(2008 Standard Specifications)

SECTION 402 PORTLAND CEMENT CONCRETE PAVEMENT REPAIRS:

402-1 Description:

The work under this section shall consist of furnishing all labor, materials and equipment necessary to repair Portland cement concrete pavement in accordance with the requirements of these specifications and as shown on the project plans or established by the Engineer.

The kind of Portland cement concrete pavement repair may consist of one or a combination of the following:

Spall Repairs
Slab Repairs
Pavement Grinding
Pavement Grooving
Joint and Crack Repair
Edge Sealing

402-2 Spall Repairs:

402-2.01 Description:

The work shall consist of furnishing all materials and removing loose material and temporary bituminous patch material from potholes, damaged joints, and spalled areas, thoroughly cleaning the repair area and placing new patch material in accordance with the details shown on the project plans and as specified herein, and in reasonably close conformity with the existing pavement cross-section.

402-2.02 Material Requirements:

(A) General:

Patch materials shall attain compressive strength of 2,000 pounds per square inch within six hours. The patch material shall attain the required compressive strength prior to opening to traffic.

(B) Accelerated Strength Portland Cement Concrete Patch Material:

The patch material shall be an Accelerated Strength Portland Cement Concrete mixture consisting of Type III Portland Cement and calcium chloride or other accelerators meeting AASHTO M 144 and shall attain a compressive strength of at least 2,000 pounds per square inch in six hours. Materials for the concrete mix shall conform to the requirements of

Section 1006 for Class S concrete. The coarse aggregate shall be as designated for size No. 67 in accordance with AASHTO M 43.

(C) Rapid Setting Patch Material:

Rapid setting patch material shall be a product approved by the Engineer. A list of approved patch materials is maintained on the Department's approved product list.

(D) Epoxy Resin Grout Patch Material:

Epoxy resin patch material shall be a low modulus moisture insensitive epoxy mortar grout prepared in accordance with the manufacturer's recommendations. Fine aggregate incorporated into the grout shall meet the fine aggregate gradation requirements specified in Subsection 1006-2.03 (B). The epoxy binder: aggregate ratio shall be between 1:7 and 1:10. The epoxy binder materials shall meet the requirements specified in ASTM C 881.

(E) Flexible Epoxy Patching Material:

(1) Description:

The patching material shall be a mixture of a solventless, medium curing time, stress relieved flexible coating epoxy and 100 percent vulcanized granulated rubber.

(2) Materials:

The epoxy shall be a two component, low viscosity mixture and have a gray color when mixed. The curing period shall be seven days at standard laboratory conditions. The cured epoxy shall meet the following physical requirements:

Test Method Requirements	Test	Material
ASTM D 638	Tensile Strength: psi	900 (minimum)
ASTM D 638	Tensile Elongation: %	85 (minimum)
Gardner	Impact Resistance: pounds Direct Reverse	 greater than 160 greater than 80
AASHTO T 237	Tensile Bond Strength: psi	310 (minimum)
ASTM D 648	Heat Deflection Temperature: ^{o}F	25
ASTM D 2240	Hardness: Shore D	62 (minimum)
AASHTO T 237	Slant Shear Strength: psi	2,000 (minimum)

The ground rubber shall be free of fabric, wire or other contaminating materials.

(3) Packaging and Marking:

The ground rubber shall be introduced into each of the two components by the manufacturer at the place of production, not at the job site. Each container of both

components shall be labeled and legibly marked with the manufacturer's name, the trade name of the product, component identification and the expiration date of the manufacturer's shelf life warranty. Material that has exceeded the shelf life warranty expiration date shall not be used.

(4) Certification Requirements:

A Certification of Compliance conforming to the requirements of Subsection 106.05 shall be submitted.

402-2.03 Construction Requirements:

(A) General:

Spalled areas to be repaired will be designated by the Engineer and shall be repaired prior to any required pavement grinding. The extent of the repair area will be marked by the Engineer and will be no less than three inches outside the area of delamination. The Engineer will be the final authority if questions arise in regard to the need for patching or the extent of a required patch.

