Vermont Agency of Transportation
Reviewed by: M.H. MacKintosh
Date: May 20, 2014
☒ CONFORMING
☐ CONFORMING AS NOTED
☐ NON-CONFORMING - RESUBMIT

GeoStabilization International

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Temporary Shoring Submittal
April 14, 2014

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STATE OF VERMONT
ALBERT C. NUCKMAN
No. 044317
CIVIL
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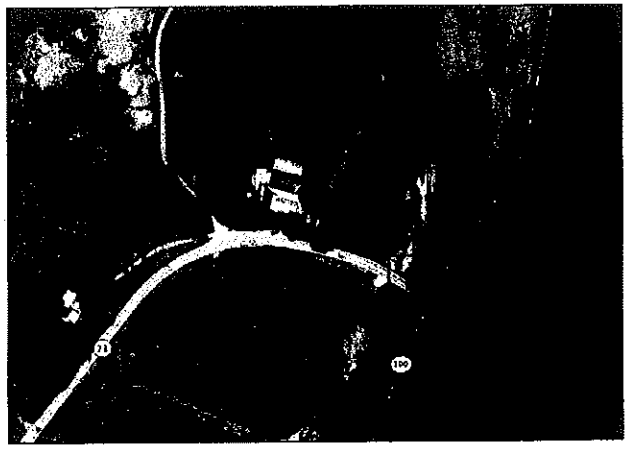
4/29/14

Temporary Shoring Details

Route 73 Bridge Project

Rochester, Vermont



Project Coordinates: 43° 51' 47.87"N 72°48' 36.58"W

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4/29/14

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Sheet Revision		
Date:		By:

Cover Sheet

Project: Route 73 Bridge Project	Drawn By: MJW
Date: April 14, 2014	Checked By:

Project No./Code:

Sheet No.: 1

GSI GeoStabilization International

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Construction Sequence/Work Schedule:

1. Set up traffic control and erosion control measures by Schultz Construction.
2. Schultz Construction will conduct clearing, excavation, and hauling of overburden soils and existing structure. Excavation will be conducted in a series of five (5) foot (maximum) vertical lifts leaving a workable slope that is no steeper than 12V: 1H. After lift excavation, associated soil nails, drain strips, and reinforced shotcrete facing will be installed. Subsequent vertical lifts will be conducted in a similar manner. .
3. GSI will provide and install the soil nails per the construction documents. GSI intends on using a Kometsu PC150 or Caterpillar 320 Hydraulic Excavator with a hydraulic percussion drill.
4. Steel reinforcement and shotcrete facing (up to 25-ft tall) will be applied to the wall face.

Size and Spacing of Nails:

- GSI will mark the locations of the proposed soil nails with survey marking paint.
- Soil Nails: 38mm B7X Injection Anchor FY=80.7 ksi.
- The Soil Nails will be injected with grout. The grout will be a Type I/II Portland Cement. The water/cement ratio will be 0.40 to 0.60. No additional aggregate or admixtures will be added to the grout.
- The design loads of the anchors is 1,500 lbs/ft.

Facing and Drainage System:

- Drain strips will be provided and installed between the soil nails every 8-feet along the face of the excavation. The drain strips shall be placed with the geotextile side against the ground. Drain strips will be continuous and any splices shall be made with a one-foot minimum overlap such that the flow of water is not impeded. Drain strips shall extend beyond the face of the shotcrete at the downhill face.

Reinforcing Steel Placement:

- Welded wire fabric will be placed along the face of the excavation with a separation of approximately 2 inches between the wire mesh and the soil.
- No. 4 Rebar will be tied to the wire mesh. Vertical bars will extend for approximately 24 inches and the horizontal bars will be continuous (with overlap splices) in the shotcrete.

Bearing Plate Placement:

- 8" x 8" x 3/8" Steel Bearing Plates will be placed over the nails and attached either with a hex nut or by welding to the nail to secure the wire mesh and rebar during shotcrete placement. If the soil nails extend beyond the hex nuts or welded plates, they will be trimmed using a gas powered demolition saw.

Shotcrete Application:

- Shotcrete will be placed from the lower part of the area upwards to prevent accumulation of rebound. The nozzle will be oriented a proper distance from and approximately perpendicular to the working face so that rebound will be minimal and compaction will be maximized.

GSI Employee Certifications:

- ACI Shotcrete Nozzlemen Certification
- 10-hour Occupational Safety and Health Training Course in Construction Safety & Health
- American Red Cross Standard First Aid Training
- American Red Cross Bloodborne Pathogens Training: PDT
- Erosion Control Supervisor Training

House Keeping:

- The site will be organized and clear of any trash or debris. All trash will be placed in a proper container and removed at the end of each work day.

Safety:

- All safety plans for lifting, hearing, dust control, PPE etc. are in place and will be followed accordingly. PPE will include safety vest, steel toed shoes, hard hat, safety glasses, and gloves.

Soil Design Parameters:

Material Name	Unit Weight (pcf)	Cohesion (psf)	Phi	Bond Strength (lb/ft)
Fill (overburden)	120	1	34	1500
Bedrock	150	4000	35	4000

Shotcrete Mix Design:

Shotcrete shall comply with the requirements of ACI 506.2, "Specifications for Materials, Proportioning and Application of Shotcrete", except as otherwise specified. Shotcreting consists of applying one or more layers of concrete conveyed through a hose pneumatically projected at a high velocity against a prepared surface.

The wet-mix process consists of thoroughly mixing all the ingredients, introducing the mixture into the delivery equipment and delivering it, by positive displacement, to the nozzle. Air jet the wet-mix shotcrete from the nozzle at high velocity onto the surface.

Material	Weight per Cubic Yard
⅜" Rock	650 lbs
Natural Sand	1800 lbs
Cement	750 lbs
Water	300 lbs
Fly Ash	150 lbs
Air Entrainment	6% (1.6 cubic feet)

0.40 to 0.50 water/cement ratio

Shotcrete shall be a pumpable mixture with a minimum 28-day compressive strength of 4,000 psi and a minimum 3-day compressive strength of 2,000 psi.

