

SECTION 623 PNEUMATICALLY APPLIED MORTAR

623.1-DESCRIPTION:

This work shall consist of repair of concrete structures, protection of structural steel, or any other type of work as may be designated on the Plans, using pneumatically placed mortar, in accordance with these Specifications and in reasonably close conformity with the dimensions and design shown on the Plans or as directed by the Engineer. It shall include removal of all loose, soft, honeycombed, and disintegrated concrete, the removal of sound surface concrete in areas designated for repair, the preparation of the surface, the furnishing and placing of reinforcing steel, including wire fabric, dowels, and expansion anchor bolts, and mixing and applying pneumatically placed mortar composed of portland cement and sand.

Pneumatically placed mortar will be designated as Shotcrete. Shotcrete shall generally be used where the depth of repair does not exceed 6 inches (150 mm).

623.2-MATERIALS:

All materials shall conform to the applicable requirements of [Division 700](#), unless otherwise indicated.

For sandblasting operations the sand shall conform to the requirements in [688.2.4.1](#) and [688.2.4.3](#), III.

The reinforcing wire mesh shall be three inch (75 mm) by three inch (75 mm) by Size # W 1.4 wire, unless noted otherwise on the Plans.

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623.3-PROPORTIONING AND MIXING:

Shotcrete shall consist of a mixture of portland cement and sand (three to five percent moisture) in the proportion of one cubic foot or 0.94 cwt of cement to three cubic feet of sand (one cement to three sand) (dry, loose measurement, due allowance being made for bulking). The materials shall be thoroughly mixed dry in a batch mixer. Before placing the mixture in the hopper, all lumps over ¼ in. (6 mm) shall be removed by screening.

623.4-CLEANING:

In concrete repair work, disintegrated concrete shall first be removed with pneumatic or hand tools. The surfaces shall then be thoroughly blasted to remove all dirt and loose materials, special care being taken in concrete repair work to thoroughly clean exposed reinforcing rods. Prior to applying each coat of Shotcrete, the concrete surfaces shall be cleaned and washed down with water and compressed air.

Structural steel shall be thoroughly cleaned of paint, rust, grease, and other foreign material. The Contractor may be required to Abrasive Blast Clean for this purpose.

623.5-PLACING REINFORCING MESH:

623.5.1-Repairing Concrete Work: In repairing concrete work, the reinforcing mesh shall be fastened to the concrete with $\frac{1}{4}$ by 4 in. (6 x 100 mm) expansion bolts spaced approximately 30 in. (750 mm) each way. Lapping of adjacent sheets shall be at least 4 inches (100 mm) in each direction and all laps shall be firmly tied together at intervals not exceeding 18 inches (450 mm). Care shall be taken to place the mesh away from the proposed finished concrete surface so that approximately a $\frac{3}{4}$ in. (19 mm) layer of Shotcrete shall be maintained outside of the plane of the mesh. In places where repairs are necessary for depths of 3 inches (75 mm) or more over considerable areas, two or more layers of mesh shall be used, the first layer being placed about $\frac{3}{4}$ in. (19 mm) out from the existing concrete.

623.5.2-Covering Structural Steel: In placing reinforcing mesh around structural steel, the mesh shall be cut in sheets of the proper size and separate sheets shall be bent carefully over templates in such a manner as to follow closely the outlines of the members to be covered and shall be securely held about $\frac{3}{4}$ in. (19 mm) out from the surfaces of the members. Adjacent sheets of mesh shall lap at least two meshes.

In placing the mesh, the rods shown on the Plans shall first be fastened to the steel, and subsequently the mesh shall be securely tied outside of these rods with wires spaced at approximately 1 ft. (300 mm) intervals. To allow for fasteners for holding the rods, holes not less than $\frac{9}{16}$ in. (14 mm) diameter shall be punched or drilled in the webs of members as near as possible to the top and bottom flanges. These holes shall be spaced on approximately 36 in. (900 mm) centers. Where steel members are more than 48 inches (1200 mm) in depth, and additional row of holes, spaced on approximately 36 in. (900 mm) centers, shall be provided on the centerline of the web.

623.6-PLACING SHOTCRETE:

623.6.1-General: Only experienced men shall be employed in placing Shotcrete.

No Shotcrete shall be placed during freezing weather or against surfaces on which there remains any frost.