Spalled areas less than six inches in length and 1-1/2 inches in width, which are adjacent to joints, shall not be repaired under this specification.

Patching material shall not be placed under conditions which will adversely affect the quality of work. The Engineer shall be the sole judge in determining the suitability of working conditions.

Concrete within the patch area shall be broken out, to the minimum depth specified for the patch material being used, with light to medium pneumatic tools until sound clean concrete is exposed. If the depth of the spalled area exceeds half the thickness of the concrete pavement slab, the affected pavement shall be removed and replaced, as designated by the Engineer and in accordance with the requirements of Subsection 402-3.

Asphaltic concrete shoulders adjacent to a patch shall be cut longitudinally to the depth of the patch and to a width of not more than 12 inches. The cut shall extend one foot beyond both transverse limits of the patch to facilitate placement of form work. Shoulders shall be patched with material similar to the existing shoulder material.

Prior to patching, the exposed faces of the concrete shall be sandblasted free of loose particles, oil, dust, traces of asphaltic concrete and other contaminates. Prior to placement of the bonding agent, all sandblasting residue shall be removed with compressed air and high suction vacuums. Sand for sandblasting shall be sharp and clean and capable of passing a No. 10 sieve and shall leave the exposed concrete face clean and dry.

The surface of the spalled area or breakup shall be clean and dry so that patching material will form a proper bond. The area to be cleaned and patched shall be limited to the area

designated by the Engineer. Patching material shall be confined to the limits of the repair and shall not lap onto the surrounding pavement.

Patch material shall be placed or consolidated to eliminate voids at the interface of the patch and existing concrete. If a partial depth repair area abuts a working joint or crack which penetrates the full depth of the slab, a temporary insert or other bond-breaking medium such as styrofoam strips shall be used to maintain the working joint or crack for the full depth of the patch and at the same width as the existing joint or crack while placing patch material. Repair material shall not bear on an adjacent slab.

The patch shall be finished to the cross-section of the existing pavement and textured with a stiff bristled brush. Texturing shall conform to that of the existing pavement. The patch surface shall be struck off flush with the existing pavement surface.

(B) Accelerated Strength Portland Cement Concrete Pavement Patch:

Patch boundaries shall be saw cut and broken out to a depth of at least 1-1/2 inches.

Following the removal and cleaning of the area to be patched, and prior to placing patch material, an approved bonding agent shall be applied to the patch area. The bonding agent shall be applied in a thin coating and scrubbed into the surface with a stiff bristled brush. Placement of patch material shall be delayed until the bonding agent becomes tacky.

(C) Rapid Setting Patch:

Rapid set patch materials shall be installed in accordance with manufacturer's instructions. In order to assure proper mixing and placement, a qualified manufacturer's representative for the approved product shall be present at the start of spall repair operations, and shall remain until the Engineer is satisfied that the contractor is conforming to the recommended procedures.

Patch boundaries shall be saw cut and broken out to a depth of at least 1-1/2 inches, or as recommended by the manufacturer, whichever is greater.

If recommended by the manufacturer, the area to be patched shall be primed with a bonding agent compatible with the patch material being used.

(D) Epoxy-Resin Grout Patch:

Patch boundaries shall be saw cut and broken out to a minimum depth of 1-1/2 inches.

Prior to placement of epoxy-resin grout, the contractor shall furnish a grout mix design for review and approval.

The epoxy-components shall be mixed in strict compliance with the manufacturer's recommendations before aggregate is added to the mixture.

(E) Flexible Epoxy Patch:

Use of flexible epoxy materials shall be in accordance with the manufacturer's recommendations unless otherwise specified by the Engineer.

The contractor shall remove the spall area to be replaced to a minimum depth of two inches or to a solid surface by saw cutting and chipping with a pneumatic hammer, without damaging the underlying intact concrete. All loose particles shall be removed before applying the flexible epoxy inlay.

