

April 24, 2026

Re: Revenue Producing Hangar
Hoven Municipal Airport
Hoven, South Dakota
AIP #3-46-0021-019/020-2026
Helms #A-9856

Bid Opening: **April 29, 2026**
2:00 pm Local Time

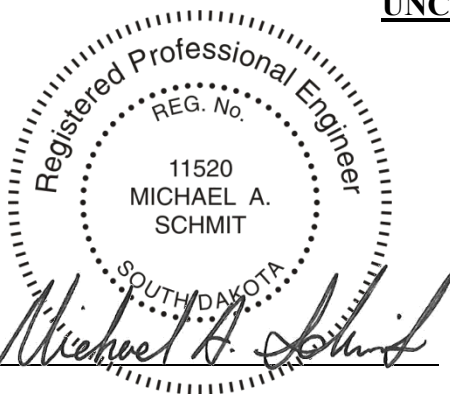
ADDENDUM NUMBER 1

The following modifications are made to the plans and specifications for the Revenue Producing Hangar Project, Hoven Municipal Airport:

CONTRACT DOCUMENTS AND TECHNICAL SPECIFICATIONS

1. **Technical Specifications, Item SP-02 30 00 Subsurface Investigation, add the attached Soils Report.**
2. **Technical Specifications, Section 08 34 16 Vertically Bi-Fold Hangar Doors, add the attached specification.**

ALL OTHER ITEMS OF THE PLANS AND SPECIFICATIONS REMAIN UNCHANGED



BY: _____

PROJECT ENGINEER – HELMS & ASSOCIATES

Acknowledge receipt of the Addendum by inserting its number on the Bid Form. Failure to do so may subject bidder to disqualification. This Addendum forms a part of the Contract Documents. It modifies them as above.

Soil Technologies, Inc.

28822 124th Street – Mobridge, SD 57601 – (605) 762-3406

www.soil-technologies.com

“Building Your Success On A Solid Foundation”

September 25, 2025

Helms and Associates
Attn: Ms. Brooke B. Edgar, P.E.
416 Production St. N.
Aberdeen, SD 57402



Subj: Proposal - Soil Exploration
Proposed Hangar
Municipal Airport
Hoven, SD
STI #25-1935

This report presents the findings of the Soil Exploration performed for the above referenced project. The exploration was performed in accordance with your authorization of our proposal to you dated November 19, 2025. An electronic file copy is being sent to you.

Soil Technologies, Inc. (STI) is dedicated to providing our clients with the most complete Soil Exploration and Geotechnical Engineering services. To accomplish this, a Geotechnical Engineer from Soil Technologies, Inc. should be retained to monitor the earthwork operations during construction. The Geotechnical Engineer will observe the soil conditions at the project site and judge when the excavations are satisfactorily completed. The Geotechnical Engineer's observations will help affirm that the earthwork is performed according to the recommendations of this report.

Thank you for the opportunity to perform these services for you on this project. If you have any questions regarding the contents of this report, or if we can be of further service to you, please feel free to contact us.

SOIL TECHNOLOGIES, INC.


Mr. Kim E. Stoecker, PE 6394
President


**HELMS AND ASSOCIATES
ABERDEEN, SD**

**SOIL EXPLORATION
PROPOSED HANGAR
MUNICIPAL AIRPORT
HOVEN, SD**

STI #25-1935

September 25, 2025

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SOIL EXPLORATION

PROPOSED HANGAR

MUNICIPAL AIRPORT - HOVEN, SD

STI #25-1935

1.0 INTRODUCTION

1.1 Project Information

We understand the proposed project will consist of the construction of a hangar building located at the Hoven Municipal airport at Hoven, SD. The proposed building will consist of a single-story, slab-on-grade (no below grade floors or crawl space), potentially heated structure. It will have overall dimensions of about 60 x 80 feet. The structure will be supported on shallow spread footing foundations.

- **Conditions:**

- The finished floor elevation of the proposed buildings will be within 2 feet above the existing grades and be at an elevations between 1876.5 and 1879.0 feet.*
- The perimeter frost footings of the proposed building will rest 4.5 to 6 feet below the finished floor and be at an elevation between 1870.5 to 1874.5 feet.*
- The new perimeter finished grades immediately surrounding the proposed building will be below the finished floor elevation.
- Column loads will be a maximum of 170 kips (total dead and live loads) with continuous footing loads less than 4 kips/ft (total dead and live loads).
- Uniform floor slab loadings exerted on the underlying soils will be a maximum 500 pounds per square foot (psf).

**Elevations based on survey data provided by Helms & Assoc.*

2.0 ENGINEERING REVIEW

The engineering recommendations provided in this report are based on the soil information obtained under this Soil Exploration along with the information and conditions of the project as described above. The recommendations are valid for the specific information and conditions listed. If there are additions, corrections, or changes to the above information or conditions, it is necessary that we be notified so that we can determine whether the new information or conditions affect our recommendations.

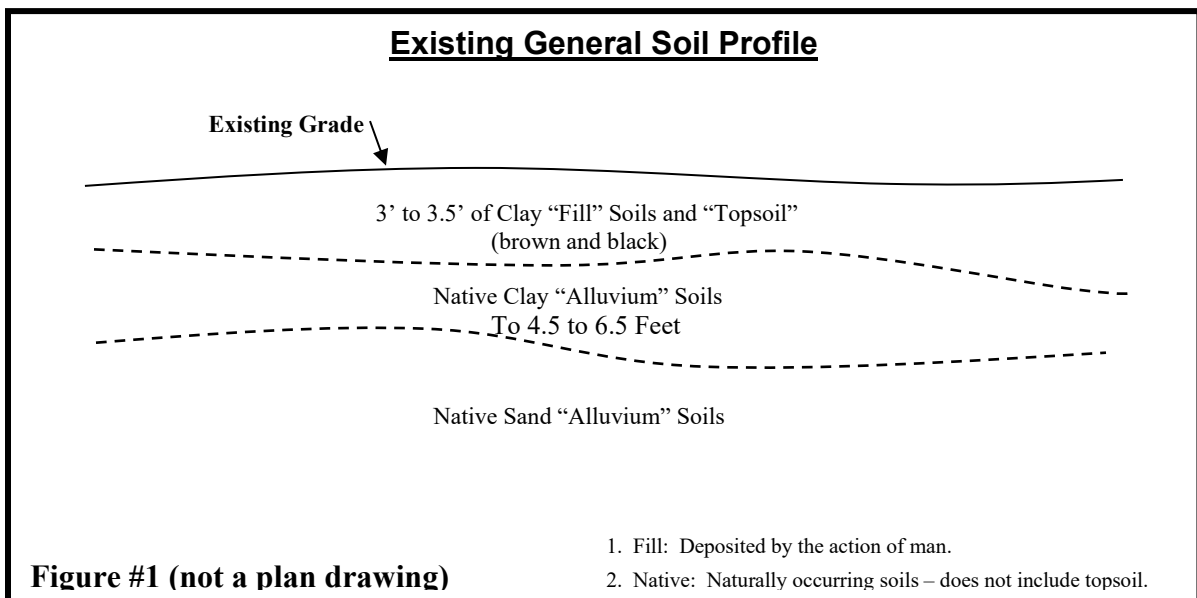
Our design assumptions include a minimum theoretical safety factor of 3 with respect to shearing or base failure of the foundations. We assume an allowable total settlement of 1 inch and a differential settlement of up to ½ inch over a length of 30 feet.

The recommendations in this report assume the location of the proposed building is within 50 feet of the boring locations as shown on the attached sketch. If the location of the proposed building is changed so as not to be within this distance for each of the respective borings, the opinions and recommendation of this report may not be applicable, and we must be contacted for additional review and potentially additional borings.

2.1 Discussion

- **Soil Profile**

The boring logs suggest that the general soil profile in the area of the proposed structure consists of about 3 to 3.5 feet of clay “fill” soils and clay “topsoil” overlying native clay “alluvium” (water deposited soils) to depths of about 4.5 to 6.5 feet below the existing grades. The native clay “alluvium” is underlain by native sand “alluvium” which extend to the termination depths of the borings at 16 below the existing grades. Please refer to Figure #1 below and the attached boring logs.



Note: The existing “fill” soils are assumed to be “undocumented” and thus, they are considered uncontrolled fill that was not monitored nor tested for quality and compaction during placement.

- **General**

Based on the subsurface conditions encountered at the boring locations, it is our opinion that the native soils at the site will support the proposed structure on shallow spread footing foundations, provided the recommendations in this report are performed and the estimated settlements are acceptable. Listed below are some of the more prominent site conditions.

- **FOOTING AREAS:** Based on the boring logs, “fill” soils and “topsoil” exist at the site and extend from the surface to depths of about 3 to 3.5 feet below the existing grades. In our opinion, these soils are not suitable for support of the footings and should be removed from the footing areas. The footings should rest on the native clay or sand “alluvium” soils or on engineered fill (soils that have been compacted and tested to the specified density) placed above the native clay or sand “alluvium” soils.
- **FLOOR AREA:** As mentioned above, “fill” soils and “topsoil” were encountered at the site and extend from the surface to depths of about 3 to 3.5 feet below the existing grades. In our opinion, these existing “fill” soils are not desirable for support of the floor slab due to unknown areas of weak soils or rubble that could exist within the “fill” soils which could result in excess future settlement. However, if the owner is willing to solely accept an increased risk of floor distress, the lower portion of the existing “fill” and “topsoil” could be left in-place and used for in-direct support of the floor slab. If used for in-direct support of the floor slab, the exposed excavated surface of the existing “fill” and/or “topsoil” must be surface compacted, prof-rolled, and approved under the direct observation of STI’s on-site Geotechnical Engineer. If the existing “fill” soils and/or “topsoil” are not surface compacted, proof-rolled, and approved by STI’s on-site Geotechnical Engineer, the “fill” soils and “topsoil” should be completely excavated from the floor area to expose the underlying native soils. The decision to leave the lower portion of the existing “fill” soils in-place and used for in-direct support of the floor slab, and the corresponding risks of excess settlement and building distress, is solely that of the owner/client.

2.2 Site Preparations

FOOTINGS (Interior, Exterior, & Thickened Edged): In our opinion, the existing “fill” soils and “topsoil” should not be used for support of the footings. Thus, we recommend that site preparations in the footing areas consist of the excavation of the existing “fill” soils and “topsoil” to expose the underlying competent native clay or underlying sand “alluvium” soils. The native clay “alluvium” soils were encountered at depths of about 3 to 3.5 feet below the existing grades at the boring locations.

During the footing area excavations, the exposed native clay or sand soils at the bottom of the footing excavation should be observed by STI’s on-site Geotechnical Engineer. The Geotechnical Engineer should perform shallow hand auger borings into the exposed native soils. Soft, sheared, disturbed, loose, or otherwise weak soils should be excavated as directed by the Geotechnical Engineer. Upon the Geotechnical Engineer’s observation and approval of the exposed native soils, the footings can then be constructed to rest on the competent native clay or sand soils, or on engineered fill soils (soils that have been compacted and tested to a specified density) placed above the native soils to meet the design footing grade elevation(s). Refer to “Engineered Fill” recommendations on pages 8-9.

