Soil Nailed Wall Slide Correction

CONTRACT M-35719

Letting August 7
Project Description and Scope

The basis of the bids will be on a theoretical soil nail project as represented in the contract plans.
Project Description and Scope

Project: SMEX

Soil/rock type: Silty clay loam on highly weathered shale with thin limestone swarms. Bedrock stratum is at 97 to 127 depth as measured from edge of pavement.

Field SPT Blowcount: 30 to 75
Max. Depth of Failure Plane (ft): 32.75
Slide Length (ft): 209

See attached detail: The scarp of the slide consists variable depth pavement underlain by approximately 1' of crushed stone. Ripping covers approximately 30% of the slope face and has been placed on the slope in an attempt to repair previous slides. Debris is also present on the slope face. Heavy vegetation of shrubs, briars and trees are located approximately 5 feet from the toe of the slope.

Existing slope face condition:
Estimated ground frost bond:
Correlation N vs. F
Correlation procedure:
Epoxy Coated bars
Shuttering thickness:
Wall facing:
Face batter:
Vertical Assumed for both

Soil Nailed-Wall (yd³):Bid an extra quantity of 5% of cast volume for extra shuttering needed due to slopping
Wire Mesh (yd³):

Ex. Ground Slide Surface

Depth of Failure Plane

Original Slide Slope

Typical Slide Section
(Shown at Maximum Depth)

NOT FOR CONSTRUCTION

INDIANA DEPARTMENT OF TRANSPORTATION

TYPICAL SLIDE SECTION (SHOWS AT MAXIMUM DEPTH)
Project Description and Scope

- Locations yet to be determined
- Landslide repair by:
  - Drilling or launching of the soil nails
  - Providing and installing necessary drainage features
  - Constructing the wire mesh, shotcrete or final facing
Scope of Services

Intent of Contract

– Provide for the complete design, construction and completion in every detail of the work described

– Plans define Department’s expectations of typical available information at the future location

– Changes subject to Department review and approval

– Perform all items of work stipulated in the Special Provisions and Scope of Services
Scope of Services

Contractor Qualifications

– The Contractor shall demonstrate to the satisfaction of the Engineer that the soil nail installer’s team is qualified to perform the work under this contract.

– In the event that the Department finds any of the project team members are not qualified, the Department may request additional information or reject any team member.

– The Department reserves the right to contact references and investigate past performance of the soil nail installer.
Scope of Services

Contractor Qualifications

– The Contractor has successfully engineered and installed no less than 3 soil nailed wall projects.

– To qualify at least 1 of the projects noted above shall have used the same key personnel as will be used on this contract.

– The Contractor shall provide the names of the key project team members and their work history
Scope of Services

Design of the Project

- Contractor shall provide all necessary services to design all permanent and temporary portions of the project conforming to current Department and AASHTO standards.

- Contractor shall be responsible for the analysis of the slope stabilization system.

- Materials and components shall meet a 75 year design life.

- Evaluation of the slope stability shall be performed by a professional engineer registered in Indiana w/ a geotechnical background.
Scope of Services

Project Schedule

– Mandatory Pre-Bid Meeting  
  June 26, 2013
  INDOT – Seymour District, Administration Bldg., Large Conference Room
  185 Agrico Lane, Seymour, IN 47274

– Contractor Qualification Submittal and Cost Proposal  
  On or before August 7, 2013
Scope of Services

Timeline for Execution of the Contract

Maintenance → Notify INDOT to Execute Contract

72 Hours – Schedule Site Visit

INDOT: NO → YES

Detailed Estimate
48 Hours – Site Survey
Slope Stability Model

NO ← YES → Delivery Order
Scope of Services

Timeline for Execution of the Contract Continued

- NO                           YES                      Delivery Order Issued

  5 days - Contractor to submit Stamped Plans. Contractor Gets Paid for Plan Submittal.

- NO                                     YES

  INDOT will provide Permits
  Erosion Control
  Traffic Control
  Utilities

- NO                                    YES

  INDOT will notify Contractor to begin work

  Contractor has 48 hours to commence repair operations
Scope of Services

Quality Control Requirements

– Plans and working drawing approval shall be in accordance with the specifications and shall be the responsibility of the Contractor.

– The Contractor shall submit a complete list of items representative of the work to be performed under the contract.

  • Pay items to conform to applicable methods of measurements, pay items, and pay units
Scope of Services

Scope of Work

— All construction activities shall be in accordance with issued permits and any revisions to permits.
Scope of Services

Utilities

– The Contractor shall determine the location of underground utilities before excavating areas where conflicts with underground structures may occur.

– The Contractor shall determine the location of all overhead utility lines within the project limits and verify that the proper clearances shall be observed.

– Where conflicts do occur, the Engineer will determine the manner of procedure.
Scope of Services

Traffic and Other Work Control

INDOT will be responsible for all traffic control unless otherwise specified.