The contractor shall mix only the amount of material that can be used before the expiration of the pot life for the material. The two parts shall be thoroughly mixed in their own containers before combining the parts together as recommended by the manufacturer. The contractor shall blend the mix thoroughly for the length of time recommended by the manufacturer, making sure the material contains no lumps or streaks, and carefully scraping the sides and bottom of the container.

The material shall be placed in the area to be patched, the surface leveled off even with the surrounding pavement, and any excess material removed.

402-2.04 Method of Measurement:

Spall repairs will be measured by the square foot for all patches constructed. Each patch will be measured to the nearest one-tenth square foot. The total cumulative measurement of all patches will be rounded to the nearest square foot.

402-2.05 Basis of Payment:

The accepted quantities of spall repairs, measured as provided above, will be paid for at the contract unit price per square foot, which price shall be full compensation for the work, complete in place including removal and disposal of the old pavement; and repair or replacement of shoulder material which is removed or damaged during spall repair work.

402-3 Full Depth Slab Repairs:

402-3.01 Description:

The work shall consist of furnishing all materials and removing existing concrete pavement and constructing full depth patches of Portland cement concrete pavement at the locations shown on the project plans, as specified herein, and in reasonably close conformity with the existing pavement cross-sections.

402-3.02 Material Requirements:

Patching material shall be an Accelerated Strength Portland Cement Concrete Mixture which includes Type III Portland Cement and calcium chloride or other accelerator conforming to the requirements of AASHTO M 144. The patch material shall attain a

compressive strength of at least 2,000 pounds per square inch in six hours. The contractor shall not place concrete patch material until the mix design has been tested and approved by the Engineer.

Materials for Portland Cement Concrete shall conform to the requirements of Section 1006. Concrete shall be Class S, with size 57 coarse aggregate as designated in AASHTO M 43.

Materials furnished for joint seal shall conform to the requirements of Subsection 1011-3.

Materials furnished for tie bars shall conform to the requirements of Section 1003.

Materials furnished for dowel bars shall conform to the requirements of AASHTO M 254 with Type B coating except that the core material shall conform to the requirements of ASTM A 615, Grade 40.

Liquid membrane-forming curing compound shall conform to the requirements of Subsection 1006-2.05.

402-3.03 Construction Requirements:

Areas to be repaired will be designated by the Engineer and shall be repaired before any specified pavement grinding. The Engineer shall be the final authority if questions arise with regard to the need for patching or the extent of the patch.

Patching material shall not be placed under any conditions which will adversely affect the quality of the work. If these conditions arise, the Engineer will determine whether or not the operation should cease. The Engineer shall be the sole judge in determining the suitability of working conditions.

Pavement slabs containing multiple cracks through the full depth of the slab, separating the slab into three or more parts and other slabs designated by the Engineer, shall be entirely removed and replaced. Pavement slabs containing a single diagonal crack intersecting the transverse and longitudinal joints within 1/3 of the width and length of the slab from the corner shall be repaired by removing and replacing the smaller portion of the slab.

Areas to be patched shall have the configuration and minimum dimensions shown in the plans. The area shall be saw cut to the full depth of the slab. An additional full depth saw cut shall be made interior to one of the initial transverse saw cuts and shall be made such that a wedge tapering from four inches to six inches from the initial cut is created.

The area inside the wedge shall be removed with light to medium weight jackhammers or other approved equipment prior to removing the larger remaining pavement section. The remaining pavement shall be lifted out in a manner approved by the Engineer. Any disturbed granular subbase shall be removed and replaced with concrete patch material and any spalls which are caused by the removal operations and which are greater than one inch wide or one inch deep, shall be repaired by resawing full depth and full width of the traveled lane, or repaired as directed by the Engineer at no additional cost to the Department.

When the patch boundary is at an existing contraction joint, the new joint shall be formed with plain round dowel bars, 1-1/4 inches in diameter and 18 inches in length. Dowel bars shall be placed as shown in the plans, and shall be placed at mid-depth of the existing slab. Holes drilled for the dowel bars shall not be less than 1-3/8 inches in diameter and shall extend nine inches into the existing slab. The bars shall be anchored into the existing concrete with an approved high viscosity epoxy. Prior to concrete placement for the replacement slab, the nine-inch long free end of the dowel bar shall be uniformly coated with a thin film of heavy waterproof grease.

