

ITEM 203.17150025 - ROCK DOWELS – ONE INCH NOMINAL DIAMETER (GRADE 150)

1. DESCRIPTION:

- 1.01 This work shall consist of drilling the necessary holes and furnishing and installing rock dowels and appurtenances in accordance with the Contract Documents and as directed by the Engineer.

2. MATERIALS:

- 2.01 **Bolts:** Furnish bolts of at least [REDACTED] one [REDACTED] inch nominal diameter pre-stressing steel. Bolts must have rolled thread-like deformations over the entire length. Larger diameter bolts are acceptable if supplied at no additional cost to the Authority.

Basis of Acceptance: Manufacturer's certification of compliance with these specification requirements. The Authority reserves the right to sample and test delivered material.

- 2.02 **Appurtenances:** Furnish appurtenances as recommended by the bolt manufacturer for the size and grade bolt supplied, consisting of a steel bearing plate, two (2) hardened washers and two (2) anchor nuts.

- 2.03 **Grout Mixing:** Cement grout shall consist of a maximum of five (5) gallons of clean potable water per sack consisting of 94 pounds of Type II or III Portland Cement. The grout shall be mixed for a minimum of five (5) minutes in a paddle type grout mixer, and passed through a #4 size sieve before being used. It may be pumped or fed by gravity into the tremie pipe or grout tube. Grout that contains lumps or has been in the grout mixer for more than 30 minutes shall not be used. No chemical additives shall be used unless approved in writing by the Engineer.

- 2.04 **Centralizers:** Centralizers shall be plastic, steel or any material not detrimental to the dowel. Wood shall not be used. Centralizers shall permit the free flow of grout.

3. CONSTRUCTION DETAILS:

- 3.01 Proceed with the installation of rock dowels from the top of slope downward. Drill dowel hole(s) into the rock at location(s) and angle(s) to a depth shown on the plans or as ordered by the Engineer.
- 3.02 The orientation of the drill hole shall be as shown in the plans or as determined in the field by the Engineer. Unless otherwise specified, the angle of installation shall be as shown on the drawings. The dowels shall be installed within 5 degrees of the specified angle.
- 3.03 The Contractor shall flush the drill hole of all drill cuttings and debris with compressed air prior to the installation of the rock dowel.
- 3.04 Holes drilled for rock dowels in which dowel installation is considered by the Engineer to be impractical, shall be re-drilled at the Contractor's expense. Abandoned holes shall be filled with grout as ordered by the Engineer.
- 3.05 Centralizers shall be provided at a maximum center to center spacing of ten (10) feet along the dowel and shall allow a minimum of 0.5 inches of grout cover along the entire length of the dowel. As a minimum, a centralizer shall be provided within one (1) foot of the top and bottom of the dowel.

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3. CONSTRUCTION DETAILS: (cont'd)

- 3.06 If the installed dowel bar length is [REDACTED] feet or less, the holes shall be filled with cement grout using a tremie pipe prior to insertion of the bars. If the installed bar length is greater than seven [REDACTED], a grout tube attached to the bar or removable tremie pipe will be used to install the grout after the bar is installed. When installed as rock dowels, the bars are not tensioned. Details of typical dowel installations are illustrated on the Contract Plans. Leave the assembly undisturbed in the hole for the time required for the grout to harden.

For dowel bar installation of [REDACTED] or less, tremie neat cement grout into hole with tremie pipe at the toe of the hole. Fill hole with grout while withdrawing tremie pipe at a rate such that the bottom of the tremie pipe remains at or below the rising grout surface.

For dowel bar installations of seven [REDACTED] or less, leave hole full of fluid grout for five (5) minutes. If grout level drops by less than one [REDACTED], insert bar with centralizers into hole. If grout level drops by more than one [REDACTED] in five (5) minutes, re-fill hole with grout. If grout level continues to drop for more than 15 minutes, thicken grout mix as directed by the Engineer. Insert bar with centralizers once the level stabilizes.

For dowel bar installations of greater than seven [REDACTED], leave hole full of fluid grout for five (5) minutes. If the grout levels drops by less than one [REDACTED], then leave the bar in the hole undisturbed until grout hardens. If grout level drops by more than one [REDACTED] in five (5) minutes, re-fill hole with grout. If grout level continues to drop for more than 15 minutes, thicken grout mix as directed by the Engineer. When the level stabilizes leave the bar in the hole undisturbed until the grout hardens.

For all dowel bars, the annular space between the dowel and the drill hole perimeter in the completed installation (minimum of [REDACTED]) shall be completely filled with cement grout over the full depth of the hole. Sufficient grout shall be used so that, at a minimum, a small amount of grout extrudes from the collar of the hole to ensure that no voids are left around the bar. The quantity of grout that is required to fill each dowel hole will vary, and is highly dependent on geological conditions.

- 3.07 Attach a nut, washer, steel bearing plate, washer, and nut to the rock dowel. The nuts shall be made snug tight.

4. METHOD OF MEASUREMENT:

- 4.01 This work will be measured as the number of linear feet of rock dowels satisfactorily installed in accordance with the Contract Documents and as directed by the Engineer.

5. BASIS OF PAYMENT:

- 5.01 The unit price bid shall include the cost of furnishing all labor, materials, tools and equipment necessary to satisfactorily complete the work. No payment will be made for rock dowels which are not satisfactorily installed except those attributed to failure of the rock being doweled.