

DIVISION 22. BASE COURSES

Construct base courses on prepared subgrades or subbases. Base courses consist of construction performed according to the requirements specified for the various types in the following sections. Comply with the lines, grades, thicknesses, and typical cross sections shown in the contract documents.

If a subbase or other prepared subgrade is not specifically required, prepare the subgrade as provided in Section 2109.

- 2201. Portland Cement Concrete Base.**
- 2203. Hot Mix Asphalt Base.**
- 2210. Macadam Stone Base.**
- 2212. Base Cleaning and Repair.**
- 2213. Base Widening.**
- 2214. Pavement Scarification.**
- 2216. Cracking and Seating PCC Pavement.**
- 2217. Rubblizing Existing Portland Cement Concrete Pavement.**

Section 2201. Portland Cement Concrete Base

2201.01 DESCRIPTION.

Construct PCC base course to the dimensions shown in the contract documents.

2201.02 MATERIALS.

Apply Article 2301.

2201.03 CONSTRUCTION.

Apply Section 2301 with the following exceptions:

- A.** Use Class A or Class C concrete, or the mixture used in the mainline paving.
- B.** The tolerance, when checked with a surface checker, shall be 0.25 inch in 10 feet (5 mm in 3 m).
- C.** If an asphalt surface is a part of the contract, a dark colored curing compound may be used.
- D.** The base may be opened to shouldering operations, traffic, or surfacing after it has attained an age of 72 hours and a flexural strength of 500 psi (3.5 MPa).
- E.** Saw and seal joints according to Section 2122 when constructing PCC paved shoulder. Joints need not be sealed for a PCC base course.

2201.04 METHOD OF MEASUREMENT.

Measurement for P.C. Concrete Base will be according to Article 2301.04, A.

2201.05 BASIS OF PAYMENT.

Payment for P.C. Concrete Base will be according to Article 2301.05, A.

Section 2203. Hot Mix Asphalt Base

2203.01 DESCRIPTION.

Construct an HMA base, as specified, upon a prepared or corrected subgrade or a previously constructed base or subbase.

2203.02 MATERIALS.

Apply Article 2303.02.

2203.03 CONSTRUCTION.

Construct HMA base to the dimensions shown in the contract documents and according to Section 2303.

2203.04 METHOD OF MEASUREMENT.

Measurement for the various items involved in the construction of a HMA base will be according to Article 2303.04.

2203.05 BASIS OF PAYMENT.

Payment for the various items involved in the construction of a HMA base will be as provided in Article 2303.05.

Section 2210. Macadam Stone Base

2210.01 DESCRIPTION.

- A.** Prior to placement of a surface course:
 1. Prepare the subgrade,
 2. Provide for a filter course,
 3. Furnish, place, and compact a Macadam base course and a choke stone course, and
 4. Apply a prime to the finished work.
- B.** Complete the above work according to the contract documents.

2210.02 MATERIALS.

- A.** Use aggregate that meets the requirements of Section 4122 for the base course and choke stone course.
- B.** For primer bitumen, use SS-1, SS-1H, CSS-1, or CSS-1H, meeting requirements of Section 4140. RC-70 and MC-70 may also be used after October 1, at the Contractor's option.

2210.03 CONSTRUCTION.

A. Equipment.

Use equipment meeting the requirements of Section 2001 and the following:

- 1. Weighing Equipment.**
Apply Article 2001.07.
 - 2. Compaction Equipment.**
Apply Article 2001.05, F. In addition, a smooth faced, steel tired roller, meeting requirements of Article 2001.05, B, will be required for final rolling of the choke stone course.
 - 3. Prewetting Equipment.**
Apply Article 2001.08, A, if prewetting is to be done.
 - 4. Spreading Equipment.**
Use spreading equipment capable of spreading the base and choke stone course to the required thickness.
 - 5. Broom.**
Apply Article 2001.14.
 - 6. Equipment for Heating and Distributing Bitumen.**
Apply Articles 2001.11 and 2001.12.
 - 7. Equipment for Applying Water.**
Apply Article 2001.09.
 - 8. Motor Graders.**
Apply Article 2001.15.
- B. Preparation of the Subgrade.**
Correct and construct the subgrade with the provision for a filter course as required by the contract documents. Macadam stone base shall not be constructed on natural soil subgrade.
- C. Macadam Base Course.**
- 1.** Spread base material to a width and depth so the base conforms to the desired profile and cross section. If spreading the base material in a single course, ensure the compaction equipment used will uniformly and satisfactorily compact the material for the full depth of the course. Spread the base material to maintain uniformity of the material. When a spreader does not spread to the full design width in one operation, the Engineer may require special handling of the center joint to avoid segregation.
 - 2.** Thoroughly and uniformly compact the base material immediately after it as been spread. Continue compacting until the base material is well seated and no appreciable displacement occurs when rolling.
- D. Choke Stone Course.**
- 1.** The aggregate may be prewetted before delivery to the Macadam stone base. The Engineer may control the material delivery rate to reduce the

time the material will remain on the base in an uncompacted condition to the practical minimum.