The approximate minimum recommended footing area excavation depths and corresponding elevations at each boring location are shown in Table 1 below. They are also noted on each of the attached boring logs. Also, refer to Figure #4 on page 7 showing “Typical Building Site Preparations.” Keep in mind that the required footing excavation depths may be significantly different at other locations at the site, and the on-site Geotechnical Engineer may require the footing excavation depths to be significantly different at those other locations.

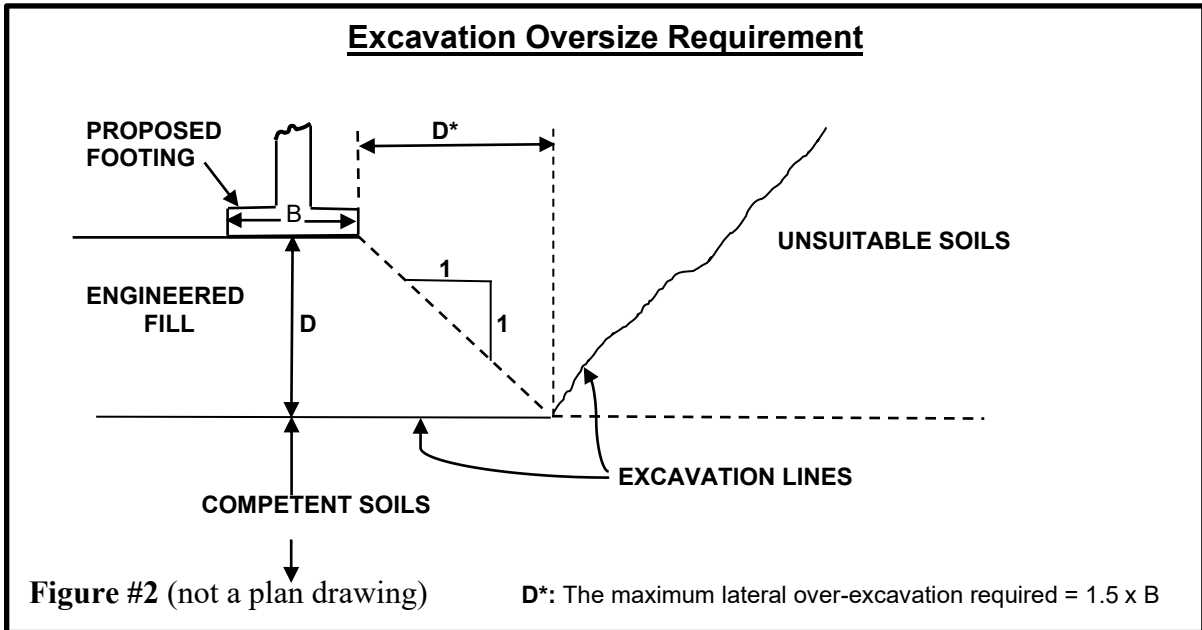
TABLE 1 – FOOTING AREA EXCAVATIONS

Boring #	<u>FOOTING AREA EXCAVATION DEPTHS</u> Minimum Depths of Excavation Below Existing Grade (Feet)	<u>FOOTING AREA EXCAVATION ELEVATIONS</u> Corresponding Minimum Excavation Elevations (Feet)*
1	3.5	1873.0
2	3.5	1873.4
3	3.0	1873.9
4	3.0	1873.8

**Elevations based on survey data provided by Helms & Assoc.*

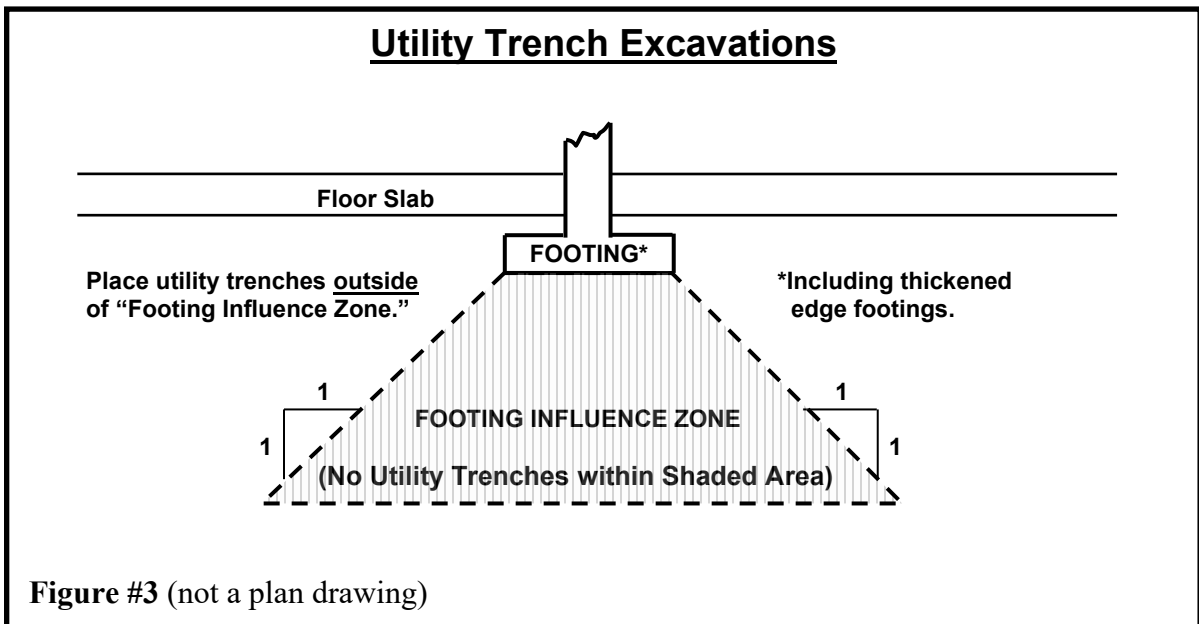
- **Excavation Oversize Requirements**

Engineered fill placed below the footings should be oversized one foot laterally for each foot of engineered fill placed below the footings (extend the excavation outwards from the outer edges of the footings a distance of 1 foot for every 1 foot of engineered fill placed below the footings). The maximum lateral over-excavation required is 1.5 times the width of the footing. Please refer to Figure #2 below illustrating the 1:1 excavation oversize requirement.



- **Utility Trenches**

Utility trenches within the building footprint (and in structural areas outside the building footprint) should be refilled with engineered fill. The engineered fill should be compacted and tested to the specified density listed on page 9. In addition, utility trenches should not be placed within the influence zone of the footings, including the influence zone of thickened edge footings. Please refer to Figure #3 below. If it is necessary to install a utility by crossing beneath an existing footing (new or old), that portion of the utility trench below the existing footing should be refilled with a lean concrete mix (flowable fill).



FLOOR SLAB: In our opinion, the existing “fill” soils and “topsoil” should not be used for direct support of the floor slab. However, the lower portion of the existing “fill” and “topsoil” could be left in-place and used for in-direct support of the floor slab. Thus, if the owner is willing to solely accept an increased risk of floor distress, we recommend that site preparations for the floor slab area consist of the excavation of at least the top 12 inches of the existing clay “fill” soils. In addition, the floor area excavation should be deep enough to place at least 24 inches of granular (sand) engineered fill below the floor slab. To accomplish this, excavation depths greater than 12 inches may be required. Refer to Figure #4 on page 7 showing “Typical Building Site Preparations.”

After completion of the floor area excavation, the exposed soils should be surface compacted using a self-propelled compaction equipment. In addition, the floor area should be proof-rolled using a loaded truck (filled to legal load limits) or similar equipment under the observation by STI’s on-site Geotechnical Engineer. The Geotechnical Engineer should perform shallow hand auger borings into the exposed soils. Soft, sheared, disturbed, loose, or otherwise weak soils as determined by the Geotechnical Engineer should be excavated and replaced with engineered fill as directed by the Geotechnical Engineer. Upon the Geotechnical Engineer’s observation and approval of the exposed native soils, at least 24 inches of granular engineered fill should be placed above the exposed soils to meet the design floor grade elevation. (Refer to the engineered fill recommendations listed on pages 8-9.)

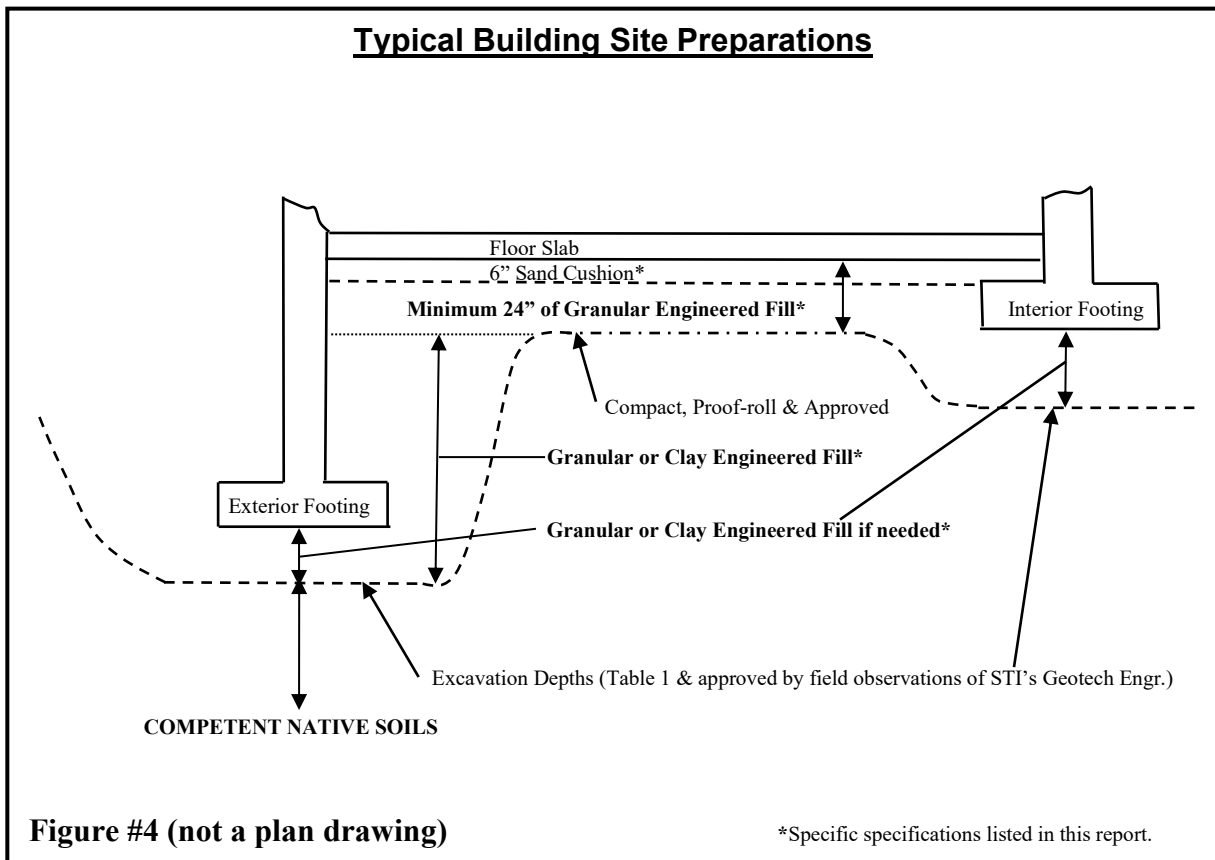
NOTE: If the exposed “fill” soils and/or “topsoil” in the floor area are not surface compacted, proofed-rolled, and approved by STI’s on-site Geotechnical Engineer, we recommend that all the existing “fill” soils and “topsoil” (3.0 to 3.5 feet) be completely excavated from the floor area.

