of lean clays with variable amounts of sand. These soils are typically considered Type B Soil under OSHA (Occupational Safety and Health Administration) guidelines; unless groundwater is encountered, at which point they would be classified as Type C Soils. Any soils from which groundwater is observed to be freely seeping from the excavation sidewalls, and soils having a pocket penetrometer resistance less than 1000 psf should be considered. OSHA guidelines indicate unsupported excavations in Type B soils should have a gradient no steeper than 1H:1V and for Type C soils maintained at a gradient no steeper than 1.5H:1V. Slopes constructed in this manner may still exhibit surface sloughing. OSHA requires an engineer to evaluate slopes or excavations over 20 feet in depth.

An OSHA-approved qualified person should review the soil classification in the field. Excavations must comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P, “Excavations and Trenches.” This document states excavation safety is the responsibility of the contractor. The project specifications should reference these OSHA requirements.

C.2.d. Excavation Dewatering

For general site grading, we anticipate dewatering of groundwater will likely not be necessary. However, if the excavations are performed immediately after spring thaw or prolonged periods of wet weather, the groundwater level in any perched water tables may be higher than anticipated, and dewatering of groundwater could be necessary. Generally speaking, the excavations will likely be open during some precipitation; thus, dewatering of precipitation or runoff will likely be necessary at some point during construction.

We recommend removing groundwater and surface water from the excavations as promptly as possible. Allowing water to pond on subgrades for extended periods will cause them to become saturated and make them more susceptible to disturbance during construction. When necessary, dewatering can likely be performed with the placement of multiple sumps and pumps in the excavation.

C.2.e. Pavement and Exterior Slab Subgrade Preparation

We recommend the following steps for exterior slab subgrade preparation, understanding the site will have a grade change of 4 feet or less. Note that project planning may need to require additional subcuts to limit frost heave.

1. Strip unsuitable soils consisting of topsoil, organic soils, peat, vegetation, existing structures and pavements from the area, within 3 feet of the surface of the proposed slab grade.
2. Have a geotechnical representative observe the excavated subgrade to evaluate if additional subgrade improvements are necessary.
3. Slope subgrade soils to areas of sand or drain tile to allow the removal of accumulating water.
4. Scarify, moisture condition and surface compact the subgrade to the requirements of Table 4.
5. Place slab on grade engineered fill to grade and compact in accordance with Section C.2.g to bottom of exterior slab section. See Section C.5 for additional considerations related to frost heave.
6. Proofroll the pavement or exterior slab subgrade as described in Section C.2.f.

C.2.f. Slab on Grade Subgrade Proofroll

After preparing the subgrade as described above and prior to the placement of the aggregate base, we recommend proofrolling the subgrade soils with a fully loaded tandem-axle truck. We also recommend having a geotechnical representative observe the proofroll. Areas that fail the proofroll likely indicate soft or weak areas that will require additional soil correction work to support pavements.

The contractor should correct areas that display excessive yielding or rutting during the proofroll, as determined by the geotechnical representative. Possible options for subgrade correction include moisture conditioning and recompaction, subcutting and replacement with soil or crushed aggregate, chemical stabilization and/or geotextiles. We recommend performing a second proofroll after the aggregate base material is in place, and prior to placing concrete pavement or gravel surfacing.

C.2.g. Engineered Fill Materials and Compaction

Table 4 below contains our recommendations for engineered fill materials.

Table 4. Engineered Fill Materials*

Locations To Be Used	Engineered Fill Classification	Possible Soil Type Descriptions	Gradation	Additional Requirements
Below foundations, within 1 foot of the interior slabs and in oversizing zones	Structural fill	SC, SM, SP, SW, SP-SM, SP-SC, SW-SM, GP, GW	100% passing 2-inch sieve ≤20% passing the #200 sieve	< 2% Organic Content (OC)
Wall backfill	Wall backfill	SP-SC, SC, CL	100% passing 1-inch sieve	< 3% OC
Pavements	Pavement fill	SP, SM, SP-SM, SP-SC, SC, CL	100% passing 3-inch sieve	< 3% OC PI < 15%
Below landscaped surfaces, where subsidence is not a concern	Non-structural fill	Any	100% passing 6-inch sieve	< 10% OC

* More select soils comprised of coarse sands with < 5% passing #200 sieve may be needed to accommodate work occurring in periods of wet or freezing weather.

We recommend spreading engineered fill in loose lifts of approximately 6 to 8 inches thick. We recommend compacting engineered fill in accordance with the criteria presented below in Table 5. The project documents should specify relative compaction of engineered fill, based on the structure located above the engineered fill, and vertical proximity to that structure.

Table 5. Compaction Recommendations Summary

<table>
<tr><th rowspan="2">Reference</th><th rowspan="2">Relative Compaction, percent (ASTM D698 – Standard Proctor)</th><th colspan="2">Moisture Content Variance from Optimum, percentage points</th></tr>
<tr><th>< 12% Passing #200 Sieve (typically SP, SP-SC)</th><th>> 12% Passing #200 Sieve (typically CL, SC)</th></tr>
<tr><td>Below foundations, within 3 feet of the interior slabs and in oversizing zones</td><td>≥98</td><td rowspan="4">As necessary to facilitate compaction</td><td>-1 to +4</td></tr>
<tr><td>Exterior wall backfill, at depths greater than 3 feet below interior slabs, below exterior slabs and pavements</td><td>≥98</td><td>-1 to +4</td></tr>
<tr><td>Within 3 feet of pavement subgrade</td><td>≥98</td><td>-1 to +4</td></tr>
<tr><td>Below landscaped surfaces, where subsidence is not a concern</td><td>≥90</td><td>±4</td></tr>
</table>

*Increase compaction requirement to meet compaction required for structure supported by this engineered fill.

The project documents should not allow the contractor to use frozen material as engineered fill or to place engineered fill on frozen material. Frost should not penetrate under foundations during construction.

We recommend performing density tests in engineered fill to evaluate if the contractors are effectively compacting the soil and meeting project requirements.

C.2.h. Special Inspections of Soils

We recommend including the site grading and placement of engineered fill within the building pad under the requirements of Special Inspections, as provided in Chapter 17 of the International Building Code, which is part of the North Dakota State Building Code. Special Inspection requires observation of soil conditions below engineered fill or footings, evaluations to determine if excavations extend to the anticipated soils, and if engineered fill materials meet requirements for type of engineered fill and compaction condition of engineered fill. A licensed geotechnical engineer should direct the Special Inspections of site grading and engineered fill placement. The purpose of these Special Inspections is to evaluate whether the work is in accordance with the approved Geotechnical Report for the project.

Special Inspections should include evaluation of the subgrade, observing preparation of the subgrade (surface compaction or dewatering, excavation oversizing, placement procedures and materials used for engineered fill, etc.) and compaction testing of the engineered fill.

C.3. Spread Footings

Table 6 below contains our recommended parameters for foundation design.