623.6.2-Pressures: The pressure in the lower chamber of the cement gun shall be that which will produce a nozzle velocity of 375 to 500 ft. (115 to 150 m) per second when a tip with a three-fourths or 1 in. (20 or 25 mm) opening is used, and a nozzle velocity of 425 to 550 ft. (130 to 165 m) per second when a tip with a $1\frac{1}{4}$ in. (32 mm) opening is used. These velocities must be steadily maintained and shall be determined by a suitable nozzle velocity meter attached to the cement gun.

Water used for hydration at the nozzle shall be maintained at a uniform pressure, which shall not be less than 15 psi (100 kPa) greater than the air

pressure in the cement gun. In no case shall a greater amount of water be used than that necessary to produce proper hydration, especially when vertical surfaces are shotcreted.

623.6.3-Thickness of Covering: In repairing concrete, the Shotcrete shall be placed to a minimum total thickness of 1 in. (25 mm) in two or more coats.

In covering structural steel, the shotcrete shall be placed to a thickness of 1½ in. (40 mm) and in two layers.

In all cases, the final coat shall be shotcreted to a thickness of ½ in. (15 mm) against the previously straightened and thoroughly cleaned and wetted surfaces.

The stream of materials from the nozzle shall impinge as nearly as possible at right angles to the surface being covered. Any deposit of loose sand shall be removed prior to placing any original or succeeding layers of Shotcrete. After placing, all mortar patches shall be sounded and any indications of pockets shall be investigated and repaired as directed by the Engineer.

623.6.4-Joints: At the end of any day's work or similar stopping period, the Shotcrete shall be sloped off to a thin edge. Before shooting the adjacent section, the sloped portion shall be thoroughly cleaned and wetted. No square joints will be allowed.

623.6.5-Forms: Forms shall be structurally sufficient and of such design that rebound or accumulated loose sand can freely escape or be readily removed. Shooting strips shall be used at corners, edges, and on surfaces where necessary to obtain true lines and proper thickness.

623.6.6-Finishing and Curing: Following applicable layers of Shotcrete, the concrete surface shall be wood or steel finished as directed by the Engineer.

The Shotcrete shall be covered with burlap mats and kept wet for at least one week after placing; but where not practicable to use mats, it shall be kept wet by sprinkling for the same length of time.

623.7-METHOD OF MEASUREMENT:

623.7.1-Repairing Concrete Structures: Measurements will be based on the amount of cement in hundredweight (cwt) (hundred kilograms) used in the Shotcrete, the pound (kilogram) of Shotcrete reinforcing mesh, and the number of hook expansion bolts.

623.7.2-Covering Structural Steel: Measurement of all areas of Shotcrete shall be based on the actual area of the members to be covered, following the lines of the members, and payment per square foot (meter) will be made of such basis.

623.8-BASIS OF PAYMENT:

623.8.1

623.8.1-Repairing Concrete Structures: The quantities, determined as provided above, will be paid for at the contract unit prices bid for the items listed in 623.9.1, which prices and payments shall be full compensation for furnishing all the material and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals necessary to complete the work.

623.8.2-Covering Structural Steel: The quantity, determined as provided above, will be paid for at the contract unit price bid for the item in 623.9.2, which price and payment shall be full compensation for furnishing all the materials, including reinforcing mesh and rods, and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies and incidentals necessary to complete the work.

623.9-PAY ITEMS:

623.9.1-Repairing Concrete Structures:

| ITEM | DESCRIPTION | UNIT |
|----------|----------------------------|-------------------------------|
| 623001-* | CEMENT FOR SHOTCRETE | HUNDRED WEIGHT (100 KILOGRAM) |
| 623002-* | REINFORCING MESH | POUND (KILOGRAM) |
| 623003-* | HOOK EXPANSION ANCHOR BOLT | EACH |

* Sequence number

623.9.2-Covering Structural Steel:

| ITEM | DESCRIPTION | UNIT |
|----------|-------------|---------------------|
| 623004-* | SHOTCRETE | SQUARE FOOT (METER) |

* Sequence number

SECTION 624 PREFORMED ELASTOMERIC JOINT SEALER

624.1-DESCRIPTION:

This work shall include furnishing and installing preformed elastomeric joint sealers for bridge decks in accordance with these Specifications and in reasonably close conformity with the lines and grades shown on the Plans or established by the Engineer. The joint sealer, to serve both as a filler and a sealer, shall be furnished in the form of an extruded compartmented tube.

624.2-MATERIALS:

Material for preformed elastomeric joint sealer shall conform to the requirements of [708.2](#).

CONSTRUCTION METHODS