- **Geotechnical Engineer’s Observations**

Soil types and strengths can sometimes vary around and in-between the borings. Some soils may not be as competent for support of the proposed building as those encountered in the borings. Therefore, we recommend that the soils exposed in the final footing and floor area excavations of the proposed structure(s) be observed in the field by a Geotechnical Engineer from Soil Technologies, Inc (STI). The Geotechnical Engineer will compare the exposed soils with the soils listed on the boring logs of this report to determine if they are the correct soil types and strengths. Once the type and strength of the soils exposed in the excavations are judged competent by STI’s Geotechnical Engineer, the engineered fill, concrete footings, and floors can be placed

as needed. STI’s Geotechnical Engineer will provide a written report detailing the observations of the exposed soils in the footing and floor slab areas. **The general contractor or owner’s representative should contact STI’s Geotechnical Engineer to perform these field observations prior to the earthwork phase of the project.**

Note: This report and its recommendations are a two-step process. The first step is the implementation of the recommendations of this report during the design of the project. The second step is the implementation of these recommendations during construction. **The second step is critical to the success of the project, and it must include the field observations of the soils by STI’s Geotechnical Engineer during the earthwork phase of the project.** It has been our experience that the lack of field observations by the Geotechnical Engineer during the earthwork phase of the project can result in oversight, in part or in whole, of the recommendations of the soils report. Therefore, the absence of our field observations of the soils during the earthwork phase, especially during the footing and floor area excavations, shall relieve us of the liability of the work performed during that phase of the project and its effect on related components. Also, refer to IBC Chapter 17 - “Special Inspections” Table 1705.6.



• **Engineered Fill - Foundation and Floor Areas**

We recommend the following types of engineered fill and compaction of engineered fill.

NOTE: Soils are classified as sand if more than 50% (by weight) is retained above the #200 sieve.

<p>Below and above the footings but more than 24 inches below the floor slab (including utility trenches):</p>	<p><u>If moist to dry soil conditions exist in the excavation:</u> Use a granular engineered fill such as a pit run or processed sand or sand with gravel (SP, SW, SM, and SC). Also, a clay engineered fill such as a non-organic and non-expansive lean clay (CL) could be used. The pit run and processed sand should have a maximum gravel/cobble size of 3 inches and at least 13% passing the #40 sieve. The clay should have a liquid limit of less than 45.</p> <p><u>If wet or saturated soil conditions exist in the excavation:</u> A clean and medium to coarse grained sand or sand with gravel (SP or SW) will likely be required until at least 2 feet above the wet or saturated soil level in order to achieve the required compaction. The clean sand should have a maximum gravel/cobble size of 2 inches, 13% to 40% passing the #40 sieve, and less than 5% passing the #200 sieve. A 6 to 8-inch layer of 3/8" or less rock can be placed at the bottom of the excavation for stabilization purposes.</p> <p><u>NOTE the following:</u></p> <ul style="list-style-type: none"> - The on-site non-organic silty sand and clayey sand soils (brown and dark brown) are acceptable as sand (SM, SC) engineered fill. - The on-site, non-organic lean clay soils (brown and dark brown) are acceptable as lean clay (CL) engineered fill. - Organic soils (topsoil) should not be used for engineered fill.
<p>From 6" to at least 24 inches below the bottom of the floor slab:</p>	<p><u>If in moist to dry excavations:</u> Use a pit run or processed sand or sand with gravel (SP, SW). The pit run and processed sand should have a maximum gravel/cobble size of 2 inches, at least 13% passing the #40 sieve, and less than 12% fines passing the #200 sieve.</p>
<p>6-inch or more sand cushion below floor slab (capillary break):</p>	<p>The final 6" or more of engineered fill (fill placed directly beneath the floor slab) should consist of free draining sand (SP or SW) having a maximum gravel size of 1" and with less than 10% passing the #200 sieve by weight. The purpose of the sand cushion is to provide a working surface for the placement of concrete and also to serve as a capillary barrier.</p>

<p>Compaction of engineered fill: (Less than 7 feet total thickness):</p>	<ul style="list-style-type: none"> - Below Footings <u>and in the footing influence zone (pg. 5):</u> - Below Floor Slabs: - Utility Trenches (inside & within 10’ outside of the building): 	<p style="text-align: center;"><u>Minimum % Compaction</u></p> <ul style="list-style-type: none"> ➤ 95% of the ASTM: D698* ➤ 95% of the ASTM: D698* ➤ Same as “Below Floor Slabs” <p>*Standard Proctor Density</p>
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• **Compaction Equipment and Placement of Engineered Fill**

Engineered fill should be compacted in maximum 12-inch loose lifts using heavy, self-propelled compaction equipment, or maximum 6-inch loose lifts using hand-operated compaction equipment. Smooth-faced, vibratory compaction equipment should be used for compaction of granular engineered fill (sand). Clay engineered fill should be placed at a moisture content ranging from -4% to +2% of the optimum moisture content as determined by the Standard Proctor (ASTM: D698). The moisture content of granular engineered fill should be such to achieve the specified compaction. The moisture content of the clay soils should be maintained until the placement of the footings and floor slabs. The engineered fill should be free of frost and should not be placed on frozen soils. Please refer to the attached “Precautions...During Cold Weather.”

2.3 Foundations

• **Allowable Soil Bearing Pressure**

In our opinion, the proposed structure can be supported on a shallow spread footing foundation system (column pads and/or strip footings). We recommend that the spread footings be designed using **an allowable soil bearing pressure of up to 2000 psf.**

The allowable soil bearing pressure listed above assumes that the site is prepared as recommended in section 2.2 Site Preparations and that the project is constructed as per the information and conditions listed in section 1.1 Project Information. **If the project information or conditions are changed, STI must be notified in writing for additional review and possibly revised recommendations.**

The allowable soil bearing pressure is based on our judgment of the soil conditions at the boring locations along with recommended compaction levels and our experience with similar soil conditions. The allowable soil bearing pressure is a net pressure and can be increased 30% for short-term loadings such as wind loads.

- **Foundation Settlement**

The recommendations in this report should provide a theoretical safety factor of at least 3.0 against localized shear failure of the footings. Long term total settlements of the building footings are estimated to be less than 1 inch with estimated differential settlements less than ½ inch over a 30-foot length.

The above estimated settlements are based on the above recommended soil bearing pressure, the site being prepared as recommended in section 2.2 Site Preparations, and the project being constructed as per the information and conditions listed in section 1.1 Project Information: ... **the finished floor elevations will range from 1876.5 and 1879.0 feet, column loads will be a maximum of 170 kips (total dead and live loads) with continuous footing loads less than 4 kips/ft (total dead and live loads), etc.**

Please note that the total and differential settlement of the footings (and floor slab) could be significantly greater than the above estimates if improper construction practices are used. These practices may include but are not limited to: allowing snow or ice to be incorporated into the engineered fill soils, allowing the soils below the footings or floor to be saturated or freeze prior to or after their placement, inadequate compaction of engineered fill soils, supporting the footings or floor slab on expansive soils such as fat clay (CH) or on soils that were inadvertently loosened during construction, etc.

- **Soil/Concrete Sliding Friction**

For horizontal loads, we recommend a soil-concrete friction factor of 0.35. The frictional factor should be applied only to the base (bottom) of the concrete foundation units and only the net downward vertical load should be used to determine the friction. An appropriate safety factor should be applied to the calculated lateral values.

- **Frost Depth**

To avoid frost related movement of the footings of heated structures during their entire life, the exterior footings should be placed at or below a frost depth as per county code, or a minimum 4½ feet below finished grade. Interior footings of heated buildings can be placed at shallower depths provided they are protected from frost during and after construction. To avoid frost related movement of the footings of unheated enclosed structures, exterior canopies, etc., both the exterior and interior footings should be placed at least 5½ feet below the finished exterior grade or the floor slab, as appropriate.

For unheated slabs, some frost related movement of slabs should be expected unless measures are taken to limit frost related movement below the slab, such as rigid insulation sheeting or placement of significant depths of free-draining granular fill. Generally, we anticipate that limited frost related movement of unheated interior slabs can be achieved if at least 36 inches of free-draining granular fill is placed immediately below the floor slab. No frost related movement is expected if at least 5½ feet of free-draining granular fill is placed immediately below the floor slab.

2.4 Exterior Backfill

- **Soil Type**

Assuming the absence of retaining or below grade basement or lower level walls, it is our opinion that the on-site or imported non-organic and non-lean clay (CL) soils should be used for exterior backfill soils (fill soils placed outside the exterior foundation walls and adjacent areas). Fat clay soils (CH) can also be used but are not desired; and the Geotechnical Engineer should approve their use and placement. Utility trenches or other excavations leading to the building foundations or floor areas should also be backfilled with the on-site or imported non-organic and non-expansive lean clay soils. However, if circumstances require that sand or silt backfill is used within 10 feet of the proposed structure, an 18-inch compacted clay cap or an asphalt or concrete pavement should be placed at the surface of the backfill to help minimize surface water from reaching the foundation soils. (Please refer to Figure #5 on page 13.)

Organic soils (usually black colored) should not be used for exterior backfill, except for cover material. Also, soils that can expand, such as fat clay (CH), should not be used for backfill against retaining type structures or below slabs, sidewalks, driveways, etc.

- **Compaction and Placement of Exterior Backfill**

Exterior backfill soils placed along foundation walls and in adjacent areas such as beneath lawns, sidewalks, traffic areas, or in utility line trenches, should be compacted to the following minimum percent densities listed in Table 2 below. Note: Exterior backfill soils placed within the “influence zone” below the footings (page5) should be compacted to the minimum densities listed for footings on page 9.

TABLE 2

<u>Compaction of Exterior Backfill</u>	Light Traffic Areas (autos, driveways, sidewalks, etc. - below granular base):	95% of the ASTM: D698*
	Heavy Truck Traffic Areas (below granular base):	97% of the ASTM: D698*
	Utility lines and other backfill within 10 feet of the proposed structure(s) except in traffic areas, use above %.	95% of the ASTM: D698*
	Non-Traffic Areas (lawns, landscaping areas, etc.) greater than 10 feet of the proposed structure(s)	92% of the ASTM: D698*

*Standard Proctor Density

Exterior backfill soils should be compacted in maximum 12-inch loose lifts using heavy, self-propelled compaction equipment, or maximum 6-inch loose lifts using hand-operated compaction equipment. Clay exterior backfill soils should be placed at a moisture content ranging from -4% to +2% of the optimum moisture content as determined by the Standard Proctor. The moisture content of granular exterior backfill soils (sand) should be such to achieve the specified compaction. Smooth-faced, vibratory compaction equipment should be used for compaction of granular backfill soils. The backfill material should be free of frost and should not be placed on frozen soils. Please refer to the “Precautions...During Cold Weather” attached to this report.

