

Payment for each item includes all direct and indirect costs and expenses required to complete the work.

Payment will be made under:

Item No.	Pay Item	Pay Unit
5011XXX	Portland Cement Concrete Pavement - <u>(thickness)</u> " Uniform	Square Yard
5012XXX	Portland Cement Concrete Pavement for Ramps - <u>(thickness)</u> " Uniform	Square Yard

SECTION 502

CONCRETE PAVEMENT PATCHING

502.01 Description. This work shall consist of replacing full depth pavement slabs on a prepared subgrade or base course in accordance with the plans and in accordance with the applicable requirements of the special provisions and Sections **501**, **701**, and **702**. The pavement replacement slabs will be placed where the distressed concrete has been removed and shall range in size from 12 feet wide by a minimum of 6 feet long up to the full slab length for jointed concrete pavements, while patches of continuously reinforced concrete pavements shall have a minimum dimension of 6 feet in length and width. The depth shall be the depth of the existing pavement. See the plans for details.

The Engineer will locate and establish the areas to be replaced by marking on the surface of the existing pavement the boundaries of the area to be patched. The boundaries of the patch area will be of sufficient width and length to assure that all of the distressed concrete is removed. Transverse boundaries do not have to be perpendicular to the shoulder in all cases, but shall be at least 18 inches away from trans-

verse cracks in the good concrete.

502.02 Materials.

A. General. The materials shall meet the requirements of Sections **302, 501, 701, and 703.**

B. Portland Cement Concrete. Portland cement shall be Type I or Type III from an approved source and shall be used at a rate of 800 lbs. per cubic yard. The mix shall have a water cement ratio not exceeding 0.38. Water cement ratio shall be maintained by using normal or high range water reducing materials Type F or G. Non-chloride accelerators shall be used to achieve the specified compressive strength and time of set. Coarse aggregates shall be No. 56, 57, or 67. Provide an air content of 4 1/2% ±1 1/2%.

At least forty-five (45) days before the beginning of placement of concrete in the roadway, the contractor shall submit a proposed mix design to the Department's Research and Materials Laboratory. The Research and Materials Laboratory may either require materials to be provided to the Department's Central Laboratory or to the ready mix plant in order to prepare trial batches. The Contractor may propose to use a previously approved mix design. A previously approved mix design shall not relieve the Contractor of the forty-five (45) day notification requirement and the department may require re-testing of the mix design at its option. Mix designs are project specific, and approval is non-transferable without written approval from the Research and Materials Engineer.

The mix design shall produce a minimum compressive strength of 2000 psi within 6 hours after addition of accelerating admixtures. The Contractor shall provide a representative to be present at the Research and Materials Laboratory or ready mix plant while the proposed mix design is produced. He shall be authorized to make any changes to the Contractor's proposed mix design in the event that the

mix does not meet time and strength requirements. An approved mix design will be furnished to the Contractor.

C Reinforcing Steel. Bar mat reinforcing steel, wire mesh, and dowel bars size and placement shall be as specified in the patching detail included in the plans, special provisions, and Section **703**.

D. Epoxy System. Epoxy system used to anchor dowel bars, tie bars shall be moisture insensitive, and the manufacturer shall furnish a certification indicating the material meets ASTM C 881, Type 4, Grade 3, Class B and/or Class C. A certification by the manufacturer shall be furnished for each lot number received at the job site. If requested by the Engineer, the proposed epoxy system shall be re-verified by using the epoxy with a No. 4 tie bar system in a scrap section of pavement slab. Equipment to test the pullout strength shall be provided by the Contractor and shall bear labels indicating up-to-date calibration by an independent calibration service. The proposed epoxy system shall demonstrate that the pullout strength is approximately 12,000 pounds.

E. Maintenance Stone. Where maintenance stone is required, aggregate shall meet the requirements of Aggregate No. CR-14 as specified in Subsection **302.02**. All aggregates shall be obtained from SCDOT approved sources.

CONSTRUCTION REQUIREMENTS

502.03 General. The full depth concrete pavement patching work shall be conducted in one lane at a time and in a manner that offers minimum inconvenience to the traveling public. A written Traffic Control Plan prepared by the Contractor shall be approved by the Engineer in advance of starting any work that will interrupt the normal flow of traffic. The inside (passing) lane shall be completed before the outside (travel) lane work begins. No concrete shall be placed when the air temperature is 40°F or below.