Table 6. Recommended Spread Footing Design Parameters

Item	Description
Maximum net allowable bearing pressure (psf) Interior column pad footings Perimeter strip footings	 2000 2000
Minimum factor of safety for bearing capacity failure	3.0
Minimum width (inches)	24
Minimum embedment below final exterior grade for heated structures (inches)	36
Minimum embedment below final exterior grade for unheated structures or for footings not protected from freezing temperatures during construction (inches)	72
Total estimated settlement (inches)	≤1 inch
Differential settlement	Typically about 2/3 of total settlement*

* Actual differential settlement amounts will depend on final loads and foundation layout. When tying into the existing buildings, the total settlement of this new building will be differential to the existing building. We can evaluate differential settlement based on final foundation plans and loadings.

C.4. Interior Slabs

C.4.a. Subgrade Modulus

The anticipated floor subgrade is a minimum of 1 foot of imported sand. We recommend using a modulus of subgrade reaction, k, of 100 pounds per square inch per inch of deflection (pci) to design the slabs with 1 foot of overexcavation and engineered fill. If the slab design requires placing 6 inches of compacted crushed aggregate base immediately below the slab, the slab design may increase the k-value by 50 pci. We recommend that the aggregate base materials be free of bituminous. In addition to improving the modulus of subgrade reaction, an aggregate base facilitates construction activities and is less weather sensitive.

C.4.b. Moisture Vapor Protection

Excess transmission of water vapor could cause floor dampness, certain types of floor bonding agents to separate, or mold to form under floor coverings. If project planning includes using floor coverings or coatings, we recommend placing a vapor retarder or vapor barrier immediately beneath the slab. We also recommend consulting with floor covering manufacturers regarding the appropriate type, use and installation of the vapor retarder or barrier to preserve warranty assurances.

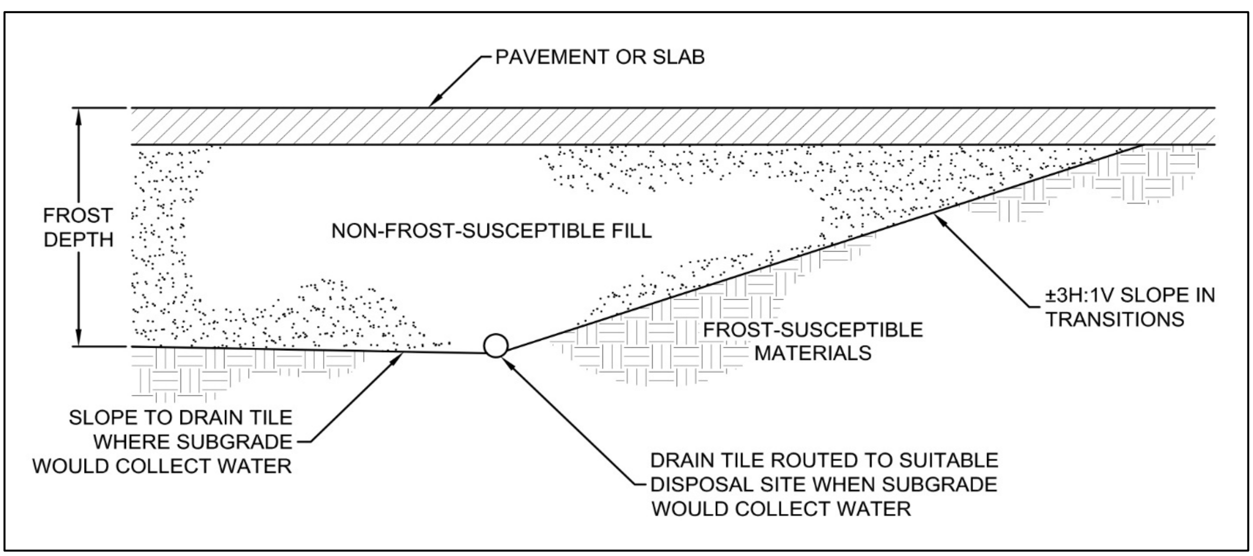
C.5. Frost Protection

We consider lean clay material with sand and imported sand fill to be slightly frost susceptible. While the proposed construction will remove the majority of these soils, unfavorable amounts of heaving could occur if these soils become saturated and freeze. Grading to direct surface drainage away from buildings helps limit the potential for saturation and subsequent heaving to occur. Still, even limited amounts of movement can create tripping hazards.

One method to help limit the potential for heaving to occur is to remove frost-susceptible soils present below the overlying slab or pavement area down to bottom-of-footing grades, and replace the excavated material with non-frost-susceptible, engineered fill. We recommend providing drainage at the base of the subcut, as well as gradual transitions from this subcut (3H:1V or flatter gradient).

Figure 3 shows an illustration summarizing some of the recommendations above.

Figure 3. Frost Protection Geometry Illustration



An alternative method to reduce the risk of heaving is to support the slabs on frost-depth footings, and suspend the slabs at least 4 inches above the underlying subgrade soils. With this alternative, we recommend making accommodations for differential frost heave at transition areas.

Over the life of the pavement or slab, cracks may develop and joints may open up, which will expose the subgrade and allow water to enter the subgrade. This water entering the subgrade increases the likelihood of heave. It will be critical that the owner develop a detailed maintenance program to repair any cracks and joints that may develop during the useful life of the various surface features. The maintenance program should pay special attention to areas where dissimilar materials abut one another, where construction joints occur and where shrinkage cracks develop.

C.6. Pavements and Exterior Slabs

C.6.a. Design Sections

Based on our geotechnical experience with the glacial lean clay soils anticipated at the pavement subgrade elevation, we recommend pavement design assume a CBR value of 3. Note the contractor may need to perform limited removal of unsuitable or less suitable soils to achieve this value. Table 7 provides recommended pavement sections, based on the soils support and traffic loads. We based the concrete pavement designs on a modulus of subgrade reaction (k) of 100 pci.

Table 7. Recommended Concrete Pavement Sections

Use	Concrete Thickness	Aggregate Thickness
Light Duty – Passenger Vehicles	6 inches	6 inches
Medium Duty – Ambulances, Delivery Truck/Garbage Truck	6 ½ inches	6 inches

Note: All pavement sections should be underlain with a geotextile separation fabric.

C.6.b. Concrete Pavements

We assumed the concrete pavement sections in Table 7 will have edge support. We recommend placing an aggregate base below the pavement to provide a suitable subgrade for concrete placement, reduce faulting and help dissipate loads. Appropriate mix designs, panel sizing, jointing, doweling and edge reinforcement are critical to performance of rigid pavements. We recommend you contact your civil engineer to determine the final design or consult with us for guidance on these items.

