Section 603. CONCRETE PAVEMENT RESTORATION

603.01 Description. This work shall consist of all work necessary to restore pavement condition. The use of the word “pavement” in a general sense shall be understood to include mainline pavement, base course, or concrete shoulders.

Concrete pavement restoration shall be done at the locations shown in the contract documents or as directed by the Engineer. This work shall include, but not be limited to:

A. Repairing portions of a concrete pavement with reinforced and non-reinforced Portland cement concrete and with the type of joint specified.

B. Diamond grinding Portland cement concrete pavement. All work shall conform with details as shown on the plans and as specified herein.

C. Resawing and sealing existing longitudinal pavement joints.

D. Sawing, cleaning, and sealing cracks in concrete pavements.

603.02 Materials. Materials shall meet the following requirements.

Concrete, Grades HE, P1	601
Concrete, Type P-MS, P-NC	603
Base Course Aggregate, 22A	902
Curing Materials for Pavements	903
Insulating Blankets	903
HMA Mixtures for Restoring HMA Shoulders	501
Steel Reinforcement	905
Joint Materials	914

For concrete pavement repairs, the type or grade of concrete required will be determined by the Engineer based on the intended opening of the repair to traffic. The type or grade of concrete required will be as follows:

From Casting to Intended Opening to Traffic	**Grade or Type of Concrete**
12 to 72 hours	Type P-NC
8 hours or less	Type P-MS
3 days	Grade HE
7 days or longer	Grade P1

A. **Mixtures.** The Contractor is responsible for selecting the proper types and combinations of cement and admixtures to obtain the required strength in the specified time allotted except that calcium chloride admixtures shall not be used unless the Engineer determines it is needed to meet maintaining traffic requirements.

Coarse aggregate shall have a maximum of 2.5 percent absorption when measured according to ASTM C 127.

The mixture shall be furnished for use at the project site as ready-mixed concrete at the required consistency. P-MS and P-NC mixtures will be proportioned by the Engineer for the specific materials to be used.

1. Type P-MS concrete shall be used only when needed in critical locations, as determined by the Engineer, where early open to traffic time less than 8 hours is required. Type P-MS concrete patching mixtures shall have a cement content of 846 pounds per cubic yard of mixture, a slump of 1 to 3 inches, air content 5.5 ±1.5 percent.

   Calcium chloride may only be used as a strength gain accelerator when the ambient air temperature is below 60 °F. Only calcium chloride in flake form, without lumps, is allowable and shall be added and mixed only at the project site. A maximum of 2 gallons of water may be used to wash chloride particles from the mixer opening and fins, and must be accounted for as mixing water. The truck mixer drum shall revolve 30 times to properly mix in the chloride flakes. When the temperature is between 45 °F and 60 °F calcium chloride shall be added at the rate of 10 pounds per cubic yard of concrete and when the temperature is below 45 °F it shall be added at the rate of 20 pounds per cubic yard of concrete.

2. Type P-NC concrete patching mixture shall have a cement content of 658 pounds per cubic yard when the anticipated air temperature is above 59 °F, or 752 pounds per cubic yard when the anticipated air temperature is 59 °F and below. A Type C or E (non-chloride) set accelerating admixture selected from the Qualified Products List may be used in conjunction with the appropriate cement content to achieve a flexural strength of 500 psi at the specified opening-to-traffic time as determined by the maintaining traffic requirements.

B. **Grout.** The material used to grout in the dowel bars, deformed tie bars, or deformed lane tie bars shall be selected from the Qualified Products List. Alternates to these materials will not be permitted.

C. **Dowel Bars.** The dowel bars shall be sized per Standard Plan R-44 Series and shall be epoxy coated according to subsection 914.07.A.

D. **Deformed Tie Bars.** The tie bars shall be sized per Standard Plan R-44 Series and be epoxy coated according to subsection 905.03.C.

E. **Bond Breaker.** The hot mix asphalt (HMA) material used to coat the portion of the dowel bar extending into the new concrete shall be an approved bond breaker material meeting the requirements of subsection 914.07.A.

F. **Bond Breaker Tape.** The bond breaker tape used in conjunction with contraction joint Crg shall be a silicone-coated paper tape with a pressure sensitive adhesive on one side.

G. **Joint Grooves.** Materials for forming joint grooves are not allowed. Joints shall be sawed according to the details shown on the plans.

H. **Expansion Caps.** Expansion caps shall meet the requirements of subsection 914.07.

I. **Hot-Poured Joint Sealant.** Hot-poured joint sealant shall meet the requirements of subsection 914.04A.

J. **Backer Road for use with Hot-Poured Joint Sealant.** Backer rod for use with hot-poured joint sealant shall meet the requirements of subsection 914.04B.

