SPECIAL SPECIFICATION
4118
Rock Nail Anchors

1. **Description.** Construct reinforced rock nails in place.

2. **Materials.** Provide materials conforming to the following requirements.

   (1) **Hydraulic Cement Concrete.** Use materials that meet the requirements of Item 421, “Hydraulic Cement Concrete.” Provide a neat cement or sand cement mixture for the grout for soil nail anchors with a 7-day compressive strength of 3,000 psi. Determine grout strength by testing the grout used for the test soil nail anchors in cubes in accordance with Test Method Tex-307-D or cylinders in accordance with Test Method Tex-418-A. Test further as directed or if the grout mixture is modified. If allowed, use test results from previous projects using an identical grout mix.

   Do not use mobile continuous volumetric mixed grout.

   (2) **Reinforcing Steel.** Use materials that meet the requirements of Item 440, “Reinforcing Steel.” Provide epoxy-coated reinforcing steel bar of the size and grade shown on the plans.

   (3) **Nail Centralizers.** Provide expanded slit PVC centralizers with a minimum diameter of 1 in. less than the nail-hole. Wheel type centralizers will not be allowed.

3. **Equipment.** Furnish suitable equipment to drill the holes to the specified diameter, depth, and line.

   Furnish a hydraulic jack and reaction frame for stressing rock nail test anchors.

   Furnish a grout mixer and pump of sufficient capacity to place grout properly in the quantities required.

4. **Construction.**

   (1) **Drilling.** Drill the hole so that its diameter is not smaller than the diameter shown on the plans or established by test anchors.

   (2) **Grouting.** Place the rock nail with centralizers spaced no more than 8 ft. apart in the hole. Set the centralizers to position the nail reinforcing bar within 1 in. of the center of the hole. To grout, advance the grouting pipe to the bottom of the hole, and leave it there until the hole is filled with grout and a return is evident at the top of the hole. Withdraw the pipe slowly while grouting continues, filling the void left by the grout pipe. Grout each nail within 8 hr. of the completion of drilling.

   Grout before nail insertion in the hole only with approval.
Record the following information concerning the grouting:

(a) Type of mixer

(b) Water-cement ratio

(c) Types of additives

(d) Type of cement

(e) Volume of grout

(3) **Rock Nail Anchor Test.** Construct and test rock nail anchors as indicated on the plans. Test the rock nail anchors before installing any production rock nail anchors. Within 6 mo. before stressing the test rock nail anchors, calibrate the jack and gauge used together as a system, and furnish certified copies of load calibration curves for all jacks and gauge systems to be used in the work. Recalibrate stressing systems when required.

Provide an adequate reaction pad large enough to resist the required load without sinking into the rock or shifting laterally during the test. Do not use a reaction pad that sinks into the ground more than 2 in. or that allows the free end of the rock nail reinforcing bar to move laterally more than 2 in. Failure to provide an adequate reaction pad will void the rock nail anchor test. Provide additional test rock nail anchors until an adequate reaction system is achieved. Furnish additional test rock nail anchors, required due to inadequate reaction pads, at no expense to the Department.

Provide a reaction pad with a center opening larger than the hole diameter to ensure that no bridging or interaction occurs between the grout column and the reaction pad. Similarly, remove all pneumatically placed concrete, excess grout, or other foreign material to expose the full face of the grout column. Ensure the reaction system does not contact or interfere with the rock nail anchor reinforcing bar during the test. Conduct the following testing method:

(a) Apply test loads to rock nail anchors in increments of approximately 10% of the required test load. Hold each load increment long enough to obtain the gauge readings. Hold the final maximum test load for 10 min.

(b) Perform initial tensioning to take the slack out of the testing apparatus at 5% of the required test load unless otherwise directed.

(c) Provide suitable means for measuring the movement of the rock nail anchor to the nearest 0.001 in. Provide gauges that extend and retract freely and move smoothly throughout their range. Provide a rigid and secure system to support the gauge independently of the jack or reaction system.

In the event that the test rock nail anchors fail to provide the minimum pullout capacity specified on the plans, modify construction methods or procedures. Then install and test additional test rock nail anchors until adequate pullout capacity is achieved. Test rock nail anchors, in addition to the number specified on the plans, are subsidiary to the Item, “Rock Nail Anchors.”
If the Contractor chooses to modify construction procedures after test rock nail anchors are completed and approved, the Engineer may require additional testing. This additional testing is subsidiary to the Item, “Rock Nail Anchors.”

5. **Measurement.** Rock nail anchors will be measured by the foot of acceptable rock nail in place. The rock nail anchor length measured is the length of the drilled and grouted hole as specified in the plans or modified by the Engineer. Rock nail anchor tests will not be measured for payment but will be considered subsidiary to this Item.

6. **Payment.** The work performed and materials furnished in accordance with this Item and measured as provide under “Measurement” will be paid for at the unit price bid for “Rock Nail Anchors.” This price will be full compensation for furnishing all materials, tools, labor, equipment and incidentals.