C.6.c. Gravel Parking Lot

We understand that the gravel parking lot will primarily be used to employee parking, but ambulance traffic will also use the gravel lot for service bay access, along with any large delivery or garbage vehicles. We recommend placing at least 10 inches of Class 5 or Class 13 gravel to use as the parking lot surface, and placing a geotextile separation fabric between the engineered fill and gravel to prevent cross-contamination. Providing grade on gravel lots are important to reduce the potential of ponding.

C.6.d. Subgrade Drainage

We recommend installing perforated drainpipes throughout pavement areas at low points, around catch basins, and behind curb in landscaped areas. We also recommend installing drainpipes along pavement and exterior slab edges where exterior grades promote drainage toward those edge areas. The contractor should place drainpipes in small trenches, extended at least 8 inches below the granular subbase layer, or below the aggregate base material where no subbase is present.

C.6.e. Performance and Maintenance

We based the above pavement designs on a 35-year performance life for concrete. This is the amount of time before we anticipate the pavement will require reconstruction. This performance life assumes routine maintenance, such as seal coating and crack sealing. The actual pavement life will vary depending on variations in weather, traffic conditions and maintenance.

Many conditions affect the overall performance of the exterior slabs and pavements. Some of these conditions include the environment, loading conditions and the level of ongoing maintenance. It is common to have thermal cracking develop within the first few years of placement, and continue throughout the life of the pavement. We recommend developing a regular maintenance plan for filling cracks in exterior slabs and pavements to lessen the potential impacts for cold weather distress due to frost heave or warm weather distress due to wetting and softening of the subgrade.

C.7. Utilities

C.7.a. Subgrade Stabilization

Earthwork activities associated with utility installations located inside the building area should adhere to the recommendations in Section C.2.g.

For exterior utilities, we anticipate the soils at typical invert elevations will be suitable for utility support. However, if construction encounters unfavorable conditions such as soft clay, organic soils or perched water at invert grades, the unsuitable soils may require some additional subcutting and replacement with sand or crushed rock to prepare a proper subgrade for pipe support. Project design and construction should not place utilities within the 1H:1V oversizing of foundations.

C.7.b. Corrosion Potential

Based on our experience, the soils encountered by the borings are moderately corrosive to metallic conduits, but only marginally corrosive to concrete. We recommend specifying non-corrosive materials or providing corrosion protection, unless project planning chooses to perform additional tests to demonstrate the soils are not corrosive.

C.8. Equipment Support

The recommendations included in the report may not be applicable to equipment used for the construction and maintenance of this project. We recommend evaluating subgrade conditions in areas of shoring, scaffolding, cranes, pumps, lifts and other construction equipment prior to mobilization to determine if the exposed materials are suitable for equipment support, or require some form of subgrade improvement. We also recommend project planning consider the effect that loads applied by such equipment may have on structures they bear on or surcharge – including pavements, buried utilities, below-grade walls, etc. We can assist you in this evaluation.

D. Procedures

D.1. Penetration Test Borings

We drilled the penetration test borings with a truck-mounted core and auger drill equipped with hollow-stem auger. We performed the borings in general accordance with ASTM D6151 taking penetration test samples at 2 1/2- or 5-foot intervals in general accordance to ASTM D1586. We collected thin-walled tube samples in general accordance with ASTM D1587 at selected depths. The boring logs show the actual sample intervals and corresponding depths. We also collected bulk samples of auger cuttings at selected locations for laboratory testing. We backfilled the penetration test boreholes with auger cuttings as noted on the Log of Boring sheets in the Appendix.

D.2. Exploration Logs

D.2.a. Log of Boring Sheets

The Appendix includes Log of Boring sheets for our penetration test borings. The logs identify and describe the penetrated geologic materials, and present the results of penetration resistance and other in-situ tests performed. The logs also present the results of laboratory tests performed on penetration test samples, and groundwater measurements. The Appendix also includes a Fence Diagram intended to provide a summarized cross-sectional view of the soil profile across the site.

We inferred strata boundaries from changes in the penetration test samples and the auger cuttings. Because we did not perform continuous sampling, the strata boundary depths are only approximate. The boundary depths likely vary away from the boring locations, and the boundaries themselves may occur as gradual rather than abrupt transitions.

D.2.b. Geologic Origins

We assigned geologic origins to the materials shown on the logs and referenced within this report, based on: (1) a review of the background information and reference documents cited above, (2) visual classification of the various geologic material samples retrieved during the course of our subsurface exploration, (3) penetration resistance and other in-situ testing performed for the project, (4) laboratory test results, and (5) available common knowledge of the geologic processes and environments that have impacted the site and surrounding area in the past.

D.3. Material Classification and Testing

D.3.a. Visual and Manual Classification

We visually and manually classified the geologic materials encountered based on ASTM D2488. When we performed laboratory classification tests, we used the results to classify the geologic materials in accordance with ASTM D2487. The Appendix includes a chart explaining the classification system we used.

D.3.b. Laboratory Testing

The exploration logs in the Appendix note most of the results of the laboratory tests performed on geologic material samples. The remaining laboratory test results follow the exploration logs. We performed the tests in general accordance with ASTM procedures.

D.4. Groundwater Measurements

The drillers checked for groundwater while advancing the penetration test borings, and again after auger withdrawal. We then filled the boreholes or allowed them to remain open for an extended period of observation, as noted on the boring logs.

E. Qualifications

E.1. Variations in Subsurface Conditions

E.1.a. Material Strata

We developed our evaluation, analyses and recommendations from a limited amount of site and subsurface information. It is not standard engineering practice to retrieve material samples from exploration locations continuously with depth. Therefore, we must infer strata boundaries and thicknesses to some extent. Strata boundaries may also be gradual transitions, and project planning should expect the strata to vary in depth, elevation and thickness, away from the exploration locations.

Variations in subsurface conditions present between exploration locations may not be revealed until performing additional exploration work, or starting construction. If future activity for this project reveals any such variations, you should notify us so that we may reevaluate our recommendations. Such variations could increase construction costs, and we recommend including a contingency to accommodate them.

E.1.b. Groundwater Levels

We made groundwater measurements under the conditions reported herein and shown on the exploration logs, and interpreted in the text of this report. Note that the observation periods were relatively short, and project planning can expect groundwater levels to fluctuate in response to rainfall, flooding, irrigation, seasonal freezing and thawing, surface drainage modifications and other seasonal and annual factors.

E.2. Continuity of Professional Responsibility

E.2.a. Plan Review

We based this report on a limited amount of information, and we made a number of assumptions to help us develop our recommendations. We should be retained to review the geotechnical aspects of the designs and specifications. This review will allow us to evaluate whether we anticipated the design correctly, if any design changes affect the validity of our recommendations, and if the design and specifications correctly interpret and implement our recommendations.

E.2.b. Construction Observations and Testing

We recommend retaining us to perform the required observations and testing during construction as part of the ongoing geotechnical evaluation. This will allow us to correlate the subsurface conditions exposed during construction with those encountered by the borings and provide professional continuity from the design phase to the construction phase. If we do not perform observations and testing during construction, it becomes the responsibility of others to validate the assumption made during the preparation of this report and to accept the construction-related geotechnical engineer-of-record responsibilities.