Weather is a key factor in the placement of shotcrete because it effects how quickly the material matures and gains strength. In hot weather, concrete stiffens quickly, especially when the concrete temperature exceeds 90-deg F. This reduces the length of time it remains workable and can cause difficulties in placing and finishing it. Cold temperatures have the opposite effect. Chemical reactions are slower at lower temperatures, so the objective during winter concrete construction is to maintain a rate of cement hydration sufficient to avoid freezing of the fresh concrete. The placement of shotcrete should be stopped if the wind is detrimental to the placement of the shotcrete, when the air temperatures are below 40-deg F or above 90-deg F, raining or lighting.

Warm water or heated aggregates may be used in batching and the shotcrete will be covered with shotcrete blankets if the weather is expected to be at 29-deg F or below and stay there for more than two hours. If the temperatures are below 50-deg the shotcrete will be covered with plastic for 24 hours.

Two methods are allowed for curing. The first method of curing is by keeping the surface of the shotcrete continually moist for at least 7 days by burlap that is kept wet. The second method of curing is by using an impervious membrane (curing compound).

Shotcrete thickness will be 4 inches nominal. The shotcrete finish will be a rough "undisturbed" gun finish.

Grout Mix Design:

Water/Cement Ratio= 0.4 - 0.6

(Batch Weight Per Cubic Yard)

Material	Weight	Volume	
Cement	1837 lbs	9.3 Cubic Feet	18.5 bags (94#)
Water	1102 lbs	17.7 Cubic Feet	132 gallons
Total		1 Cubic Yard	

(Per 94# Bag of Cement)

Material	Weight	Volume	
Cement	94 lbs	0.48 Cubic Feet	1 bag (94#)
Water	56.4 lbs	0.9 Cubic Feet	6.8 gallons
Total Volume		1.38 Cubic Feet	

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Compressive strength test results will verify the proposed mix design achieves a minimum compressive strength of 1500 psi at 3 days, and a minimum compressive strength of 3,000 psi at 28 days in accordance with the requirements given in AASHTO T 106, "Compressive Strength of Hydraulic Cement Mortar (Using 50 mm or 2 inch Specimens)".

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Sheet Revision

Date:		By:

General Notes

Project: Route 73 Bridge Project

Drawn By: MJW

Date: April 14, 2014

Checked By:

Project No./Code:

Sheet No.: 2

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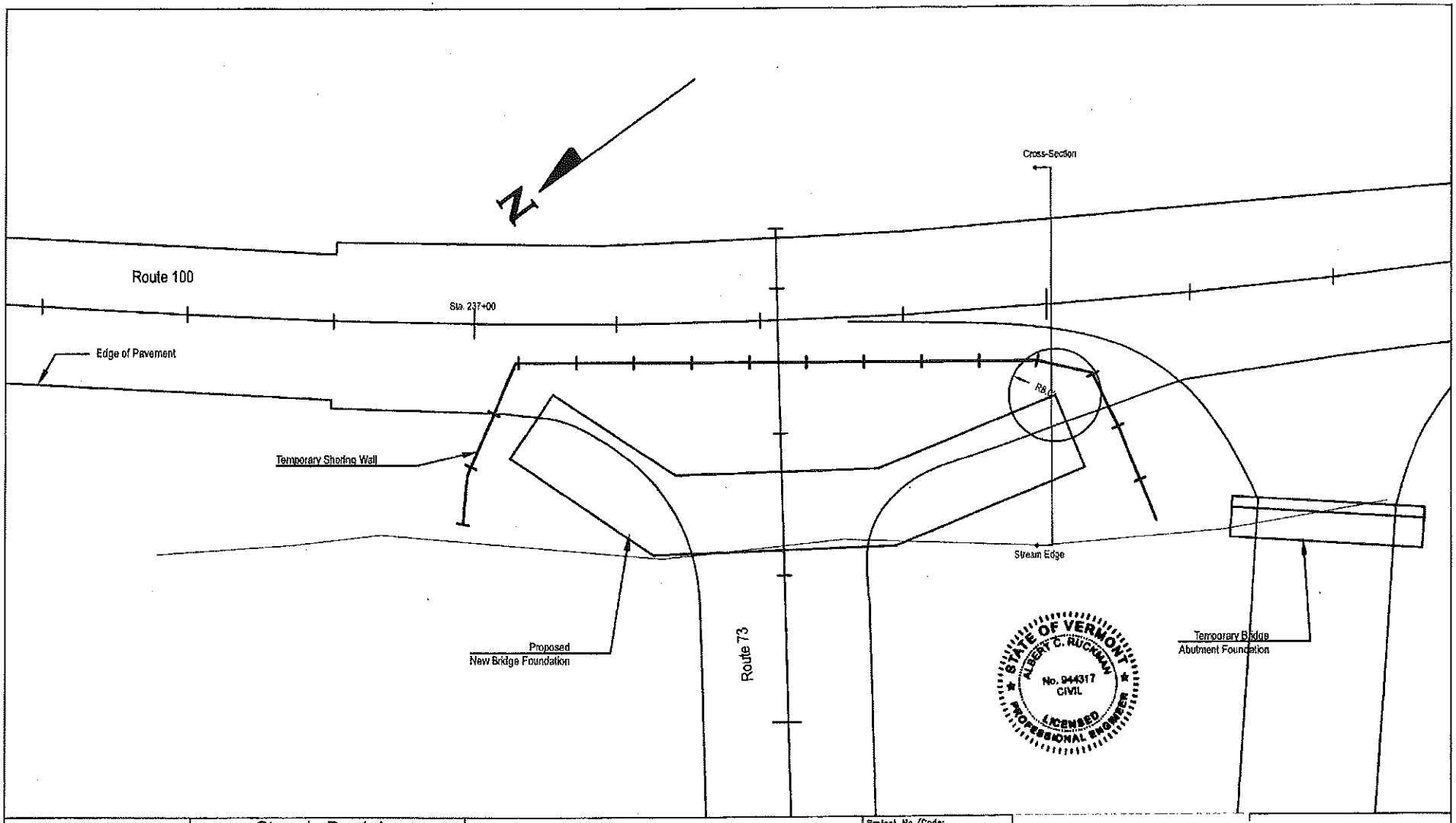

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Sheet Revision		
Date:		By:

Plan View1

Project: Route 73 Bridge Project	Drawn By: MJW
Date: April 14,2014	Checked By:

