

SUPPLEMENTAL SPECIFICATION

SECTION 580 - STRUCTURAL CONCRETE REPAIR

580.01 DESCRIPTION. This work shall consist of the removal and disposal of delaminated and unsound concrete from an existing superstructure or substructure and its replacement with new portland cement concrete or an approved patching material.

This Section shall be used in conjunction with Section 501 - Structural Concrete or Supplemental Specification Section 501A - HPC Structural Concrete, whichever is applicable to other concrete items on this project. Where both specifications are used, Supplemental Specification Section 501A shall be used for this work. Anything not specifically addressed in this Section relative to concrete shall be governed by Section 501 or Supplemental Specification Section 501A.

580.02 MATERIALS. Materials shall meet the requirements of the following subsections of Division 700 - Materials:

Coarse Aggregate for Concrete [9.5 mm (3/8 inch)]	704.02
Concrete Repair Materials	780.01
Overhead & Vertical Concrete Repair Material	780.02
Rapid Setting Concrete Repair Material	780.03
Rapid Setting Concrete Repair Material with Coarse Aggregate	780.04

Concrete (Class AA, Class A, and Class B) shall meet the applicable requirements of Subsections 501.02 through 501.19 of the Standard Specifications or Concrete High Performance (Class AA, Class A, and Class B) shall meet the applicable requirements of Subsections 501.02A through 501.19A of the Supplemental Specification. Where future references in this Specification are made to Concrete (Class AA, Class A or Class B), they shall mean that class or corresponding class of concrete described in the governing concrete specification.

580.03 PROPORTIONING AND MIXING. All Concrete Repair Materials shall be mixed with a mechanical mixer at the project site in accordance with the manufacturer's recommendations on the project packaging, one bag (unit) at a time. Except for Rapid Setting Concrete Repair Materials with Coarse Aggregate, the product shall not be extended with sand or gravel.

At no time shall recommended water content be exceeded nor shall any mixture be retempered by adding water and/or remixing once the material reached initial set.

Rapid Setting Concrete Repair Material with Coarse Aggregate shall be mixed with approved materials in the proportions designated by the Materials and Research Engineer. When Rapid Setting Concrete Repair Material with Coarse Aggregate is used on a project, the Contractor shall submit six (6) 100 mm (4 inch) diameter test cylinders to the Agency's Materials & Research Section for testing for each quantity of 25 bags (units) of materials or less used on the project.

580.04 SURFACE PREPARATION FOR REPAIRS, OVERLAYS AND MEMBRANES. Surfaces to be repaired or overlaid shall be chipped back to sound concrete as directed by the Engineer using approved hand or mechanical methods.

When removing unsound portions of an existing structure in preparation for repair, the edges of all areas to be repaired shall be saw cut in straight lines to a minimum depth of 25 mm (1 inch).

After complete removal of unsound concrete, the entire area to be patched or overlaid and all exposed steel which will have concrete placed against or around it (metal plate expansion joints, scuppers, finger plate expansion joints, reinforcing steel, etc.) shall be sandblasted to remove contaminants and laitance a maximum of 24 hours prior to placing the new concrete. The area shall be vacuumed or flushed, using high pressure air or water to remove all loose particles, dust and debris.

Air or water used for cleaning shall be free of oil and other contaminants. After sandblasting, once the concrete is wet, whether from flushing or rain, the concrete must be kept wet until the placing of neat cement paste and concrete. If the concrete is allowed to dry out or the 24 hour time limit has lapsed, the area shall be re-sandblasted and the entire area vacuumed or flushed again. This work shall all be included in the bid price for the appropriate pay item.

Following concrete removal, additional surface preparation for the application of Overhead and Vertical Concrete Repair Material, shall be as recommended on the product packaging by the manufacturer.

Where Rapid Setting Concrete Repair Material or Rapid Setting Concrete Repair Material with Coarse Aggregate is to be used, concrete surfaces shall be thoroughly sandblasted and prepared as recommended by the manufacturer.

Concrete bridge decks or other surfaces designated by the Engineer to be prepared for application of a waterproofing membrane shall be ground to a smooth uniform surface by either a hand held grinder or a wheel mounted grinder unit specifically designed for the purpose. Ridges or areas of unevenness designated by the Engineer shall be ground so there remains no surface deviation greater than 1.6 mm (1/16 inch).