502.04 Removal of Existing Pavement. The Engineer will locate and establish the areas to be replaced by marking on the surface of the existing pavement the boundaries of the area to be patched. Existing pavement slab shall be removed by sawing the pavement full depth with a diamond tipped blade and leaving vertical concrete edges. A carbide tipped wheel saw will be permitted to with in 3 inches of the transverse limits of the patch. The deteriorated pavement slab shall be prepared for removal by either of the following procedures:

1. Make a 1/4 inch wide sawcut the full depth of the pavement in the shoulder-pavement longitudinal joint. The shoulder must not be damaged when removing the adjacent pavement slab.
2. Make sawcut in the shoulder at a distance of 12 inches parallel to the pavement/shoulder longitudinal joint. The length of the sawcut shall be the length of the required pavement patch plus enough distance to accommodate formwork.

Procedure 1 will only be allowed on patches 6 feet to 12 feet in length where the shoulder is not damaged. If the vertical edge of the shoulder is undamaged, the new concrete for the pavement slab may be placed against the undisturbed shoulder.

After Procedure 2, the shoulder material shall be removed and a form set for a new shoulder pavement joint. When the form is removed and longitudinal drains are to be placed at a later date, the shoulder area will be repaired with temporary material that shall consist of thoroughly compacted Aggregate No. CR-14, conforming to the requirements of Subsection **302.02**, and topped with an asphalt surface course selected by the Engineer. If no drains are required, the shoulder area shall be repaired as specified in Subsection **502.11**.

Care shall be taken during the removal of the deteriorated pavement and the placement of new concrete to prevent damage to the vertical sawcut in the existing pavement or to the

base material.

The Contractor shall be responsible for the proper disposal of the concrete pavement that has been removed.

502.05 Base Preparation. After the deteriorated pavement has been removed, the base shall be prepared and compacted to the depth of the existing pavement. This may require removing some of the existing base material. In the event that poor materials are encountered, additional material shall be removed and a new grade depth established as directed by the Engineer. Aggregate No. CR-14 or portland cement concrete of the same composition used for the pavement patching, as directed by the Engineer, will be used to backfill to the bottom of the existing pavement. All materials on which the concrete pavement is to be placed shall be thoroughly compacted using vibratory compactors. The saw-water from the pavement removal operations may deteriorate compacted base material in the replacement area. The deterioration of the base shall be corrected before placing the new concrete.

When it is necessary to repair continuously reinforced concrete (CRC) pavement in the areas at or near terminal ends, it will not be necessary to remove the terminal end to its full depth. The pavement may be removed to the normal depth of the pavement, taking care to leave the shear steel. If the shear steel is inadvertently removed or damaged, it shall be re-established by means of drilling into the terminal end, and grouting or epoxying new shear steel equivalent in area to the old shear steel.

502.06 Faces of Existing Pavement. Before placing concrete, the faces of the existing pavement shall be thoroughly cleaned and prepared to receive the concrete. Featheredge spalls shall be removed by sawing a new face on the existing pavement.

502.07 Placing of Reinforcement. After removing the deteriorated concrete, new dowels and tie bars shall be established in the vertical faces of the remaining pavement slab by

drilling and grouting with quick setting, non-shrink mortar or epoxy. Dowel and tie bars shall be established in pavement at a spacing of 12 inches on center or in between the longitudinal reinforcement (where present) in accordance with the details shown in the plans.

Bar mat reinforcing steel or wire mesh shall be installed as specified on the plans or in the special provisions. Reinforcement shall be securely anchored and held in place to avoid movement during concrete placement.

The smooth dowel bars extending into the patch opening shall be thoroughly and uniformly greased to allow the patch concrete to expand and contract. Care shall be taken to ensure that the top and bottom surfaces of the bars are coated with grease.

502.08 Concrete Finishing. The replacement concrete surface shall be given a fine broom texture finish to establish a surface similar to the existing pavement (no tline marks required) and sprayed with curing compound as specified in Subsection **702.04**.

502.09 Curing. Freshly poured surfaces shall be covered with insulated curing blankets during the curing period, regardless of ambient air temperature. The curing time shall be provided as part of the approved mix design. The curing system shall be approved by the Engineer before commencement of work.