603.03 Construction.

A. **Equipment Requirements.** The following equipment, provided as needed for the type of repair placed, shall meet the requirements of section 602 and as specified below.

1. **Concrete Saw/Cutting Wheel.** The saw blade/cutting wheel shall be of sufficient size to saw/cut pavements full depth for the depth of repair specified in the pay item.

2. **Metal or Wood Forms.** For repairs 10 feet or less in length, forms shall be one piece. For repairs over 10 feet in length, the forms shall lock together, or shall be spliced, to provide a continuous form. Nominal 2-inch thick lumber shall be used for wood forms on the shoulder sides and nominal 1-inch thick lumber shall be used between lanes.

3. **Drilling Machine.** The machine used to drill the holes in the face of the existing pavement shall be as follows.

a. Capable of drilling the specified diameter holes to the specified depth (± ½ inch) at mid-pavement.

b. Produce holes which are parallel to the pavement surface and parallel to the longitudinal joint within a tolerance of ⅛ inch.

c. Constructed so that when it is positioned against the face of the existing pavement, the holes will be parallel to the longitudinal joint.

d. Constructed with support rails that rest on the pavement surface at both ends of a nominal 8 foot long repair (or other suitable alignment methods) so that the holes are parallel to the surface of the pavement.

e. Forward and reverse travel of the drill shall be controlled by mechanically applied pressure. The drill and pressure mechanism shall be matched to drill the nominal depth holes without cracking the concrete and without causing spalls in excess of ½ inch horizontally or vertically.

f. Equipped with a snug fitting drill guide bushing positioned against the face of the concrete (or other suitable methods) to prevent eccentricity or oversizing of the holes in excess of $^{1}/_{16}$ of an inch, and to maintain the alignment tolerances.

g. The bars shall be spaced according to Standard Plan R-44 Series.

h. The hole size for the dowel bars and the deformed tie bars shall be 1⅜ inches in diameter and 9 inches ± ⅜ inch deep.

i. The hole size for the deformed lane tie bars shall be ¾ of an inch in diameter and 7 inches ± ⅜ inch deep.

4. **Air Wand.** The air wand shall be fully inserted to clean the drilled holes prior to placement of the grout.

5. **Grout Dispenser.** The grout dispenser and static mixing nozzle used in conjunction with bulk grout systems shall be as recommended by the manufacturer of the grout material. The machine shall be capable of properly proportioning the components, mixing the components as they are extruded through the static nozzle, and depositing the mixed material in the back of the hole. The grout dispenser and static mixing nozzle used in conjunction with pre-packaged injection grout systems shall be as supplied by the manufacturer of the grout material. The static mixing nozzle shall be of sufficient length to deposit the grout in the back of the hole. If the Contractor elects to use a bulk grout system, two bulk grout dispensers must be provided on site, or one bulk grout dispenser and a two-day supply of pre-packaged grout material, dispensers, and static mixing nozzles.

6. **Internal Vibrator.** The vibrator shall be approved by the Engineer.

7. **Vibratory or Roller Screeds.** The vibratory screed shall be steel-shod, of sufficient weight and shall vibrate at a suitable frequency so that it is capable of screeding concrete at the specified slump flush with the existing pavement with two passes. Roller type screeds shall have sufficient weight and speed to screed the surface of concrete at the specified slump flush with the existing pavement in two or more passes. Screeds shall be at least 6 inches longer than the width of the pour.

8. **Straightedges.** The Contractor shall provide 6-foot, 8-foot, and 10-foot straightedges.

9. **Membrane Sprayer.** The sprayer for applying curing compound shall meet the requirements of section 602.03.A.12.

10. **Diamond Grinding Equipment.** Grinding operations will use diamond blades mounted on a self propelled machine designed for grinding and texturing pavement. The equipment shall be such that it will not cause damage to the underlying surface of the pavement. Grinding equipment that causes ravels, aggregate fractures, spalls, or disturbance to the transverse or longitudinal joints will not be permitted. Vacuuming equipment shall be used for removal of residue and excess water. The equipment will have a positive means of extracting the slurry material from the pavement and for preventing dust from escaping into the air.

11. **Equipment for Sawing and Sealing Cracks.** The equipment shall conform to subsection 602.03.A.13 except that the crack saw shall be equipped with a diamond blade with a diameter of 8 inches or less.

B. **Construction Requirements for Concrete Pavement Repair.** Construction methods shall be as specified under section 602, except as modified by this subsection.

Repairs shall not be shorter than 6 feet. When the area to be repaired leaves a section of pavement less than 6 feet from an existing joint or less than 15 feet from the next area to be repaired, the Engineer will require that section to be removed also.