When the patch boundary is at an existing longitudinal joint, the patch shall be tied to existing concrete with two-foot long No. 5 deformed steel tie bars placed in the joint at 30-inch intervals as shown on the plans. Holes drilled in the existing slab shall be one foot deep and of a diameter sufficient to accommodate the tie bars. The tie bars shall be anchored into the existing slab using an approved high viscosity epoxy.

When the patch boundary is located near mid slab, the patch shall be tied to existing concrete with two-foot long No. 8 deformed steel tie bars placed in the transverse joint at 18-inch intervals and No. 5 deformed steel tie bars placed in the longitudinal joint at 30-inch intervals as shown in the plans. Holes drilled in the existing slab shall be one foot deep and of a diameter sufficient to accommodate the tie bars. The tie bars shall be anchored into the existing slab using an approved high viscosity epoxy.

Patch material shall be placed and consolidated to eliminate voids at the interface of the patch and existing concrete. A new sealant reservoir shall be sawed or formed at the interface of the patch and existing concrete, as shown on the plans.

The patch shall be finished to the cross-section of the existing pavement and textured with a stiff bristled brush to match the existing pavement. The patch surface shall be within 1/8 inch of the existing pavement surface. No texturing will be required if pavement grinding or grooving is to be done after patching.

402-3.04 Method of Measurement:

Slab Repairs will be measured by the square yard of pavement repaired. Each patch will be measured to the nearest one-tenth square foot. The total cumulative measurement of all pavement repaired will be rounded to the nearest square yard.

402-3.05 Basis of Payment:

The accepted quantities of slab repairs, measured as provided above, will be paid for at the contract unit price per square yard, which price shall be full compensation for the work complete in place including the removal and disposal of existing materials, the excavation and subsequent backfilling or repairs to subbase materials incidental to the removals and the repair or replacement of shoulder materials which are damaged or removed during the work.

402-4 Pavement Grinding:

402-4.01 Description:

The work shall consist of furnishing all materials and grinding the surface of existing concrete pavement at the locations shown on the project plans and in accordance with the requirements of these specifications.

402-4.02 Blank

402-4.03 Construction Requirements:

(A) General:

Prior to grinding, spalled areas shall be repaired as specified. Grinding shall be done prior to any specified sawing and sealing of existing transverse and longitudinal joints.

Pavement surfaces shall be ground longitudinally.

The contractor shall grind a test section of pavement, where designated by the Engineer, to determine that the equipment proposed for use on the project will provide the specified surface texture.

The entire area of pavement designated to be ground shall be ground in a manner that results in a uniform surface appearance. Grinding shall continue for the full lane width until the pavement surface on both sides of all transverse joints and all cracks is in the same plane. Longitudinal ridges in adjacent passes of the grinding equipment shall not exceed 1/8 inch in depth.

In any one lane, a maximum distance of 1,000 linear feet of unfinished work area between the lead grinder and the last grinder in that lane will be allowed at the end of any work shift.

Ground surfaces shall not be smooth or polished and shall have a wet Arizona Mu-Meter number of not less than 60 at 40 miles per hour.

The surface shall have a finished texture that has grooves between 0.090 and 0.130 inches wide, spaced 0.060 to 0.110 inches apart and not less than 0.030 inches or more than 0.115 inches in depth.

The ground area of any selected two-foot by 100-foot longitudinal area of pavement specified to be ground shall not be less than 98 percent of the selected area. This selected area will be within the center eleven feet of a traffic lane.

Residue and excess water resulting from grinding shall be removed from the roadway by vacuuming or any other method approved by the Engineer. The residue shall be removed prior to opening the lane to traffic. Residue and water from grinding operations shall not be permitted to flow across lanes occupied by traffic, onto roadway shoulders or areas

containing vegetation, or to flow into gutters or other drainage facilities. Dried residue shall be broomed with a pickup or power broom prior to allowing traffic over the opened work area.

