Construction Specification 63—Treatment of Rock Surfaces

1. Scope

This work consists of preparing and cleaning the designated rock surfaces, including the specified dental excavation, and the furnishing and placing of the specified treatment material for either dental or slurry grout.

2. Material

Portland cement shall conform to the requirements of Material Specification 531 for the type specified in section 10 of this specification.

Pozzolans conforming to the ASTM C 618, Class C or F, may be used in amounts not to exceed 25 percent, based on absolute volume, to substitute for an equal amount of portland cement in the concrete grout mixture, unless otherwise specified in section 10 of this specification.

Aggregates shall conform to the requirements of Material Specification 522, Aggregates for Portland Cement Concrete, except that the grading for coarse aggregate shall be as specified in section 10 of this specification.

Water shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances.

Admixtures, when specified, shall be of the type and quality specified in section 10 of this specification.

Curing compound shall conform to the requirements of Material Specification 534, Concrete Curing Compound.

3. Preparation and cleaning

After excavation of the overburden has been completed, the rock surfaces shall be thoroughly cleaned and dewatered. All loose rock, ledges, and overhangs exposed during preparation of the rock surfaces shall be removed. Surfaces exceeding the slope limitations specified in section 10 of this specification shall be eliminated by excavation or by filling with concrete as described in section 7 of this specification.

Dental excavation shall consist of the removal of all soil and soft or loose rock from cracks, fissures, holes, and solution channels exposed during excavation activities. The extent of the dental excavation shall be as shown on the drawings with onsite adjustments as determined by the engineer.

Rock surfaces shall be cleaned by air-water cutting, water jetting, wire brush scrubbing, or other suitable methods determined necessary to obtain an acceptable surface. No surface treatment material shall be applied until rock surfaces have been inspected and approved.

Rock surfaces shall be free of standing or running water during the placement of surface treatment material.

4. Design of surface treatment material

The treatment material and mix proportions shall be as specified in section 10 of this specification. During the surface treatment operation, the engineer may require adjustment of the mix proportions. The mix shall not be altered without the approval of the engineer.

5. Handling and measurement of material

Material shall be stockpiled and batched by methods that prevent segregation or contamination of aggregates and ensure accurate measurement and proportioning of the mix ingredients.

Except as otherwise provided in section 10 of this specification, cement and aggregates shall be measured as follows:

a. Cement shall be measured by weight or in bags of 94 pounds each. When cement is measured in bags, no fraction of a bag shall be used unless properly weighed.

b. Aggregates shall be measured by weight. Mix proportions shall be based on saturated, surface-dry weights. The batch weight of each aggregate shall be required saturated, surface-dry weight plus the weight of the surface moisture it contains at the time of batching.

c. Water shall be measured, by volume or weight, to an accuracy within 1 percent of the total quantity of water required for the batch.

d. Admixtures shall be measured within a limit of accuracy of 3 percent.

6. Mixers and mixing

The mixer, when operating at capacity, shall be capable of combining the ingredients of the concrete into a thoroughly mixed and uniform mass and of discharging the mix with a satisfactory degree of uniformity.

The mixer shall be operated within the limits of the manufacturer's guaranteed capacity and speed of rotation.

The time of mixing, after all cement and aggregates are combined in the mixer, shall be a minimum of 1 minute for mixers having a capacity of 1 cubic yard or less. For larger capacity mixers, the minimum time shall be increased 15 seconds for each cubic yard or fraction thereof of additional capacity. The batch shall be so charged into the mixer that some water enters before the cement and aggregates, with the balance of the mixing water introduced into the mixer before a fourth of the total mixing time has elapsed.

No mixing water in excess of the amount required by the approved job mix shall be added to the grout mix during mixing or hauling or after arrival at the delivery point.

7. Conveying and placing

Surface treatment material shall be delivered to the site and placed within 1.5 hours after the introduction of the cement to the aggregates. In hot weather or under conditions contributing to accelerated stiffening of the concrete, the time between the introduction of the cement to the aggregates and complete discharge of the concrete shall be a maximum of 45 minutes. The engineer may allow a longer period if the setting time of the concrete is increased a corresponding amount by the addition of an approved set-retarding admixture. In any case concrete shall be conveyed from the mixer to the final placement as rapidly as practical by methods that prevent segregation of the aggregates, loss of mortar, or both.

Concrete shall not be allowed to free fall more than 5 feet unless suitable equipment is used to prevent segregation.