If distress is occurring in the lane adjacent to the lane being repaired, the Contractor shall schedule the removal and recasting of concrete repairs in the adjacent lane after the repaired lane is opened to traffic, as approved by the Engineer.

1. **Removing Existing Pavement (Concrete Pavement Repair).**

    a. **Removing Pavement.** Sections of pavement to be removed which are over 50 feet in length shall be removed according to section 204 or subsection 603.03.C.2 below.

    b. **Removing Pavement (Repair).** Removing pavement (repair) consists of the sawing, removal, and disposal of sections of the existing pavement. Sections of pavement to be removed where there is no intent in the plans to disturb the base shall be removed as follows.

    Pavement that is to remain in place but has been spalled by the Contractor during removal operations shall be repaired as follows: Isolated spalls that are less than 10 square inches shall be filled with hot-poured joint sealant. Isolated spalls 10 square inches and greater, numerous spalls in the same joint area, intermediate spalls as defined in subsection 602.03.P.2 and major spalls as defined in subsection 602.03.P.3 shall be repaired by resawing. The new saw cuts shall be located to be in line with or at least 2 feet from a repair in an adjacent lane. Such additional saw cuts, removal, disposal and the additional concrete required for the repair will be at the Contractor's expense.

    Where the portion of pavement to be removed includes part-depth or full-depth HMA patches, removal of the HMA patches will be considered as removal of concrete, without regard to any additional effort which may be involved in the removal of dissimilar materials. Removal shall be such as to avoid disturbing the base.

    Where the area to be repaired includes concrete shoulders, the removal of the shoulders shall be accomplished in the same manner as the removal of the pavement and according to the plans.

    Where the area to be repaired includes the repair of curbing (concrete curb, curb and gutter, or valley gutter), the Contractor shall remove the curbing adjacent to the repair and in line with the joints in the repair. If the curbing removed results in an adjacent free and unconnected length of curbing of less than 6 feet between the saw cut and the nearest existing joint in the curbing, the Contractor shall also remove this short length of curbing, constructing the joint at that location instead of in line with the joint in the repair.

The concrete shall be sawed full depth, in multiple passes within the same 12 hour period or in one pass, according to the details shown in the contract documents. Transverse saw cuts shall be made in a straight line at a right angle to the centerline of the pavement, within a tolerance of one inch per lane width. The longitudinal joint adjacent to other lanes, ramps, shoulders, or curb and gutter shall be sawed full depth. The surface of the pavement shall be flushed with water immediately after the sawing operation to remove all saw slurry. The sawing operations shall not precede the removal operations by more than 2 weeks, unless otherwise approved by the Engineer. The concrete shall not be removed until the day the repair is placed. Concrete between narrowly spaced saw cuts at the end of a slab shall be removed with air hammers and hand tools. Except for utility cuts, lifting devices shall be installed and the slab lifted without disturbing the base. The area shall then be cleaned out with hand tools. Saw slurry shall be removed from all sawed surfaces by appropriate methods.

For repairing pavements previously constructed with blast furnace slag, the Engineer may allow use of a cutting wheel or other approved methods in lieu of a concrete saw to relieve the existing internal pavement stresses. Use of this equipment will be approved to cut the Trg joint ends only if maximum spalls are generally 10 square inches or less and no deterioration of the remaining pavement occurs.

2. **Installing Dowels or Deformed Tie Bars in Transverse Joints.** The faces of the existing pavement shall be drilled with a machine to allow the insertion of the dowel bars or deformed tie bars. Where drilling machines are removed before all holes are drilled to the proper depth, diameter, and alignment, redrilling to the proper depth, diameter, and alignment will be required.

   After the holes are drilled, they shall be cleaned with a blast of oil-free compressed air with a minimum pressure of 90 psi. The air wand shall be fully inserted into the holes at the time of cleaning. After the holes are cleaned, a sufficient quantity of grout shall be deposited into the back of the holes so that the space around the dowel bar or deformed bar is completely filled for the full length of embedment when the bars are inserted. The bars shall be slowly inserted into the holes (with hand pressure) with a twisting motion, until they are fully seated. The inserted length of the dowels or bars shall be fully coated with grout. Excess grout extruded around the bars shall be wiped around the face of the concrete with a metal trowel.

   The fiber filler used in conjunction with expansion joints Erg shall be drilled or punched to match the location of the holes in the existing pavement. The holes shall be drilled or punched in the filler in such a manner as to produce neat, clean holes without excessive tearing of the filler material. After the dowel bars are grouted-in-place, the filler shall be installed and positioned against the existing pavement in one continuous length, except that a short piece of filler may be used to fill a gap resulting from the pavement being wider than the nominal lane width.