After grinding has been completed, the pavement surface will be tested in accordance with the requirements of Arizona Test Method 801. Two Profilograph readings shall be taken in the vehicle wheel paths three feet from the edge of the traffic lane.

To be acceptable, a Profile Index shall not exceed 10 inches per mile in any 0.1-mile section. In addition, all areas representing high points having deviations in excess of 0.3 inches in 25 feet, shall be reground until such deviations, as indicated by reruns of the Profilograph, do not exceed 0.3 inches in 25 feet.

Additional grinding shall be performed, if necessary, to reduce the overall Profile Index, as measured by the Profilograph, to 10 inches per mile in any 0.1-mile section or remaining portion thereof, along any line parallel to the edge of the pavement. In any areas requiring regrinding, the regrinding shall be done over the full lane width.

The contractor shall broom the surface of the concrete so that Profilometer readings can be taken. Profilograph measurements shall be the responsibility of the contractor on all but the final acceptance measurement. The contractor shall bear all costs of profilograph measurements. Traffic control for the final acceptance measurements shall be provided by the contractor.

(B) Equipment and Procedures:

Grinding shall be done with diamond blades, mounted on a self-propelled machine that has been designed for grinding and texturing of pavements. The equipment shall be designed such that it will not cause strain or damage to the underlying surface of the pavement. Grinding equipment that causes excessive ravels, aggregate fractures, spalls, or disturbances of the transverse and/or longitudinal joints shall not be used.

All grinding machines used in the cross-section of a lane shall have the same wheel or grinding head configuration. Overlapping of grinding passes will not be allowed.

The noise level created by any one machine shall not exceed 86 dbA at a distance of 50 feet normal to the direction of traffic.

No equipment will be allowed within three feet of a traffic lane open to the public. Maintenance and Protection of Traffic shall conform to the requirements of Section 701.

402-4.04 Method of Measurement:

Pavement grinding will be measured by the square yard of pavement ground and accepted. The quantity will be determined by multiplying the width by the length of the ground area.

402-4.05 Basis of Payment:

The accepted quantities of pavement grinding, measured as provided above, will be paid for at the contract unit price, which price shall be full compensation for the work complete as specified.

402-5 Pavement Grooving:

402-5.01 Description:

The work consists of furnishing all materials and grooving the surface of existing Portland Cement Concrete Pavement at the locations shown on the project plans and in accordance with the requirements of these specifications.

402-5.02 Blank

402-5.03 Construction Requirements:

(A) General:

The pavement surface shall be grooved longitudinally.

The methods used and tolerances employed shall provide a surface which will provide good wet or dry driving characteristics.

Longitudinally grooved areas shall begin and end at lines normal to the pavement center line and shall be centered within the lane width.

No equipment shall be allowed within three feet of a traffic lane open to the public. Maintenance and Protection of Traffic shall be in accordance with Section 701.

Removal of all slurry or residue resulting from the grooving operation shall be continuous. Residue from grooving operations shall not be permitted to flow across shoulders or lanes occupied by public traffic or to flow into gutters or other drainage facilities. Dried residue, resulting from grooving operations, shall be removed from pavement surfaces with a pick up or power broom before such residue is blown by the action of traffic or wind.

The noise level created by any one machine shall not exceed 86 dbA at a distance of 50 feet normal to the direction of traffic.

(B) Equipment and Procedures:

Grooving shall be done with diamond blades, mounted on a multi-blade arbor on a self-propelled machine which has been built for grooving of pavements. The groover shall have a depth control device which will detect variations in the pavement surface and adjust the cutting head height to maintain the specified groove depth. The grooving machine shall have alignment control devices. Flailing type grooving will not be permitted.

At the beginning of each work shift, all grooving machines shall be equipped with a full complement of grooving blades that are capable of cutting grooves of the specified width, depth and spacing.

