

SOIL NAILING OF A BRIDGE FILL EMBANKMENT*

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Soil nailing, as an alternate lateral earth support system, has been used extensively in Europe to stabilize highway slopes and to support temporary and permanent vertical soil cuts. In the United States, this system has also been successfully used for the same functions. In 1985, the first highway soil-nailed wall was used to temporarily support cuts up to 40 feet on the Federal Highway Administration's (FHWA) Cumberland Gap Tunnel project in Kentucky.

A recent construction project involved widening and lowering the grade of the Swift Highway under the south end of the Oregon Slough Bridge approximately seven miles north of Portland. This project included construction of the first permanent soil nailed wall on the State highway system.

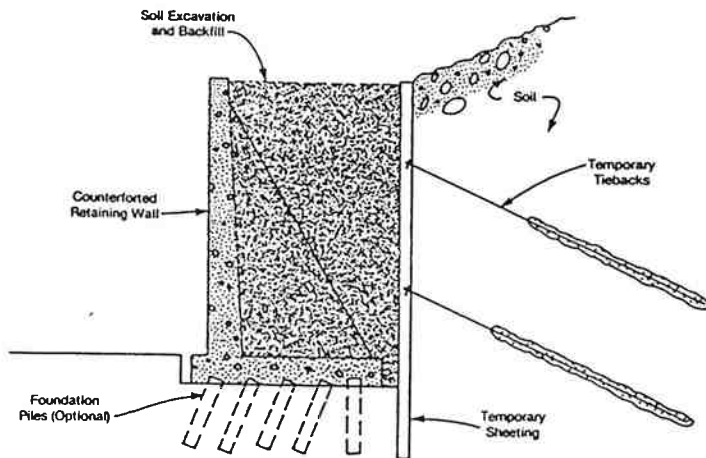
This soil nailing (embankment support) construction consisted of placing passive* (unstressed) steel bars in the in-situ soil to improve the shear strength of the reinforced soil by limiting decompression and dilation immediately after excavation. The reinforced soil body, given improved strength characteristics, became the prime structural element. The reinforced zone performs as a homogenous and resistant unit to support the unreinforced soil behind it, in a manner similar to a gravity wall. The excavation was staged and from the "top down." The soil nails (steel bars) were installed in a lift-by-lift sequence as the excavation progressed. Nail spacing was designed so the material between the nails would arch and form a reinforced earth block. The outside facing of the structure, which prevents relaxation or sloughing of the ground, consists of a thin layer of shotcrete with wire mesh reinforcing.

The construction of this project shows that soil nailing is a viable lateral earth support system to retain the existing Oregon Slough Bridge fill embankment and roadway widening without disrupting bridge traffic. The soil nailing technique offered the following advantages over other types of walls:

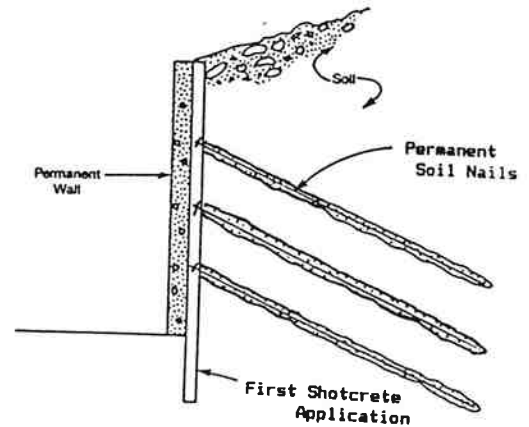
- 1) Soil nailing is better suited than Tiedback walls for roadway widening under an existing bridge. Soil nailing required no soldier pile installation; therefore, holes did not have to be cut through the existing bridge deck.
- 2) Soil nailing is easier to construct and reduces the construction time. No soldier pile installation was required, and construction equipment was small scale and mobile, allowing the contractor to work in low overhead clearance conditions.
- 3) Soil nailing is a flexible form of construction. The sequence of construction was altered, and the modification easily adapted during construction to fit the soil site conditions.

Recently, the results of this study were published in a construction report titled "Soil Nailing of a Bridge Fill Embankment." To obtain a copy of this report or any additional information on this topic, please contact:

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a. Conventional Retaining Wall



b. Permanent Soil-Nailed Wall