ITEM 17203.171120 M - 25 mm NOMINAL DIAMETER RESIN ROCK BOLTS GRADE 1035 Mpa (MODIFIED)

DESCRIPTION

Under this Item the Contractor shall drill the necessary holes and shall furnish and install rock bolts and appurtenances as shown on the plans or as ordered by the Engineer.

MATERIALS

1. Bolts

The bolts shall be made of at least Grade 1035 MPa (ASTM-A722), 25 mm nominal diameter stress-relieved prestressing steel bars. The bars shall have rolled thread-like deformations over the entire length. Larger diameter bolts will be acceptable when supplied at no additional cost to the State.

Basis of Acceptance: Acceptance of this material will be based on the manufacturer's certification of compliance with these specification requirements.

The Department reserves the right to sample and test delivered material.

2. Appurtenances

Appurtenances shall be as recommended by the bolt manufacturer for the size and grade bolt specified and shall consist of a steel bearing plate, a hardened washer if required and an anchor nut. Two beveled or wedge washers per bolt may be required as ordered by the Engineer.

3. Resin

The resin shall be of the two-component type, specifically manufactured for rock bolting. Resin packages of two different setting times shall be used with each bolt unless otherwise specified. The setting time for the slower resin shall be not less than fifteen minutes, as designated by the manufacturer. Sufficient fast set resin shall be used to fill a minimum of 760 mm of annular space in the bottom of the hole. Greater equivalent lengths of fast set resin will be necessary in some rock types in order to meet the pull test requirements. All resin shall be contained in the appropriate diameter package, shall be within the unexpired shelf life designated by the manufacturer on the package.

CONSTRUCTION DETAILS

The installation of rock bolts shall proceed from the top of slope downward. Bolt hole(s) shall be drilled into the rock at locations(s) and angles(s) as ordered by the Engineer, to a depth equal to 150 mm less than the desired bolt length. The bolt hole diameter shall be compatible with the resin cartridge diameter, as recommended by the bolt manufacturer, but in no case shall the bolt hole diameter exceed the resin cartridge diameter by more than 6 mm. The bearing plate shall be within 90 ± 15 degrees to the axis of the rock bolt and shall be in intimate contact with the rock surface for its entire area. The method of leveling the rock surface shall be approved by the Engineer. Acceptable methods include, but are not limited to the following:

1. Chipping the rock surface.

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2. Applying a special mix supplied by the bolt manufacturer for leveling purposes.
3. Use of steel wedges plus a leveling mix.
4. A combination of chipping and leveling with or without wedges.

The bolt hole shall be cleaned out to its full depth with air or water. The appropriate equivalent length of fast set resin shall be placed in the bottom of the hole first and the appropriate equivalent length of slower setting resin shall then be placed toward the top of the hole. The bolt shall be assembled with the appropriate appurtenances so that 100 mm of the bolt extend past the anchor nut and shall be inserted into the tip of the hole and slowly (50 to 120 rpm) rotated down through the resin cartridges by a means approved by the Engineer until within 150 mm of the bottom of the hole. The bolt shall be slowly rotated in this position for thirty seconds to insure mixing of the resins in the hole and then pushed to the bottom until the appurtenances are compressed against the rock surface. The assembly shall be left undisturbed in the hole for the time required for the fast set resin to harden but less than the set time for the slower setting resin. The bolt shall be tensioned to 333 kN or as ordered by the Engineer, by means of a hollow-ram hydraulic jack, or other means approved by the Engineer. The base of the jack shall be supported at 90 ± 2 degrees to the axis of the bolt.

The first bolt installed shall be pull tested to 444 kN (80% of the ultimate strength of the bolt) or as ordered by the Engineer. The test shall be conducted immediately after tensioning the bolt and prior to installation of other bolts in the area.

Additional pull tests may be required where different rock types or conditions are encountered, or when resin bearing a different manufacturer's code number is being used for the first time.

If a failure of the bolt or anchorage occurs, a determination of the cause of failure will be made by a Departmental Engineering Geologist. Failures for reasons other than displacement of the rock in the anchorage zone shall be remedied by the Contractor, as ordered by the Engineer, at no expense to the State.

METHOD OF MEASUREMENT

Rock bolting shall be measured by the number of linear meters of rock bolts satisfactorily installed.

BASIS OF PAYMENT

The unit price bid per linear meter of this Item shall include the cost of furnishing all materials, equipment, labor and tools necessary to satisfactorily complete all installation and testing work. No payment will be made for rock bolts which are not satisfactorily installed.

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