E.3. Use of Report

This report is for the exclusive use of the addressed parties. Without written approval, we assume no responsibility to other parties regarding this report. Our evaluation, analyses and recommendations may not be appropriate for other parties or projects.

E.4. Standard of Care

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

Appendix

F:\2024\B2409006\GIS\B2409006.aprx

BRAUN INTERTEC
The Science You Build On.
526 10th St NE, Suite 300
West Fargo, ND 58078
701.492.5875
braunintertec.com

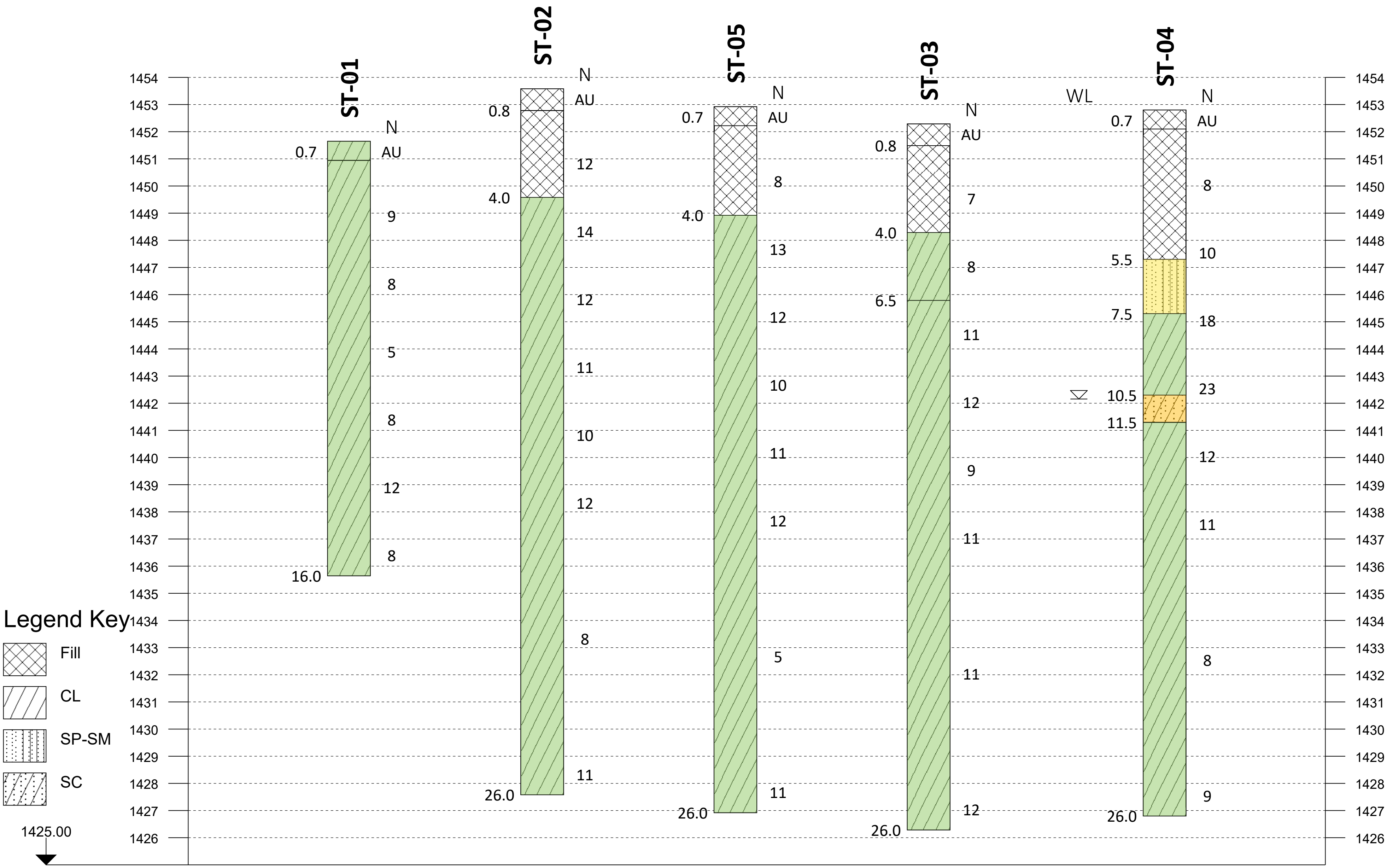
Project No:	B2409006
Drawing No:	BoringLocs
Drawn By:	SL
Date Drawn:	12/18/2024
Checked By:	KD
Last Modified:	12/18/2024

Ellendale E.M.S Building

U.S. Highway 281 and 15th St. N

Ellendale, North Dakota

Boring Location Sketch



SECTION LINE 1

Fence Diagram

Geotechnical Evaluation
Ellendale E.M.S Building
U.S. Highway 281 and 15th St. N
Ellendale, North Dakota

Project ID: B2409006
Vert. Scale: 1"= 5'
Hor. Scale: NTS
Date: 11/18/2024

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2409006
Geotechnical Evaluation
Ellendale E.M.S Building
U.S. Highway 281 and 15th St. N
Ellendale, North Dakota

BORING:	**ST-01**		
LOCATION: Captured with RTK GPS.			
DATUM: WGS 84			
LATITUDE:	46.017410	LONGITUDE:	-98.525379
START DATE:	11/07/24	END DATE:	11/07/24
SURFACING:	Grass	WEATHER:	Clear