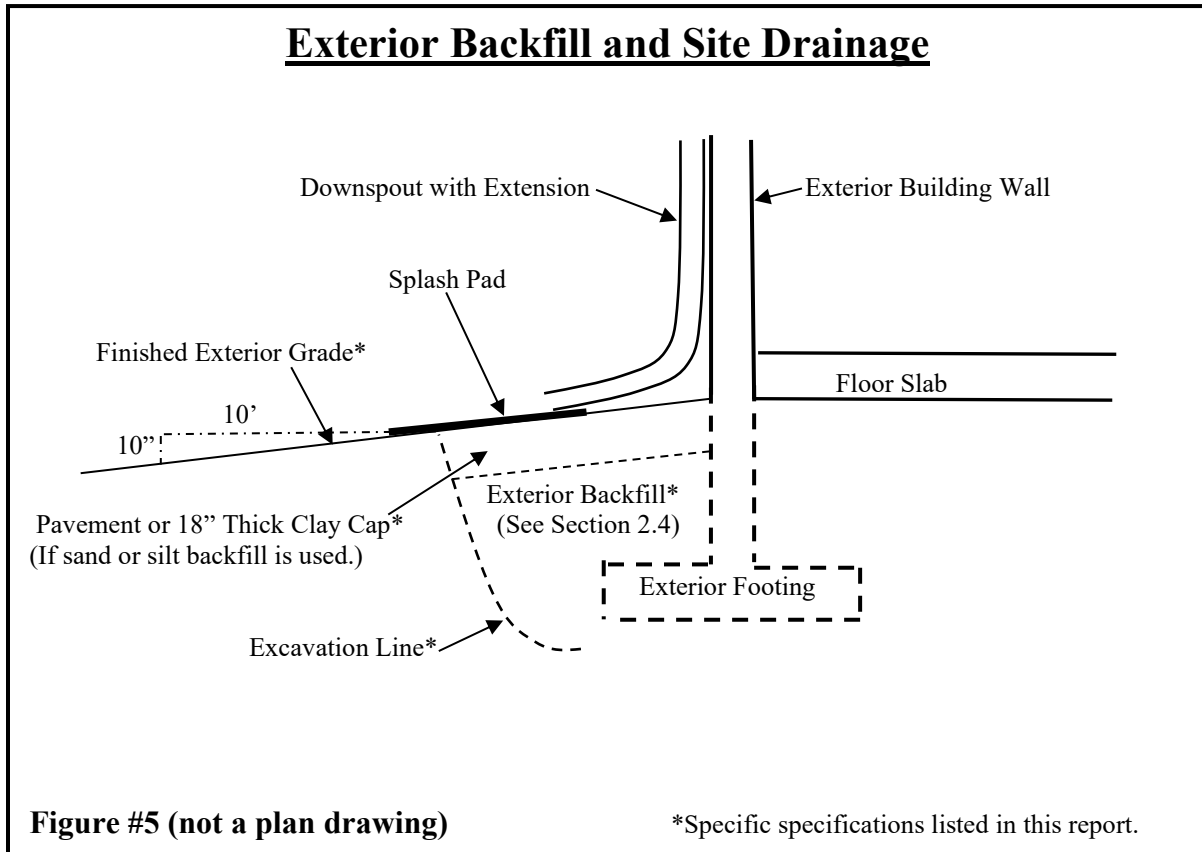
2.5 Site Drainage

- **Site Grading**

Proper drainage should be maintained during and after construction. General site grading should not allow water to pond in the building area or in the excavations. Any ponded water should be removed immediately. Finished grades around the perimeter of the structure should be sloped away from the structure with a minimum slope of 1 inch per foot for at least 10 feet beyond the excavation lines. (Please refer to Figure #5 below.) The slope can be reduced to ¼ inch per foot in areas that are completely surfaced and properly sealed with asphalt or concrete. The slope and proper drainage should be maintained throughout the life of the structure.

- **Roof Runoff**

Roof runoff water should be controlled by a system of downspouts and gutters with proper extensions to remove the runoff water away from the structure. The gutters and downspouts, as well as splash pads and extensions, should be maintained so that leakage does not occur adjacent to the structure. (Please refer to Figure #5 below.)



3.0 CONSTRUCTION AND DESIGN CONSIDERATIONS

3.1 Construction Considerations

- **Soil Disturbance & Moisture Changes**

The soils encountered at the site can be sensitive to disturbance and may experience strength loss under the influence of construction traffic and/or additional moisture. Construction traffic in areas where these soils are used for structural or floor support should be limited. If self-propelled compaction equipment is used, extra care should be taken so as not to disturb (weaken) the native soils due to excess weight and/or vibration of the equipment. If the soil used for structural, floor, or wheel traffic support becomes frozen, desiccated, saturated, or is disturbed, the affected soil should be removed; or if the disturbance is shallow, it should be recompacted in-place prior to placement of additional fill or structural units.

Also, the site preparations should include complete removal of all remnants of previously existing structures, structural units, utilities, tree roots, etc. Excavations to remove these items,

or intrusions (accidental, deliberate, or otherwise) should be backfilled with engineered fill and compacted to the specified density listed on page 9.

The excavations should be left open a minimal amount of time to prevent strength loss of these soils by sluffing of soils, ponding of water, or changes in their in-situ moisture content. In addition, surface drainage away from the excavations should be provided during construction. Also, the excavations should be done with an excavation bucket having a smooth cutting edge.

- **Dewatering**

The footing and floor excavations may extend near or below the groundwater level. Thus, dewatering of the excavations (lowering the groundwater level within and below the bottom of the excavations) may be required for proper placement of engineered fill and/or the footings and floor slab systems. Please refer to the groundwater measurements listed at the bottom of the attached boring logs. Generally, we anticipate that, if required, de-watering should be able to be accomplished using typical sump-pump methods.

If groundwater is encountered, the excavations and dewatering must be such as to provide for physical access and observations of the soils at the bottom of the excavations, and for proper compaction of the engineered fill soils at the bottom of excavations. Also, the excavations should remain dewatered until placement of the engineered fill, foundations, and lower portions of the exterior backfill are completed.

3.2 Design Considerations

- **Polyethylene Vapor Membrane (Slab-on-grade)**

We recommend that consideration be given to placing a polyethylene vapor membrane (retarder) beneath the floor slab, especially if there are areas where moisture sensitive flooring materials, or impermeable floor coatings, or moisture sensitive equipment or product are planned. If used, consideration should be given to the potential of curling of the concrete floor due to the presence of the membrane. Placing the membrane at least 2 inches beneath the surface of the sand cushion can help to minimize the potential for curling of the concrete floor. The architect or structural engineer of record should decide on the use and placement of the membrane. The slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder. Also refer to IBC section 1907.

- **Subgrade Modulus**

Placement of engineered fill soils from the bottom of the recommended floor excavation depths to the design slab elevation will generally increase the overall modulus. The amount of increase is dependent on the type and depth of engineered fill placed. A granular engineered fill would generally provide a higher modulus than clay engineered fill. For design purposes, we have provided estimated subgrade modulus (“K”) values as listed below in Table 3. The subgrade modulus values are assumed to be at the surface of the described soil type compacted to at least 95% of the Standard Proctor density (ASTM: D698). Please note that these values are only estimates based on soil types and densities. “Plate Load Tests” should be performed to provide specific “K” values.

TABLE 3

<u>Soil Type</u> (Minimum 95% Compaction) and/or approved by the on-site Geotechnical Engineer)	<u>Depth of</u> <u>Engineered Sand</u> <u>Soils</u>	<u>Estimated</u> <u>Subgrade</u> <u>Modulus (pci)*</u>
Engineered Sand Soils over Lean Clay Soils	6” to 9”	130
Engineered Sand Soils over Lean Clay Soils	9” to 12”	170
Engineered Sand Soils over Lean Clay Soils	15” to 18”	200
Engineered Sand Soils over Lean Clay Soils	More than 20”	230

*Values should be reduced (up to 40%) for exterior pavements or slabs exposed to freeze thaw cycles.

- **Seismic Category**

Based on IBC 2021, the subsurface conditions encountered at the site, and our experience with other general geologic conditions for this area, it is our opinion that Site Class D should be used to determine site coefficients and seismic design category.

- **Existing Structure**

Although not anticipated, if the foundations for the proposed building are placed next to an existing structure, care should be taken not to undermine the foundations of the existing structure. Also, to prevent additional loading on the existing foundations, the new foundations should rest at or below the depth of the existing foundations. If the new foundations rest within a 45⁰ envelope below the existing foundations, the new foundations may need to be designed for increased loading caused by the overlying pressures of the existing footings. Please contact us if this situation develops in the design.

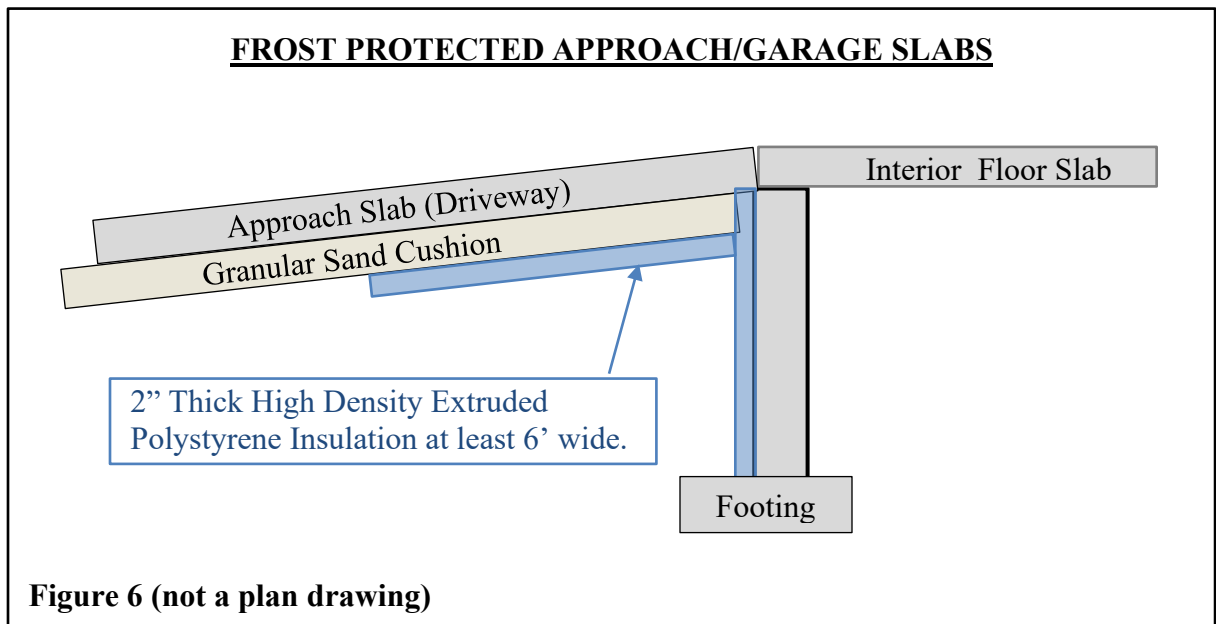
- **Moisture or Frost Related Movement**

Exterior architectural features, slabs, and utilities can experience moisture or frost related

movement which can result in distress. The existing clay soils likely have a moderate susceptibility of frost related movement. The risk of this potential movement and subsequent distress can be reduced (but not necessarily eliminated) by:

1. The use of control joints.
2. The use of self-adjusting utility connections.
3. Allowing for movement of exterior features attached to structural elements.
4. The use of significant depths of clean granular fill beneath slabs-on-grade (floors), driveways, sidewalk, etc.
5. Proper drainage away from exterior slabs-on-grade.
6. Placement of rigid insulation sheeting under at least 10 inches of free draining granular fill.