If during the course of work, a single grooving blade on any individual grooving machine becomes incapable of cutting a groove, work will be permitted to continue for the remainder of the work shift and the contractor will not be required to otherwise cut the groove omitted because of the failed blade. Should two or more grooving blades on any individual grooving machine become incapable of cutting grooves, the contractor shall cease operations.

The grooved area of any selected two-foot by 100-foot longitudinal area of pavement specified to be grooved shall not be less than ninety percent of that area. Ungrooved pavement within the selected area shall be limited to that which occurs as a result of pavement irregularities.

(C) Tolerance:

Longitudinal grooving shall begin six inches from the outside edge of pavement or reflective marker and run in a continuous pattern across the lane surface to within six inches of the longitudinal joint. The groove pattern shall be 0.125 inches in width by 3/16 inch in depth with a center-to-center spacing of 3/4 inch. The groove spacing tolerance shall be plus or minus 1/8 inch. The width of the groove shall have a tolerance of plus or minus 0.015 inches. The depth of the groove shall have a tolerance of plus or minus 1/16 inch.

On curves and/or superelevations, the width of the groove may exceed the above dimensions as approved by the Engineer.

If the pavement profile is very uneven, the Engineer may permit a variation in maximum groove depth in areas adjacent to rutted pavement and/or faulted joints.

Grooving shall be terminated a minimum of one foot from any device in place in the pavement, such as manholes, inlet casting, valve boxes, etc.

402-5.04 Method of Measurement:

Pavement grooving will be measured and accepted by the square yard of grooved pavement. The quantity of grooved pavement will be determined by multiplying the width times the length of the grooved area. No deduction will be made for grooving omitted at joints, manholes, inlets or other similar installations in the pavement surface.

402-5.05 Basis of Payment:

The accepted quantities of pavement grooving, measured as provided above, will be paid for at the contract unit price per square yard, which price shall be full compensation for the work, complete as specified herein.

402-6 Joint and Crack Repair:

402-6.01 Description:

The work shall consist of furnishing all materials and renovating longitudinal and transverse contraction control joints and routing and sealing random cracks in existing Portland Cement Concrete Pavement, as specified herein, detailed on the project plans and as directed by the Engineer.

402-6.02 Material Requirements:

Joint sealant shall conform to the requirements of Section 1011.

Grout for filling wide joints shall be a low modulus moisture insensitive epoxy-resin grout of a viscosity suitable for flowing into the irregular cracked portion of the joint. The ratio of epoxy-resin: sand shall be between 1:7 and 1:10 or as specified by the epoxy manufacturer. Epoxy binder material shall conform to the requirements of ASTM C 881.

Sand used in epoxy grout shall conform to the requirements of Subsection 1006-2.03 (B) except that the gradation shall be as follows:

Sieve Size	Percent Passing
No. 8	100
No. 16	95 - 100
No. 50	10 - 40
No. 200	0 - 4.0

A rapid set Portland cement concrete pavement patching material may be substituted for epoxy grout as approved by the Engineer.

402-6.03 Construction Requirements:

(A) General:

Joint and crack repairs shall be accomplished by first removing old sealant and joint inserts, then refacing and cleaning the joints and cracks followed by installation of a backer rod (if required) and installation of new sealant.

(B) Joint and Crack Preparation:

Cracks shall be sawed or routed to the dimensions shown on the plans.

Inserts shall be removed from insert formed joints by sawing to provide a clean vertical face. The width and depth of the saw cuts shall be sufficient to insure complete removal of the insert and to provide a finished joint of the dimensions specified for the sealant material to be used. If the insert is not vertical, additional parallel saw cuts shall be provided as required to insure full removal of the inserts.

Joints that are not insert formed shall be sawed to the widths and depths specified herein. Joints previously sawed and sealed will be inspected to assure the proper dimensions and shall be resawed to the proper widths and depths, when required.

