



<b>SUPERSEDED BY EB 23-024</b> <b>EFFECTIVE 8/3/23</b>		<i>New York State</i> <i>Department of</i> <i>Transportation</i> <b>ENGINEERING</b> <b>INSTRUCTION</b>	<b>EI</b> <b>08-031</b>
<b>Title: REVISED SPECIAL SPECIFICATION FOR LAUNCHED SOIL NAIL SHALLOW SLOUGH TREATMENT</b>			
<b>Distribution:</b> <input type="checkbox"/> Manufacturers (18) <input type="checkbox"/> Surveyors (33) <input checked="" type="checkbox"/> Local Govt. (31) <input checked="" type="checkbox"/> Consultants (34) <input checked="" type="checkbox"/> Agencies (32) <input checked="" type="checkbox"/> Contractors (39) <input type="checkbox"/> _____ ( )		<b>Approved:</b>  <hr/> Robert L. Sack, P.E., Deputy Chief Engineer (Research) <span style="float: right;"> <b>1 OCT 08</b>          Date       </span>	

**ADMINISTRATIVE INFORMATION:**

- This Engineering Instruction (EI) is effective beginning with projects submitted for the letting of January 8, 2009.
- This EI supersedes EI 05-026.
- The information transmitted by this issuance will reside in the Special Specifications directory of the Toolbox Server.

**PURPOSE:** The purpose of this EI is to issue a revised special specification for launched soil nail slope reinforcement.

**TECHNICAL INFORMATION:**

● Launched soil nailing is a technique developed in the United Kingdom for the reinforcement of locally unstable existing soil masses. Soil nails are inserted using high-pressure air approaching 17.2 MPa by a launcher that is mounted on a hydraulic excavator. As the soil nail passes into the soil, the ground around the nail is displaced by compression at the nail tip. This forms an annulus of compression which reduces the soil drag on the nail. As the nail comes to rest, the soil rebounds onto and bonds with the nail. The soil nails reinforce the locally unstable soil mass by transferring the nail's tensile and shear resistance through the failure plane of the sliding soil. The nails maintain the resisting force because they are anchored beyond the slip plane.

● Revisions to Special Specification: The special specification was revised as follows: Galvanized nails were removed as a material option, and replaced with fiberglass nails that are currently available for use. Fiberglass nails provide the pull out resistance required for minor slope slough stabilizations and will not corrode. A grout option for use with steel hollow nails is now provided.

● PIN Approval: The Launched Soil Nail Shallow Slough Treatment special specification is to be approved on a project-by-project basis. Designers must send their request for approval to the Design Quality Assurance Bureau (DQAB) and the Geotechnical Engineering Bureau (GEB) through the Regional Special Specification Coordinator as per Highway Design Manual (HDM) Chapter 21.

**IMPLEMENTATION:**

- The following special specifications are disapproved:  
 Item 554.16----17 - Launched Soil Nail Slope Reinforcement (Galvanized).

**TRANSMITTED MATERIALS:**

Attached are the following revised Metric and US Customary special specifications:

Metric:

- Item 554.15----17 – Launched Soil Nail Shallow Slough Treatment.
- Item 554.17----17 – Shotcrete Cover for Launched Soil Nail Slope.
- Item 554.18----17 – Composite Reinforced Erosion Control Material Cover for Launched Soil Nail Slope.

US Customary:

- Item 554.15000017 – Launched Soil Nail Shallow Slough Treatment.
- Item 554.17000017 – Shotcrete Cover for Launched Soil Nail Slope.
- Item 554.18000017 – Composite Reinforced Erosion Control Material Cover for Launched Soil Nail Slope.

**BACKGROUND:** The special specification was created and originally issued by EI 05-026 to provide designers with another option for stabilizing earth slopes that show evidence of localized surface failures. The installation of launched soil nails will improve or reinstate the strength and stability of the soil structure. This treatment is intended for shallow slope sloughs where the slip plane is within the minimum three meter soil nail embedment depth.

Soil nails are long steel or fiberglass rods installed to reinforce or strengthen the existing ground. Recently, there has been a development in the installation process which incorporates a tool utilizing compressed air to launch a soil nail into place. Applications of the installation method include the ability to work beneath most overhead utilities, a relatively rapid installation process (approximately 25 linear meters of road per day for a two-row installation), minimum ground disturbance, single lane closure for mobilization, and installation from the top of the affected slope. The installation method is not appropriate for use in very compact soils or soils containing a significant quantity of boulders and/or cobbles. Underground utility mark-out is required to avoid damage by the installation process. Design methodology may be found in the FHWA publication listed in the references.