580.05 FORMS. The forms shall be constructed in such a manner that the final concrete surface has the same architectural score marks and exterior face appearance as the original surface.

For additional requirements for forms see subsection 501.09 or 501.09A, Forms.

580.06 PLACING CONCRETE. The Contractor shall comply with the requirements of 501.10, Placing Concrete for this work.

In addition, the following is applicable to concrete repair.

- (a) Portland Cement Concrete. When Epoxy Bonding Compound is not specified on the plans, the prepared concrete surface shall be flooded with water for at least one hour prior to fresh concrete placement, standing water shall be removed and a neat cement paste shall be brushed into the surface. The cement (AASHTO M 85, Type II) and water shall be mixed to a thick latex paint consistency. The neat cement paste shall not be allowed to dry out before it is covered with fresh concrete.
- (b) Concrete Repair Material. The moisture condition of the prepared concrete surface, the use of bonding agents and the placement of Overhead and

Vertical Concrete Repair Material, Rapid Setting Concrete Repair Materials or Rapid Setting Concrete Repair Material with Coarse Aggregate shall be as recommended by the manufacturer of the product being placed.

- (c) Alternate Methods of Repair. The Contractor may propose an alternate means of repairing vertical and overhead surfaces. The alternate may include, but is not limited to, the use of pneumatically applied materials. Should the Contractor choose an alternate method of repair, the written approval of the Structures Engineer shall be obtained before work utilizing the alternate method is begun.

580.07 CURING CONCRETE. In addition to the requirements of Section 501.17 or 501.17A, Curing Concrete, the following requirements apply to concrete repair.

A membrane-forming curing compound may be used to cure the repairs made with concrete, provided the patched areas are covered with white polyethylene sheeting after the curing compound is applied. White Polyethylene Sheeting shall conform to 725.01(c). The type of curing compound shall be approved by the Engineer prior to its use. The curing period for patches made with concrete shall be seven (7) days regardless of the curing method chosen.

Concrete patches may be cured in accordance with 501.17(b) or 501.17A(b), Parts 1, 2, 3, 5, or 7 also. If the method used does not produce the desired results, alternate curing procedures may be required by the Engineer. Evidence of improper cure could be a dry surface, a cracked or cracking surface, or a streaked or blotchy appearance of the surface.

Overlay concrete shall be cured in accordance with 501.17(b) or 501.17A(b), Parts 1, 2, 5, or 7 only.

Concrete Repair Materials shall be cured in accordance with the manufacturer's recommendations on the product packaging or specification sheet.

580.08 METHOD OF MEASUREMENT. The quantity to be measured for payment of Repair of Concrete Superstructure Surface, Class I or Class II will be the number of square meters (square yards) of repaired concrete surfaces.

Repair of Concrete Superstructure Surface, Class I, shall include the removal of concrete from the surface of existing concrete to a maximum depth as determined by the top of the top bars of the top mat of existing reinforcing steel.

Repair of Concrete Superstructure Surface, Class II, shall include removal of concrete from the surface of the existing concrete to a maximum depth of the top of the top bar of the bottom mat of reinforcing steel. The minimum depth shall be 19 mm ( $\pm$  6 mm) [ $\frac{3}{4}$  of an inch ( $\pm$   $\frac{1}{4}$  inch)] below the bottom bar of the top mat of reinforcing steel.

The quantity to be measured for payment of Concrete Substructure Surfaces, Class I or Class II, will be the number of square meters (square yards) of repaired substructure surfaces, whether they are flat, vertical or overhead.

Repair of Concrete Substructure Surface, Class I shall include removal of concrete from the plane of the original concrete surface to a maximum depth as determined by the outside face of the first mat of reinforcing steel.

Repair of Concrete Substructure Surface, Class II shall include removal of concrete from the plane of the original concrete surface to a maximum depth of 150 mm (6 inches) measured from the plane of the original surface. The minimum depth removed under this item shall be 19 mm ( $\pm$  6 mm) [ $\frac{3}{4}$  of an inch ( $\pm$   $\frac{1}{4}$  inch)] beyond the inside face of the first mat of reinforcing steel.

The quantity to be measured for payment of Repair of Concrete Superstructure Surface, Class III, will be the number of cubic meters (cubic yards) of concrete removed. Repair of Concrete Superstructure Surface, Class III, shall include removal from the top of the existing concrete surface to the bottom of the concrete deck (i.e. full depth removal).

