*Designer Note: Use this plan note to specify the design parameters for a soil nail retaining wall. This note is to be used in conjunction with the Special Provision: Soil Nail Retaining Wall.*

**Soil Nail Retaining Wall**

**Description of Work:**

This work consists of constructing a permanent soil nail wall as specified herein, as shown on the contract drawings, and per the project Special Provisions. Furnish all labor, materials, equipment, and incidentals to complete the work. Design the soil nail wall to meet the minimum requirements specified herein, shown on the contract drawings, or specified in the project Special Provisions.

**Design:**

Reference: AASHTO LRFD Bridge Design Specifications Article 11.12, Soil Nail Walls. The batter of the designed wall is (1) . Provide (2) soil nails with a Factored Design Load of (3) kips per nail. The nails shall consist of a minimum of (4) ksi steel, with a maximum (5) -foot vertical spacing and a maximum (6) -foot horizontal spacing. The nails shall be installed at an inclination of (7) degrees from the horizontal. Hollow Bar Soil Nails (HBSN) are not\* allowed. The shotcrete facing reinforcement shall consist of welded wire fabric per ASTM A1060. The shotcrete wall facing shall be per Item 520, with a minimum thickness of (8) ". The cast-in-place permanent wall facing shall be per Item 511, Class QC1 Concrete, with a minimum thickness of (9) ", and shall be reinforced per the wall details. For all evaluations of overall stability, the department considers the proposed soil nail wall to be a "critical" structure as defined in FHWA-NHI-14-007.\*\*

**Wall Drainage System:**

Provide all elements of the soil nail wall drainage system consisting of geocomposite drain strips, PVC connection pipe, and weepholes, as shown in the contract drawings, that will provide a continuous path for water flow and prevent pore water pressure from building behind the wall. Provide geocomposite drain strips, weepholes, and outlet pipe per Item 518.

**Testing:**

Perform a minimum of (10) soil nail verification tests on sacrificial pre-production soil nails. Perform proof tests on 5% of the soil nails in each nail row or a minimum of one per row; at locations accepted by the engineer.

**Basis of Payment:**

The following estimated quantities have been carried to the General Summary to complete the above work:

Item 530, Special - Retaining Wall, Soil Nail, (2) , Each

Item 530, Special - Retaining Wall, Soil Nail Verification Test, (10) , Each

Item 530, Special - Retaining Wall, Soil Nail Proof Test, (11) , Each

Item 503, Unclassified Excavation, As Per Plan, (12) CY

Item 509, Epoxy Coated Reinforcing Steel, As Per Plan, (13) LB

Item 511, Class QC1 Concrete, Retaining/Wingwall Not Including Footing, As Per Plan, (14) SY

Item 518, Prefabricated Geocomposite Drain, (15) SY

Item 518, \_\_\_ inch Corrugated Polyethylene Smooth Lined Pipe, Including Specials, (16) FT

Item 520, Pneumatically Placed Concrete Shotcrete, As Per Plan, (17) SF

**NOTES TO DESIGNER:**

1. Specify the batter of the wall (e.g. 80 degrees, 1H:4V, etc.). If this is clear from the detail drawings in the plans, this sentence may be eliminated from the plan note.
2. Specify the number of soil nails for the wall. If there are multiple groups of nails with different design loads, repeat this sentence as necessary.
3. Specify the Factored Design Load (FDL) for the soil nails, for soil nail walls designed under LRFD. The FDL is the load that the nails are to be designed to resist, the actual design of the nails being a design-build item.
4. Specify the minimum yield strength of the soil nail bars. This is typically 60, 75, 80, 100, or 150 ksi, but may be any value that meets ASTM A615 or ASTM A722. Note that Hollow Bar Soil Nails, if allowed, typically have a yield tensile strength between 60 and 90 ksi.
5. Specify the maximum vertical spacing of the soil nails. This is typically the same as the height of the soil excavation lifts for the wall face and is generally between 3 and 6 feet.
6. Specify the maximum horizontal spacing of the soil nails. This is generally between 4 and 6 feet.
7. Specify the inclination from the horizontal for the installation of the soil nails. This is typically 15 degrees, but it can be anywhere from 0 degrees to 45 degrees. However, inclinations flatter than 15 degrees are infeasible for gravity-grouted soil nails.
8. Specify the minimum thickness of the shotcrete wall facing.
9. Specify the minimum thickness of the cast-in-place permanent wall facing. If the wall is to have no cast-in-place permanent wall facing, this sentence may be eliminated from the plan note.
10. Provide the specified number of verification tests for the Plan estimated quantities.
11. Provide the calculated number of proof tests for the Plan estimated quantities.
12. Provide the calculated quantity of structure excavation for the Plan estimated quantities required to excavate for the wall face. Show the pay limit between structure excavation (Item 503) and general earthwork excavation (Item 203) in the plan details.
13. Provide the calculated quantity of reinforcing steel for both the shotcrete facing and cast-in-place permanent facing for the Plan estimated quantities.
14. Provide the calculated square yards of cast-in-place permanent facing for the Plan estimated quantities.
15. Provide the calculated square yards of geocomposite drain for the Plan estimated quantities. Geocomposite drain shall provide 100% coverage of the wall face, between the cut soil face and the shotcrete facing, with the exception of small gaps necessary for the placement of the soil nails and anchorage.
16. Provide the calculated quantity of corrugated polyethylene smooth lined pipe for the Plan estimated quantities in order to construct drainage pipe to an outlet or weep holes. Drainage pipe shall be continuous and sloped at a minimum 1% to provide a positive gravity flow to an outlet. Show the approximate location of the outlet or weep holes on the plan view.
17. Provide the calculated square yards of shotcrete facing for the Plan estimated quantities.

\* Typically, Hollow Bar Soil Nails (HBSN) are not allowed, due to concerns with quality control and difficulties in isolating bonded and unbonded segments for load testing; in this case, this sentence shall remain as-is in the plan note. However, HBSN are quick to install, and are generally preferable in granular soil conditions to avoid the necessity for a cased excavation; in this case, remove the word “not” from this sentence in the plan note.

\*\* Any soil nail wall supporting a bridge or other type of structure shall be considered a “critical” structure for considerations of overall (global) stability, per GEC 7 Table 5.1, and shall meet a minimum Factor of Safety FoS = 1.5 (a LRFD resistance factor of 0.65). Soil nail walls that do not support a structure may be considered non-critical and need only meet an overall stability FoS = 1.35 (a LRFD resistance factor of 0.75). In this case, this sentence may be eliminated from the plan note.