   The portion of all dowel bars used in conjunction with contraction joint Crg and expansion joint Erg, which extend beyond the face of the existing pavement or the fiber

filler shall be uniformly coated with an approved bond breaker. Deformed bars used in conjunction with tied joint Trg or grouted-in-place lane ties shall not be coated with a bond breaker.

An approved expansion cap shall be properly installed on the end of each dowel bar for expansion joint Erg, after the application of an approved bond breaker.

3. **Site Preparation.** Where base corrections are required, excavation and backfill shall be as specified under sections 205 and 302. A low base condition in excess of 2 inches which existed prior to removal of the concrete shall be corrected by adding base course aggregate and thoroughly compacting to the proper elevation. Any low base condition which is caused by the Contractor's operation and any low base condition not exceeding 2 inches shall be filled with concrete at no cost to the Department when the repair is constructed.

   Forms shall be set to the proper line and grade. For repairs over 15 feet in length, the repair area in adjacent lanes, ramps, or shoulders shall be cast separately.

4. **Pavement Reinforcement.** The reinforcement shall be positioned and supported according to Standard Plan R-44 Series. The wire size and spacing of the wires shall be as specified according to Standard Plan R-45 Series.

5. **Longitudinal Joints.** Where more than one lane is cast in a single pour, longitudinal joints shall be constructed in line with the existing longitudinal joints and to a depth of one-third the thickness of the pavement, either by sawing before opening to traffic or by forming. An external longitudinal joint is not required between concrete pavement repairs and concrete curbing or shoulders.

   Lane ties shall be installed according to Standard Plan R-44 Series. Grouted-in-place lane ties shall be constructed in the same manner as deformed bars used in conjunction with tied joint Trg, except that the holes may be drilled with a handheld drill.

6. **Transverse Joints.** Transverse joints in pavement, shoulders, and curb repairs shall be of the type shown on the plans. Where existing curbs are to be left in place and expansion space is provided in the adjacent lane repair, an expansion joint Esc shall be constructed by sawing and chipping. The width of the joint shall be equal to the width of the joint in the adjacent lane repair. The joint shall be constructed in line with the expansion joint in repair. The fiber joint filler material shall be shaped to fit the specified curb cross section.

7. **Placing Concrete.** Sufficient staff, equipment, and material shall be available at the project site prior to beginning concrete placement. This requirement is a priority until all concrete placed is protected. Unless otherwise approved by the Engineer, concrete shall be placed the same day that the existing pavement is removed.

   Immediately prior to the concrete placement, the faces of the existing pavement and the surface of the aggregate base shall be wetted with water.

Each repair shall be cast in one continuous full-depth operation. The concrete shall be consolidated by use of a hand-held immersion-type vibrator. Special attention shall be given to consolidating the concrete around dowel bars, deformed tie bars, and deformed lane tie bars.

8. **Finishing Requirement.** The surface shall be struck off flush with the existing pavement surface at least twice with the vibratory or roller screed. Floating in lieu of striking off with a screed is not acceptable. For repairs 15 feet or less in length, the screed shall be placed parallel to the centerline of the roadway. For repairs over 15 feet in length, the screed shall be placed perpendicular to the centerline.

   While the concrete is still plastic, the Contractor shall test the repair surface for trueness and for being flush with the edges of the repair by use of a straightedge and according to the following:

   For repairs 10 feet or less in length, the straightedging shall be done by placing the straightedge parallel to the pavement centerline with the ends resting on the existing pavement and drawing the straightedge across the repair. The straightedging of 6-foot, 8-foot and 10-foot repairs shall be accomplished by use of a straightedge not exceeding the length of the repair by more than 6 inches. The straightedge shall be in contact with the existing pavement while drawing it across the repair and any high or low spots exceeding ⅛ inch shall be corrected. If any corrections are made, the Contractor shall recheck the surface and eliminate irregularities.

   For repairs over 10 feet in length, the straightedging shall be done according to subsection 602.03.I, except that the first and the last measurement shall be made with approximately half of the straightedge resting on the existing pavement, and the second and the next to last measurement shall each be made with 2 to 3 inches of the straightedge resting on the existing pavement. Any irregularities in excess of ⅛ inch in 10 feet shall be corrected.

   Prior to texturing, an edger with a ⅛ to ¼ inch radius shall be run along the entire periphery of the repair to round the corner of the concrete. The temporary forms shall be removed after the concrete has gained sufficient strength to allow removal of the forms without the concrete sagging or spalling.

9. **Texturing.** The surface of the repair shall be textured transversely to the pavement centerline by use of a broom to a texture similar to the texture of the adjacent pavement. If the repair is to be overlaid with HMA, texturing shall be omitted.