Project No./Code:

Sheet No.: 3

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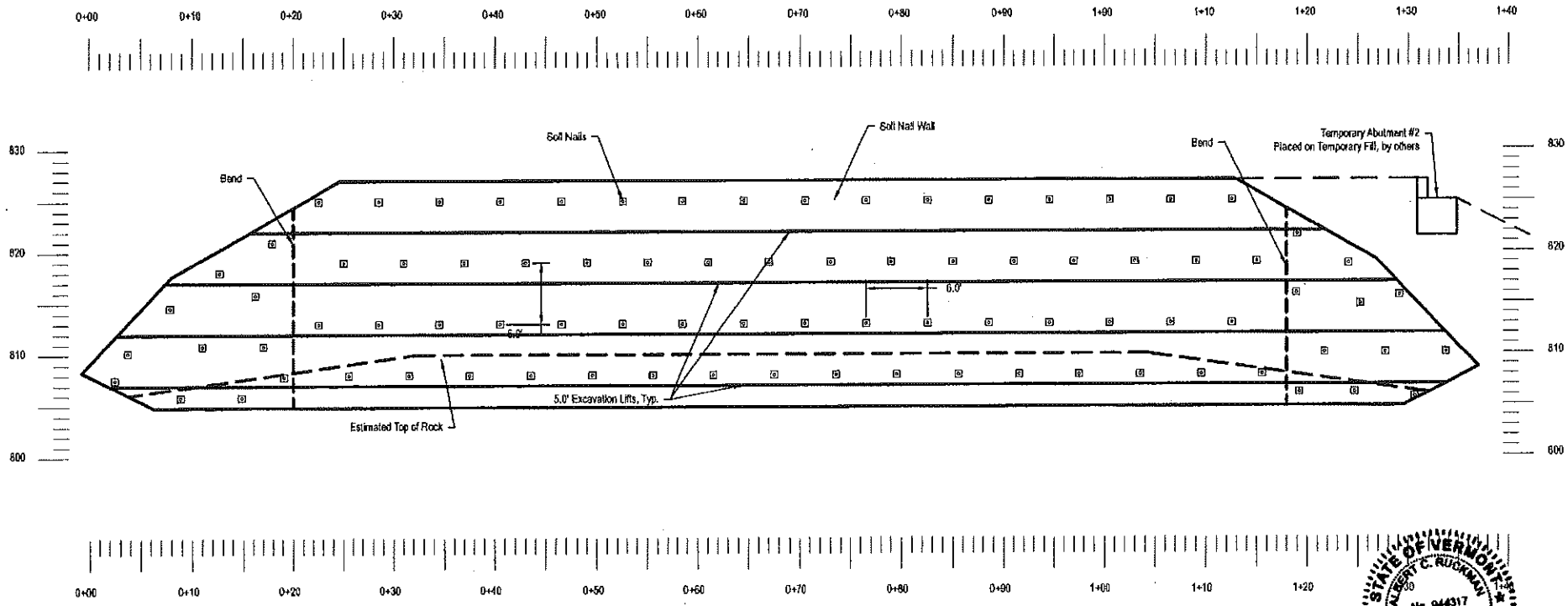
Shoring Area



Note: Approximately 2,630 sq. ft.

20 0 20

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Sheet Revision		
Date:		By:

Elevation View

Project: Route 73 Bridge Project	Drawn By: M.JW
Date: February 23,2014	Checked By:

Project No./Code:

Sheet No.: 4

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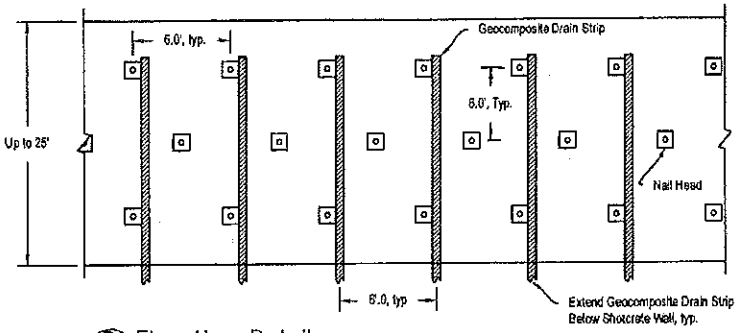
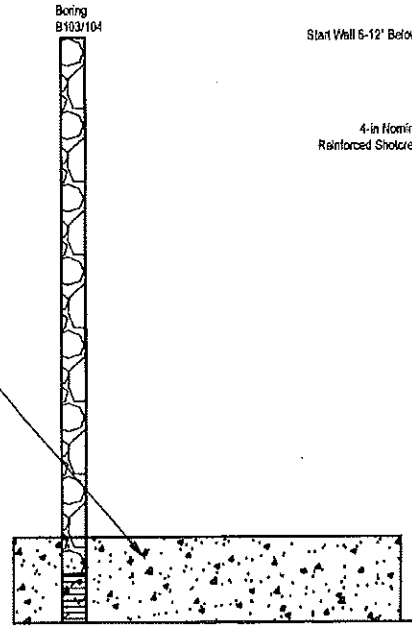
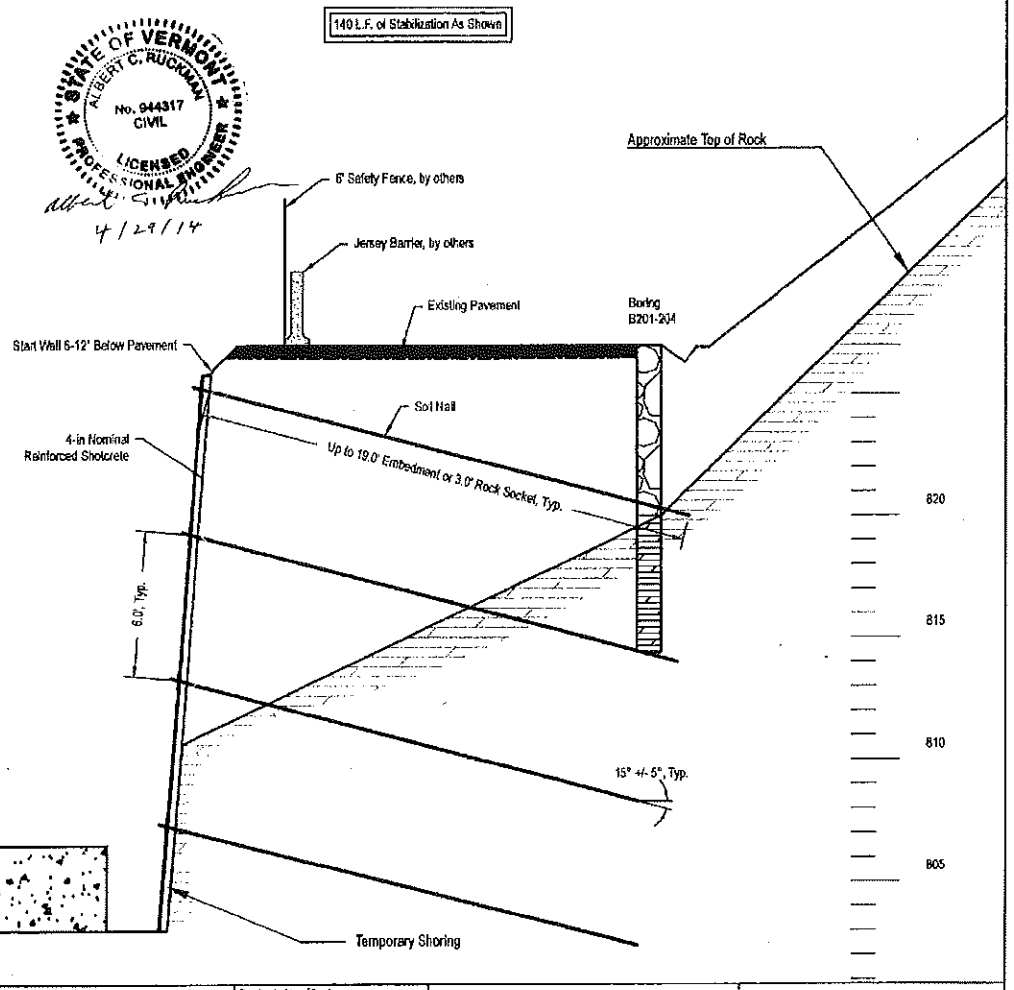


