ITEM 11583.3001 M - Vertical and Overhead Repairs with Low Pressure Spray Mortar, No Reinforcement Bar Encasement
ITEM 11583.3002 M - Vertical and Overhead Repairs with Low Pressure Spray Mortar, Reinforcement Bar Encasement

DESCRIPTION. Repair structures with low pressure spray mortar as noted on the contract documents or directed by the Engineer. Pump low slump, plastic mortar to the nozzle, jet it onto the prepared surface with low pressure, finish to final grade or elevation and similar to the surrounding surface, and cure.

MATERIALS.

Vertical and Overhead Patching Material . . . . . §701-08
Water . . . . . §712-01

Use a Vertical and Overhead Patching Material from the Approved List that also meets the following requirements, according to the manufacturer's literature. Submit the manufacturer's literature 28 days prior to starting work to the Director, Materials Bureau, for review.

1. Drying Shrinkage at 28 days - less than 0.01%
2. Rapid Chloride Permeability at 56 days or less - less than 1000 coulombs
3. Contains corrosion inhibitor meeting §711-13, or approved equal. Add corrosion inhibitor either during the Item 701-08 manufacturing process or add separately at a minimum dosage of 19.8 liters per cubic meter, or powder form equivalent. If added separately, provide independent laboratory testing that the Item 701-08 material with separate corrosion inhibitor meets the drying shrinkage and permeability criteria.
4. May contain microsilica (silica fume) and fibers.

Qualification Test. For encasement of reinforcing bars (not wire fabric), perform this test prior to beginning production work:

1. Fabricate a test panel (or panels) 600 mm x 600 mm to simulate the work. Place reinforcement in the panel to provide a minimum 25 mm (front and rear) embedment. Use the same size reinforcement and spacing encountered in the structure. Short segments of reinforcement may be abutted end to end to facilitate breaking open the panel for inspection.
2. Have the designated operator shoot the panel in the vertical and overhead positions as expected to be encountered.
3. After hardening, break open the test panel, in a manner approved by and in the presence of the Engineer, to verify reinforcement embedment. Individual, isolated voids less than 25 mm in any direction, as determined by the Engineer, are acceptable.
4. If unacceptable voids exist, shoot additional panels until results are acceptable to the Engineer. Thereafter, use the designated operator and the accepted shooting procedure for the work. The Engineer will disqualify any operator who does not achieve acceptable results within 3 attempts.

Additional test panels and qualification tests will be required whenever operators or other significant changes in the operation occur, as determined by the Engineer.

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CONSTRUCTION DETAILS.

A. Surface Preparation. Remove all unsound and deteriorated concrete, as determined by the Engineer, as per other specifications. Roughen any smooth concrete surfaces by means acceptable to the Engineer.

When abutting any areas that are to remain in place, make all repairs rectangular or square in plan shape. Sawcut the abutting perimeter of the repair to a depth of 20 ± 3 mm. Chip out the damaged or defective concrete until there are no offsets in the repair area which cause an abrupt change in thickness, except for a transition from above to below reinforcement. Angle the wall below the sawcut of any abutting areas at 45 ±15° toward the center of the repair.

Prepare the surfaces of the repair, and do not damage materials which are to remain in place. Repair any damage at no cost to the Department.

Maintain a minimum clearance of 25 mm between the reinforcement and the prepared surface (or form) to provide clearance for complete reinforcement encasement with mortar.

Repair, in a manner satisfactory to the Engineer, reinforcement which has lost significant section, as determined by the Engineer.

B. Surface and Reinforcement Cleaning. Clean the surface to an acceptable condition per manufacturer's instructions. If necessary, blast clean the sound surface in accordance with §584-3.02A. Abrasive material containing more than 1% free silica by weight will not be allowed. Clean the reinforcing bars of loose mill scale, loose rust, oil or other coatings that interfere with bonding.

C. Preparation of Materials. Use an Approved List Prebagged Material capable of being machine applied with low air pressure to allow up-close application and complete encasement of reinforcement. Follow the manufacturer's instructions for mixing and application, including any needed to add a separate corrosion inhibitor on site.

D. Placement. Follow the manufacturer's instructions for surface wetting prior to mortar application. If there are no instructions, thoroughly wet the concrete surface and all porous surfaces to be in contact with new concrete for at least 12 hours immediately prior to mortar placement. Remove any standing water with oil-free compressed air, and protect the concrete from drying so the concrete remains in a saturated surface dry condition when placing the mortar.

