Section 2529. Full Depth Finish Patches

2529.01 DESCRIPTION.

A. Remove pavement in areas designated by the Engineer to be patches. Restore the subbase and/or subgrade and furnish and place subbase aggregate, furnish and place patching material, and restore the shoulder area. Construct a new finished traffic surface in the patch area.

B. Work under this specification may include the types of patches listed below. Generally, the patch type will be consistent with the existing pavement.

1. Full depth HMA finish patches.

2. Full depth PCC finish patches, without dowels.

3. Full depth PCC finish patches, without dowels, composite section.

4. Full depth PCC finish patches, with dowels.

5. Full depth PCC finish patches, with dowels, composite section.

6. Full depth PCC finish patches, continuously reinforced.

7. Full depth PCC finish patches, continuously reinforced, composite section.

2529.02 MATERIALS.

A. Hot Mix Asphalt Mixture.
Unless stated elsewhere in the contract documents, use HMA meeting or exceeding Section 2303 requirements for a 300,000 ESAL surface mixture with a PG 64-22 Performance Graded asphalt binder.

B. Portland Cement Concrete.
It is the intention to obtain concrete with a high early strength for early opening to traffic. Meet the requirements of the current Materials I.M. 529 with the following modifications:

1. Slump.
a. Slump, measured according to Materials I.M. 317 prior to addition of calcium chloride solution, is to be between 1 inch (25 mm) and 2 1/2 inches (65 mm) as a target range, allowing a maximum of 3 inches (75 mm). If calcium chloride solution is not to be added, the slump is to be between 1 inch (25 mm) and 3 inches (75 mm) as a target range, allowing a maximum of 4 inches (100 mm).
b. When a Type A Mid Range water reducing admixture is used, the slump, tested prior to the addition of calcium chloride, is to be between 1 inch (25 mm) and 4 inches (100 mm) as a target range, allowing a maximum of 5 inches (125 mm).

2. Air Entrainment.
The entrained air content of the unconsolidated concrete will be determined according to Materials I.M. 318, prior to addition of calcium chloride if it is to be added. The air entrainment shall be as follows:
a. When calcium chloride is to be added: 5.0%, with a tolerance of ± 2.0%.
b. When no calcium chloride is to be added: 6.5%, with a tolerance of ± 1.5%.

3. Temperature.
Refer to Paragraph 4 below for temperature requirements of Full Depth Portland Cement Concrete patching material, as delivered to the job site. Heat the water or aggregate, or both, if necessary to meet this requirement. The cost of heating is incidental to patching.

4. Cement.
For Class M mixes, meet the requirements of Section 4101. Table 2529.02-1 lists cement types and maximum allowable substitution rates. The maximum substitution for Type IS shall not exceed 25%.

Table 2529.02-1: Cement Types and Maximum Allowable Substitution Rates

Patch Type	Cement Type	Maximum Allowable Substitution	Minimum Mix Temperature
5 Hour	Type I, Type II Type IS	0% Fly Ash 0% Fly Ash	75ºF (24ºC) 80ºF (27ºC)*
10 Hour	Type I, Type II Type IS	10% Fly Ash 0% Fly Ash	65ºF (18ºC) 70ºF (21ºC)*
* When a Type A Mid Range Water reducing admixture is used, limit the minimum mix temperature to that required when Type I/II cement is used.			

5. **Calcium Chloride.**
   a. When calcium chloride is required, furnish it in water soluble form and add it to the mixture at the job site. Use a commercial 32% calcium chloride solution, or equivalent, prepared according to Table 2529.02-2:

Table 2529.02-2: Proportions for 32% Calcium Chloride Solutions

Type of Solid Calcium Chloride	Pounds (Grams) of Solid per Gallon (liter) of Water	Solution Produced per Gallon (Liter) of Water
Type 1 – Regular Flake (77% material)	7 (840)	1.35
Type 2 – Concrete Flake or Pellets (94% material)	5 (600)	1.18

   b. Add the solution at the rate of 2.75 gallons per cubic yard (13.6 L/m^3) of concrete. The Engineer may approve alternate calcium chloride solutions of different concentrations provided appropriate adjustments in the total concrete composition are made.
   c. Agitate the mixture until the calcium chloride is completely in solution. Continue agitation, as necessary, to maintain uniformity. The calcium chloride will crystallize out of a 32% solution at 20°F (-7°C), so the solution shall be maintained at a higher temperature at all times.
   d. Except when using continuous mixing equipment described in Article 2001.20, E, ensure the calcium chloride solution is present in the mix for at least 2 minutes of mixing.