Also, if limited differential frost movement between the driveway approach slabs and the building floor slab is desired, high density extruded polystyrene insulation can be placed below the driveway approach slabs. Please refer to Figure #6 below.



- **OSHA**

Excavations must comply with the requirements of local, state, federal and other prescribed safety regulations, e.g., OSHA Part 1926, Subpart P, "Excavations." Reference to these requirements should be included in the project specifications.

- **Concrete**

The concrete used for the project should be composed of a quality mix that has proven success, or a mix design should be established for proper proportions of aggregate, cement, water, and any

admixtures. The concrete should be handled, placed, and cured according to the recommendations in the current **ACI** manual. Improper mix designs, placement methods, saw joints, curing methods, temperatures, etc. could result in the concrete experiencing excessive shrinkage, cracking, curling, pop-outs, and other distress. These items should be monitored by a qualified engineer during construction. Also, floor covering should not be placed on the slab until it is nearly fully cured. Typically, flooring manufacturers require 3 to 4 weeks or more of curing time at room temperature (60° F or more) prior to placement of flooring.

4.0 EXCAVATION OBSERVATION AND TESTING

The opinions and recommendations contained in this report are based on the subsurface conditions found at the boring locations. It is possible that there are soil conditions on the site that were not represented by the borings. Consequently, on-site observation by a qualified Geotechnical Engineer during construction is considered integral to the successful implementation of the recommendations.

We recommend that a Geotechnical Engineer from Soil Technologies, Inc. be on-site during the excavation operations. The engineer will judge if the soils exposed at the bottom and along the sidewalls of the excavations are adequate for support of the floor slab and for the foundations designed with the allowable soil bearing pressure recommended in this report. The Geotechnical Engineer should also be on-site immediately prior to placement of the sand cushion and reinforcing steel of the floor slab to verify that the floor area soils are not frozen, rutted, desiccated, saturated and/or otherwise disturbed. In addition, we recommend that density testing be performed within the sequence of the engineered fill.

5.0 GENERAL EXPLORATION INFORMATION

5.1 Scope of Exploration

We have conducted a soil exploration for the proposed project. The scope of our services under this exploration is limited to the following:

1. To perform soil borings to explore the subsurface soil and groundwater conditions.
2. To perform nominal laboratory tests to aid in judging the soil properties.
3. To provide a geotechnical engineering report including the results of the field and laboratory tests as well as geotechnical engineering opinions and recommendations that are relative to the project.

Four standard penetration test borings were performed at the site on September 18th, 2025. The borings were performed at the locations shown on the attached sketch. Some settlement of the soils used to fill the open bore holes should be anticipated and closure of the holes is the responsibility of the client or property owner.

5.2 Site Surface Conditions

The site of the proposed construction is located at the Hoven municipal airport northwest of Hoven, SD. The site is bordered on the west by a taxiway and by grass on the other 3 sides. The site surface at the time of our soil borings consisted of grass. The overall general topography of the site is relatively level. The ground elevations at the boring locations were provided by Helms and Assoc. The elevations are listed at the top of the attached boring logs.

5.3 Site Subsurface Conditions

The subsurface conditions encountered at each boring location are illustrated on the boring logs attached to this report. The logs also indicate the possible geologic origin of the materials encountered (alluvium, till, lacustrine etc.). A description of the general soil profile is also provided in section **2.1 Discussion**. We wish to point out that the subsurface conditions at other times and locations at this site may differ from those found at the boring locations. If different subsurface conditions are encountered during construction, it is necessary that you contact us so that our recommendations can be reviewed.

5.4 Water Levels

Observations for subsurface groundwater were made at the boring locations during our field operations. Groundwater was encountered at the boring locations during our sampling operations. Specific information relative to the groundwater observations is shown at the bottom of the attached boring logs.

The absence or present level of groundwater in the borings may not represent the actual static groundwater levels. In order to accurately determine the static groundwater level, observations over an extended period are usually required. Such periods of observation are normally not available in a typical soil exploration program. Seasonal and annual fluctuations of the groundwater levels should be expected to occur. It is possible that the subsurface groundwater levels during or after construction could be significantly different than at the time the borings were performed.

5.5 Laboratory Test Program

Soil samples were selected for laboratory tests to determine the engineering and index properties. Where applicable, the tests were performed in accordance with the American Society for Testing and Materials (ASTM) procedures. The test results are shown on the boring logs opposite the samples upon which the tests were made, or they are attached.

6.0 LIMITATIONS, REVIEW, USE, AND PURPOSE OF REPORT

- **Limitations**

The data obtained from the sampling and testing of the soils encountered at the boring locations are the basis of the opinions and recommendations submitted in this report. However, variations can occur between these borings and between the samples. Thus, no exploration program can totally reveal the exact subsurface conditions for the entire site. If the subsurface conditions encountered at the time of construction differ from those represented by our borings, it is necessary to contact us so that our opinions and recommendations can be reviewed. Differing subsurface conditions may result in altering our recommendations, which may affect construction costs. It is suggested that a contingency be provided for this purpose.

- **Review of Report**

This report is founded on the information and conditions listed in this report for design of the proposed structure(s). We recommend that we be retained to briefly review the geotechnical aspects of the final design and specifications to determine whether any changes in design may have had an effect on the validity of the recommendations contained in this report, and whether our recommendations have been correctly communicated so that their intent has been implemented in the design and specifications. Divergence from our recommendations by the design, specifications, or field applications shall relieve us of the responsibility of that portion of the project and its effect on related components unless our written agreement with such divergence has been obtained. Also, we recommend that this report is provided to the owner(s) along with the architect(s), engineer(s), contractor(s), etc. chosen for design and construction of the project.

- **Use of Report**

This report is intended for the Client's sole use and benefit and solely for the Client's use in the design and construction of the proposed project described herein and in preparation of construction documents. The data, analysis, opinions, and recommendations contained in this



report may not be appropriate for extensions of the proposed project or for other projects or purposes. Thus, this report shall not be used or relied on by persons or entities for extensions of the proposed project or for other projects or purposes. Parties contemplating extensions of the proposed project or for other projects or purposes must contact us for additional review. In the absence of our written review and approval, we make no representation and assume no responsibility for extensions of the proposed project or for other projects or purposes. Also, this report is not a bidding document and is only an aid in the design and construction of the proposed project. Contractors and others involved in the project must draw their own conclusions regarding the site conditions and construction methods.

- **Purpose of Report**

The purpose of this report is to present the results of our field and laboratory tests as well as our geotechnical engineering review and recommendations for the project. Our work is intended for geotechnical purposes only and not to verify the presence or extent of any contamination at the site. If environmental information is desired, an environmental assessment should be conducted.

7.0 STANDARD OF CARE

The recommendations contained in this report represent our professional opinions. These opinions were arrived at in accordance with currently accepted engineering procedures at this time and location. Other than this, no other representation, guarantee, or warranty, either expressed or implied, is made.

This report was prepared by:

Kim E. Stoecker, PE
President

**Proposed Hangar
Municipal Airport
Hoven, SD
STI #25-1935**



Untitled Map

Write a description for your map.

Legend

Feature 1

Google Earth

Image © 2025 Airbus

200 ft



BORING LOG

STI JOB #: 25-1935		Project: Hangar - Hoven Municipal Airport		BORING #: 1													
		Location: Hoven, SD		Sheet 1 of 1													
Latitude (North)=		Longitude (West)=		SURFACE ELEVATION = 1876.5													
Depth (ft.)	Elev. (ft.)	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	Water Level	N. Value	SAMPLE		LABORATORY TESTS									
						Sample No.	Sample Type	Moisture (%)	Dry Density (pcf)	Pocket Pen (tsf)	Qu (psf)	Liquid Limit	Plastic Limit	200 Sieve (%)			
1	1875.5	Fill, Organic Lean Clay, dark brown, moist	FILL		6	1	SPT										
		Fill, Lean Clay, black and brown, moist															
2.5	1874.0																
3.5	1873.0	Organic Lean Clay, dark brown, moist (CL-OL)	TOPSOIL		7	2	SPT	22	103	1.7							
4.5	1872.0	Lean Clay with Sand, dark brown, moist (CL)	FINE ALLUVIUM														
		Clayey Sand, fine to coarse grained, a little Gravel, dark brown, wet, medium dense (SC)	MIXED ALLUVIUM		20		SPT	16							17		
6.5	1870.0	Silty Sand, fine to medium grained, a trace of Gravel, dark brown, waterbearing, medium dense (SM)			23	4	SPT										
15	1861.5																
16	1860.5	Silty Sand, fine to medium grained, gray, waterbearing, loose (SM)			6	7	SPT										
		END OF BORING															
WATER LEVEL MEASUREMENTS				▼	Boring Started: 9/18/2025 at 13:40												
					Boring Completed: 9/18/2025 at 14:09												
DATE:	TIME:	SAMPLED TO:	CAVE IN:	CASING:	DEPTH:	Drilling Method: to											
09/18/2025	14:09		7'	None	3.9'	Drilling Method: 3 1/4" HSA 0 to 14.5'											
						Jet with Drilling Mud: to											
						Hammer Type: Auto Hammer (140 lb.)											
						Crew Chief: M.H. Logged By:											
						Backfill Method:											
SOIL TECHNOLOGIES, INC					28822 124TH ST., MOBRIDGE, SD TELEPHONE: (605) 762-3406												

For Footings: Excavate the Clay and Sand "Fill" soils and "Topsoil" to expose the competent native Clay "Alluvium" soils at a depth of at least 3.5' below existing grade. Final excavation depths shall be approved by STI's on-site Geotechnical Engineer.