**REFERENCES:** The following sources of information were used in developing this EI and the attached Special Specification and are sources for further information on the subject matter:

1. Website for launched soil nails found at [www.soilnaillauncher.com](http://www.soilnaillauncher.com)
2. Launched Soil Nails Stabilize Embankments, Robert Barrett, Albert Ruckman, Bernard Myles, and John Steward, July 23, 2002.
3. US Department of Transportation, Federal Highway Administration, Publication No. FHWA-FPL-93-003: Application Guide for Launched Soil Nails Volume 1 and Publication No. FHWA-FPL-93-004: Project Report for Launched Soil Nails-1992 Demonstration Project Volume 2.

The launched soil nails will be designed by the Geotechnical Engineering Bureau using a procedure developed based on these references.

**CONTACT:** Questions or comments regarding this issuance should be directed to Randall J. Romer, P.E., of the Geotechnical Engineering Bureau at (518) 457-4714, [romer@dot.state.ny.us](mailto:romer@dot.state.ny.us). Questions or comments regarding the technical aspects of the Special Specification should be directed to James Reinhold, P.E., of the Geotechnical Engineering Bureau at (518) 457-4715, [jreinhold@dot.state.ny.us](mailto:jreinhold@dot.state.ny.us).

<b>ITEM 554.15</b>	<b>17 -</b>	<b>LAUNCHED SOIL NAIL SHALLOW SLOUGH TREATMENT</b>
<b>ITEM 554.17</b>	<b>17 -</b>	<b>SHOTCRETE COVER FOR LAUNCHED SOIL NAIL SLOPE</b>
<b>ITEM 554.18</b>	<b>17 -</b>	<b>COMPOSITE REINFORCED EROSION CONTROL MATERIAL COVER FOR LAUNCHED SOIL NAIL SLOPE</b>

### **DESCRIPTION**

This work shall consist of installing Launched Soil Nails and furnishing all equipment and materials for the installation. The Launched Soil Nails may be left exposed or may incorporate a cover, as described below, in accordance with the contract documents.

Launched soil nails shall be inserted into existing soil masses by high-pressure air. The soil nails reinforce locally unstable shallow soil sloughs by transferring the tensile and shear resistance developed by the soil nail from the stable side of the slip plane to the unstable side.

The Contractor or Subcontractor performing this work shall have prior experience installing launched soil nails.

### **MATERIALS**

**Soil Nails:** Soil Nails to be furnished shall have a nominal outside diameter of 38 mm and a minimum length of 5.5 m. The contractor shall provide certification that the tensile strength of the nails is a minimum of 200 MPa. The soil nails shall be solid steel, perforated hollow steel bars with a smooth outer surface and a minimum wall thickness of 3.05 mm, or fiberglass nails as specified by a note in the contract documents entitled "Launched Soil Nails." Remaining lengths from previously installed Soil Nails shall not be accepted for reuse.

Perforations shall be two 9.5 mm holes every 150 mm on the bottom 2.4 m or as directed by the Engineer.

**Shotcrete:** Provide shotcrete conforming to the requirements of Section 583- Shotcrete.

**Wire Fabric:** Provide wire fabric conforming to the requirements of § 709-02, Wire Fabric For Concrete Reinforcement.

**Composite Reinforced Erosion Control Material:** Provide a synthetic erosion control material which promotes vegetative growth, and is internally reinforced by a double-twisted steel wire mesh with a wire diameter of at least 2.20 mm and a nominal mesh opening between the angles of twist of 83 mm. Acceptance will be based on the submission to the Engineer of a nominal sample and copy of the manufacturer's specifications. The sample shall be submitted one week prior to application.

### **CONSTRUCTION DETAILS**

At least 30 days prior to the scheduled start of work, the contractor shall submit proof to the Engineer that whoever will perform the work has successfully installed launched soil nails on at least two projects within the past five years.

**ITEM 554.15 17 - LAUNCHED SOIL NAIL SHALLOW SLOUGH TREATMENT**  
**ITEM 554.17 17 - SHOTCRETE COVER FOR LAUNCHED SOIL NAIL SLOPE**  
**ITEM 554.18 17 - COMPOSITE REINFORCED EROSION CONTROL MATERIAL**  
**COVER FOR LAUNCHED SOIL NAIL SLOPE**

Furnish soil nails, launching equipment, and incidentals necessary to complete the work. Install soil nails using a launcher with a single stroke at initial velocities in excess of 322 km/h or at a launcher chamber pressure of 17.2 MPa. The location limits of the launched soil nail application(s) shall be shown in the contract documents.