6. **Water Reducer.**
   A Type A Mid Range water reducing admixture may be used. Use one listed in Materials I.M. 403, at the manufacturer's recommended dosage.

7. **Aggregate Durability.**
   Unless specified otherwise, use coarse aggregate of the proper class of durability as defined in Article 4115.04.

8. **Transit Mix Concrete.**
   Use a mix from a plant from which the concrete can be delivered and placed within 60 minutes from the time of mixing. The time may be extended to 90 minutes when a retarding admixture, used according to Materials I.M. 403 including temperature dosage guidelines (and at no additional cost to the Contracting Authority), is added at the plant. Continuous mixing equipment using volumetric proportioning may be used according to Article 2001.20, E. Place the concrete within 30 minutes after introduction of calcium chloride.

9. **Concrete Mixtures.**
   For PCC patches, use Class M mixtures with calcium chloride. The Engineer may waive the use of calcium chloride on patches cured longer than 10 hours.

10. **Dowel Bars and Tie Bars.**
Use epoxy coated dowel bars meeting the requirements of Article 4151.02, C. Use tie bars cut from epoxy coated reinforcing bars as specified in Article 4151.03, C.

C. Joint Sealing Material.
Use joint sealer and backer rod meeting the requirements of Article 4136.02, A, 1. When joint or crack sealing or filling is a part of the contract, use only hot pour material.

D. Tack Coat Bitumen.
As specified in Article 2303.02, E.

E. Subbase.
Meet the requirements of Section 4121.

2529.03 CONSTRUCTION.

A. General.

1. The contract documents will include a tabulation of patches showing location and approximate area. This tabulation is intended primarily for estimating purposes. The actual patch location and size will be determined by the Engineer. The patch thickness and type of patch material may be included. The contract documents will identify the existing pavement type, thickness, and reinforcement, and may identify the coarse aggregate classification. A detail, typical of each type of patch, will be shown.

2. When the contract documents include reconstruction of gore areas, this work may be done as a separate operation. For PCC patches in gore areas, mixtures with calcium chloride will be allowed. Cure the concrete as specified for the mixture used.
3. When the contract documents include joint and crack sealing, perform joint sealing of the patches as part of that work.

B. Full Depth Patch Thickness.
If full depth patch thickness is not shown in the contract documents, establish thickness as follows:

1. **HMA Patches.**
Interstate and Primary pavement: the thickness of the HMA pavement, but no less than 9 inches (230 mm) or more than 15 inches (380 mm).

2. **PCC Patches.**
   a. PCC pavements on Interstate and Primary Roads: the thickness of the pavement but no less than 9 inches (230 mm) or more than 12 inches (300 mm).
   b. County roads: thickness no less than 6 inches (150 mm) or more than 12 inches (300 mm).

3. **Composite Patches.**
PCC pavements which have been resurfaced with HMA: patch materials and thickness the same as the existing pavement except the PCC portion of the patch is not to be less than 9 inches (230 mm) or more than 12 inches (300 m) unless specified otherwise in the contract documents. If the HMA resurfacing exceeds 4 1/2 inches (120 mm) (nominal) place an HMA patch, unless specified otherwise in the contract documents.