DRILLER: B.Hatle	LOGGED BY: K.Dragos		
SURFACE ELEVATION: 1451.6 ft	RIG: 7520	METHOD: 3 1/4" HSA	

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1450.9 / 0.7		LEAN CLAY (CL), trace roots, trace Sand, dark brown, moist (TOPSOIL)		AU			
		LEAN CLAY with SAND (CL), trace Sand and Silt lenses, brown and gray, moist, medium to stiff, iron oxide staining (GLACIAL TILL)		2-4-5 (9) 8"	1		
			5	2-4-4 (8) 10"	1.25	11	
				1-2-3 (5) 13"	1.25		
		Trace Gravel below 9.5 feet	10	1-4-4 (8) 13"	1.5	18	
				3-5-7 (12) 16"	2		
1435.6 / 16.0		*Gray below 14.5 feet*	15	2-4-4 (8) 12"	2	18	Water not observed while drilling.
		END OF BORING Boring then backfilled with auger cuttings					
			20				
			25				
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2409006 **Geotechnical Evaluation** **Ellendale E.M.S Building** **U.S. Highway 281 and 15th St. N** **Ellendale, North Dakota**	BORING: **ST-02**		
	LOCATION: Captured with RTK GPS.		
	DATUM: WGS 84		
	LATITUDE: 46.017421	LONGITUDE: -98.526013	
DRILLER: B.Hatle	LOGGED BY: K.Dragos	START DATE: 11/07/24	END DATE: 11/07/24
SURFACE ELEVATION: 1453.6 ft	RIG: 7520 / METHOD: 3 1/4" HSA	SURFACING: Grass	WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1452.8 / 0.8		LEAN CLAY (CL), trace roots, trace Sand, brown, moist (TOPSOIL FILL)		AU			
1449.6 / 4.0		FILL: LEAN CLAY with SAND (CL), trace Gravel, brown, moist, iron oxide staining		3-5-7 (12) 8"			
		LEAN CLAY with SAND (CL), trace Gravel, with mineralization, brown, moist, stiff to medium, iron oxide staining (GLACIAL TILL)	5	3-6-8 (14) 11"	1.25	17	LL=31, PL=14, PI=17
		Fine to medium grained Sand lenses and trace Gravel below 6 feet					
		Brown and gray below 7 feet		3-5-7 (12) 12"	1.75		
			10	3-5-6 (11) 11"	1.75	20	
				2-4-6 (10) 14"	1.75		
			15	4-5-7 (12) 11"	1.75	19	Possible coarse Gravel and Cobbles from 14 to 19 feet
			20	2-4-4 (8) 10"	2		
1427.6 / 26.0		*Gray below 24.5 feet*	25	3-4-7 (11) 12"	1		Water not observed while drilling.
		END OF BORING					
		Boring then backfilled with auger cuttings					
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2409006 **Geotechnical Evaluation** **Ellendale E.M.S Building** **U.S. Highway 281 and 15th St. N** **Ellendale, North Dakota**	BORING: **ST-03** LOCATION: Captured with RTK GPS. DATUM: WGS 84	LATITUDE: 46.017235	LONGITUDE: -98.526196
DRILLER: B.Hatle / LOGGED BY: K.Dragos	START DATE: 11/07/24	END DATE: 11/07/24	
SURFACE ELEVATION: 1452.3 ft / RIG: 7520 / METHOD: 3 1/4" HSA	SURFACING: Grass	WEATHER: Clear	

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1451.5 / 0.8		FILL: LEAN CLAY (CL), trace roots, trace Sand, dark brown, moist		AU			
1448.3 / 4.0		FILL: LEAN CLAY (CL), trace Sand, with mineralization, brown and gray, moist, iron oxide staining		2-3-4 (7) 9"			
1445.8 / 6.5		SANDY LEAN CLAY (CL), trace Gravel, brown, moist (POSSIBLE FILL)	5	3-4-4 (8) 12"		16	LL=28, PL=13, PI=15
		LEAN CLAY with SAND (CL), trace Gravel, with mineralization, brown and gray, moist, stiff, iron oxide staining (GLACIAL TILL)		3-5-6 (11) 13"	2		
			10	4-5-7 (12) 12"	1.5	17	
		Gray below 12 feet		3-3-6 (9) 14"	1.5		
			15	2-4-7 (11) 13"	1	18	
		Trace brown Sand lenses below 19.5 feet	20	3-5-6 (11) 12"	1.25		
1426.3 / 26.0			25	4-6-6 (12) 13"	1		
		END OF BORING Boring then backfilled with auger cuttings	30				Water not observed while drilling.

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2409006 **Geotechnical Evaluation** **Ellendale E.M.S Building** **U.S. Highway 281 and 15th St. N** **Ellendale, North Dakota**	BORING: **ST-04** LOCATION: Captured with RTK GPS. DATUM: WGS 84		
	LATITUDE: 46.017376	LONGITUDE: -98.526303	
DRILLER: B.Hatle	LOGGED BY: K.Dragos	START DATE: 11/07/24	END DATE: 11/07/24
SURFACE ELEVATION: 1452.8 ft	RIG: 7520 / METHOD: 3 1/4" HSA	SURFACING: Grass	WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample Depth	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1452.1 / 0.7		LEAN CLAY (CL), trace roots, trace Sand, dark brown, moist (TOPSOIL FILL)		AU			Bulk sample obtained from 1 to 6 feet
1447.3 / 5.5		FILL: LEAN CLAY (CL), trace Gravel, Sand, and mineralization, brown and gray, moist, iron oxide staining		2-3-5 (8) 6"			LL=38, PL=16, PI=22 P200=63% MDD=111.3 pcf OMC=14.5%
			5	1-3-7 (10) 13"		17	
1445.3 / 7.5		POORLY GRADED SAND with CLAY (SP-SC), fine to coarse-grained, trace fine Gravel, brown, moist (GLACIAL TILL) *Wet Sand from 7 to 7.5 feet*		2-8-10 (18) 12"	1	14	P200=20%
1442.3 / 10.5	▽	LEAN CLAY with SAND (CL), trace Gravel, trace Sand, brown and gray, moist, very stiff to hard, iron oxide staining (GLACIAL TILL)	10	3-10-13 (23) 12"		9	
1441.3 / 11.5		CLAYEY SAND (SC), fine to coarse-grained, trace fine Gravel, brown, moist, medium dense (GLACIAL OUTWASH)		3-5-7 (12) 16"	1.5		
		LEAN CLAY with SAND (CL), trace Gravel, gray, moist, stiff to medium (GLACIAL TILL)	15	4-5-6 (11) 12"	1.25	16	
			20	3-3-5 (8) 10"	1		
1426.8 / 26.0		*Trace mineralization below 24.5 feet*	25	4-3-6 (9) 13"	0.5		Water observed at 10.5 feet while drilling.
		END OF BORING Boring then backfilled with auger cuttings	30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2409006 **Geotechnical Evaluation** **Ellendale E.M.S Building** **U.S. Highway 281 and 15th St. N** **Ellendale, North Dakota**	BORING: **ST-05** LOCATION: Captured with RTK GPS. DATUM: WGS 84 LATITUDE: 46.017165 LONGITUDE: -98.526053
DRILLER: B.Hatle LOGGED BY: K.Dragos	START DATE: 11/07/24 END DATE: 11/07/24
SURFACE ELEVATION: 1452.9 ft RIG: 7520 METHOD: 3 1/4" HSA	SURFACING: Grass WEATHER: Clear