Launched Soil Nails may be two or more rows as shown in the contract documents. Install nails in subsequent rows offset from the nails in the previous row.

The exposed portion of installed soil nails shall be cut off flush with the final slope face. The final slope face may be bare slope, shotcrete, or other slope face protection as shown in the contract documents. Cut off the exposed portion of the soil nails using a method which does not leave an exposed sharp, pointed end.

Soil nails that do not penetrate a minimum of 3.0 m from the slope surface will be rejected. Do not remove nails which do not meet the minimum penetration embedment. An additional nail will be installed within a 450 mm radius of the rejected soil nail. If the additional nail does not reach the minimum penetration depth of 3.0 m, then the area shall be evaluated by the Geotechnical Engineering Bureau for remedial action.

If a soil nail which penetrates beyond the maximum soil nail length of 6.0 m, then the contractor shall reduce the installation pressure to allow for embedment within 5.5 to 6.0 m.

If noted in the contract documents, apply shotcrete to the limits of the installed soil nailed surface. Reinforce the shotcrete with wire fabric. Positively anchor the wire fabric to the installed soil nails. Contour the wire fabric to the surface profiles. After the wire fabric is in place, apply a 100 mm thick application of shotcrete, encapsulating the wire fabric. Keep ungrouted hollow soil nail heads free of debris to facilitate drainage.

Provide shotcrete equipment capable of delivering the premixed material accurately, uniformly and continuously through the delivery hose. Control shotcrete application thickness, nozzle technique, air pressure, and rate of shotcrete placement to prevent sagging or sloughing of freshly applied shotcrete.

If noted in the contract plans, provide composite reinforced erosion control material internally reinforced with double-twisted steel wire mesh in lieu of shotcrete. Secure the composite reinforced erosion material onto the slope face in accordance with the manufacturer's recommendations or as amended by the contract plans.

Turf establishment of the slope shall be paid for separately. Use of erosion control material other than that described above shall be placed under a separate specification.

**METHOD OF MEASUREMENT**

The launched soil nail slope reinforcement work measured for payment will be the nearest whole number of square meters of treated slope face between the payment lines shown in the contract documents.

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Shotcrete and wire fabric reinforcement work will be measured for payment in square meters measured to the nearest whole square meter of slope face.

Composite reinforced erosion control material will be measured for payment in square meters to the nearest whole square meter.

**BASIS OF PAYMENT**

The unit price bid per square meter of slope treated with launched soil nails shall include the cost of furnishing all labor, materials, and equipment required to install the launched soil nails to the minimum embedment.

The unit price bid per square meter of shotcrete, wire fabric reinforcement, and connector plates shall include the cost of furnishing all labor, materials, and equipment required for the installation.

The unit price bid per square meter of composite reinforced erosion control material shall include the cost of furnishing all labor, materials, and equipment required for the installation.

**ITEM 554.15000017 - LAUNCHED SOIL NAIL SHALLOW SLOUGH TREATMENT**  
**ITEM 554.17000017 - SHOTCRETE COVER FOR LAUNCHED SOIL NAIL SLOPE**  
**ITEM 554.18000017 - COMPOSITE REINFORCED EROSION CONTROL MATERIAL**  
**COVER FOR LAUNCHED SOIL NAIL SLOPE**

**DESCRIPTION**

This work shall consist of installing Launched Soil Nails and furnishing all equipment and materials for the installation. The Launched Soil Nails may be left exposed or may incorporate a cover, as described below, in accordance with the contract documents.

Launched soil nails shall be inserted into existing soil masses by high-pressure air. The soil nails reinforce locally unstable shallow soil sloughs by transferring the tensile and shear resistance developed by the soil nail from the stable side of the slip plane to the unstable side.

The Contractor or Subcontractor performing this work shall have prior experience installing launched soil nails.

**MATERIALS**

**Soil Nails:** Soil Nails to be furnished shall have a nominal outside diameter of 1 ½ in. and a minimum length of 18 ft. The contractor shall provide certification that the tensile strength of the nails is a minimum of 29 ksi. The soil nails shall be solid steel, perforated hollow steel bars with a smooth outer surface and a minimum wall thickness of ¼ in., or fiberglass nails as specified by a note in the contract documents entitled "Launched Soil Nails." Remaining lengths from previously installed Soil Nails shall not be accepted for reuse.