Surface treatment material shall not be placed until the rock surfaces have been inspected and approved by the engineer.

All cracks, fissures, solution channels, and other surfaces within the designated area shall be treated as shown on the drawings. Surfaces to be treated shall be kept moist for at least 2 hours before treatment.

Concrete shall be filled against any specified remaining rock surfaces that exceed the slope limitations and shall be shaped so that no part of the finished surface exceeds these limitations.

Material placed in cracks, fissures, and solution channels shall be consolidated by vibration, spading, or tamping as necessary to assure complete filling of the void.

8. Curing and protection

Method 1—The surface of treatment material shall be prevented from drying for a minimum curing period of 7 days after placement. Exposed surfaces shall be maintained in a moist condition continuously for the 7-day curing period or until curing compound has been applied as specified in this section. Moisture shall be maintained by sprinkling, flooding, or fog spraying or by covering with continuously moistened canvas, cloth mats, straw, sand, or other acceptable material. Water or moist covering shall be used to protect the concrete treatment during the curing process without causing damage to the treatment surface by erosion or other mechanisms that may cause physical damage.

The concrete treatment material may be coated with an approved curing compound as an alternative method to maintaining a continuous moisture condition during the curing period. The compound shall be sprayed on the moist treatment surfaces as soon as free water has disappeared and all surface finishing has been completed. The compound shall be applied at a minimum uniform rate of 1 gallon per 175 square feet of surface and shall form a continuous adherent membrane over the entire treated surface. Curing compound shall not be applied to surfaces requiring bond to subsequently placed grout or concrete. If the membrane is damaged during the curing period, the damaged area shall be resprayed at the rate application specified for the original treatment.

Backfilling operations shall not commence for a minimum period of 24 hours following the placement of concrete treatment unless otherwise specified.

Method 2—A minimum earth cover of 1.5 feet depth shall be placed and compacted before the rock surface treatment material (concrete) has established an initial set. The earth cover may be placed on the concrete with a dragline or hoe, or it can be bladed onto the treated surface by lightweight dozer or similar equipment operating from a covered and compacted surface. Compaction shall be accomplished by pneumatic-tired equipment or by an alternative method that provides an equivalent density.

Use with either method—No backfill material shall be placed until the treated surfaces have been inspected and approved by the engineer.

Surface treatment material shall not be placed when the daily minimum temperature is less than 40 degrees Fahrenheit unless facilities are provided to ensure that the temperature of the material is maintained at a minimum temperature of 50 degrees Fahrenheit and not greater than 90 degrees Fahrenheit during placement and the curing period. Concrete treatment material shall not be placed on a frozen surface. When freezing conditions prevail, rock surfaces to be treated must be covered and heated to within a range of 50 to 90 degrees Fahrenheit for a minimum period of 24 hours before placing concrete treatment material.

9. Measurement and payment

Method 1—For items of work for which specific unit prices are established in the contract, the area of rock surfaces to be prepared, cleaned, and treated is measured to the nearest square yard within the limits established by the engineer. The volume of surface treatment material placed within the established limits is computed to the nearest 0.1 cubic yard of concrete placed. Payment is made at the contract unit price for surface preparation, cleaning, and installation of surface treatment material. Such payment constitutes full compensation of all labor, equipment, material, and all other items necessary and incidental to the completion of the work.

Method 2—For items of work for which specific unit prices are established in the contract, the area of rock surfaces to be prepared, cleaned, and treated will not be measured. The volume of surface treatment material delivered and properly installed to treat rock surfaces is determined to the nearest 0.1 cubic yard. Areas to be treated are shown on the drawings with the final extent of rock surface treatment to be determined by the engineer. The volume of any waste or otherwise unsuitable material is determined by procedures established by the engineer and deducted from the volume of concrete delivered to the site. Payment is made at the contract unit price for surface preparation, cleaning, and installation of surface treatment material. Such payment constitutes full compensation of all labor, equipment, material, and all other items necessary and incidental to the completion of the work.

All methods—For each load of concrete delivered to the site for placement as rock treatment material, the contractor shall furnish to the engineer a delivery ticket at the time of delivery, This ticket shall provide as a minimum: Weights in pounds of cement, aggregates (fine and coarse), pozzolan (if used), and water; weight in ounces of air-entraining agent; time of loading; and, the revolution counter reading at the time batching was started.

Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in section 10 of this specification.

10. Items of work and construction details