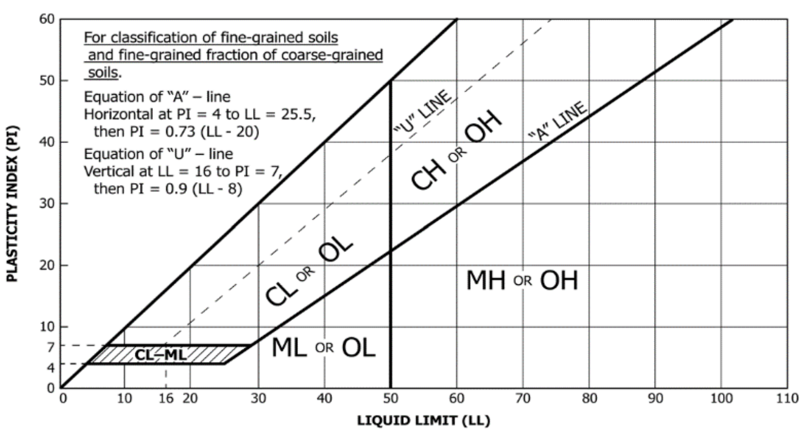
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Depth	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1452.2 / 0.7		LEAN CLAY (CL), trace Gravel, roots, and Sand, dark brown, moist (TOPSOIL FILL)			AU			
1448.9 / 4.0		FILL: LEAN CLAY (CL), trace Gravel, roots, and Sand, brown, moist			2-4-4 (8) 6"			
		LEAN CLAY with SAND (CL), trace Gravel, mineralization, brown, moist, stiff to medium, iron oxide staining (GLACIAL TILL)	5		9-6-7 (13) 10"	0.75	21	LL=42, PL=16, PI=26
					3-5-7 (12) 11"	1.5		
			10		2-4-6 (10) 10"	1.5	18	
		Gray below 12 feet			3-5-6 (11) 12"	1.5		
			15		3-6-6 (12) 10"	1.25	18	
			20		1-2-3 (5) 8"			
1426.9 / 26.0			25		3-5-6 (11) 10"			Water not observed while drilling.
		END OF BORING Boring then backfilled with auger cuttings	30					

Descriptive Terminology of Soil

Based on Standards ASTM D2487/2488
(Unified Soil Classification System)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification: Group Symbol	Soil Classification: Group Name[B]
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[C])	$C_u \geq 4$ and $1 \leq C_c \leq 3$[D]	GW	Well-graded gravel[E]
			$C_u < 4$ and/or ($C_c < 1$ or $C_c > 3$)[D]	GP	Poorly graded gravel[E]
		Gravels with Fines (More than 12% fines[C])	Fines classify as ML or MH	GM	Silty gravel[E F G]
			Fines Classify as CL or CH	GC	Clayey gravel[E F G]
	Sands (50% or more coarse fraction passes No. 4 sieve)	Clean Sands (Less than 5% fines[H])	$C_u \geq 6$ and $1 \leq C_c \leq 3$[D]	SW	Well-graded sand[I]
			$C_u < 6$ and/or ($C_c < 1$ or $C_c > 3$)[D]	SP	Poorly graded sand[I]
		Sands with Fines (More than 12% fines[H])	Fines classify as ML or MH	SM	Silty sand[F G I]
			Fines classify as CL or CH	SC	Clayey sand[F G 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 on or above "A" line[J]	CL	Lean clay[K L M]
			PI < 4 or plots below "A" line[J]	ML	Silt[K L M]
		Organic	Liquid Limit – oven dried / Liquid Limit – 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	Liquid Limit – oven dried / Liquid Limit – 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. $C_u = D_{60} / D_{10}$ $C_c = (D_{30})^2 / (D_{10} \times D_{60})$
E. If soil contains ≥ 15% sand, add "with sand" to group name.
F. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
G. If fines are organic, add "with organic fines" to group name.
H. 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
I. If soil contains ≥ 15% gravel, add "with gravel" to group name.
J. If Atterberg limits plot in hatched area, soil is CL-ML, silty clay.
K. If soil contains 15 to < 30% 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.



Laboratory Tests

DD	Dry density, pcf	**q_p**	Pocket penetrometer strength, tsf
WD	Wet density, pcf	**q_U**	Unconfined compression test, tsf
P200	% Passing #200 sieve	**LL**	Liquid limit
MC	Moisture content, %	**PL**	Plastic limit
OC	Organic content, %	**PI**	Plasticity index

Particle Size Identification

Boulders............. over 12"
Cobbles............... 3" to 12"
Gravel
  Coarse............ 3/4" to 3" (19.00 mm to 75.00 mm)
  Fine................ No. 4 to 3/4" (4.75 mm to 19.00 mm)
Sand
  Coarse............. No. 10 to No. 4 (2.00 mm to 4.75 mm)
  Medium........... No. 40 to No. 10 (0.425 mm to 2.00 mm)
  Fine................. No. 200 to No. 40 (0.075 mm to 0.425 mm)
Silt........................ No. 200 (0.075 mm) to .005 mm
Clay...................... < .005 mm

Relative Proportions[L, M]

trace............................ 0 to 5%
little............................. 6 to 14%
with............................. ≥ 15%

Inclusion Thicknesses

lens.............................. 0 to 1/8"
seam............................ 1/8" to 1"
layer............................. over 1"

Apparent Relative Density of Cohesionless Soils

Very loose .... 0 to 4 BPF
Loose .... 5 to 10 BPF
Medium dense............. 11 to 30 BPF
Dense........................... 31 to 50 BPF
Very dense................... over 50 BPF

Consistency of Cohesive Soils	Blows Per Foot	Approximate Unconfined Compressive Strength
Very soft..................	0 to 1 BPF..................	< 0.25 tsf
Soft..........................	2 to 4 BPF..................	0.25 to 0.5 tsf
Medium....................	5 to 8 BPF	0.5 to 1 tsf
Stiff..........................	9 to 15 BPF................	1 to 2 tsf
Very Stiff..................	16 to 30 BPF..............	2 to 4 tsf
Hard.........................	over 30 BPF................	> 4 tsf

Moisture Content:

Dry: Absence of moisture, dusty, dry to the touch.
Moist: Damp but no visible water.
Wet: Visible free water, usually soil is below water table.

Drilling Notes:

Blows/N-value: Blows indicate the driving resistance recorded for each 6-inch interval. The reported N-value is the blows per foot recorded by summing the second and third interval in accordance with the Standard Penetration Test, ASTM D1586.

Partial Penetration: If the sampler could not be driven through a full 6-inch interval, the number of blows for that partial penetration is shown as #/x" (i.e. 50/2"). The N-value is reported as "REF" indicating refusal.

Recovery: Indicates the inches of sample recovered from the sampled interval. For a standard penetration test, full recovery is 18", and is 24" for a thinwall/shelby tube sample.

WOH: Indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

WOR: Indicates the sampler penetrated soil under weight of rods alone; hammer weight and driving not required.

Water Level: Indicates the water level measured by the drillers either while drilling (▽), at the end of drilling (▼), or at some time after drilling (▼).