Electronic File Copy 09-30-2025

BORING LOG

STI JOB #: 25-1935		Project: Hangar - Hoven Municipal Airport		BORING #: 3												
Location: Hoven, SD		Sheet 1 of 1														
Latitude (North)=		Longitude (West)=		SURFACE ELEVATION = 1876.9												
Depth (ft.)	Elev. (ft.)	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	Water Level	N. Value	SAMPLE		LABORATORY TESTS								
						Sample No.	Sample Type	Moisture (%)	Dry Density (pcf)	Pocket Pen (tsf)	Qu (psf)	Liquid Limit	Plastic Limit	200 Sieve (%)		
0.66	1876.3	Fill, Lean Clay with Sand, dark brown and black, moist, some organics	FILL		5	1	SPT	17	3.6							
2	1874.9	Fill, Sandy Lean Clay, brown and dark brown, moist														
3	1873.9	Organic Lean Clay with Sand (CL-OL), black, moist	TOPSOIL		6	2	SPT	For Footings: Excavate the Clay and Sand "Fill" soils and "Topsoil" to expose the competent native Clay "Alluvium" soils at a depth of at least 3.0' below existing grade. Final excavation depths shall be approved by STI's on-site Geotechnical Engineer.								
		Lean Clay with Sand, brown, moist, firm (CL)	FINE ALLUVIUM	▼												
6.5	1870.4	Silty Sand, fine to coarse grained, a little Gravel, dark brown, waterbearing, loose (SM)	COARSE ALLUVIUM			6	4	SPT								
						7	5	SPT								
						10	6	SPT								
14	1862.9	Sand with Silt, fine to coarse grained, a little Gravel, gray, waterbearing, loose (SM)				10	7	SPT								
16	1860.9	END OF BORING														
WATER LEVEL MEASUREMENTS				▼	Boring Started: 9/18/2025 at											
					Boring Completed: 9/18/2025 at											
DATE:	TIME:	SAMPLED TO:	CAVE IN:	CASING:	DEPTH:	Drilling Method: to										
09/18/2025		8.5'		7'	7.5'	Drilling Method: 3 1/4" HSA 0 to 14.5'										
09/18/2025		16'		14'	4'	Jet with Drilling Mud: to										
						Hammer Type: Auto Hammer (140 lb.)										
						Crew Chief: M.H. Logged By:										
						Backfill Method:										
SOIL TECHNOLOGIES, INC				28822 124TH ST., MOBRIDGE, SD TELEPHONE: (605) 762-3406												

Electronic File Copy 09-30-2025

BORING LOG

STI JOB #: 25-1935		Project: Hangar - Hoven Municipal Airport		BORING #: 4												
Location: Hoven, SD		Sheet 1 of 1														
Latitude (North)=		Longitude (West)=		SURFACE ELEVATION = 1876.8												
Depth (ft.)	Elev. (ft.)	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	Water Level	N. Value	SAMPLE		LABORATORY TESTS								
						Sample No.	Sample Type	Moisture (%)	Dry Density (pcf)	Pocket Pen (tsf)	Qu (psf)	Liquid Limit	Plastic Limit	200 Sieve (%)		
3	1873.8	Fill, Lean Clay with Sand, brown and black, moist, 3" of black Topsoil at the surface	FILL		7	1	SPT									
4.3	1872.5	Lean Clay, light brown, moist (CL)	FINE ALLUVIUM	▼	5	2	SPT	15	114	2.9						
6	1870.8	Sandy Lean Clay, a little Gravel, dark brown and gray, moist, firm (CL)	MIXED ALLUVIUM		5	3	SPT									
		Silty Sand, fine to coarse grained, a little Gravel, dark brown, waterbearing, medium dense (SM)				15	4	SPT								
9	1867.8	Silty Sand, fine to medium grained, brown to 15.5' then gray, waterbearing, a layer of Sandy Lean Clay at 13', loose to medium dense to loose (SM)			8	5	SPT									
					13	6	SPT									
16	1860.8	END OF BORING			6	7	SPT									
WATER LEVEL MEASUREMENTS				▼	Boring Started: 9/18/2025 at 14:37											
					Boring Completed: 9/18/2025 at 15:03											
DATE:	TIME:	SAMPLED TO:	CAVE IN:	CASING:	DEPTH:	Drilling Method:										
09/18/2025	15:03		6.9'	NONE	3.1'	Drilling Method: 3 1/4" HSA		0 to 14.5'								
					Jet with Drilling Mud:		to									
					Hammer Type:		Auto Hammer (140 lb.)									
					Crew Chief:		M.H. Logged By:									
					Backfill Method:											
SOIL TECHNOLOGIES, INC				28822 124TH ST., MOBRIDGE, SD TELEPHONE: (605) 762-3406												

For Footings: Excavate the Clay and Sand "Fill" soils and "Topsoil" to expose the competent native Clay "Alluvium" soils at a depth of at least 3.0' below existing grade. Final excavation depths shall be approved by STI's on-site Geotechnical Engineer.

Electronic File Copy 09-30-2025

FIELD EXPLORATION PROCEDURES

Soil Sampling

Soil sampling was performed in accordance with ASTM: D1586. Using this procedure, a 2" O.D. split barrel sampler is driven into the soil by a 140-lb. weight (hammer) falling 30". After an initial set of 6", the number of blows required to drive the sampler an additional 12" is known as the penetration resistance or N value. The N value is an index of the relative density of the cohesionless (sandy) soils and the consistency of cohesive (clayey) soils. Thin walled tube samples, if taken, were obtained according the ASTM: D1587 where indicated by the appropriate symbol on the boring logs. Rock core samples, if taken, were obtained by rotary drilling in accordance with ASTM: D2113. Power auger borings, if performed, were done in general accordance with ASTM: D1452.

Soil Classification

As the samples were obtained in the field, they were visually and manually classified by the crew chief in general accordance with ASTM: D2487. Representative portions of the samples were then returned to the laboratory for further examination and for verification of the field classification. Logs of the borings (test holes) indicating the depth and identification of the various strata, the N value, water level information and pertinent information regarding the method of maintaining and advancing the bore holes are attached. Charts illustrating the descriptive terminology and the symbols used on the boring logs are also attached.

LOG OF BORING– “DESCRIPTIONS”

Depth - Depth below the existing grade at the location and time the sampling was performed.

Description of Material – Soil type based on visual and manual methods and/or laboratory tests (see “Soil Classification” above).

Surface Elevation – Elevation of the existing grade at the boring location and at the time the boring was performed.

Geologic Origin - A description of the most likely source of the soil deposit.

WL - The highest groundwater measurement at the time and location the sampling was performed marked by the symbol ▼. (Also see “Water Level Measurements” on boring log).

N VALUE - The number of hammer blows required to drive the sampler 12" (see “Soil Sampling” above).

SAMPLE NO. – The sample number, i.e. 1, 2, 3....

SAMPLE TYPE – The type of equipment used to sample the soil (SPT = Standard Penetration Test, SB = Split Barrel Sampler, FA = Flight Auger, HSA = Hollow Stem Auger).

QU – Laboratory test. (See the attached “Symbols and Terminology.”)

Drilling Method – The type of equipment used in to advance (drill) the boring.

SYMBOLS AND TERMINOLOGY

DRILLING AND SAMPLING SYMBOLS

<u>SYMBOL</u>	<u>DEFINITION</u>
N	Standard Penetration – blows per foot
WOH	Weight of Hammer
B	Bag Sample
DM	Drilling Mud
FA	Flight Auger
HA	Hand Auger
HSA	Hollow Stem Auger
JW	Jetting Water
NSR	No Sample Recovered
_Q	BQ, NQ or PQ Wireline System
SB	Split Barrel Sampler
SPT	Standard Penetration Test
3TW	3" Thin Walled Tube Sample
CS	California Sampler
▼	Water Level Symbol

TEST SYMBOLS

<u>SYMBOL</u>	<u>DEFINITION</u>
W	Water Content by weight (ASTM:D2216)
D	Dry Density - pounds per cubic foot
LL	Liquid Limit (ASTM: D4318)
PL	Plastic Limit (ASTM: D438)
Qu	Unconfined Compressive Strength – pounds per square foot (ASTM: D2166)
Pq	Penetrometer Reading – tons/square ft.
Su	Undrained Shear Strength
R	Laboratory Resistivity
G	Specific Gravity – ASTM: D854
OC	Organic Content
K	Coefficient of Permeability
VS	Field Vane Shear (ASTM: D2573)
RQD	Rock Quality Designation - percent
CR	Core Recovery (percent)

WATER LEVELS

Water levels shown on the test hole (boring) logs are the water levels measured in the test holes at the time and under the conditions indicated. In sand soil, the indicated levels may be considered fairly reliable ground water levels. In clay soil, it may not be possible to determine the ground water level within the normal time required for the test hole, except where lenses or layers of more pervious waterbearing soil are present. Even then, an extended period of time may be necessary to reach equilibrium. Therefore, the water levels shown on the test hole logs for cohesive or mixed texture soils may not indicate the true level of the ground water table. Perched water refers to water above an impervious layer, thus impeded in reaching the water table. The available water level information is given at the bottom of the log sheet.

DESCRIPTIVE TERMINOLOGY

<u>RELATIVE DENSITY</u>	<u>“N” VALUE</u>	<u>CONSISTENCY</u>	<u>“N” VALUE</u>		
very loose	0-4	very soft	0-1	Lamination	Up to ½” thick stratum
loose	5-10	soft	2-4	Layer	½” to 6”
medium dense	11-24	firm	5-8	Lens	½” to 6” discontinuous stratum, pocket
dense	25-50	stiff	9-15	Varved	Alternating laminations of clay, silt and/or fine grained sand, or colors thereof
very dense	>50	very stiff	16-30	Dry	Powdery, no noticeable water
		hard	31-60	Moist	Below saturation
		very hard	>60	Wet	Saturated, above liquid limit
				Waterbearing	Pervious - soil is below water

“N” is the Standard Penetration, in blows per foot, of a 140 pound hammer falling 30 inches onto a 2 inch OD split barrel sampler.

RELATIVE GRAVEL PROPORTIONS

<u>TERM</u>	<u>RANGE</u>
A trace of gravel	Less than 4%
A little gravel	5 – 15%
With gravel	16 – 50%

RELATIVE SIZES

Boulder	Over 12”
Cobble	3” - 12”
Gravel - Coarse	¾” - 3”
Gravel – Fine	#4 - ¾”
Sand – Coarse	#4 - #10
Sand - Medium	#10 - #40
Sand - Fine	#40 - #200
Silt & Clay	-#200, Based on Plasticity

PRECAUTIONS FOR EXCAVATING AND REFILLING DURING COLD WEATHER

The winter season in this area presents specific problems for foundation construction. Soils which are allowed to freeze undergo a moisture volume expansion, resulting in a loss of density. These frost-expanded soils will consolidate upon thawing, causing settlement of any structure supported on them. To prevent this settlement, frost should not be allowed to penetrate into the soils below any proposed structure.

Ideally, winter excavation should be limited to areas small enough to be refilled to a grade higher than footing grade on the same day. Typically, these areas should be filled to floor grade. Trenching back down to unfrozen soils for foundation construction can then be performed just prior to footing placement. The excavated trenches should be protected from freezing by means of insulating or heating during foundation construction. Backfilling of the foundation trenches should be performed immediately after the below-grade foundation construction is finished. In addition, any interior footings, or footings designed without frost protection should be extended below frost depth, unless adequate precautions are taken to prevent frost intrusion until the building can be enclosed and heated.

In many cases, final grade cannot be attained in one day's time, even though small areas are worked. In the event final grade cannot be attained in one day's time, frost can be expected to develop overnight. The depth of frost penetration can be minimized by leaving a layer of loose soil on top of the compacted material overnight. However, any frost which forms in this loose layer, or snow which accumulates, should be completely removed from the fill area prior to compaction and additional soil placement. Frozen soils, or soils containing frozen material or snow should never be used as fill material.

After the structure has been enclosed, all floor slab areas should be subjected to ample periods of heating to allow thawing of the soil system. Alternatively, the frozen soils can be completely removed and be replaced with an engineered fill. The floor slab areas should be checked at random and representative locations for remnant areas of frost, and density tests should be performed to document fill compaction prior to slab placement.

Due to the potential problems associated with fill placement during cold weather, any filling operations should be monitored by a full-time, on-site soils technician. Full-time monitoring aids in detecting areas of frozen material, or potential problems with frozen material within the fill, so that appropriate measures can be taken. The choice of fill material is particularly important during cold weather, since clean granular fill materials can be placed and compacted more efficiently than silty or clayey soils. In addition, greater magnitudes of heaving can be expected with freezing of the more frost susceptible silts and clays.