C. Pavement Removal.

1. **General.**
Remove pavement for full depth patch construction according to the following requirements:
   a. When repairing PCC pavement, even though it may have been resurfaced, remove the material for the full pavement depth, unless designated otherwise. Excavation will be required for the patch thickness and, if required, for the granular subbase.
   b. The contract documents will include an estimate of the number of anchor lugs to be removed. When an anchor lug is encountered within an area to be patched:
      - Break the anchor lug down to approximately 6 inches (150 mm) below the bottom of the pavement,

- Remove all exposed anchor lug reinforcing, and
- Replace the concrete with granular subbase aggregate, compacted as required, to the elevation of the bottom of the patch.

c. Remove reinforcement from the patch area, and to approximately 1 inch (25 mm) or less from the concrete that is to remain, except for continuously reinforced pavements.

d. Unless shown otherwise in the contract documents, construct all patches to be full lane width. The length of each patch, measured parallel to the center line, will not be less than 6 feet (1.8 m) on Interstate pavements and 4 feet (1.2 m) on other pavements except continuously reinforced full depth finish patches. Continuously reinforced patches will not be less than 8 feet (2.4 m) in length.

e. Perform pavement removal according to Article 2510.03, A.

2. Full Depth HMA Finish Patches.

Except where an existing longitudinal or transverse joint forms an edge of the patch, construct the patch edge by sawing full depth of the patch. Use a saw, a concrete cutter, or other equipment that will result in a reasonably vertical edge. For patches in HMA pavement, a 15 inch (380 mm) deep saw cut will be considered full depth. After sawing, a drop hammer, hydrohammer, or other heavy equipment may be used. Do not damage pavement that will remain.

3. Full Depth PCC Finish Patches, With or Without Dowels.

This applies to PCC finish patches for jointed PCC pavement, including composite sections of resurfaced PCC pavement.

a. Patches With Dowels.

Saw the edges of proposed patches to full depth with a blade saw.

b. Patches Without Dowels.

1) Saw the transverse edges of proposed patches to a depth of 1 1/2 inches (40 mm) with a blade saw. Sever the pavement by a full depth cut with a saw or concrete cutter approximately 1 1/2 inches (40 mm) inside the original 1 1/2 inch (40 mm) transverse saw cut. Saw the edges at center lines and lane lines with a blade saw.

2) After severance is made, pavement in removal areas may be broken by use of a drop hammer, hydrohammer, or other heavy equipment. Perform this work in a manner to not damage concrete that is to remain. Do not use heavy equipment adjacent to new concrete until the specified curing is completed.

3) Complete the preparation of patch edges using equipment no heavier than a 15 pound (7 kg) air chisel. A 30 pound (14 kg) air chisel may be used if its use does not result in significant undercutting of the pavement. The finished transverse edge shall be sawed to 1 1/2 inches (40 mm) as specified above. Remove the ledge at the bottom of the 1 1/2 inch (40 mm) saw cut to the bottom of the pavement at a uniform constant taper towards the patch interior. Limit the removal to within 0 to 1 1/2 inches (0 mm to 40 mm) from vertical. Roughen the surface to promote interlock. Avoid undercutting. If spalling at the top edge or undercutting continues, the Engineer may withdraw permission to use equipment heavier than a 15 pound (7 kg) air chisel.

4. Full Depth PCC Finish Patches, Continuously Reinforced.

This method applies to PCC finish patches for continuously reinforced PCC pavement, including composite sections of resurfaced PCC pavement, where the continuous reinforcement is to be restored.

a. Construct the transverse edges of the patch with a blade saw to a nominal depth of 1 1/2 inches (40 mm). Avoiding cutting longitudinal reinforcement. Saw the edges at center lines and lane lines with a blade saw through existing tie bars.

b. Within the patch area, sever the pavement transversely by a full depth cut with a blade saw inside the 1 1/2 inch (40 mm) saw cut to a depth through the existing reinforcing. Locate this severance so as to leave a minimum of 20 inches (500 mm) of longitudinal steel protruding into the patch area.

c. Break the pavement in such a manner not to damage concrete that will remain. Do not use heavy equipment adjacent to new concrete until the specified curing is completed.