502.10 Joints. Joints shall be sealed in accordance with the plans and the requirements of Section **504**.

502.11 Shoulders. Where it is necessary to place side forms adjacent to the shoulder, the damaged shoulder shall be repaired using the following based on type of shoulder in place.

A. Asphalt Shoulder. Repair damaged shoulder with Aggregate No. CR-14 and Hot Mix Asphalt Surface Course - (Type 1) overlay as directed by the Engineer.

B. Portland Cement Concrete Shoulder. Repair PCC shoulder with same mix as used in the mainline patching. Coat the surface of the set concrete with a moisture insensitive high modulus epoxy recommended by the manufacturer for the purpose of bonding fresh concrete to old concrete certified to meet ASTM C 881, Type V, Grade 1 or 2, Class B or Class C. Deposit concrete in the shoulder area to be patched after the epoxy coating becomes tacky and before it dries.

502.12 Opening Pavement to Traffic. The patched pavement shall not be opened to traffic (public or otherwise) until the strength of 2000 psi has been verified by early break cylinders unless otherwise instructed by the Engineer. The Contractor shall furnish a calibrated compressive test machine in a well-protected area for testing the concrete cylinders at the job site.

After the first patches are made and opened to traffic, they shall be evaluated by traveling over them in normal traffic flow pattern at the allowable speed limit. In the event the patches exhibit noticeable impact or steering indication to the vehicle, the finishing techniques on remaining patches shall be adjusted to provide patch surfaces that do not affect the vehicle as it passes over the patch.

502.13 Method of Measurement. The quantity measured for payment under this section shall be the number of square yards of full depth concrete pavement patching, completed and accepted, and measured in place along the surface of the pavement and ramps. Patches constructed outside the area designated to be patched shall be disregarded in computing the number of square yards.

Adjacent to bridge ends, over trenches, and at other places where the Engineer authorizes the thickness to be other than that specified in the plans, the volume of concrete pavement authorized by the Engineer and actually placed and accepted shall be converted into equivalent square yards of depth of patching as shown on the plans.

The lean concrete used for replacing base course, cement stabilized subbase, and/or subgrade removed as outlined above, shall be measured to the nearest 0.1 cubic yard for Portland Cement Concrete (Special Use) placed and accepted. If Aggregate No. CR-14 is used for this purpose, it will be measured by the ton of Aggregate No. CR-14 placed and accepted.

Unless a separate bid item is included in the contract for temporary or permanent repairs in bituminous shoulders, work and materials for temporary or permanent repairs in bituminous shoulders shall not be measured for payment, but will be considered as an incidental part of the work for this item.

Wire mesh, bar mat reinforcement, dowels, tie bars, load transfer devices, and other materials necessary to complete the patching in accordance with the plans will not be measured separately. Work or material used to anchor reinforcement and ties will not be measured for payment. No direct payment will be made for these items, and they will be considered as part of the pavement patching work.

502.14 Basis of Payment. Payment for the concrete pavement patch area measured in Subsection **503.13** will be made at the contract unit price for Full Depth Concrete Pavement Patching, which price and payment shall be full compensation for furnishing all materials, equipment, tools, labor, supplies, and incidentals necessary to complete the work. It shall include sawing, removal, and disposal of the existing deteriorated pavement, work and materials used for temporary and permanent repairs to shoulders, joint construction and sealing, wire mesh, bar mat reinforcement, dowels, tie bars, load transfer devices, restoration of terminal ends in continuously reinforced pavement, drilling and grouting reinforcement, epoxy system for reinforcement anchorage and concrete bonding, preparation of subbase, furnishing, placing, finishing, curing, and testing concrete necessary to satisfactorily complete the work.

Payment for Aggregate No. CR-14 or Portland Cement Concrete (Special) used to repair the base under the removed slab as required in these specifications or as directed by the Engineer will be paid at the contract unit price for the respective item.

Payment for each item includes all direct and indirect costs and expenses required to complete the work.

Payment will be made under:

Item No.	Pay Item	Pay Unit
3022000	Aggregate No. CR-14	Ton
50210XX	Full Depth Concrete Pavement Patch - <i>(thickness)</i> "	Square Yard
5029000	Portland Cement Concrete (Special Use)	Cubic Yard

SECTION 503

GRINDING AND TEXTURING EXISTING CONCRETE PAVEMENT

503.01 Description. This work shall consist of grinding and texturing the existing portland cement concrete pavement longitudinally as shown on the plans or as specified herein.