Maintain the temperature of the mortar approximately equal to, but preferably lower than the surface to which it is to be applied, to minimize thermal cracking. Follow minimum and maximum mortar temperatures as stated on the bag or manufacturer's data sheet.

Weather Conditions. Do not apply when:

1. Precipitation can cause the spray mortar to run.
2. Wind disrupts the nozzle spray.
3. Ambient air temperature is below 7°C. It may be applied in accordance with §555-3.06B, Provision of External Heat, when all receiving surfaces are heated to, and maintained at, approximately 7°C by a method approved by the Engineer.

Application. Ground wires may be installed to establish the thickness and surface planes of the spray mortar build up. Both horizontal and vertical ground wires may be installed at corners and offsets not clearly established by formwork (at exterior corners of walls, column or beam corners, and other locations). They may also be used as screed guides. Eighteen or 20 gage, hard steel, piano wire is recommended for this purpose. Use tight, true to line, ground wires placed in such a manner that they may be further tightened.

Place each area to final grade or elevation in a single days placement, applying successive layers as needed. Bulkhead areas as necessary.

E. Quality Control (Test Panels and Cores). Acceptance or rejection will be based on compressive strength test results from test panel cores, and visual results of any cores taken to verify reinforcement encapsulation.

1.1 Test Panels - make to determine the physical quality of the low pressure spray mortar:

a. Immediately before operations begin.
b. At a rate of 1 panel per shift. (After a few panels are tested, and if the results are satisfactory, the Materials Bureau may give the Engineer permission to reduce the testing rate.)
c. Immediately after operations are ended.

1.2 Test Panel Construction

a. Use 20 mm thick, 300 mm square plywood panels with wire fabric (minimum 13 mm square openings) attached to and projecting 4 inches above the perimeter of the board.
b. Erect the test panels vertically or overhead, depending on the anticipated shooting positions.
c. Completely fill the test panel, and then screed or cut such that it contains a 100 mm uniform depth of mortar.
d. Cover the test panels with wet covers, keep wet and cure for a minimum of 7 days.
e. The Engineer will fill out and attach a BR 240 form to each panel.

2. Test Results. Send the test panels to the Department of Transportation's Materials Bureau in Albany for testing at 14 days. Compressive strength will be reported to the Engineer.

3. Cores - use to determine acceptability of reinforcing bar encasement. Take a core, at a location determined by the Engineer, from each structural element, such as pier, abutment, arch, etc. For large structures, take a core from segments of an element, such as each face, half or other area designated by the Engineer. Only cores which contain reinforcing bars will be used to determine encasement acceptability. Individual, isolated voids less than 25 mm in any direction, as determined by the Engineer, are acceptable. If interconnected voids are found, the structural element represented by that core is rejected.

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Repair or replace all rejected low pressure spray mortar at no additional cost. Proposed repair methods require approval by the Engineer. Additional cores may be taken at locations approved by the Engineer to establish the limits of rejected work. Do not jeopardize the design integrity of the structural element with the additional coring. If additional cores are not taken, all work on that structural element remains rejected. Patch core holes with an applicable concrete repair material from the Approved List.

F. Finishing. Match the finish with the surrounding surface, as approved by the Engineer.

G. Curing. Follow the manufacturer's instructions. For areas where penetrating sealers will be applied, the use of curing compounds will not be allowed unless blast cleaning removes the curing compound after completion of curing, and prior to sealer application.

METHOD OF MEASUREMENT. The quantity to be paid for under this item will be the number of cubic meters of low pressure spray mortar placed, as determined from field measurements, and finished. Prior to placing, measurement will be taken as the plane projection of the finished surface by the average depth.

BASIS OF PAYMENT. Include the cost of furnishing all labor, materials and equipment necessary to complete the work in the unit bid price per cubic meter. Surface preparation and sealers will be covered by other items. If using curing compound, include blast cleaning to remove curing compound prior to sealer application.

For **Item 11583.3002 M - Vertical and Overhead Repairs with Low Pressure Spray Mortar, Reinforcement Bar Encasement,** include the cost of furnishing all labor, materials and equipment necessary to complete the work in the unit bid price per cubic meter, except that replacement of deteriorated reinforcement will be paid for in accordance with §109-05, Extra & Force Account Work, if no other method is specified. Payment will not be made until cores verify acceptability.