2. If the material is prewetted before delivery, or if water is added to the base after delivery, ensure the water is uniformly distributed throughout the material so that all particles are uniformly wet. Verify water is within 2.0% of the amount determined as field optimum to produce maximum density together with stability with the field compaction procedure. This moisture content will usually be 85 to 90% of the optimum determined according to Materials Laboratory Test Method No. Iowa 103. Maintain this moisture content in the material until base compaction is complete.
3. Spread the choke stone course as required for the Macadam base course.
4. Immediately after spreading the material, thoroughly and uniformly compact with three passes of a vibratory roller. During the compaction process, perform wetting, shaping, and edge trimming necessary to ensure proper compaction and to achieve the required profile, crown, cross section, and edge alignment. An additional final rolling with a smooth faced, steel tired roller will be required. Ensure the finished surface is free from irregularities and loose material and has a smooth riding surface.

E. Fillets for Intersecting Roads, Drives, and Turnouts.

Construct fillets according to the contract documents.

F. Priming Base Course.

Prime the surface of the choke stone course and adjacent subgrade according to the contract documents.

G. Maintenance of Completed Base.

1. The Contractor may choose how far in advance of the course to complete the base.
2. Prior to and during subsequent construction activities, maintain the completed base to the required density and cross section, and to a smooth condition free from loose material. Do not place hauling equipment or other traffic on the completed base.
3. If the Engineer permits traffic by others authorized to do work on the project that exceeds the Contractor's self imposed limit during base construction, the Contracting Authority will pay to repair the damage (if any) caused by this traffic. The Engineer will determine the cost for repair of the damage.

H. Winter Seal.

1. Prime (as specified) all base not covered with upper base or surface the same season which it is constructed. The Engineer may require an application of a winter seal. Except as modified by the Engineer, use a

winter seal consisting of the bituminous material used as the primer or tack coat applied at 0.12 gallon per square yard ($0.5\text{L}/\text{m}^2$), and a sand cover applied at 10 to 15 pounds per square yard (5 to $8\text{ kg}/\text{m}^2$). Spread bituminous material and aggregate according to Section 2307. Winter seal the Engineer requires will be paid for according to Article 1109.03, B.

2. Except where road closure is provided in the contract documents, traffic will be allowed to use the road from the time construction is stopped until work is resumed the following season. Make required repairs to the base when construction is resumed, at no additional cost to the Contracting Authority.

2210.04 METHOD OF MEASUREMENT.

Measurement for the quantities of the various classes of work involved in the construction of accepted portions of Macadam stone base will be as follows:

A. Macadam Stone Base.

Computed in tons (megagrams) from weights (mass) of individual truck loads.

B. Choke Stone Base.

Computed in tons (megagrams) from weights (mass) of individual truck loads, including free moisture in the material at the time of delivery. Moisture added after delivery of the material to the roadbed will not be measured for payment.

C. Primer Bitumen for Macadam Stone Base.

Apply Article 2307.04, B.

2210.05 BASIS OF PAYMENT.

For the performance of the various classes of work involved in construction of Macadam stone base, measured as provided above, payment will be the contract unit price as indicated below. Payments are full compensation for furnishing all materials, including water, and for all operations involved in the construction of the base.

A. Macadam Stone Base.

Per ton (megagram) for the number of tons (megagrams) placed.

B. Choke Stone Base.

Per ton (megagram) for the number of tons (megagrams) placed.

C. Primer Bitumen for Macadam Stone Base.

Per gallon (liter) for the number of gallons (liters) measured for payment.

Section 2212. Base Cleaning and Repair

2212.01 DESCRIPTION.

Clean and repair pavement in preparation for resurfacing with HMA.

2212.02 MATERIALS.

Meet the following requirements:

A. Hot Mix Asphalt.**1. Surface Patches.**

Apply Article 2530.02, A. For patches on the Interstate system use a 1/2 inch or 3/4 inch (12.5 mm or 19 mm) mixture size.

2. Partial Depth Repair Patches.

Apply Article 2530.02, A. For patches on the Interstate system, use a 1/2 inch or 3/4 inch (12.5 mm or 19 mm) mixture size.