B/5 Elevation Detail
Not to Scale





A/5 Typical Section
Not to Scale

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Date:		By:

Typical Cross-Section and Elevation Detail

Project: Route 73 Bridge Project	Drawn By: MJW
Date: April 14, 2014	Checked By:

Project No./Code:

Sheet No.: 5

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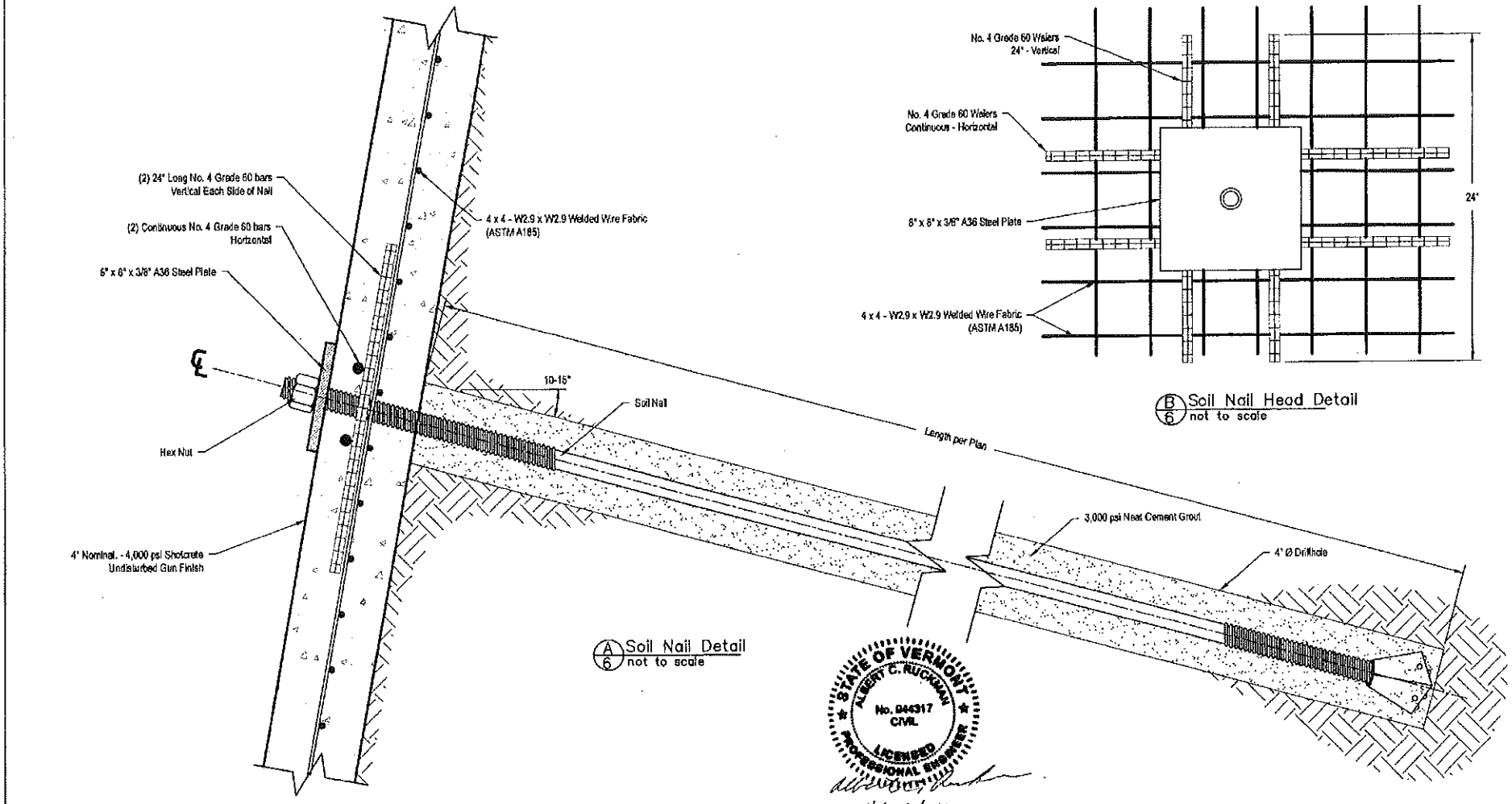