10. **Stenciling.** The month and the year shall be stenciled in each repair according to subsection 602.03.L. If the existing stationing is removed the station shall be stenciled in the repair at the appropriate location.

11. **Curing.** Curing compound shall be applied immediately after any free water has evaporated from the surface. White membrane curing compound shall be used, except that if the repair is to be overlaid with HMA then transparent curing compound shall be

used. Both types of curing compound shall be applied at a rate of not less than 1 gallon per 20 square yards.

Curing compound application shall be ongoing, continuous, and closely coordinated with concrete placement and finishing. The Contractor shall not delay application of curing compound in preference of other work items while concrete is being placed and finished.

If at any time, the Contractor is not able to apply curing compound as specified, concrete placement shall stop immediately. The portion of concrete placed that has not been protected with curing compound shall be covered and kept continuously wet until membrane curing compound can be applied. The Contractor shall wet the pavement in a manner that does not damage the surface of the pavement.

If the layer of curing compound is damaged by rain or other means, such as sawing of joints or foot traffic to carry on the work, before the pavement obtains 70 percent of its design strength, an additional application shall be immediately applied to any of the affected areas.

The Contractor shall place insulated blankets as necessary to meet open to traffic requirements and protect pavement from weather damage. These insulated blankets shall have a minimum thickness of 2 inches and shall be placed over the repaired area as soon as the curing compound has been applied when the air temperature during the curing period falls below 65°F for Type P-MS and P-NC concrete repairs. Edges and seams in the blanket shall be secured to prevent loss of heat. The Contractor is responsible for protecting the concrete until the concrete has attained a flexural strength of 500 psi for Type P-MS and P-NC concrete. The Contractor's quality control plan shall address the method for achieving the open to traffic strength within the specified time. Test beams, for open to traffic strengths, shall be cured the same as the repair.

12. **Cleaning Joints.** All concrete remaining on top of the filler in the expansion joint shall be removed prior to blast cleaning. All joints, except tied joint Trg, shall be blast cleaned and then cleaned with a jet of compressed-air, free of oil and water, having a minimum pressure of 90 psi, immediately prior to sealing. A bond breaker tape shall be placed in the bottom of the contraction joint Crg groove after the final cleaning and prior to sealing.

13. **Sawing and Sealing Joints.** Longitudinal bulkhead joints, joints in base course repairs, joints in repairs constructed in preparation for HMA overlays, and tied joints Trg need not be constructed with reservoirs for seals and need not be sealed. All other joints and all sawcuts which were made in pavements, shoulders, or gutters by overcutting, shall be cleaned and then sealed with hot-poured sealant.

    Joint grooves for the contraction joint Crg shall be saw cut to ½ inch wide and ¾ inch deep.

    For an expansion joint Erg the expansion joint fiber filler shall extend the full depth of the repair and be flush with existing pavement surface. Prior to sealing, the joint fiber

filler at the pavement surface shall be removed by saw cutting 1 inch wide and 1½ inches deep to permit the placement of sealant.

Contraction joints C2 and expansion joints E2 shall be final sawed according to standard plans.

Joint grooves for C2 and E2 joints shall be sawed as soon as the concrete has hardened enough so that no excess raveling or spalling occurs but before any random cracks develop. The joint groove may be constructed in a two stage operation with stage one being the relief cut and stage two extending the groove to the plan width and depth as specified in subsection 602.03N. The choice of sawing an initial relief cut or initially sawing to the plan dimensions shall be at the Contractor's option.

14. **Resealing Transverse and Longitudinal Pavement Joints.** The joints shall be sealed with hot-poured sealant as specified in subsection 602.03.S after all concrete pavement repair, spall repair and pavement texturing or profiling is done. The transverse and longitudinal joints shall be resawed over the existing joint groove to produce a finished joint with two freshly sawed faces. Immediately following the sawing operation, the joint groove shall be flushed with water at sufficient pressure to remove the slurry and debris from the joint groove. After final cleaning of the joints, a backer rod shall be inserted into the joint to provide a 1:1 width to depth ratio of the hot-poured sealant. The joint groove shall be sealed flush to ⅛ inch (after cooling) below the surface of the pavement.

15. **HMA Shoulder Replacement.** Prior to opening to traffic, HMA shoulders shall be restored to the existing line and grade using a plant-mixed HMA as directed by the Engineer. Cold patch mixtures used for temporary patching shall be replaced with plant-mixed HMA, unless shoulder reconstruction is a part of the project and has not been accomplished. The HMA shall be compacted by mechanical or hand methods suitable for the size hole being filled. The voids shall be filled and compacted flush with the surrounding shoulder. Hot-mixed asphalt shall be placed at a temperature suitable for compaction.