d. Use jackhammers or other hand equipment to remove pavement between the 1 1/2 inch (40 mm) saw cut and the severance. Complete the edge of the patch at the 1 1/2 (40 mm) inch saw cut using equipment no heavier than a 15 pound (7 kg) air chisel. A 30 pound (14 kg) air chisel may be used if its use does not result in significant undercutting of the pavement. Remove the shoulder at the bottom of the 1 1/2 inch (40 mm) saw cut. Ensure

the edge below the saw cut is reasonably vertical, tapered to the interior of the patch, and has a rough surface to promote interlock. Work with the air chisel should continue until the taper at the bottom of the pavement is approximately within 0 to 1 1/2 inches (0 mm to 40 mm) from vertical. Avoid undercutting. If necessary, reconstruct the saw cut so the top edge at the pavement surface is not frayed or spalled. If spalling at the top edge or undercutting continues, the Engineer may withdraw permission to use equipment heavier than a 15 pound (7 kg) air chisel.

e. Break or remove pavement in such a manner that protruding longitudinal steel is not unduly disturbed. Preserve a 20 inch (500 mm) length of longitudinal steel. Do not bend the steel more than the minimum necessary for concrete removal and subgrade or subbase compaction.

5. Full Depth Composite Patches.
When an existing PCC pavement has been resurfaced with 4 1/2 inches (120 mm) of HMA or less, construct the patch according to Section 2212, PCC Full Depth Repair Patches and HMA Surface Patches to result in a composite patch, unless specified otherwise in the contract documents. Lightly tack the PCC area and edges of the patch, and place the hot mixture in the remaining depth and compact, while hot, to provide a dense, smooth riding surface.

D. Restoring Subbase or Subgrade for Full Depth Finish Patches.

1. When subbase is required by the contract documents or by the Engineer, remove the exposed subbase or subgrade, or both, to a depth of 6 inches (150 mm) below the bottom of the new patch. Replace with subbase. When unstable material or excessive moisture is encountered in the subgrade, the Engineer may order an additional thickness of subbase, if necessary, to ensure drainage.

2. When the existing subgrade, base, or subbase is damaged during removal operations and subbase placement is not required, perform repairs at no additional cost to the Contracting Authority. Overdepth removal may be replaced with granular subbase material or the patching mixture. When the granular subbase material cannot be properly drained, replace the overdepth removal with the patching mixture.

3. Place subbase material with a field optimum moisture content established by the Engineer. Place it in lifts not exceeding a nominal compacted thickness of 6 inches (150 mm). Compact the material by a minimum of four complete coverages using a vibratory compactor, with additional coverages as necessary to ensure maximum consolidation. The compaction procedure for subbase normally will be established by the Engineer using the initial area as a trial section.

4. Compact the exposed subgrade or subbase by a minimum of four complete coverages using a plate type vibratory compactor with a manufacturer's certified force rating of 6,000 pounds (26 kN).

E. Restoring Reinforcement for Portland Cement Concrete and Continuously Reinforced Concrete Finish Patches.
Cut off existing tie bars. Replace when required by the contract documents. Place new tie bars in predrilled holes using epoxy grout, as provided in Article 2301.03, E. When there is a common line for patching, a bent bar may be placed in a keyway and later straightened.

1. PCC Finish Patches without Dowels.
Restoration of reinforcement is not required, except for tie bars as described above.

2. PCC Finish Patches with Dowels.

a. When dowels and/or tie bars are required at the transverse edges of the patch, the contract documents will show details of the placement. Place individual dowels or tie bars in predrilled holes using epoxy grout, according to Article 2301.03, E. Control the drilling alignment using a suitable jig designed for that purpose. Coat the dowels extending into the patch area with a bond breaker. Do not coat reinforcing bars.

b. When CD joints are required, the contract documents will show details of the placement of dowel assemblies. Locate these joints to meet joints or cracks in the adjacent lane. Use dowel assemblies meeting the requirements of Article 4151.02, C. Place the dowel

assemblies and secure in proper position before the concrete is placed, according to Article 2301.03, E.