If more specific frost information or cold weather data concerning other construction materials is required, please contact us.

CONSTRUCTION OBSERVATIONS AND TESTING

- **Geotechnical Engineer's Observation**

The recommendations made in this report have been made based on the subsurface conditions found in the borings. It is possible that there are soil and water conditions on-site that were not represented by those borings. Therefore, we recommend that the completed excavation and prepared subgrade be observed and tested by a Geotechnical Engineer prior to fill placement or construction of any foundation elements. These observations are necessary to judge if all unsuitable materials have been removed from within the planned construction area and that an appropriate degree of lateral oversize has been provided for in those areas where fill will be placed below the bottom of foundation grade.

- **Field Density Tests**

We recommend a representative number of field density tests be taken in the engineered fill to aid in judging its suitability. We suggest the following guidelines relative to the number and spacing of the density tests:

- Footing Trench Areas: At least one density test should be performed for each 1½ foot depth of engineered fill placed below the footings and for each 1½ foot depth of engineered fill placed above the footings. The lateral spacing between each 1½ foot test below the footings should not exceed 30 lineal feet. Also, the lateral spacing between each 1½ foot test above the footings should not exceed 30 lineal feet.*
- Floor Slab Areas: At least one density test should be performed for each 1½ foot of engineered fill depth. The density tests should be laterally spaced so that there is a minimum of one test performed for every 2000 square feet of engineered fill placed below the floor slab.*
- Exterior Backfill Areas: At least one density test should be performed for each 2 feet of engineered fill depth and at least one test for every 30 lineal feet of engineered fill placed.*
- Utility Trench Areas: At least one density test should be performed for each 2 feet of engineered fill depth and at least one test for every 50 lineal feet of engineered fill placed.*
- Large Open Areas Such As Small Dams or Athletic Fields: The number of density tests will depend on the size and purpose of the area being filled, and thus should be left to the discretion of a qualified engineer or his representative.*

*Additional tests should be taken in confined areas, such as building corners. The actual number of tests should be left to the discretion of a qualified engineer or his representative. All proposed engineered fill material should be submitted to the laboratory for tests to check compliance with our recommendations and project specifications.

IMPORTANT INFORMATION

ABOUT YOUR

GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, due in large measure to programs and publications of ASFE/ The Association of Engineering Firms Practicing in the Geosciences:'

The following suggestions and observations are offered to help you reduce the geotechnical-related delays, cost-overruns and other costly headaches that can occur during a construction project.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include: the general nature of the structure involved, its size and configuration, the location of the structure on the site and its orientation; physical concomitants such as access roads, parking lots, and underground utilities, and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of the report may affect its recommendations.

Unless your consulting geotechnical engineer indicates otherwise, *your geotechnical engineering report should not be used:*

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership, or
- for application to an adjacent site.

Geotechnical engineers cannot accept responsibility for problems which may develop if they are not consulted after factors considered in their report's development have changed.

MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by geo-

technical engineers who then render an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those inferred to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact.* For this reason, *most experienced owners retain their geotechnical consultants through the construction stage, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.*

SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly-changing natural forces. Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, *construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time.* Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or ground-water fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Geotechnical engineers' reports are prepared to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Unless indicated otherwise, this report was prepared expressly for the client involved and expressly for purposes indicated by the client. Use by any other persons for any purpose, or by the client for a different purpose, may result in problems. *No individual other than the client should apply this report for its intended purpose without first conferring with the geotechnical engineer. No person should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer*

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid these problems, the geotechnical engineer should be retained to work with other appropriate design professionals to explain relevant geotechnical findings and to review the adequacy of their plans and specifications relative to geotechnical issues.

BORING LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

Final boring logs are developed by geotechnical engineers based upon their interpretation of field logs (assembled by site personnel) and laboratory evaluation of field samples. Only final boring logs customarily are included in geotechnical engineering reports. *These logs should not under any circumstances be redrawn* for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimize the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes and unanticipated costs are the all-too-frequent result. To minimize the likelihood of boring log misinterpretation, *give contractors ready access to the complete geotechnical engineering report* prepared or authorized for their use. Those who do not provide such access may proceed un-

der the *mistaken* impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes which aggravate them to disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY

Because geotechnical engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against geotechnical consultants. To help prevent this problem, geotechnical engineers have developed model clauses for use in written transmittals. These are *not* exculpatory clauses designed to foist geotechnical engineers' liabilities onto someone else. Rather, they are definitive clauses which identify where geotechnical engineers' responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your geotechnical engineering report, and you are encouraged to read them closely. Your geotechnical engineer will be pleased to give full and frank answers to your questions.

OTHER STEPS YOU CAN TAKE TO REDUCE RISK

Your consulting geotechnical engineer will be pleased to discuss other techniques which can be employed to mitigate risk. In addition, ASFEE has developed a variety of materials which may be beneficial. Contact ASFEE for a complimentary copy of its publications directory

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SECTION 08 34 16 VERTICALLY BI-FOLD HANGAR DOORS

PART 1 - GENERAL

VERTICALLY BI-FOLD HANGER DOOR

1. QUANTITY

1.1 Doors for this project will consist of (1) bi-fold doors

2. SIZE OF DOOR - Clear Open Width & Height

2.1 Hanger door with door in up position, shall have a minimum clear opening width of (70'-0") as shown in the plans and a minimum clear height of (18'-0") above finished floor elevation.

3. PLACEMENT of the Bi-Fold Door unto the building

3.1 Door shall be mounted flush with exterior walls of building.

4. GENERAL / CONTRACTORS REQUIREMENTS: - DESIGN CRITERIA

4.1 The bi-fold hangar doors shall be designed to the same loading requirements for live, dead and wind loads as the Boat Support Building.

4.2 The doors shall be engineered to resist all anticipated loads without sagging, bowing or conflicting with its smooth and efficient operation.

4.3 The design shall be furnished, approved and sealed by a professional engineer registered in the state where the project is located.

4.4 The building header shall be designed to accommodate horizontal and vertical building deflections to support the bi-fold door in all positions (with the proper lateral bracing).

4.5 The building's door columns shall be framed of the proper design and size to reinforce the opening (with lateral bracing) and to carry all loads and vibrations imposed thereon.

4.6 The Bi-fold should have solid footing with sill directly underneath the door frame and extending outward from the door to provide a base for the door's weather seal. This also prevents flow of water into, or under, the door installation.

4.7 The finished floor of the building should be designed to prevent flow of water under the door installation. Sills shall have a slight slope outward of the bi-fold door to prevent water flow under the door installation.

5. GENERAL / ELECTRICAL REQUIREMENTS:

5.1 The building contractor shall furnish and install a prewired electrical door operating mechanism to control each bi-fold door.

5.2 The contractor is responsible and required to completely install the prewired electrical door operating mechanism, push button controls, devices and electrical conduit and wiring to the door operating controls.

5.3 The electrical door mechanism and control shall be field wired by the contractor (Not The Door Manufacturer).

5.4 Control panel with up/down/off switch pre-wired to motor, and over-ride controls with the required number of adequately sized insulated electrical conductors.

6. GENERAL / Electric Power Operator: For the Bi-Fold Doors

- 6.1 All electrical controls and devices shall conform to the requirements of the current National Electrical Code 513, NEMA, and be UL approved.
- 6.2 Provide UL Listed Electric Operator, size and type as recommended by the manufacturer.
- 6.3 The operator is furnished complete and consists of a motor and factory-wired control panels consisting of main fused disconnect switch, magnetic reversing starters, limit switches and push button controls, control circuit transformers, relays, timing devices, and warning devices.

7. SUBMITTALS

- 7.1 Product Data: Submit manufacturer's A1, A2, A3 Spec Sheets for each Bi-fold Door, plus product data and installation instructions. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes. Provide roughing-in diagrams, Include the following:
 - A. Summary of forces and loads on walls and jambs.
 - B. Setting drawings, templates, and installation instructions for built-in or embedded anchor devices.
- 7.2 Shop Drawings: Submit shop drawings for approval prior to fabrication. Include detailed plans, elevations, details of framing members, required clearance, anchors and accessories. Include relationship with adjacent materials. The make and type of door, operators and controls shall be clearly shown. Door weight, method of suspension, operation, and all fastenings shall be indicated.
- 7.3 Submit (1) copies each of the following manufacturer's Manuals / Diagrams
 - A. Bi-Fold Door Literature
 - B. Installation Manual
 - C. Operating Instructions
 - D. Maintenance data/manual.
 - E. Safety Decal Placement Guide Manual / Warning Labels
 - F. Electrical System Manual for the bi-fold door system
 - 1) Electrical Schematics
 - 2) Electrical Wiring Diagram
 - G. Diagram's of potentially hazardous locations related to the operation of the door.
 - H. Shop drawings for approval.
- 7.4 Submit shop drawings specific for this project.

NOTE: Generalized project drawings not specific to this project will not be acceptable.

8. QUALITY ASSURANCE

- 8.1 Source Limitations: Obtain Bi-Fold doors through one source from a single manufacturer.

- 8.2 Manufacturer Qualifications: Engage a firm experienced in manufacturing Bi-Fold doors similar to those indicated for this Project and with a record of successful in-service performance.
- 8.3 Installer Qualifications: Engage an experienced installer who is an authorized representative of the door manufacturer for both installation and maintenance of units required for this Project.
- 8.4 Product Options: Drawings indicate size, profiles, and dimensional requirements of Bi-Fold doors and accessories. Other manufacturers' systems with equal performance and dimensional characteristics may be considered. Refer to OPTIONAL UPGRADE EQUIPMENT.
- 8.5 Pre-Installation Conference: Schedule a pre-installation conference prior to commencement of field operations that might affect installation of bi-fold doors to establish procedures for maintaining optimum working conditions, and to coordinate this work with related and adjacent work.
- 8.6 The contractor shall touch up all scratches, abrasions or other slight painting defects with the same type and color of paint as originally applied.

9. DELIVERY, STORAGE AND HANDLING

- 9.1 Deliver materials and products in manufacturer's labeled protective packages. Store and handle in strict compliance with manufacturer's written instructions and recommendations. Protect from damage from weather, excessive temperatures and constructions operations.
- 9.2 Inspect vertical bi-fold doors upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect. Other wise, remove and replace damaged items as directed.
- 9.3 Place bi-fold door frame units on minimum 4" high wood blocking. Store doors components & Packages at building site under cover. Avoid use of non vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately.
- 9.4 The contractor shall store the sheet, panels, components and other manufactured items so that they will not be damaged or deformed. Store metal sheets or panels so that water accumulations will drain freely. Do not store sheets or panels in contact with other materials which might cause staining.

10. APPROVED MANUFACTURERS

- 10.1 The bi-fold doors supplied by a manufacturer who is regularly engaged in the manufacture of aircraft hangar doors for a minimum of ten years, and upon request from the owner provide a list of completed projects. Bi-fold door shall be as manufactured by Schweiss Bi-Fold Doors, Box 220, Fairfax, MN 55332, phone 507-426-8273 or approved equal.

A. Schweiss Bi-Fold Doors

P.O. Box 220

Fairfax, MN. 55332

Phone 507-426-8273 Fax 507-426-7408

B.

- 10.2 All manufacturer's seeking approval of their products must comply with requirements of the Instructions to Bidders.