3. Full Depth Repair Patches.

Apply Article 2529.02.

B. Portland Cement Concrete.**1. Partial Depth Repair Patches.**

Apply Article 2530.02.

2. Full Depth Repair Patches.

Apply Article 2529.02.

2212.03 CONSTRUCTION.**A. Equipment.**

Use equipment meeting the requirements of Section 2001 and the following:

1. Bituminous Distributor.

Apply Article 2001.12.

2. Portland Cement Concrete Equipment.

Apply Section 2301.

3. Mechanical Tampers.

Apply Article 2001.04.

4. Sand Spreader.

Apply Article 2001.13, C.

5. Weighing Equipment.

Apply Article 2001.07.

6. Equipment for Heating Bituminous Materials.

Apply Article 2001.11.

7. Field Laboratory.

Apply Section 2520.

B. Preparation and Repair of Base.

Before any HMA surface patch, base, leveling, strengthening, wedge, intermediate, or surface course is placed, clean and repair the old pavement surface in the following manner:

1. Cleaning and Preparation of Base.

- a. Remove spalled and scaled material, old patch and joint material, debris, and all other loose material that can be removed by hand tools, such as picks or air blast, as directed by the Engineer. Use mechanical hammers when required by the Engineer. On both concrete and bituminous surfaces, remove existing bituminous patch materials that are unstable to the degree that they have distorted under traffic or contain fractures or spalled particles.
- b. Bituminous seal coats, or other bituminous layers that may not be as well cured or may be flushed at the surface but that lack sufficient thickness to cause instability to themselves or the new resurfacing, may be allowed to remain in place.
- c. Clean cracks more than 3/4 inch (20 mm) wide to a depth of at least 1 inch (25 mm), and to a depth up to 3 inches (80 mm) if the material is readily removable. Use scrapers, air hoses, or brooms as necessary to ensure the base is free of foreign material at the time the resurfacing is spread.
- d. All material removed from the pavement becomes the property of the Contractor. Remove the material from the work site according to Article 1104.08. Remove (by blading) portions of the earth shoulder that would interfere with placement of base, intermediate, or surface courses.
- e. The Contractor may be required to mow grass on the shoulder, or otherwise prepare that surface, when a guide string line reference is to be positioned on the adjacent shoulder.

2. Base Repair.**a. General.**

- 1) Repairing pavement for base repair consists of the following:
 - Surface Patches.
 - Partial Depth Repair Patches.
 - Full Depth Repair Patches.
- 2) The Engineer will identify the areas to be repaired.
- 3) When specified in the contract documents, full depth or partial depth repair patches may be PCC, HMA, or a combination. The Engineer may require HMA patches where sight distance is restricted.
- 4) For HMA repair patches, ensure the final surface of the patch is level with (or not more than 1/4 inch (5 mm) above) the surrounding pavement.
- 5) For PCC full depth and partial depth repair patches, finish the concrete to be level with (or not more than approximately 1/4 inch (5 mm) above) the existing surface for repair of PCC pavements that are to be resurfaced. For composite patches, finish the surface of the repair patch at approximately the level of the old PCC surface. Then finish the patch to the surface of

the surrounding pavement with HMA at the direction of the Engineer.

- 6) Cure PCC full depth and partial depth repair patches according to Article 2529.03, H.
 - 7) Curing compound will not be allowed on repair patches.
 - 8) If sawed joints are required in repair patches, the curing protection may be removed from each patch immediately prior to sawing and must be replaced immediately after sawing joints in that patch. Do not seal joints on repair patches.
 - 9) Allow PCC repair patches to cure a minimum of 5 hours, or as directed by the Engineer, prior to resurfacing with HMA. Prior to covering the patch with HMA, tack the patch area and edges.
 - 10) For PCC patches when dowel bars are not required at the transverse edges, ensure the transverse edge of the existing pavement is vertical with a roughened face. The severance may be made at the patch edge using a wheel saw. Do not use a blade saw for a full depth severance at the patch edge.
 - 11) A 10 inch (250 mm) severance will be considered full depth if the adjacent pavement exceeds that thickness. Perform all work in a manner that will not damage concrete that is to remain. Do not use heavy equipment adjacent to new concrete until the curing is completed. Remove material not designated for salvage according to Article 1104.08. Removed material becomes the property of the Contractor.
- b. Full Depth Repair Patches.**
- 1) Construct full depth repair patches according to Section 2529 with the following exceptions:
 - a) If the thickness of full depth repair patches is not shown in the contract documents, base the thickness on the existing pavement type.
 - b) Construct patches to be no less than:
 - (1) 6 inches (150 mm) for County Roads.
 - (2) 9 inches (230 mm) for Primary Roads.
 - (3) 12 inches (300 mm) for Interstate Roads.
 - 2) Base maximum full depth repair patch thickness on the following:
 - a) **Portland Cement Concrete Repair Patch.**
 - (1) **Rigid Pavement:** Pavement thickness, but not more than 12 inches (300 mm).
 - (2) **Rigid Pavement resurfaced with HMA (composite patch):** Rigid pavement thickness and the patch covered with HMA surface.
 - (3) **Flexible Pavement:** Same as above for resurfaced rigid pavement.
 - b) **Hot Mix Asphalt Repair Patch.**
 - (1) **Rigid Pavement:** Pavement thickness, but not more than 12 inches (300 mm).
 - (2) **Rigid Pavement resurfaced with HMA:** Thickness of pavement, including resurfacing, but not more than 12 inches (300 mm).