3. **PCC Finish Patches, Continuously Reinforced.**
   a. After the subbase, if required, is in place and compacted, set new reinforcement. Make the protruding longitudinal reinforcement ends as true as practical. Clean them of loose concrete and concrete which would interfere with close placement of new reinforcement.
   b. Restore longitudinal reinforcement using bars of the same grade, size, and spacing as in the original pavement. The contract documents will describe the reinforcement in the existing pavement.
   c. Set new longitudinal reinforcement to connect the longitudinal reinforcement across the repair area, lapping the protruding reinforcement at the same elevation. Wire tie at least twice. Furnish bars (maximum length 20 feet (6 m)) in appropriate lengths to minimize the number of splices.

F. Subdrains.

When subbase material and longitudinal subdrains are required by the contract documents or the Engineer, place the subbase as backfill material to drain to the longitudinal subdrain.

G. Placing Full Depth Hot Mix Asphalt Finish Patches.

1. After removal of the old pavement, lightly tack the edges of the old pavement and the adjacent 1 foot (0.3 m) of subgrade.

2. Deposit the HMA patch mixture in layers. Deposit the upper 5 inches (125 mm) in at least two layers, with the top layer not exceeding 2 inches (50 mm) in thickness when compacted. Lifts should be at least 3 times the mixture size. Thoroughly compact each layer, while hot, by rolling or compacting with a vibratory compactor to provide a dense compacted surface. Succeeding layers may be placed as soon as the preceding layer has been properly compacted. Smooth the final layer with a steel tired finish roller meeting requirements of Article 2001.05, B or F. A roller meeting requirements of Article 2001.05, F, may be a small roller suitable for this type of operation.

3. The Engineer may require test cores for density and depth be taken, at no additional cost to the Contracting Authority, to verify that the construction method used is satisfactory.

4. Ensure the final compacted surface is level with, or not more than approximately 1/4 inch (5 mm) above the surrounding pavement surface. Cut off patch material which extends beyond the edge of the pavement.

5. Do not open the patch to traffic until the mixture has cooled to provide stability; however, on two lane highways, do not leave barricades in place overnight. If the patch becomes distorted for any reason, smooth the surface the next working day by blading, scraping, filling, or by other approved means.

6. Prior to final acceptance, the patch shall be level with, or no more than 1/8 inch (3 mm) above, the adjacent pavement, and have a smooth riding surface.

H. Placing Full Depth Portland Cement Concrete Finish Patches.

1. Use forms on all exposed edges and also along the center line for patches that extend into an adjacent lane. Wood forms may be used in lieu of steel by using 2 inch (50 mm) nominal dimension lumber the full depth of concrete. Where old pavement has a curb, extend the forms from the bottom of the patch to the top of the curb. Stake all wood forms to hold the forms in place and in proper alignment.

2. Place, consolidate, finish, and cure of the concrete as provided in Section 2301, except as follows:
   a. Moisten the subbase or subgrade or cover with a single layer of plastic film meeting requirements of Section 4107.

b. Except for preplanned joints, place the patch in a continuous manner until placement is completed. When a delay of 45 minutes can not be avoided, construct an appropriate DW joint.

c. Dump or convey the concrete into the patch areas to avoid segregation of the aggregates and cement. Spread it into place and vibrate with a mechanical vibrator. Smooth the concrete and finish it to the elevation of the adjacent PCC surface. Avoid excessive vibrating.

d. Finish full lane width patches over 25 feet (10 m) long flush with the adjacent pavement. Use a finishing machine that has at least one vibrating screed. To ensure a smooth riding surface, straight edge all patches finished flush with adjacent pavement. Texture patches by finishing with a burlap, carpet drag, or rake, to approximately match the texture of the adjacent surface.

e. Check the patches with a 10 foot (3 m) straightedge before the concrete has set. Correct spots that are 1/8 inch (3 mm) high or low, as shown by the straightedge. The existing pavement crown shall be maintained.

f. Finish all edges and ends of patches with an edging tool.

g. Construct lane edges and the ends of patches to a depth of approximately 1 1/8 inches (30 mm), leaving an opening of at least 3/8 inch (10 mm) to provide a reservoir for joint sealer. The reservoir may be constructed by hand methods or may be sawed. When white pigmented curing compound is used, protect the reservoir with tape or other suitable material.

h. On patches finished flush with the pavement surface, stamp two numerals indicating the year of placement 2 feet (0.6 m) from the outside edge, facing outward to be read from the near shoulder.