Sample Symbols

Standard Penetration Test	Rock Core
Modified California (MC)	Thinwall (TW)/Shelby Tube (SH)
Auger	Texas Cone Penetrometer
Grab Sample	Dynamic Cone Penetrometer

BRAUN INTERTEC
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Standard Proctor M-D Relationship

ASTM D698

Report Date: 11/26/2024

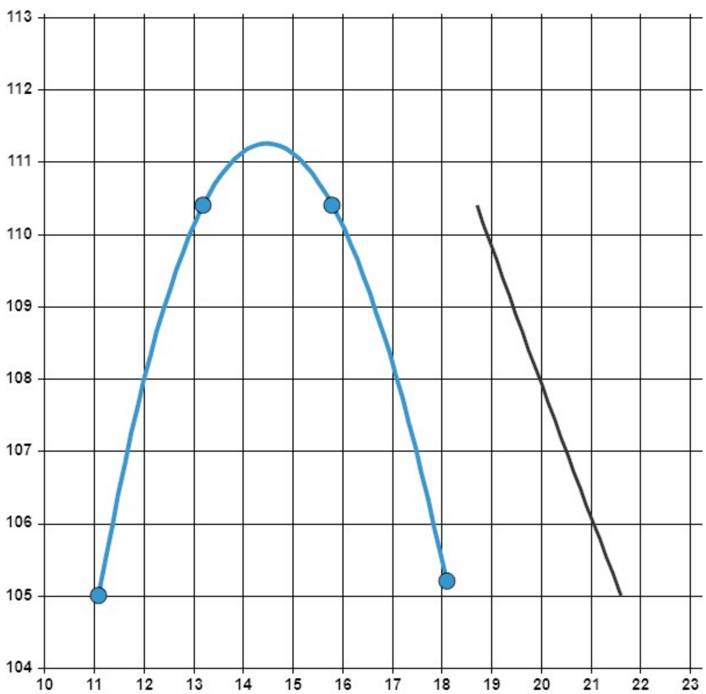
526 10th St NE, Suite 300
PO Box 485
West Fargo, ND 58078
Phone: 701-232-8701

Client:	**Project:**
Interstate Engineering, Inc. 1903 12th Ave SW PO Box 2035 Jamestown, ND 58401	B2409006 Ellendale E.M.S Building U.S. Highway 281 and 15th St. N Ellendale, ND 58436

Sample Information

Sample Number:	633510	**Alternate ID:**	P-01
Boring Number:	ST-04	**Depth (ft):**	1' - 6'
Sample From:	Auger Cuttings	**Sampled By:**	Drill Crew
Sample Date:	11/07/2024		
Received Date:	11/22/2024	**Lab:**	526 10th Street NE, Suite 300, West Fargo, ND
Tested Date:	11/26/2024	**Tested By:**	Lage, Andrew