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Date:		By:

Self–Drilling SuperNail® Detail

Project: Route 73 Bridge Project	Drawn By: MJW
Date: April 14, 2014	Checked By:

Project No./Code:

Sheet No.: 6

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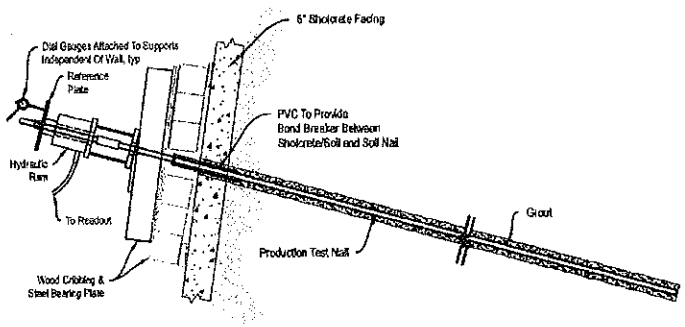
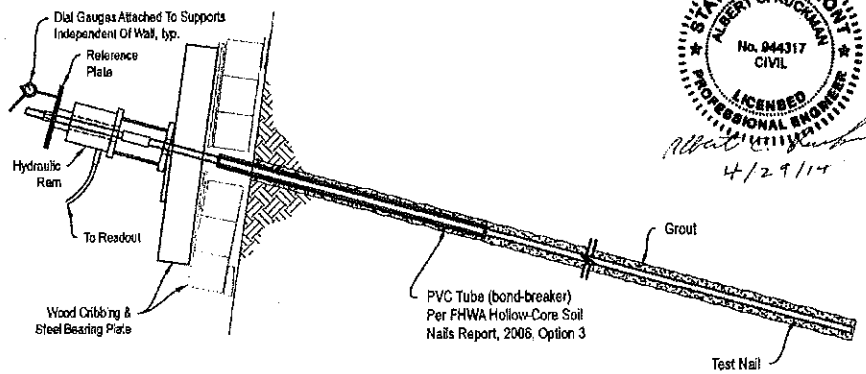


Test Nail Detail (With Shotcrete)
Not to Scale



Test Nail Detail (Without Shotcrete)
Not to Scale

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- Four (4) proof tests will be performed on production nails, one nail for each row, and test nails will be determined by the onsite engineer. Test nails will be tested 72 hours after installation. Proof testing may be conducted before 72 hours provided that the Contractor submits qualified independent test data demonstrating that the grout mix has reached its minimum 3-day compressive strength.

Proof Test Procedure: Testing equipment shall include dial gauges, dial gauge support, jack, and pressure gauge. Electronic testing equipment or load cells shall not be used. The testing reaction frame shall be constructed of sections of heavy timber sufficiently rigid and of adequate dimensions such that excessive deformation of the testing equipment does not occur. The jack shall be independently supported and centered over the nail bar so that the bar does not carry the weight of the testing equipment. The jack, bearing plates and stressing anchorage shall be aligned with the bar such that unloading and repositioning of the equipment shall not be required during the test. The Contractor shall apply and measure the test load with a hydraulic jack and pressure gauge; the pressure gauge shall be graduated in 100 psi increments or less. The jack and pressure gauge shall have a pressure range not exceeding twice the anticipated maximum test pressure. Jack ram travel shall be sufficient to allow the test to be done without resetting the equipment. Monitor the nail load during verification tests with both the pressure gauge and load cell. The Contractor shall measure the nail head movement with a dial gauge capable of measuring to 0.0010 inch. Visually align the gauge to be parallel with the axis of the nail and support the gauge independently from the jack or reaction frame. Due to the type of installation, test nails shall have bonded lengths only.

. The following equation shall be used for determining the proof test nail dimensions to be used to avoid structurally overstressing the proof test nail bar size:

- $(CFy) \geq 1.5Qd$
  Where:
  C = 0.8 for Grade 85 bars
  Fy = Minimum Bar Yield Strength (90.7 kips for a 38mm Injection Anchor)
  1.5 = Pullout Resistance Safety Factor
  Qd = Allowable Pullout Resistance (1.5 kips/ft)

  Here, CFy = 90.7 kips * 0.8 = 72.6 kips and 1.5Qd = 20.4 kips, so the proposed test passes.

- The Design Test Load (DTL) during proof testing shall be 1,500 lbs/ft (28.5 kips for up to 19.0' long nail). Proof tests shall be performed by incrementally loading the proof test nail to a maximum test load of 150 percent of the Design Test Load (DTL). The test load shall be monitored by a jack pressure gauge with sensitivity and range meeting the requirements of pressure gauges used for soil nail testing. At load increments other than maximum test load, the load shall be held long enough to obtain a stable reading. Incremental loading for proof tests shall be in accordance with the following loading schedule. The soil nail movements shall be recorded at each load increment.

PROOF TEST LOADING SCHEDULE
LOAD HOLD TIME
AL (0.05 DTL Max.) Until Stable
0.25 DTL Until Stable
0.50 DTL Until Stable
0.75 DTL Until Stable
1.00 DTL Until Stable
1.25 DTL Until Stable
1.50 DTL Max Test Load - See Below

Depending on performance, either ten (10) minute or sixty (60) minute creep tests shall be performed at the maximum test load (1.50TL). The creep period shall start as soon as the maximum test load is applied and the nail movement shall be measured and recorded at 1, 2, 3, 5, 6 and 10 minutes. Where the nail movement between 1 minute and 10 minutes exceeds 0.04 inch, the maximum test load shall be maintained an additional 50 minutes and movements shall be recorded at 20, 30, 50 and 60 minutes.

- Proof test nail acceptance criteria:
  a. A total creep movement of less than 0.04 inch is measured between the 1 and 10 minute readings or a total creep movement of less than 0.08 inch is measured between the 6 and 60 minute readings and the creep rate is linear or decreasing throughout the creep test load hold period.
  b. For proof tests, the total measured movement at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the test nail unbonded length.
  c. A pullout failure does not occur at 1.5 DTL test load under proof testing. Pullout failure is defined as the inability to further increase the test load while there is continued pullout movement of the test nail. Record the pullout failure load as part of the test data.