3. After the concrete has been finished and surface water has disappeared, cure the concrete. Place curing materials no later than 20 minutes after completing finishing operations. Cure concrete by completely covering it with an insulating blanket-type cover consisting of a layer of closed cell polystyrene foam protected by at least one layer of plastic film, rated by the manufacturer with a minimum R-value of 0.5 (0.08805 for metric units). Cover the blanket-type cover completely with insulation board having the following properties: cellulosic fiber sheathing with a nominal 3/4 inch (19 mm) thickness. The board may be wrapped with plastic film to protect it from rain. Place the board over the patch and adjacent surface and hold it tightly in place with weights to retain all possible heat in the concrete.

4. Cure PCC patches placed on multi-lane sections for a minimum of 10 hours before opening to traffic. Cure PCC patches placed on two-lane sections a minimum of 5 hours before opening to traffic. These restrictions may be modified in the plans or by the Engineer for specific sections.

5. Replace patches that are damaged in any manner during the curing period at no additional cost to the Contracting Authority.

6. Saw C and CD joints. Timing is critical for this operation. Perform sawing as soon as possible without excessive raveling of the saw cut edges.

7. For patches finished flush with the adjacent pavement, and not to be covered with HMA, seal C and CD joints and the edged reservoir formed by edging or sawing according to Article 2301.03, P, except sand cleaning will not be required.

I. Smoothness.

Apply Section 2316 to smoothness of full depth finish patches (except when the contract includes an overlay or pavement surface repair by diamond grinding or milling within the patch area) with the following modifications:

1. Profilometer testing and evaluation is required for each patch with a length of 50 feet (15 m) or more. Perform the testing near the center of the traffic lane after the patch is placed. For each patch added by the Engineer that is greater than 50 foot (15 m) long, the Contractor will be paid $500 in addition to the appropriate unit prices involved. This is to compensate for additional smoothness requirements.

2. Patches 50 feet to 100 feet (15 m to 30 m) in length:

a. Test the patch length, and the existing pavement in that lane, for a distance of three times the patch length on both ends of the patch. If a patch occurs near a bridge, an intersection, and so forth, where the proper distance can not be tested, make up the required total on the other end of the patch. If interference occurs on both ends, test only to the points of interference.

b. Establish one Average Base Index (ABI) of the pavement for both ends of patch.

c. Calculate a new index for the entire length.

d. Compare the new index with the ABI.

1) If the new index does not exceed the ABI, the work is acceptable and no correction is required.

2) Corrective action is also not required if the new profilometer index is equal to or less than 12 inches per mile (190 mm/km), regardless of the ABI.

3) If the new profilometer index is greater than 12 inches per mile (190 mm/km) and less than 30 inches per mile (470 mm/km) and is also within 2 inches per mile (32 mm/km) of the ABI, corrective action is not required.

4) If the new profilometer index is greater than 30 inches per mile (470 mm/km), corrective action is required to reduce the new index at least to the ABI.

e. Corrective action involves correction of bumps and dips exceeding a vertical height of 0.5 inch (13 mm) in a 25 foot (7.6 m) span in the patch, if identified from the trace, plus appropriate surface correction within the patch and existing pavement, or both, on either end of the patch within the limits tested.

3. Patches 100 feet to 250 feet (30 m to 75 m) in length: Article 2529.03, I, 2, above applies, except the length tested is the patch length, and the existing pavement in that lane for a distance of 300 feet (90 m) on both ends of the patch.