The quantity to be measured for payment of Repair of Concrete Substructure, Class III, will be the number of cubic meters (cubic yards) of concrete removed. Repair of Concrete Substructure Surface, Class III, shall include removal from the face of the existing concrete surface to a depth greater than 150 mm (6 inches).

The quantity to be measured for payment of Concrete, Class AA Overlay, will be the number of square meters (square yards) of finished surface complete in place. The limits of removal shall be as specified for Repair of Concrete Superstructure Surface, Class II or Class III, as determined by the Engineer.

The quantity to be measured for payment for Surface Preparation for Membrane will be the number of square meters (square feet) of prepared surface. Payment will be made for surface preparation of existing surfaces and not for new patches, which will be the responsibility of the Contractor.

The quantity to be measured for Rapid Setting Concrete Repair Materials, Rapid Setting Concrete Repair Material with Coarse Aggregate, and Overhead and Vertical Concrete Repair Material will be the number of cubic meters (cubic feet) of material mixed for use, as approved by the Engineer. The volume will be computed on the basis of the quantity identified as being contained in the product packaging.

580.09 BASIS OF PAYMENT. The accepted quantities will be paid for at the Contract unit prices for the pay items specified, which price shall be full compensation for performing the work specified, including satisfactory completion of curing, and the furnishing of all forms, materials, including joint filler, labor, tools, admixtures, equipment and incidentals necessary to complete the work.

The cost of heating or cooling materials and protecting the concrete against cold weather and any additional cost for cement, shall be included in the Contract unit price for Structural Concrete Repair, Section 580.

The unit price bid for item 580.10, Repair of Concrete Superstructure Surface, Class I, item 580.11, Repair of Concrete Superstructure Surface, Class II, and item 580.12, Repair of Concrete Superstructure Surface, Class III, will be full

compensation for the removal and replacement of concrete. Replacement concrete shall be Concrete, Class AA.

The unit price bid for item 580.13, Repair of Concrete Substructure Surface, Class I and item 580.14, Repair of Concrete Substructure Surface, Class II, will be full compensation for the removal and replacement of concrete. Replacement material shall be Concrete, Class AA, Overhead and Vertical Concrete Repair Material or an acceptable alternate such as pneumatically applied concrete.

The unit price bid for item 580.15, Repair of Concrete Substructure Surface, Class III, will be full compensation for the removal and replacement of concrete. Replacement material shall be Concrete, Class AA, Class A, Class B or an acceptable alternate as directed by the Engineer.

The accepted quantity of item 580.16, Surface Preparation for Membrane will be paid for at the contract unit price per square meter (square foot), which price shall be full compensation for the furnishing of all labor, tools, equipment and incidentals necessary to complete the work.

The accepted quantity of item 580.17, Rapid Setting Concrete Repair Material, item 580.18, Overhead and Vertical Concrete Repair Material, and item 580.20, Rapid Setting Concrete Repair Material with Coarse Aggregate will be paid for at the contract unit price bid per cubic meter (cubic foot), which price shall be full compensation for furnishing, transporting, storing, handling, and placing the materials specified and for furnishing all labor, tools, equipment and incidentals necessary to complete the work.

The unit price bid for item 580.19, Concrete, Class AA Overlay, will be full compensation for the removal and replacement of concrete. Replacement concrete shall be Concrete, Class AA.

Duplicate payment will not be made for preparation of concrete surfaces in any area. For example, if an area is originally prepared as Class I and the Engineer orders a change to the Class II depth, the total depth will be paid as Class II. Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
580.10 Repair of Concrete Superstructure Surface, Class I	SM (SY)
580.11 Repair of Concrete Superstructure Surface, Class II	SM (SY)
580.12 Repair of Concrete Superstructure Surface, Class III	CM (CY)
580.13 Repair of Concrete Substructure Surface, Class I	SM (SY)
580.14 Repair of Concrete Substructure Surface, Class II	SM (SY)
580.15 Repair of Concrete Substructure Surface, Class III	CM (CY)
580.16 Surface Preparation for Membrane	SM (SF)
580.17 Rapid Setting Concrete Repair Material	CM (CF)
580.18 Overhead & Vertical Concrete Repair Material	CM (CF)
580.19 Concrete, Class AA Overlay	SM (SY)
580.20 Rapid Setting Concrete Repair Material with Coarse Aggregate	CM (CF)

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