Joints shall be sawed as follows:

Initial Joint Width "W": Inches	Sawed Width: Inches	Sawed Depth"D": Inches, (1)
$W \leq 1/2$	1/2	D = 1-3/4
$1/2 < W \leq 3/4$	3/4	D = 2-1/8
$3/4 < W \leq 1\text{-}1/2$	No Sawing Required	D = 2W + 3/4
(1) "D" is distance from pavement surface to bottom of backer rod.		

Immediately after saw cutting a joint or routing a crack, old sealant shall be removed and the internal surfaces of the joint or crack shall be thoroughly cleaned by sandblasting. Sand for sandblasting shall be sharp and clean and shall be capable of passing a No. 10 sieve. The amount of compressed air and the nozzle pressure shall be such that the joints and cracks will be thoroughly cleaned and the edges will have etched surfaces.

(C) Dowel Placement:

Dowel bars shall be placed in transverse joints when the initial joint width is greater than 1-1/2 inches. Slots for dowel bar placement shall be made with two saw cuts perpendicular to the joint and 1-1/2 ± 1/8 inches apart. Saw cuts shall be one half the depth of the slab plus 1/2 inch. Concrete shall be removed between the saw cuts and smooth, epoxy coated dowels which are 1-1/4 inches in diameter and 18 inches long shall be inserted into the formed slot. Dowels shall be supported above the bottom of the slot so that epoxy grout can flow around the circumference of the dowel. Dowels shall be placed so that the dowel is embedded equal distance into the two slabs. Dowel bars shall conform to the requirements of AASHTO M 254 with Type B coating, except that the core material shall conform to the requirements of ASTM A 615, Grade 40. Dowel bars shall be placed as shown on the plans, and shall be placed at approximately mid-depth of the existing slab. The bar shall be thoroughly and uniformly coated with a waterproof grease prior to placement into the slot then covered with an approved epoxy grout. A 1/2-inch thickness of preformed joint filler shall be placed next to one edge of the joint such that a one ± 1/8-inch deep sealant reservoir can be formed at the top, as shown on the plans. The wide joint shall be filled with epoxy grout.

On longitudinal joints where the joint opening exceeds 1-1/2 inches, the saw cuts for placement of tie bars perpendicular to the joint, shall be 7/8 inch apart so that a No. 5 deformed tie bar 24 inches long can be inserted into the slot. This 24-inch tie bar shall be placed at mid slab depth and equal distance into each slab, then covered with an approved epoxy grout. The bars shall be at 36-inch spacing. The wide joint shall also be filled with epoxy grout.

(D) Cleaning Prior to Sealing:

Prior to sealing, all foreign or loosened particles shall be removed from the joints to the full depth of the original sawed joints. The removal of all foreign or loosened particles shall be accomplished with compressed air or by other methods approved by the Engineer. Air compressors shall be capable of furnishing a sufficient amount of compressed air to clean the joints properly.

(E) Separating or Blocking Medium (Backer Rod):

Immediately following the cleaning of joints and prior to the application of sealant, a backer rod composed of an inert, compressible material shall be inserted along the lower portion of the joint groove at a uniform depth as shown on the project plans.

The backer rod shall be compatible with the sealant in accordance with the manufacturer's recommendations. The product shall be clean, free of scale, foreign matter, oil or moisture and shall be non-absorbing. The Engineer shall be assured that the material proposed for use has been used successfully in similar installations.

Backer rod sizes shall be as follows:

Joint Width: Inches	Backer Rod Diameter: Inches
1/2	5/8
3/4	1
1	1-1/4
1-1/4	1-1/2
1-1/2	2

(F) Installation of Sealant:

Sealant compound shall not be placed unless the joint is dry, clean and free of dust. The face of the joint shall be surface dry and the ambient and pavement temperatures shall both be at least 50 degrees F at the time of application of the sealant. Installation of the sealant shall be such that the in-place sealant shall be well bonded to the concrete and free of voids or entrapped air. The joints shall be sealed in a neat and workmanlike manner, so that upon completion of the work, the surface of the sealant material will be 1/4 ± 1/8 inch below the adjacent pavement surface. The contractor shall refill all low joints before final acceptance. Any excess material on the surface of the pavement shall be removed and the pavement surface shall be left in a clean condition. Vehicular or heavy equipment traffic shall not be permitted on the pavement in the area of the joints during the curing period.