    Materials removed from the shoulder shall be disposed of by the Contractor.

16. **Opening to Traffic.** The concrete repairs may be opened to traffic when the new concrete has attained a flexural strength of 500 psi and all joints have been sawed in accordance with section 603.03.B.13. Traffic may be allowed over the repair prior to cleaning and sealing the joints.

C. **Diamond Grinding Concrete Pavement.** Grinding will be performed in a longitudinal direction and will begin and end at lines perpendicular to the pavement centerline. The area ground shall not be left slick or polished. Grinding shall be discontinued when there is danger of water freezing. Grinding limits will be as shown in the contract documents.

    Reflective pavement markers (RPM) shall not be disturbed as part of the grinding operation. Grinding shall be tapered to the existing pavement surface within 2 inches of the RPM.

A minimum of 95 percent of the pavement surface shall be textured by the grinding operation. Extra depth grinding to eliminate minor depressions in order to provide texturing of the entire pavement surface is not required. Exceptions can be made as directed by the Engineer.

Faulting at transverse cracks and joints should not exceed 1/16 inch after grinding. Areas in excess of 1/16 inch shall be re-ground until faulting is less than 1/16 inch.

Grinding shall result in a parallel corduroy type texturing consisting of grooves 1/16 to ⅛ inch wide. The center-to-center spacing of grooves shall be 1/16 to ⅛ inch. The peaks of the ridge shall average approximately 1/16 of an inch higher than the bottom of the grooves. The finished texture shall be uniform. The transverse slope of the pavement shall be uniform to the degree that no depressions or misalignment of slope greater than ⅛ inch in 10 feet exists when checked with a 10-foot straightedge. Straightedge requirements do not apply across longitudinal joints or outside of ground areas. Adequate cross slope drainage must result after grinding so that no ponding of water occurs.

Auxiliary or ramp lane grinding shall transition, as required, from the mainline edge to provide positive drainage and acceptable riding surface. Transitions from ground to unground pavement surfaces shall be gradual to conform to rideability. Transitions will be determined by the Engineer.

All joint restoration work (except sealing) shall be completed prior to the diamond grinding operation. All sealing of joints shall be completed after the grinding operation.

1. **Disposal of grinding residue.** The work of diamond grinding concrete includes the following.

    a. At no time will the grinding residue be allowed to enter a closed drain system. A suitable means to restrict the infiltration of the grinding residue into the closed drain system shall be provided.

    b. The Contractor will be responsible for hauling the grinding residue to a suitable location. With approval of the Engineer, the grinding residue can be spread along the slopes of the roadway a minimum of 5 feet from the edge of curb.

    c. Residue will not be spread within100 feet of any natural stream or lake.

    d. Residue will not be spread within 15 feet of a water filled ditch.

    e. The spread rate will not generate surface runoff. If surface runoff occurs at the grinding location, the Contractor will haul the grinding residue to a suitable location at the grinding location at no additional cost.

    f. The Contractor shall obtain the Engineer's approval for the spreading/disposal method prior to beginning the grinding operation.

D. **Resawing and Sealing Longitudinal and Transverse Pavement Joints.** This work includes resawing and sealing existing longitudinal and transverse concrete pavement joints.

The longitudinal and transverse joints shall be resawed to the dimensions specified, cleaned, and sealed with a low-modulus hot-poured joint sealant as directed by the Engineer.

The joints shall be sealed with the hot-poured sealant as specified in subsection 602.03.S with the following exceptions and additions.

1. Spalls along the longitudinal joint are to be repaired as directed by the Engineer. The spalls shall be repaired prior to resawing the longitudinal joint.

2. The existing longitudinal and transverse joints shall be resawed to a depth of 1 to 1¼ inches and a width of ¼ to ½ inch. Immediately following the sawing operation, the joint groove shall be flushed with water at sufficient pressure to remove the slurry and debris from the joint groove. The longitudinal joints shall be sawed prior to resealing the intersecting transverse joints.

3. The joints shall receive a final cleaning, just prior to sealing, as specified in Subsection 602.03 R. After final cleaning, a backer rod shall be inserted into the longitudinal joint to a depth that will provide a 1:1 width to depth ratio of the low-modulus hot-poured joint sealant.

4. The faces of the joint groove and the pavement surface shall be dry at the time of sealing. The joint groove shall be sealed flush to ⅛ inch (after cooling) below the surface of the pavement.

E. **Sawing and Sealing Cracks.** The cracks shall be sealed with a hot-poured sealant as follows.

1. **Crack Sawing.** All cracks shall be sawed to a width of ⅝ to ⅞ inch and a depth of ⅝ to ⅞ inch.