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Sheet Revision

Date:		By:
		MJW
		MJW

Test Nail Detail

Project: Route 73 Bridge Proejct
Drawn By: MJW
Date: April 14, 2014
Checked By:
Project No./Code:
Sheet No.: 7

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Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: VT 73 update
- Slide Modeler Version: 6.027
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 3/3/2014, 10:31:04 AM

General Settings

- Units of Measurement: Imperial Units
- Time Units: days
- Permeability Units: feet/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 62.4 lbs/ft3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Grid Search
- Radius Increment: 10
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack

Material Properties

Property	Overburden	Rock	Shotcrete
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	120	150	145
Cohesion [psf]	1	4000	5000
Friction Angle [deg]	34	35	35
Water Surface	None	None	None
Ru Value	0	0	0

- Minimum Elevation: Not Defined
- Minimum Depth: 3

Loading

- 1 Distributed Load present

Distributed Load 1

- Distribution: Constant
- Magnitude [psf]: 500
- Orientation: Vertical

Support Properties

Temporary 38 mm SD

- Support Type: Soil Nail
- Force Application: Active
- Out-of-Plane Spacing: 6 ft
- Tensile Capacity: 50000 lb
- Plate Capacity: 50000 lb
- Default Bond Strength: 1500 lb/ft
- and Material Dependent

Bond Strength Dependency:

Material	Bond Strength (lbs/ft)
Overburden	1500
Rock	4000

Global Minimums

Method: bishop simplified

- FS: 1.399290
- Center: -73.692, 872.217
- Radius: 70.664
- Left Slip Surface Endpoint: -34.073, 813.705
- Right Slip Surface Endpoint: -14.423, 833.740
- Resisting Moment=1.95929e+006 lb-ft
- Driving Moment=1.4002e+006 lb-ft
- Total Slice Area=206.243 ft2

Method: janbu simplified

- FS: 1.349560
- Center: -73.692, 872.217
- Radius: 70.664
- Left Slip Surface Endpoint: -34.073, 813.705
- Right Slip Surface Endpoint: -14.423, 833.740
- Resisting Horizontal Force=20308.4 lb

Method: janbu simplified

Error Codes:

- Error Code -103 reported for 86 surfaces
- Error Code -106 reported for 24 surfaces
- Error Code -107 reported for 225 surfaces
- Error Code -108 reported for 336 surfaces

- Driving Horizontal Force=15048.2 lb
- Total Slice Area=206.243 ft2

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 2694
- Number of Invalid Surfaces: 2157

Error Codes:

- Error Code -103 reported for 86 surfaces
- Error Code -106 reported for 24 surfaces
- Error Code -107 reported for 225 surfaces
- Error Code -108 reported for 75 surfaces
- Error Code -112 reported for 89 surfaces
- Error Code -115 reported for 1658 surfaces

- Number of Valid Surfaces: 2440
- Number of Invalid Surfaces: 2411

- Error Code -112 reported for 82 surfaces
- Error Code -115 reported for 1658 surfaces

Error Codes

The following errors were encountered during the computation:

- -103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
- -106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
- -107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
- -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
- -112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
- -115 = Surface too shallow, below the minimum depth.

Slice Data

- Global Minimum Query (bishop simplified) - Safety Factor: 1.39929

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	1.09782	974.939	Shotcrete	5000	35	2987.74	4180.72	-1170.05	0	-1170.05
2	0.773021	1725.63	Overburden	1	34	801.371	1121.35	1660.99	0	1660.99
3	0.773021	1768.71	Overburden	1	34	862.202	1206.47	1787.18	0	1787.18
4	0.773021	1656.95	Overburden	1	34	934.874	1308.16	1937.94	0	1937.94
5	0.773021	1601.89	Overburden	1	34	902.715	1263.16	1871.23	0	1871.23
6	0.773021	1545.22	Overburden	1	34	870.113	1217.54	1803.59	0	1803.59
7	0.773021	1486.9	Overburden	1	34	837.053	1171.28	1735.01	0	1735.01
8	0.773021	1426.87	Overburden	1	34	978.432	1369.11	2028.31	0	2028.31
9	0.773021	1365.07	Overburden	1	34	769.562	1076.84	1595	0	1595
10	0.773021	1301.43	Overburden	1	34	735.116	1028.64	1523.54	0	1523.54
11	0.773021	1235.87	Overburden	1	34	700.194	979.775	1451.09	0	1451.09
12	0.773021	1168.32	Overburden	1	34	664.795	930.241	1377.66	0	1377.66
13	0.773021	1098.7	Overburden	1	34	628.913	880.031	1303.22	0	1303.22
14	0.773021	1026.9	Overburden	1	34	592.542	829.138	1227.76	0	1227.76
15	0.773021	952.819	Overburden	1	34	942.993	1319.52	1954.78	0	1954.78
16	0.773021	876.35	Overburden	1	34	518.32	725.28	1073.79	0	1073.79
17	0.773021	797.364	Overburden	1	34	480.462	672.306	995.25	0	995.25
18	0.773021	715.722	Overburden	1	34	442.103	618.63	915.67	0	915.67
19	0.773021	631.269	Overburden	1	34	403.24	564.25	835.051	0	835.051
20	0.773021	543.832	Overburden	1	34	493.857	691.049	1023.04	0	1023.04
21	0.773021	453.214	Overburden	1	34	324.011	453.386	670.69	0	670.69
22	0.773021	359.197	Overburden	1	34	283.653	396.913	586.965	0	586.965
23	0.773021	261.53	Overburden	1	34	242.809	339.76	502.232	0	502.232
24	0.773021	159.924	Overburden	1	34	201.492	281.946	416.52	0	416.52
25	0.773021	54.0495	Overburden	1	34	159.725	223.501	329.871	0	329.871