402-6.05 Method of Measurement:

Joint and crack repairs will be measured by the linear foot.

402-6.06 Basis of Payment:

The accepted quantities of joint and crack repairs, measured as provided above, will be paid for at the contract unit price per linear foot, which price shall be full compensation for the work, complete in place.

402-7 Edge Sealing:

402-7.01 Description:

The work shall consist of furnishing all materials and sawing or routing, and sealing the joints between the Portland Cement Concrete Pavement and the asphaltic concrete distress lane. This work shall be done after the completion of any specified pavement grinding and after any specified rehabilitation of the distress lane or outside shoulder. The work shall be accomplished in accordance with the details shown on the project plans and as specified herein.

402-7.02 Materials:

(A) General:

The sealant to be used shall be any one of the following:

A mixture of asphalt and 100 percent vulcanized, granulated rubber.

Premixed block material consisting of asphalt and 100 percent vulcanized rubber.

(B) Ground Rubber:

All material shall meet the requirements of these specifications and the contractor shall submit a Certificate of Compliance conforming to the requirements of Subsection 106.05.

Rubber shall be free of fabric, wire or other contaminating materials. No more than four percent by weight calcium carbonate may be included to prevent the particles from sticking together.

Rubber shall meet the following requirements when tested in accordance with Arizona Test Method 714.

Sieve Size	Asphalt Rubber (Vulcanized): % passing	Premixed Asphalt Rubber 100% (Vulcanized): % passing
No. 8	100	100
No. 10	95 - 100	95 - 100
No. 30	0 - 10	

The rubber shall have a specific gravity of 1.15 ± 0.20.

(C) Asphalt Cement:

(1) Asphalt-Rubber (Vulcanized):

Type A:

Asphalt cement shall be an asphalt binder performance grade PG 58-22, conforming to the requirements of Section 1005.

Type B:

Asphalt cement shall be an asphalt binder performance grade PG 64-16, conforming to the requirements of Section 1005.

402-7.03 Construction Requirements:

(A) Material Mixing Requirements:

The methods used to combine the materials and the design of the equipment shall be such that the Engineer can readily determine the percentages by weight of the materials being incorporated into the mixture.

(1) Asphalt-Rubber (Vulcanized):

The mixture shall consist of 75 ± 2 percent asphalt and 25 ± 2 percent rubber by weight.

The materials shall be combined as rapidly as possible for such a time and at such a temperature that the consistency of the mixture approaches that of a semi-fluid material. Since the time required to achieve this state is a function of the temperature of the asphalt, the time may vary and shall conform to that recommended by the manufacturer.

(B) Equipment Requirements:

The equipment used in the application of the asphalt-rubber material shall have a mixing system in the heating unit in order to maintain a consistent, uniform, homogeneous mixture throughout the crack sealing operation. The equipment shall be designed to provide a continuous supply so that operations may proceed without delays.

(C) Weather:

The asphalt-rubber mixture shall not be placed during wet weather or under other conditions which will adversely affect the operations. The sealant shall not be placed in cracks which are wet.

If adverse weather conditions are such as to affect the operations, the Engineer will determine whether or not the operations should cease.

(D) Application of Asphalt-Rubber Sealant:

The joint shall be sawed in the asphaltic concrete directly adjacent to the edge of the Portland cement concrete pavement and shall be at least 1/2 inch wide and one inch deep.

Immediately prior to placement of the sealant, the joints shall be cleaned as approved by the Engineer.

402-7.04 Method of Measurement:

Edge sealing will be measured by the linear foot of longitudinal edge joint sealed.

402-7.05 Basis of Payment:

The accepted quantities of edge sealing, measured as provided above, will be paid for at the contract unit price per linear foot of edge seal, complete in place.