2. **Crack Cleaning.** All slivers of concrete less than one inch in width remaining along the crack after sawing shall be removed with hand tools or a lightweight chipping hammer. Immediately prior to sealing, both faces of the sawed crack shall be dry abrasive blasted to remove all contamination and to texture the faces. After dry abrasive blasting, the crack shall be cleaned of all debris and residue with oil-free compressed air at a minimum pressure of 90 psi.

3. **Crack Sealing.** The faces of the crack and pavement surface shall be dry at the time of sealing. If the crack below the sealant reservoir is greater than ⅜ inch wide, a backer rod shall be inserted into the crack to form the bottom of the reservoir at the proper depth. The surface of the sealant (after cooling) shall be flush to ⅛ inch below the surface of the pavement.

Due to the crown of the roadway and the slope of the shoulder it may be necessary to fill the reservoir in two or more passes and/or place temporary dikes in the sealed reservoir. The temporary dikes shall be removed before the sealant has fully cooled and the resulting cavity shall be sealed. Additional sealant shall be applied prior to any contamination of the previous application.

F. **Testing (Diamond Grinding Concrete Pavement).** The Department will take random samples of the grinding residue and cooling water for chemical testing. The Contractor shall allow access for Department personnel to obtain the samples.

603.04 Measurement and Payment.

Contract Item (Pay Item)	**Pay Unit**
Pavt Rep, Conc, Moving from Repair to Repair	Each
Pavt Rep, Rem	Square Yard
Saw Cut, Intermediate	Yard
Pavt Rep, Reinf Conc, ___ inch	Square Yard
Pavt Rep, Nonreinforced Conc, ____ inch	Square Yard
Calcium Chloride	Pound
Non-Chloride Accelerator	Gallon
Joint, Contraction, Crg	Foot
Joint, Expansion, Erg	Foot
Joint, Expansion, Esc	Foot
Joint, Tied, Trg	Foot
Lane Tie, Epoxy Anchored	Each
Diamond Grinding Conc Pavt	Square Yard
Resawing and Sealing Longit Pavt Joints	Foot
Resealing Trans Joints with Hot-Poured Rubber	Foot
Resealing Longit Joints with Hot-Poured Rubber	Foot
Crack Sealing, Conc Pavt	Foot
Resawing and Sealing Trans Pavt Joints	Foot

Final pavement repair thickness will be determined as per subsection 603.04.C. Pavement repairs which have been cored and found to be deficient in depth and/or with reinforcement improperly located will be paid for at an adjusted unit price as provided under subsection 602.04.

A. **Pavt Repair, Conc, Moving from Rep to Rep** includes the cost of relocating all the necessary materials, labor, and equipment from repair site to repair site. If more than one lane is repaired in one operation, it will be considered as one operation. The moving of labor, material, and equipment to the first repair site and removing the same from the project is considered as part of the item of mobilization according to section 150.

B. **Pavt Rep, Rem** applies to sections of pavement to be removed where there is no intent in the plans to disturb the base. The work includes the saw cuts, and the removal of adjacent concrete shoulders, curb, curb and gutter, and valley gutter; the removal of areas of concrete pavement having part-depth or full-depth HMA patches; lifting the section out without disturbing the base; and loading, hauling, and disposing of the material removed

and placing of any HMA mixture necessary to restore the shoulders to the existing line and grade. The pavement removed will be replaced as per subsection 603.04.

Saw Cut, Intermediate only applies to sections of pavement where the item **Pavt Rep, Rem** applies; it does not apply to sections of pavement where the item **Pavt, Rem** applies. Payment will be made for the cost of making intermediate saw cuts to remove a section of a pavement lane which is over 6 feet in length, if required to permit loading onto the hauling unit. Additional saw cuts made at the option of the Contractor to reduce slabs into pieces smaller than 6 feet by one lane width will not be paid for separately.

C. **Pavt Rep, Reinf Conc**, of the thickness specified, will be measured by area in square yards. Longitudinal measurements for area will be made along the actual surface of the roadway. Transverse measurements shall be the dimension shown in the contract documents. Payment includes furnishing, placing, finishing, texturing, stenciling, and curing the concrete; furnishing and placing bar chairs and the steel reinforcement; furnishing any additional concrete required to correct low base conditions which do not exceed 2 inches in depth.