4. Patches over 250 feet (75 m) in length: Apply the requirements for Chart B pavement, Section 2316.

J. Area Restoration.

When the patch is completed, remove the forms and place backfill material in the trench. If a form is necessary on a longitudinal joint, temporarily fill the space between the patch and the adjacent traveled lane with suitable material until the adjacent patch can be constructed. Fill the excavated space along the outside pavement edge with material similar to that in the existing shoulder. Thoroughly compact, as directed by the Engineer, before the section is opened to traffic.

K. Limitation of Operations.

1. Conduct all operations with minimum inconvenience to traffic. Maintain traffic during construction operations unless the road is closed.

2. On two-lane roads, conduct patching on only one lane at a time when traffic is maintained.

3. For roads with multiple lanes each direction, the work area may include one lane each direction or as allowed by the traffic control details.

4. Place Stop Sign Rumble Strips, when included in the plans, prior to opening roadway sections to traffic.

5. When conditions permit, patch areas may extend up to 2 feet (0.6 m) into an adjacent lane. When this encroachment is not tabulated in the contract documents, it shall be approved by the Engineer prior to beginning work. A flagger will be required at these locations. Work in an adjacent lane shall be completed and opened to traffic the same day using PCC (Class A or B) or HMA to match the normal patch area material.

6. When HMA patches on two-lane roadways and PCC patches with calcium chloride are constructed, adjust the work schedule so all equipment and obstructions are removed from the travel lanes and shoulders from 30 minutes before sunset to 30 minutes after sunrise.

7. When PCC patches without calcium chloride are constructed, place two drums meeting the requirements of Article 2528.03, C, in front of each patch location where there is a possibility of

turning into or returning to the closed lane. Additional drums need not be placed for patches spaced closer than 150 feet (45 m).

8. If unforeseen difficulties should result in excavated areas being left overnight, assign a sufficient number of flaggers to warn and direct traffic until the areas are complete. No extra payment will be made for the necessary flaggers.

9. Limit full depth sawing to patch areas scheduled to be constructed the following work day. The Engineer may limit advance sawing.

10. Do not reconstruct pressure relief joints within patch areas. When these joints extend into adjacent lanes, construct a full depth patch in the adjacent lane as directed by the Engineer.

11. Joints and edges of PCC patches to be sealed may be cleaned and sealed as soon as the vertical surfaces appear dry by visual examination. Complete sealing within 5 working days after the patch is placed. For PCC patches to be covered by HMA, cover them with HMA during the working day the curing is completed.

12. When other work is included in the contract, sequence the operations in an area in the following order:
- **a.** Undersealing,
- **b.** Longitudinal subdrains,
- **c.** Patching,
- **d.** Milling,
- **e.** Installation of retrofit load transfer, and then
- **f.** Crack and joint sealing.

13. If a DW joint becomes necessary, fill the area following the joint with a suitable temporary hot or cold paving mixture or stable granular material, as directed by the Engineer.

2529.04 METHOD OF MEASUREMENT.

Measurement for the various items involved in satisfactory construction of full depth pavement patches will be as follows:

A. Full Depth Finish Patches.

1. By count. Patches in each traffic lane will be individually counted.

2. By area. The areas of full depth finish patches will be computed in square yards (square meters) to the nearest 0.1 square yards (m^2) from measurements of the areas of pavement removed and replaced, except that each patch which is less than 2.0 square yards (2.0 m^2) in area will be counted as 2.0 square yards (2.0 m^2). The length will be measured parallel to the center line. Includes areas associated with anchor lug removal.

3. Tie bars and dowel bars at the patch edges, when required, will not be measured for payment.

B. CD Joint Assembly and CT Joint.

By count for joints properly installed of each type respectively, when CD Joint Assemblies or CT Joints are required within the patch area. Each joint is for one lane width. Partial lane width joints will be counted as one lane width for payment purposes.

C. Hot Mix Asphalt (Composite Section).

Tons (megagrams), computed or estimated, of HMA placed on PCC surfaces for patches. Asphalt binder will not be measured for pay.

