Geotechnical Features

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Geotechnical Design Process

1. Geotechnical Features
2. Site Investigation
3. Geotechnical Design
4. Construction
What is a Geotechnical Feature?
Identified by thinking critically about design and construction of roadway elements.
What is a Geotechnical Feature?

Mostly related to earthwork and foundations.
What is a Geotechnical Feature?

Sometimes include unusual problems.
Major Geotechnical Features

- Cuts/Fills
- Embankment Over Soft Ground
- Rock Slopes
- Retaining Structures
- Pipes
- Structure Foundations
- Landslide Corrections
Primarily driven by Slope Stability analysis, short-term and long-term
G. Dig out, in areas of digout, excavate the full road width to a depth as shown in the contract or as directed by the Project Manager. Excavate parallel to the finished grade, daylighting to the left and right slopes. Shape the ends of the digout no steeper than 9H:1V. Dispose of the excavated material to the satisfaction of the Project Manager.

Provide special borrow for digout replacement material consisting of a well-graded sand and gravel, free of organic and other deleterious material, meeting the AASHTO M 27 requirements for A-1 aggregate classification, with 100% passing the 1 inch (25 mm) sieve and a maximum of 3% passing the No. 200 (0.075 mm) sieve. The material may consist of up to 50% fillings, uniformly blended. Crusher fines and reject material may be used if the requirements in Table 711-22 are met.

Provide stabilization geotextile that meets the requirements of Subsection 716.33 for Stabilization geotextile.

Place stabilization geotextile over the bottom and sides of the excavated digout area in conformance with Subsection 822.02. Extend the geotextile up the side walls of the excavation for the full height of the proposed subgrade walls.

Place the initial lift of special borrow over the geotextile in accordance with Subsection 822.02.2. 

Reput any geotextile damaged during construction in conformance with the Manufacturer’s recommendations or as directed by the Project Manager or Contractor's engineer.
Digouts, Subexcavation, Coal Waste
Cuts/Fills
Constructability
Embankments Over Soft Ground
Stability (Bearing Capacity)

Culvert S of Opheim
UPW 8853000
Station 469+00
Short-term Analysis

Factor of Safety: 1.62
Embankments Over Soft Ground
Settlement
Embankments Over Soft Ground
Constructability
Rock Slopes
Stability
Barrier, scaling.
MSE, Soil Nail, Gabion, Gravity, Cantilever
Stability of wall (bearing capacity, sliding, global stability)
Drainage components
Retaining Structures
Constructability
Pipes
Settlement
Pipes
Constructability

SPECIAL PROVISIONS

1. CULVERT FOUNDATION TREATMENT, REVISED 12/11/95

A. Description: Prior to culvert placement, embed the culvert foundation consisting of subsoil excavation, geosynthetic placement, and foundation material placement in accordance with the plans as directed by the Project Manager.

B. Geosynthetic sheets:
   1. Geosynthetic meeting the requirements of Section 7.11
   2. Geosynthetic foundations with a minimum of 3 ft. of 3:8 grading to maintain the required design of the culvert.

C. Foundation:
   1. Foundation shown on the plans, as shown in Section 1, shall be constructed in accordance with the requirements of Subsection 7D.8.4.2.
   2. Geosynthetic with a minimum of 3 ft. of 3:8 grading to maintain the required design of the culvert.

D. Geosynthetic:
   1. Geosynthetic shown on the plans, as shown in Section 1, shall be constructed in accordance with the requirements of Subsection 7D.8.4.2.
   2. Geosynthetic with a minimum of 3 ft. of 3:8 grading to maintain the required design of the culvert.

E. Foundation:
   1. Foundation shown on the plans, as shown in Section 1, shall be constructed in accordance with the requirements of Subsection 7D.8.4.2.
   2. Geosynthetic with a minimum of 3 ft. of 3:8 grading to maintain the required design of the culvert.

2. Geosynthetic is paid in accordance with Subsection 602.00.
Structure Foundations

Type
Structure Foundations
Size/Depth
Lateral loads (Ice, Seismic, Impact), liquefaction, lateral spread
# Structure Foundations

## Constructability

![Image of construction site]

### Table: Foundation Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth (ft)</td>
<td>4.9, 5.5, 6.5, 7.0</td>
</tr>
<tr>
<td>Diameter (in)</td>
<td>15, 16, 17, 18</td>
</tr>
<tr>
<td>Embedment (ft)</td>
<td>3.0, 3.5, 4.0, 4.5</td>
</tr>
<tr>
<td>Drilled</td>
<td>23.5</td>
</tr>
<tr>
<td>Rebar</td>
<td>2.0</td>
</tr>
<tr>
<td>Grout</td>
<td>1.5</td>
</tr>
<tr>
<td>Total Weight (lbs)</td>
<td>12345</td>
</tr>
</tbody>
</table>

### Diagram: Baseline Plan

- **Legend:**
  - Concrete: Gray
  - Steel: Yellow
  - Rebar: Red

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Landslide Corrections
Repair Strategies
Forensic, Mitigation
Unusual Geotechnical Features

- Subsurface Voids
- Expansive Soils
- Collapsible Soils
- Frost Heave
- Forensic Evaluations
Questions