INDOT will provide all public notification, utility certification, environmental permits, right of way, and access approval as needed.
Launched Nails
Landslide Locations in the Seymour District

US 52      RP 143.5   West of Brookville
US 52      RP 152.6   West of Brookville
US 52      RP 153.8 to 154.1 West of Brookville
US 52      RP 162.8   East of Brookville
SR 252     RP 37.4    East of Brookville
SR 250     RP 67.2 to 67.8 West of Patriot
SR 250     RP 68.0    West of Patriot
SR 262     RP 2.7 to 3.2
SR 262     RP 4.3 to 4.4
SR 262     RP 5.3 to 5.8
SR 262     RP 10.9 to 11.3
SR 1       RP 2.8, 4.5-4.9, 5.6, 7.3, 8.6, & 11.1-11.4
SR 56      RP 146.9   East of Madison

Note: None of the above locations are programmed for development.
<table>
<thead>
<tr>
<th>PRIORITY</th>
<th>DISTRICT</th>
<th>ROUTE</th>
<th>BP</th>
<th>COUNTY</th>
<th>LOCATION</th>
<th>ADT</th>
<th>LF</th>
<th>COST</th>
<th>COST/LF</th>
<th>LATITUDE</th>
<th>LONGITUDE</th>
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**SEYMOUR TOTALS**: $7,173,899.78 | $696
• Cost – Original Proposal
  • $125,787 for 172 lf = $731 per lf

• Cost – Final, with added GCS wall
  • $225,787 for 172 lf = $1,313 per lf

• Time
  • 3 weeks construction
  • 6 weeks total for design-build
## KYTC Contract Usage

<table>
<thead>
<tr>
<th>State</th>
<th>Year</th>
<th>Number of Sites Repaired</th>
<th>Number of Slides Reviewed and Proposals Submitted</th>
<th>Linear Feet (LF) of Roadway Repaired</th>
<th>Average price per site</th>
<th>Average price per LF</th>
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<td>2007</td>
<td>8</td>
<td>100</td>
<td>1,197</td>
<td>$91,860</td>
<td>$613.93</td>
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<td>2008</td>
<td>23</td>
<td>80</td>
<td>4,724</td>
<td>$175,110</td>
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<td>Kentucky</td>
<td>2009</td>
<td>44</td>
<td>109</td>
<td>6,906</td>
<td>$154,411</td>
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<td>Kentucky</td>
<td>2010</td>
<td>53</td>
<td>106</td>
<td>9,359</td>
<td>$148,427</td>
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<td>74</td>
<td>179</td>
<td>10,920</td>
<td>$133,548</td>
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<td>Kentucky</td>
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<td>84</td>
<td>6,846</td>
<td>$179,470</td>
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<td>105</td>
<td>10,470</td>
<td>$194,255</td>
<td>$872.01</td>
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<td>Kentucky</td>
<td>2014 (so far)</td>
<td>51</td>
<td>144</td>
<td>8,208</td>
<td>$113,677</td>
<td>$706.33</td>
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<td><strong>TOTAL</strong></td>
<td><strong>8 Years</strong></td>
<td><strong>331</strong></td>
<td><strong>907</strong></td>
<td><strong>58,630</strong></td>
<td><strong>$148,845</strong></td>
<td><strong>$823.99</strong></td>
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</table>
What do you do if one of your roads looks like this tomorrow?
Emergency Landslide Correction
Benefits of a Contract

Joey Franzino, P.E.
INDOT Geotechnical Operations Engineer

March 11, 2015
Geotechnical Challenges with Landslides

- **Lengthy investigation generally required**
  - Borings including Rock Cores
  - Lab Testing
  - Slope Indicators with up to one year of monitoring
  - Lots of analyses

- **Constant Maintenance**
  - Asphalt and riprap often get dumped to fill cracks and offsets in pavement
  - Guardrail gets displaced
  - Eventually, the road can no longer be maintained and must be closed
Geotechnical Challenges with Landslides

- **Road closures**
  - Some roads closed for years until repair
  - Detours are often lengthy, could cost motorists over 20 miles of time and fuel

- **Repair Costs**
  - Costs vary from $1,000 to $10,000 per linear foot
  - Frequent change orders due to unexpected conditions
US 52 Slope Failure
If we had no contract...

- US 52 was closed on April 2, 2014
- Our next step would be to get borings with rock cores.
  - I would have to treat it as an emergency and drop everything else to drill it, causing other projects to be delayed
  - The drilling would likely be complete in two to three weeks
- I would then need some lab testing
  - I would likely limit the lab testing in the interest of time since we have a closed road
  - At best, this lab testing would take two more weeks
If we had no contract...

- Based on my site observations, and what I saw encountered during the soil nail wall construction, I believe our best option without a contract would be a reinforced slope.
  - I would then need to do analysis at multiple locations.
  - I would have to write a report.
  - The total time for this would be one to two weeks.
If we had no contract...

- I would then turn my Geotechnical Report into INDOT Design
  - They would need to draw up plans
  - I would have to review the plans
  - They have to set them up for a letting
  - The project would be let
  - The total time for this process would be three to four months
If we had no contract...

- The project would then go to Construction
  - A pre-construction meeting would be held and the contractor would wait for Notice to Proceed
  - The Construction would be tedious with the reinforcement and aggregate compaction
  - From the letting date to the road being opened might take six to eight weeks
<table>
<thead>
<tr>
<th>Correction Method</th>
<th>Cost</th>
<th>Date Road Opens</th>
<th>Road Closed Days</th>
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</thead>
<tbody>
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<td>Reinforced Slope in the absence of Contract</td>
<td>$420,000</td>
<td>Sept. 19, 2014</td>
<td>170</td>
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<tr>
<td>Soil Nail Wall with Contract</td>
<td>$225,000</td>
<td>May 2, 2014</td>
<td>30</td>
</tr>
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</table>
Special Thanks Today

- Athar Khan
- Jonathan Paauwe
- Yuhui Hu
- Jane Twaddle
- Greg Bachman
Questions?