Perforations shall be two ⅜ in. holes every 6 in. on the bottom 8 ft. or as directed by the Engineer.

**Shotcrete:** Provide shotcrete conforming to the requirements of Section 583- Shotcrete.

**Wire Fabric:** Provide wire fabric conforming to the requirements of § 709-02, Wire Fabric For Concrete Reinforcement.

**Composite Reinforced Erosion Control Material:** Provide a synthetic erosion control material which promotes vegetative growth, and is internally reinforced by a double-twisted steel wire mesh with a wire diameter of at least 1/12 in. and a nominal mesh opening between the angles of twist of 3 ¼ in. Acceptance will be based on the submission to the Engineer of a nominal sample and copy of the manufacturer's specifications. The sample shall be submitted one week prior to application.

**CONSTRUCTION DETAILS**

At least 30 days prior to the scheduled start of work, the contractor shall submit proof to the Engineer that whoever will perform the work has successfully installed launched soil nails on at least two projects within the past five years.

**ITEM 554.15000017 - LAUNCHED SOIL NAIL SHALLOW SLOUGH TREATMENT**  
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**COVER FOR LAUNCHED SOIL NAIL SLOPE**

Furnish soil nails, launching equipment, and incidentals necessary to complete the work. Install soil nails using a launcher with a single stroke at initial velocities in excess of 200 mph or at a launcher chamber pressure of 2500 psi. The location limits of the launched soil nail application(s) shall be shown in the contract documents.

Launched Soil Nails may be two or more rows as shown in the contract documents. Install nails in subsequent rows offset from the nails in the previous row.

The exposed portion of installed soil nails shall be cut off flush with the final slope face. The final slope face may be bare slope, shotcrete, or other slope face protection as shown in the contract documents. Cut off the exposed portion of the soil nails using a method which does not leave an exposed sharp, pointed end.

Soil nails that do not penetrate a minimum of 10 ft. from the slope surface will be rejected. Do not remove nails which do not meet the minimum penetration embedment. An additional nail will be installed within an 18 in. radius of the rejected soil nail. If the additional nail does not reach the minimum penetration depth of 10 ft., then the area shall be evaluated by the Geotechnical Engineering Bureau for remedial action.

If a soil nail which penetrates beyond the maximum soil nail length of 20 ft., then the Contractor shall reduce the installation pressure to allow for embedment within 18 ft. to 20 ft.

If noted in the contract documents, apply shotcrete to the limits of the installed soil nailed surface. Reinforce the shotcrete with wire fabric. Positively anchor the wire fabric to the installed soil nails. Contour the wire fabric to the surface profiles. After the wire fabric is in place, apply a 4 in. thick application of shotcrete, encapsulating the wire fabric. Keep ungrouted hollow soil nail heads free of debris to facilitate drainage.

Provide shotcrete equipment capable of delivering the premixed material accurately, uniformly and continuously through the delivery hose. Control shotcrete application thickness, nozzle technique, air pressure, and rate of shotcrete placement to prevent sagging or sloughing of freshly applied shotcrete.

If noted in the contract plans, provide composite reinforced erosion control material internally reinforced with double-twisted steel wire mesh in lieu of shotcrete. Secure the composite reinforced erosion material onto the slope face in accordance with the manufacturer's recommendations or as amended by the contract plans.

Turf establishment of the slope shall be paid for separately. Use of erosion control material other than that described above shall be placed under a separate specification.

**METHOD OF MEASUREMENT**

The launched soil nail slope reinforcement work measured for payment will be the nearest whole number of square feet of treated slope face between the payment lines shown in the contract documents.

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**COVER FOR LAUNCHED SOIL NAIL SLOPE**

Shotcrete and wire fabric reinforcement work will be measured for payment in square feet measured to the nearest whole square foot of slope face.

Composite reinforced erosion control material will be measured for payment in square feet to the nearest whole square foot.

**BASIS OF PAYMENT**

The unit price bid per square foot of slope treated with launched soil nails shall include the cost of furnishing all labor, materials, and equipment required to install the launched soil nails to the minimum embedment.

The unit price bid per square foot of shotcrete, wire fabric reinforcement, and connector plates shall include the cost of furnishing all labor, materials, and equipment required for the installation.

The unit price bid per square foot of composite reinforced erosion control material shall include the cost of furnishing all labor, materials, and equipment required for the installation.