• Global Minimum Query (Janbu simplified) - Safety Factor: 1.34956

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	1.09782	974.939	Shotcrete	5000	35	3064.39	4135.58	-1234.52	0	-1234.52
2	0.773021	1725.63	Overburden	1	34	821.949	1109.27	1643.08	0	1643.08
3	0.773021	1768.71	Overburden	1	34	884.14	1193.2	1767.51	0	1767.51
4	0.773021	1656.95	Overburden	1	34	958.438	1293.47	1916.16	0	1916.16
5	0.773021	1601.89	Overburden	1	34	925.25	1248.68	1849.76	0	1849.76
6	0.773021	1545.22	Overburden	1	34	891.617	1203.29	1782.47	0	1782.47
7	0.773021	1486.9	Overburden	1	34	857.531	1157.29	1714.28	0	1714.28
8	0.773021	1426.87	Overburden	1	34	1002.12	1352.42	2003.56	0	2003.56
9	0.773021	1365.07	Overburden	1	34	787.99	1063.44	1575.13	0	1575.13
10	0.773021	1301.43	Overburden	1	34	752.527	1015.58	1504.17	0	1504.17
11	0.773021	1235.87	Overburden	1	34	716.588	967.078	1432.27	0	1432.27
12	0.773021	1168.32	Overburden	1	34	680.175	917.937	1359.41	0	1359.41
13	0.773021	1098.7	Overburden	1	34	643.283	868.149	1285.6	0	1285.6
14	0.773021	1026.9	Overburden	1	34	605.909	817.71	1210.82	0	1210.82
15	0.773021	952.819	Overburden	1	34	963.981	1300.95	1927.26	0	1927.26
16	0.773021	876.35	Overburden	1	34	529.698	714.859	1058.34	0	1058.34
17	0.773021	797.364	Overburden	1	34	490.856	662.44	980.626	0	980.626
18	0.773021	715.722	Overburden	1	34	451.522	609.356	901.928	0	901.928
19	0.773021	631.269	Overburden	1	34	411.695	555.607	822.239	0	822.239
20	0.773021	543.832	Overburden	1	34	504.038	680.23	1007	0	1007
21	0.773021	453.214	Overburden	1	34	330.574	446.129	659.931	0	659.931
22	0.773021	359.197	Overburden	1	34	289.29	390.414	577.331	0	577.331
23	0.773021	261.53	Overburden	1	34	247.538	334.068	493.793	0	493.793
24	0.773021	159.924	Overburden	1	34	205.334	277.11	409.35	0	409.35
25	0.773021	54.0495	Overburden	1	34	162.7	219.573	324.048	0	324.048

Interslice Data

- Global Minimum Query (bishop simplified) - Safety Factor: 1.39929

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	-34.0729	813.705	0	0	0
2	-32.9751	814.464	4157.53	0	0
3	-32.2021	815.016	3856.91	0	0
4	-31.429	815.585	3504.92	0	0
5	-30.656	816.17	3091.34	0	0
6	-29.883	816.772	2660.3	0	0
7	-29.11	817.392	2213.28	0	0
8	-28.3369	818.03	1751.85	0	0
9	-27.5639	818.686	2648.21	0	0
10	-26.7909	819.362	2163.12	0	0
11	-26.0179	820.058	1668.98	0	0
12	-25.2449	820.776	1167.85	0	0
13	-24.4718	821.515	661.903	0	0
14	-23.6988	822.277	153.478	0	0
15	-22.9258	823.063	-354.902	0	0
16	-22.1528	823.874	2273.15	0	0
17	-21.3798	824.712	1773.23	0	0
18	-20.6067	825.577	1282.21	0	0
19	-19.8337	826.472	803.549	0	0
20	-19.0607	827.398	341.039	0	0
21	-18.2877	828.357	982.156	0	0
22	-17.5147	829.352	564.812	0	0
23	-16.7416	830.384	177.383	0	0
24	-15.9686	831.457	-174.527	0	0
25	-15.1956	832.575	-484.656	0	0
26	-14.4226	833.74	0	0	0

* Global Minimum Query (janbu simplified) - Safety Factor: 1.34956

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	-34.0729	813.705	0	0	0
2	-32.9751	814.464	4308.84	0	0
3	-32.2021	815.016	4037.48	0	0
4	-31.429	815.585	3717.35	0	0
5	-30.656	816.17	3338.76	0	0
6	-29.883	816.772	2941.95	0	0
7	-29.11	817.392	2528.38	0	0
8	-28.3369	818.03	2099.62	0	0
9	-27.5639	818.686	3034.74	0	0
10	-26.7909	819.362	2580.63	0	0
11	-26.0179	820.058	2116.6	0	0
12	-25.2449	820.776	1644.65	0	0
13	-24.4718	821.515	1166.93	0	0
14	-23.6988	822.277	685.746	0	0
15	-22.9258	823.063	203.563	0	0
16	-22.1528	823.874	2874.22	0	0
17	-21.3798	824.712	2398.27	0	0
18	-20.6067	825.577	1930	0	0
19	-19.8337	826.472	1472.83	0	0
20	-19.0607	827.398	1030.45	0	0
21	-18.2877	828.357	1696.95	0	0
22	-17.5147	829.352	1296.77	0	0
23	-16.7416	830.384	924.86	0	0
24	-15.9686	831.457	586.706	0	0
25	-15.1956	832.575	288.423	0	0
26	-14.4226	833.74	0	0	0