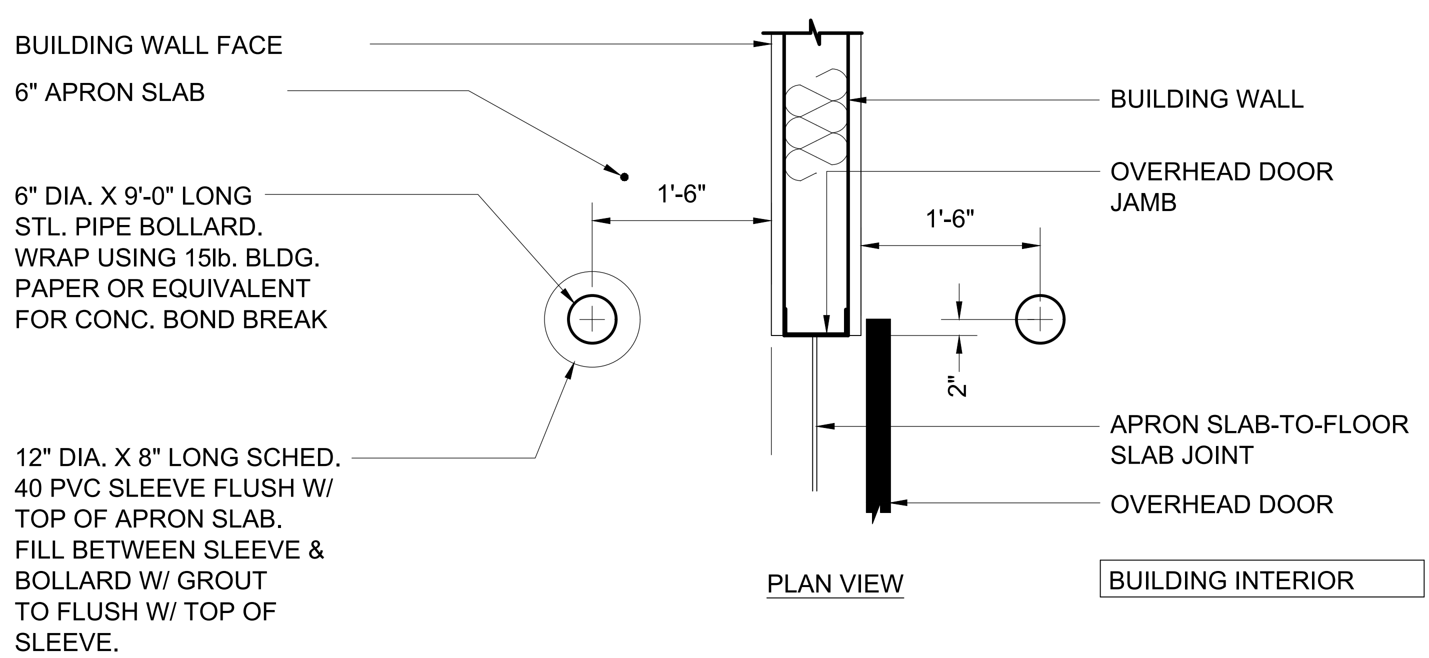
Laboratory Data

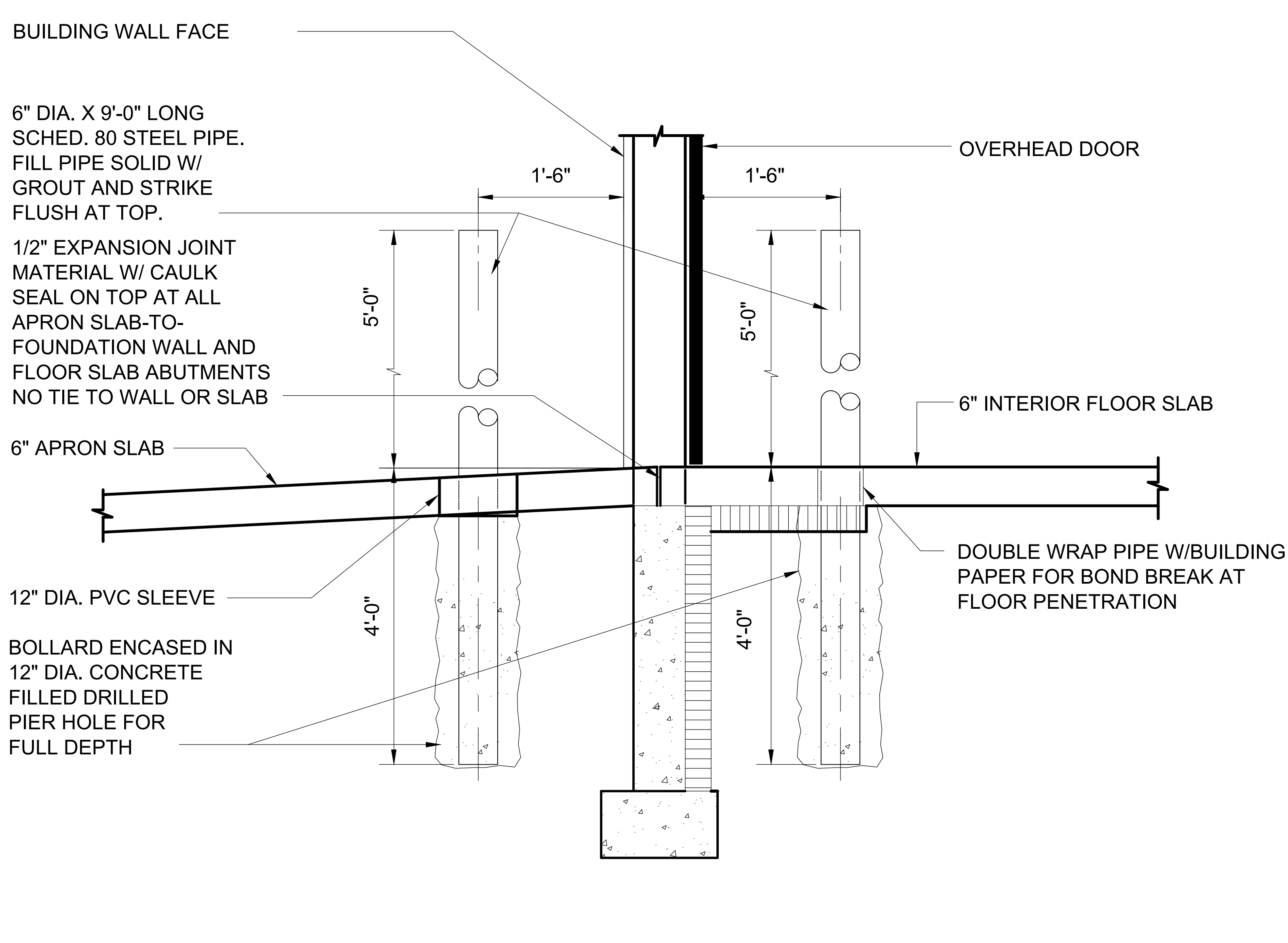


Proctor ID:	P-01		
Maximum Dry Density (pcf):	111.3		
Optimum Moisture (%):	14.5		
Method:	Method A		
Preparation Method:	Moist		
Rammer Type:	Manual Round		
Specific Gravity:	2.65		
Specific Gravity Source:	Assumed		
Liquid Limit:	38	**Plastic Limit:**	16
Plastic Index:	22		
Passes #200 (%):	63.4	**Retained #200 (%):**	36.6
Retained On 3/4 (%):	0	**Retained On 3/8 (%):**	0
Retained On #4 (%):	2	**Passing #4 (%):**	98

Classification: Sandy Lean Clay with trace Gravel (CL), Brown

General

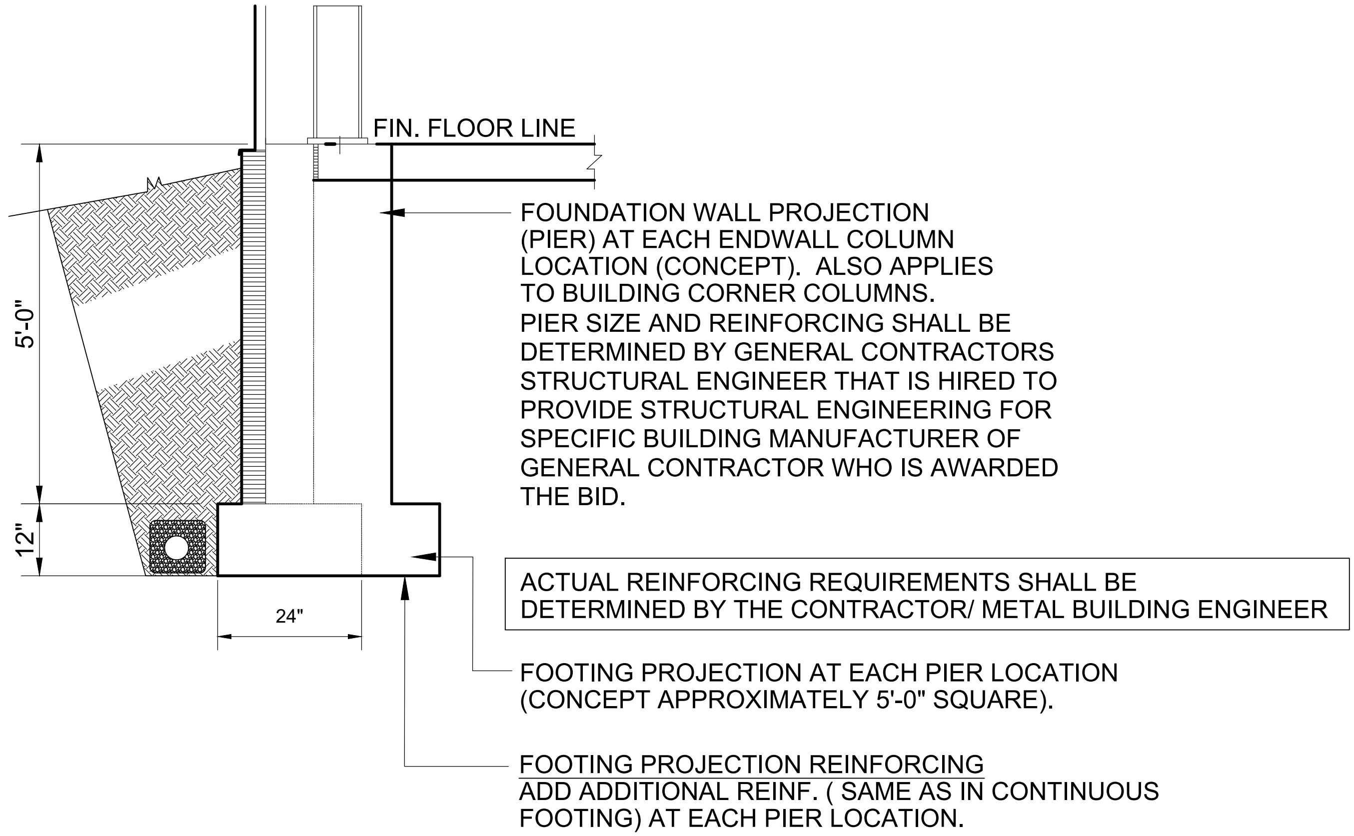




OVERHEAD DOOR BOLLARD DETAILS

0 1' 2'

SCALE: 1/2"



FOUNDATION PIER (CONCEPT)

SCALE: 3/8"