D. Subbase (Patches).

1. Where subbase aggregate is placed in patch areas, as required by the contract documents or the Engineer, the Engineer will compute in square yards (square meters) the areas of subbase placed as provided in Paragraph A, above. Excludes areas associated with anchor lug removal. The Engineer will not measure subbase aggregate used for special shaping at longitudinal drains or subbase used at the Contractor's option.

2. The Engineer will separately compute areas in square yards (square meters), where subbase was directed to be placed to a depth greater than that originally specified.

E. Removal of Anchor Lugs.
By count for anchor lugs removed in each traffic lane.

2529.05 BASIS OF PAYMENT.
For construction of the various items measured for pavement patches, the Contractor will be paid as follows:

A. Full Depth Finish Patches.
When joint and crack sealing is included in the contract, joint sealing of the patches will be paid for as part of that work.

1. Full Depth Finish Patches, by Count.
a. Each. The type or types of patches to be counted will be identified by the following types and tabulated in the contract documents.
1) Full Depth HMA Finish Patches.
2) Full Depth PCC Finish Patches, Without Dowels.
3) Full Depth PCC Finish Patches, Without Dowels, Composite Section.
4) Full Depth PCC Finish Patches, With Dowels.
5) Full Depth PCC Finish Patches, Composite Section.
6) Full Depth PCC Finish Patches, Continuously Reinforced.
7) Full Depth PCC Finish Patches, Continuously Reinforced, Composite Section.
b. Payment is full compensation for all sawing or cutting necessary and for furnishing and installation of dowel bars at patch edges.

2. Full Depth Finish Patches, by Area.
a. Per square yard (square meter) to the nearest 0.1 square yards (m^2).
b. Payment is full compensation for:
- Removal of the old pavement,
- Restoring the subgrade or subbase,
- Furnishing and installation of tie bars,
- Restoring longitudinal reinforcement for continuously reinforced patches, and
- Furnishing and placing the patching material, including the asphalt binder, tack coat, curing, joint sealing, and placing backfill material in the disturbed area.

c. When the average thickness of ~~the existing pavement~~ a patch at any one ~~patch~~ location varies from the patch thickness shown in the plans, the square yard (square meter) patching quantity will be adjusted per Table 2529.05-1. Quantities will be increased when ~~pavement~~ patch thickness is greater than shown in the plans and decreased when less than shown in the plans. Adjustments will not be made for increased thickness due to damaged subgrade, base, or subbase as described in Article 2529.03, D, 2.

Table 2529.05-1: Patching Quantity Adjustment

% Change of Thickness	% Change of Quantity
0 to 10	0
> 10 to 20	10
> 20 to 30	15
> 30	20

B. CD Joint Assembly and CT Joint.
Each, for the type of joint.

C. Hot Mix Asphalt (Composite Sections).

1. Per ton (megagram).

2. Payment includes full compensation for placement and compaction, the asphalt binder in the HMA mix, and tack.

D. Subbase (Patches).

1. For the number of square yards (square meters) of subbase furnished and placed, the Contractor will be paid the contract unit price per square yard (square meter).

2. Payment is full compensation for:
- Furnishing and installing subbase,
- Additional excavation necessary for this placement and the removal of excavated material,
- Construction of transverse subdrains, and
- Placing backfill material in the disturbed shoulder area.

3. When subbase has been placed to a greater depth than specified in the contract documents, at the Engineer's direction, payment per square yard (square meter) for those areas will be increased by 20% for each inch (30 mm) of increased depth. This increased payment is full compensation for additional excavation and subbase material, associated compaction, and if so ordered, additional depth for the transverse subdrain.

E. Removal of Anchor Lugs.

1. Each.

2. Payment is full compensation for removal and for furnishing and placing subbase material, as specified. If removal of anchor lugs is not a bid item in the contract documents, payment will be paid $600 per lane in which an anchor lug, or portion of anchor lug, is removed.

3. When a PCC finish patch is required to be finished low and covered with HMA, but a patch of composite section is not so identified in the contract documents, the additional associated cost will be paid for as extra work.

4. When reconstruction of gore areas is required as a part of the contract documents, this reconstruction will be measured and paid for as specified in the contract documents.