List Of Coordinates

Line Load

X	Y
-31.6324	833.74
-9.926	833.74

External Boundary

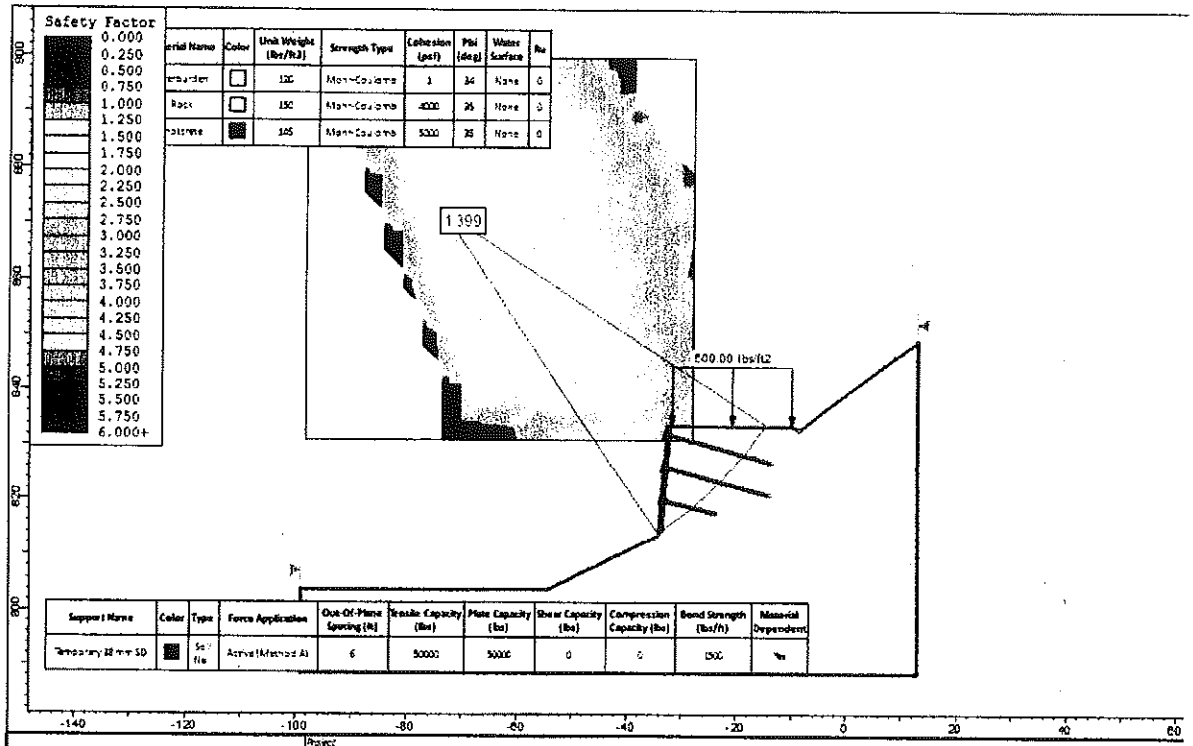
X	Y
-8.671	832.974
-9.926	833.74
-31.6324	833.74
-32.382	833.74
-34.075	813.68
-54.547	803.822
-65.987	803.822
-99.1422	803.822
-99.1422	788.48
13.1127	788.48
13.1127	845.697
13.1127	849.142
8.893	846.335

Material Boundary

X	Y
-34.075	813.68
-32.9944	814.187
-9.799	825.061
13.1127	845.697

Material Boundary

X	Y
-32.9944	814.187
-31.6324	833.74



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
[illegible]		120	Mohr-Coulomb	1	34	None	0
Rock		150	Mohr-Coulomb	4000	35	None	0
[illegible]		145	Mohr-Coulomb	5000	35	None	0

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (ft)	Tensile Capacity (lbs)	Plate Capacity (lbs)	Shear Capacity (lbs)	Compression Capacity (lbs)	Bond Strength (lbs/ft)	Material Dependent
Temporary 38 mm SD		Soil Nail	Active (Method A)	6	50000	50000	0	0	1500	Yes

GSI GeoStabilization International

Project	Route 73 Bridge Replacement Project: Temporary Shoring
Analysis Description	Temporary Shoring
Drawn By	
Company	GeoStabilization International
Date	04/14/2014
File Name	VT 73 update.slm

GeoStabilization International

P: 970.210.6170 | F: 970.245.7737

www.geostabilization.com

W.M. Schultz Construction, Inc.
831 State Route 67
Curtis Industrial Park
Ballston Spa, NY 12020

Subject: Rochester ER BRF 0162(18) – Response to Comments – Temporary Shoring

Dear Kevin Ture:

We have reviewed the comments by VTrans submitted in a letter dated April 9, 2014. Below are our responses to comments.

1. Sheets updated to show "Excavation will be conducted in a series of five (5) foot vertical lifts." Shown both on Sheet 2 (Notes) and Sheet 4 (Elevation View).
2. Details showing the temporary abutment location and configuration were developed from plans provided. It is also our understanding that this location approximates the final location. Presently, the representation indicates that there will not be a conflict between the temporary shoring wall and proposed temporary bridge abutment and wing-wall.
3. Additional loads have been placed on the temporary shoring structure to approximate reaction loads from the temporary bridge.
4. Calculations have been updated. Initial modelling used a surcharge load of 250 psf (equivalent of 2-ft of additional soil). The revised models shows a load equivalent to 2 feet of soil with an additional 2 feet of equivalent soil (total of 4 feet) to account for normal traffic loads, construction activities, and additional reaction loads from the temporary bridge.
5. Plans have been updated to indicate a maximum vertical excavation of five (5) vertical feet prior to installation of nails (see response to comment 1, above). Also Sheet 2 has been updated to indicate the overall slope will be excavated approximately at a 12V: 1H or flatter.
6. Plans have been updated and indicate preliminary lengths for soil nails of up to 19 feet, or a three (3) foot rock socket. A GSI engineer will determine final lengths based on field conditions and/or testing.
7. The design load has been incorporated in to the plan sheets.
8. The design plans have been updated to include a test nail sheet. A proof test will be conducted on one nail per row of production nails.
9. The Wire Welded Fabric will be a 4x4 W2.9 x W2.9, equivalent or better.
10. The grout and shotcrete mixes specified for this project are mixes that have been used successfully in the past, including on VTrans projects in which testing was performed by

CORPORATE ADDRESS: PO Box 4709, Grand Junction, CO 81502
BRANCH OFFICES: Arizona, British Columbia, California, Colorado, Kentucky, North Carolina, Ontario, Oregon, Tennessee, Utah, and Virginia

VTrans. In regards to nail systems, most nails will fail due to the grout/soil interface, which will be tested with the proof tests. GSI will be satisfied with the system with the results of the proof tests. However, we will also make available the dates of our grouting if VTrans would like to collect grout samples to test if desired. Furthermore, if desired by VTrans, we will construct and make available a shotcrete test panel for testing to surrender to VTrans.

11. See answer to number 10.

Additional Comments:

1. We recommend that the temporary shoring remain in place and backfilled adjacent to the temporary shoring.
2. Dewatering is not an anticipated need to the temporary shoring.
3. A Professional Engineer Licensed in the State of Vermont will stamp GSI calculations and details.

Sincerely,

Martin J. Woodard, PhD PG PE
Northeast Regional Engineer