11. BI-FOLD DOOR FRAMEWORK- FABRICATION / CONSTRUCTION REQUIREMENTS

- 11.1 Hangar doors shall be of the electrically operated bi-fold canopy type and shall be integral with the hangar building design.
- 11.2 When in the open position the doors shall have a slight slope to direct drainage away from the building.
- 11.3 Door shall be hinged horizontally at the top and center, and be arranged to open by moving frame out & up.
- 11.4 Door frames shall have pre-located top hinges to align with the building truss members.
- 11.5 Door shall be self contained with only the top hinges, bottom door rollers and column followers / wind rails.
- 11.6 The door framework shall consist of jig welded steel tube sections engineered by the door manufacturer to resist all anticipated loads without sagging, bowing or conflicting with its smooth operation.
- 11.7 Structural steel door framing members shall be ASTM A500 Grade B square structural welded steel tubing.
- 11.8 All labor, materials, accessories, equipment and services necessary to furnish a complete installation of a bi-fold hangar door as indicated by the manufacturer. Including frame, sections, brackets, guides, tracks, hardware, operators and installation instructions.
- 11.9 Shop connections shall be welded.
- 11.10 Field connections shall be bolted.

12. DRIVESHAFT / LIFT DRUMS

- 12.1 The solid steel driveshaft with lift drums mounted on bottom cord of door runs continuously along entire door width providing an even lift of the door at all times.
- 12.2 The drive shaft shall be attached to the door frame with (grease-able) bearing mounts wherever there is a cable drum installed, to minimize stress on the shaft.
- 12.3 Solid Driveshaft and lift drums shall be in sufficient amount to give 5:1 safety factor.

13. LIFTING METHODS

13.1 LIFT STRAPS

- A. The door power unit shall be operated by a system of lifting straps (NOT CABLES), lifting drums and drive shafts.
- B. Lift Straps attached to a retainer on the upper door frame passing through a strap guide attached at the top chord of the door frame, thereby transmitting forces directly to header of building & relieving door of unnecessary stresses.

- C. The Lift Straps shall have adjustable slack take-up device to keep proper tension on each Lift Strap.
- D. The lift drums must be properly shielded to avoid any potential hazards to people.
- E. Lift Straps and Lift Drums shall be manufacturer's standard adequately sized in sufficient amount to give 5:1 safety factor.

14. HEAVY DUTY HINGES

- 14.1 Heavy Duty Steel Hinges furnished complete. Each Hinge set shall be 10.50" wide, pins shall be 11/16" diameter minimum.

15. DOOR TRUSS'S

15.1 INTERNAL TRUSS - STANDARD

- A. An extra heavy duty center truss shall be installed in the center of the interior side.
- B. There will be a truss at the base of the door to provide extra strength.

16. HEAVY DUTY SIDE ROLLERS

- 16.1 The bi-fold hangar doors shall include 3" Heavy Duty minimum guide rollers with sealed bearings on bottom of door at jamb location.

17. COLUMN FOLLOWERS / WIND RAILS

- 17.1 System provided by the door manufacture to hold the base of the door securely against the building when the door is in the closed position.
 - A. Solid square columns secure only in the closed position = Wind Rails.

18. WIND PINS

18.1 Automatic Wind Pins

- A. Center wind pins 1" diameter minimum - provide a sturdy installation - Must automatically engage/ disengage.

19. AUTOMATIC LATCHING SYSTEM'S

19.1 Standard Manual Latch - STANDARD

- A. The latching system shall be provided on both sides of the doors.
- B. A automatic latching system will be furnished so that the door is automatically unlocked before the door can be opened and automatically relocked after the door is in the closed position.

20. PAINT

- 20.1 The door frame members and parts shall be factory primer finished with gray primer.

21. TOP & BOTTOM RUBBER SEALS

- 21.1 Provide manufacturer's standard seal continuous at top, bottom of each door.
- 21.2 The door shall be equipped with neoprene weather stripping at heads and jambs to prevent flow of moisture into the door installation. Sills shall have a special fabric

reinforced high grade rubber astragal. The entire door perimeter shall be weather tight.

- 21.3 Note: That existing bituminous surface varies and seals shall be placed accordingly.

22. Weather Seal - Kit

- 22.1 The sides, and center of each bi-fold can be sealed off with a special weather stripping. The center of the door must have a self sticking foam cushion seal the entire door perimeter must be weather tight.

23. BI-FOLD DOOR ELECTRIC POWER OPERATOR --- BOTTOM DRIVE

23.1 Location of Power Operator

- A. Motor shall be located on bottom chord of door frame.

23.2 Electrical Controls

- A. All electrical controls and devices shall be designed to meet National Electrical Code Section 513.
- B. All controls are pre-wired and factory tested.

24. ELECTRIC MOTOR / VOLTAGE / PHASE

24.1 ELECTRIC MOTOR / VOLTAGE / PHASE - OPTION 1 - STANDARD

- A. Service: 240 VAC, single phase, 3 wire service.
- B. Single Phase Motor's shall be totally enclosed capacitor start.
- C. Single phase, 240-volt electric motor with overload protection direct mounted to a gear reduction box and winding drum.
- D. The size of the motor shall be as recommended by the manufacturer.
- E. Door operator shall be pre-wired at factory complete with 24 V.A.C. control system.

25. Gear Motor

- 25.1 The gear motor is equipped with an electric brake, which will stop and hold door in any position of door travel.
- 25.2 Provide high starting torque, reversible, continuous duty, class A insulated, electric motors complying with NEMA MG 1, with overload protection, sized to start, accelerate, and operate door in either direction, from any position.
- 25.3 A magnetic starter, with 24v control unit for reliability is standard.
- 25.4 Design operator so motor may be removed without disturbing limit switch adjustment and without affecting emergency auxiliary operator.

26. CONTROL STATION'S

26.1 2 Button Constant Hold Control Station - for opening & closing your Bi-fold door.

- A 2-button constant contact dead man switch, prevents operator from leaving control panel while door is in motion, either up or down.

- B. When the operator takes his hand off the up /down button, the door immediately stops regardless of its opening / closing position.
- C. The motor automatically stops when the door reaches either the full open or closed position.

27. Limit Switches

- 27.1 Heavy duty limit switch box shall be weatherproof.
- 27.2 Heavy duty limit switch box shall provide adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- 27.3 Note: Safety edges shall not be used as limit switches.

28. ELECTRICAL DISCONNECT

- 28.1 Provide Electrical Disconnect to completely disable the door, for service, maintenance, emergency backup operations.
- 28.2 Mount disconnect so it is accessible from floor level.

29. EXECUTION

- 29.1 Examination
 - A. Examine wall and overhead areas, including opening framing and blocking, with Installer present, for compliance with requirements for installation tolerances, clearances, and other conditions affecting performance of Work of this section.
 - B. Proceed with installation only after unsatisfactory conditions have been corrected.

30. INSTALLATION

- 30.1 General:
 - A. Door manufacturer is required to coordinate with the metal building manufacturer in the development of the exact installation details, and provide weights and door loadings to building manufacturer.
 - B. Install door, track, and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports according to Shop Drawing, manufacturer's written instructions, and as specified.
 - C. Fasten vertical track assembly to framing at not less than 24 inches o.c. Hang horizontal track, hinges from structural overhead framing with angle or channel hangers welded and/or bolt fastened in place. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track, hinges and door-operating equipment.
- 30.2 Top and Bottom Limits Settings
 - A. Each bi-fold door has a recommended clear opening setting, specified by the manufacture. Do not over travel the door beyond the recommended setting.

- 30.3 Exterior wall panels
 - A. Metal building erector to install the same exterior wall panels that are on the building, use the same type on the bi-fold doors. Install the proper trims that are recommended by the manufacturer.
- 30.4 Apply Proper Safety Markings
 - A. Apply Proper Markings for any potentially hazardous locations related to the operation of the door. B. Follow the pictorial diagram included in the door installation manual.
- 30.5 Installing Warning Labels
 - A. Furnish warning labels for any potentially hazardous locations related to the operation of the door.
 - B. Fasten warning labels to the bi-fold door frame and by the operator's station in accordance with manufacturers instructions, NO EXCEPTIONS.
- 30.6 Installer Certificates: Signed by manufacturer certifying that installers comply w/ specified requirements.

31. ELECTRICAL WORK - Contractor is responsible for:

- 31.1 The contractor is responsible and required to completely install the prewired electrical door operating mechanism, push button controls, devices and electrical conduit & wiring to the door operating controls.
- 31.2 Detail wiring for power, signal, and control systems.
 - A. Differentiate between manufacturer-installed and field installed wiring & between components pro-vided by door manufacturer and those provided by others.
- 31.3 Install bi-fold doors in accordance with manufacturers instructions.

32. Adjust & Clean

- 32.1 Lubricate, test adjust doors - to operate easily, free from warp, twist, or distortion and fitting weather tight for entire perimeter.
- 32.2 Prime Coat Touch Up:
 - A. Immediately after erection, sand smooth any rusted or damaged areas of prime coat.
 - B. Touch-up damaged coating and finishes and repair minor damage.
 - C. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer of material or product being cleaned, and apply touch up of compatible air drying primer.
- 32.3 Final Adjustments:
 - A. Lubricate bearings and moving parts, adjust open and closed limits & doors to operate easily, free from warp, twist, or distortion and fitting weather tight for the entire perimeter.
 - B. Check and readjust operating finish hardware items, leaving vertical bi-fold doors undamaged and in complete and proper operating condition.

33. DEMONSTRATION

- 33.1 Startup Services: Engage a qualified -authorized service representative to perform startup services and to train Owner's maintenance personnel as specified below:
- A. Test and adjust controls and safeties. Replace damaged and malfunctioning controls & equipment.
 - B. Train Owner's maintenance personnel on procedures and schedules related to startup and shut down, operating, troubleshooting, servicing, and preventative maintenance.
 - C. Review data in the installation & maintenance manuals.
 - D. Schedule training with Owner at least 7 days advance notice.

34. WARRANTY

- 34.1 The Contractor shall warrant the door to be free of defects in accordance with the General Conditions, except the warranty shall be extended by manufacturer's 2 - year written warranty against defects in materials and workmanship, against problems which arise through normal anticipated usage of the door during the warranty period. The warranty shall be signed by the manufacturer.

34.2 Additional Warranty On the Straps

In addition to the warranty specified above, the door manufacturer shall warrant the original lift straps for a period of five years, against defects in material.

35 OPTIONAL UPGRADE EQUIPMENT

Note to Specifier: Select desired upgrade options below, and verify materials and insulation / application with the manufacturer; those related to door operating safety relative to danger to humans, and followed by an (R), may be required for your project; delete (R) in final text for those selected.

35.1 Top Override Safety Switches

Upper override switch that disconnects power to door if upper limit fails or if limits are overridden.

This safety feature is designed to prevent the door from traveling beyond its recommended clear opening height. If the door passes its full clear opening height, it will activate the override and stop the door automatically.

35.2 Side Latch Safety Switches

Side Latch Safety Switches eliminate possible damage if door is opened while in locked position.

These switches are designed to prevent the door from operating while the side latches are locked in the closed position.

35.3 Warning Lights And Horn (R)

Warning Lights and Horn, which alerts persons in the area that door is opening or closing.

END OF SECTION 08 34 16