The depth of the repair specified in the pay item is considered the average depth of concrete that will be required for the repairs. The pay-item depth is based on the plan thickness originally specified for the existing concrete pavement plus one inch. It is expected that the depth of concrete placed in the repairs will not vary more than ± one inch from the pay-item depth. Any work required to correct low base conditions, caused by the Contractor's removal operation, will not be paid for separately but will be considered as having been included in the contract unit prices bid for other contract items. Site preparation required to correct base conditions in excess of 2 inches not caused by the Contractor's operations shall be paid for as provided under applicable contract items. When there are no applicable contract items, the work shall be paid for as extra work.

D. If the Engineer determines that the time from the casting of the repair area to the intended opening to traffic requires the use of faster setting concrete mixtures (Grade HE or Type P-MS mixtures), the Contractor, in addition to the square yards of concrete pavement repair placed, will be paid for extra cement. The cement will be measured by weight in tons and paid for as specified in subsection 602.04 on the following basis: 94 pounds per cubic yard will be paid for where Grade HE concrete is required, and 282 pounds per cubic yard will be paid for where Type P-MS concrete is required. For Type P-NC concrete, 94 pounds per cubic yard will be paid for when the anticipated air temperature is above 59 °F and 188 pounds per cubic yard will be paid for when the anticipated air temperature is 59 °F and below.

E. When the Engineer requires **Calcium Chloride** to be added to the concrete mixture, it will be measured by weight in pounds of 77 percent flake chloride required to be added. The pay quantity will be the number of sacks of flake chloride used times the nominal weight indicated on the sacks.

Calcium chloride used for base stabilization will not be paid for separately.

F. When the Engineer requires a Type C or E **Non-Chloride Accelerator** to be added to the concrete mixture it will be measured by volume in gallons based on the actual quantity printed on the automated batch ticket and paid for at contract unit prices. Deductions will be made for wasted or rejected materials.

G. The repair of concrete shoulders, curbs, and/or gutters will be measured in square yards and paid for as **Pavt Rep, Conc, Nonrein**, and of the same thickness as the adjacent pavement repair.

H. **Joints.**

1. **Joint, Expansion, Esc** will be measured by length in feet. Payment for the joint includes the cost of sawing and chipping the joint in the type of curb specified and furnishing and installing the joint filler material.

2. **Joint, Contraction, Crg; Joint, Expansion, Erg;** and **Joint, Tied, Trg**, will be measured by length in feet. Payment for the joint includes the cost of making the saw cuts required at the ends of the repairs; removing the saw slurry from the pavement surface and sawed faces; drilling and cleaning the holes for the dowel bars and deformed bars; furnishing, mixing, and installing the grout; furnishing and installing the dowel bars and deformed bars; and sawing the joint grooves. Payment for **Joint, Contraction, Crg** also includes furnishing and applying the dowel bar bond breaker coating; cleaning and preparing the joint groove; furnishing and installing the bond breaker tape; and furnishing and installing the joint groove sealant. Payment for **Joint, Expansion, Erg** also includes furnishing and applying the dowel bar bond breaker coating; furnishing, drilling (or punching), and installing the fiber filler; furnishing and installing the dowel bar expansion caps; cleaning and preparing the joint groove; and furnishing and installing the joint groove sealant. The sawing included in this item is for the pay-item repair depth; depths encountered in excess of one inch over the pay-item repair depth will be paid for as extra work.

3. **Transverse Plane-of-Weakness Joints D1**, required in concrete pavement repairs, will be measured and paid for as specified in subsection 602.04.

4. **Transverse Plane-of-Weakness Joints U**, required in concrete base course repairs, will not be paid for separately but will be considered to have been included in the payment for concrete pavement repair.

I. **Lane Tie, Epoxy Anchored** will be paid for as units. The contract unit price includes the cost of drilling and cleaning the holes; furnishing, mixing, and installing the grout; and furnishing and installing the deformed bars.

Final trim and clean-up, part-width construction, and restoration of shoulders will not be paid for separately but will be considered as having been included in associated items of work.

J. **Diamond Grinding Conc Pavt** will be measured by area in square yards. Pay areas will include the final textured surface area. No deductions will be made for minor

areas of untextured pavement provided that minor areas total no more than 5 percent of the designated area to be textured.

The work of collection, hauling and spreading of the grinding residue is included in the contract unit price for diamond grinding. Payment for additional passes or regrinding to meet ride quality requirements will not be paid for separately and will be included in other contract items.

K. Payment for **Resawing and Sealing Longit Pavt Joints** includes sawing, cleaning, and sealing the joints, with the exception of spall repair, which will be paid for separately.

L. **Resealing Trans Joints with Hot-Poured Rubber and Resealing Longit Joints with Hot-Poured Rubber** include removing all existing sealants and cleaning and sealing the joints. This item will be measured in a straight line in the general direction of each joint.

M. **Crack Sealing, Conc Pavt** will be measured in a straight line in the general direction of each crack.