(3) Flexible Pavement: Thickness of surface and base course, but not more than 12 inches (300 mm).

c. Surface Patches.

- 1) In areas where spalled concrete or old patching material is removed according to Article 2212.03, B, 1, for a depth greater than 1 inch (25 mm), but less than the total thickness of the old pavement:
 - a) Clean the depressions.
 - b) Apply a tack coat.
 - c) Fill depressions with hot HMA. Deposit the HMA in layers which, after compaction, will not exceed 3 inches (80 mm) in thickness.
- 2) Thoroughly compact each layer, while hot, by rolling with an adequately weighted pneumatic tire or by tamping with a mechanical tamper until it has attained a density satisfactory to the Engineer.
- 3) Succeeding layers may be placed as soon as the preceding layer has been properly compacted.
- 4) Ensure the final compacted surface is level with (or not in excess of 1/4 inch (5 mm) above) the surrounding surface.

d. Partial Depth Repair Patches.

Construct partial depth repair patches according to Section 2530, except patch edges do not need to be sawed with a blade saw.

C. Limitations of Operations.

1. Conduct work on only one lane at a time unless road is closed.
2. On two-way roadways, do not disturb the pavement for full depth or partial depth repair patches or surface patches unless the patch can be completed before the end of the working day.
3. Unless the road is closed, traffic shall be permitted to use the pavement during construction operations. Conduct operations to provide a minimum of inconvenience to traffic.
4. Adjust the work schedule so that excavating, placing backfill material, compacting, and finishing of each patch will be completed in 1 day for two lane roads. For roads with multiple lanes in each direction, the work area may include one lane in each direction or as allowed by the traffic control details. If unforeseen conditions result in excavated section being left overnight, assign flaggers to warn and direct traffic from the time construction operations have stopped until they have resumed. No extra payment will be made for the necessary flaggers.
5. Apply Articles 1107.08, 1107.09, and 1108.03.

2212.04 METHOD OF MEASUREMENT.

Measurement for the various items involved in base repair will be according to the following:

A. Cleaning and Preparation of Base.

The length shown in the contract documents.

B. Full Depth Repair Patches.

Computed in square yards (square meters) to the nearest 0.1 square yards (0.1 m²) from measurements of areas of concrete removed and replaced. Each patch less than 2 square yards (2 m²) in area will be counted as 2 square yards (2 m²).

C. Partial Depth Repair Patches.

Computed in square yards (square meters) to the nearest 0.1 square yards (0.1 m²) from measurements of the patch areas.

D. Patches by Count.

In addition to the measurements described in Paragraph B, the Engineer will count the total number of full depth patches placed. Patches in each traffic lane will be individually counted.

E. HMA Surface Patches.

Tons (megagrams) as provided in Article 2303.04, A.

F. Primer or Tack Coat Bitumen.

Not measured for payment.

G. Hot Mix Asphalt (Composite Section).

According to Article 2529.04, C.

H. CD and CT Joints.

According to Article 2529.04, B.

I. Hot Mix Asphalt Mixtures.

In addition to the measurement described in Paragraph C, the Engineer will measure the weight (mass) of HMA placed in partial depth patches according to Article 2303.04. If the patch area is increased to accommodate milling equipment, only the quantities for the area designated by the Engineer will be measured for payment. Asphalt binder and tack coat will not be measured separately for payment.

2212.05 BASIS OF PAYMENT.

Payment for construction of the various items involved in the base repair, measured as specified above, will be the contract unit price as follows:

A. Cleaning and Preparation of Base.

Per mile (kilometer).

B. Full Depth Repair Patches.

1. Per square yard (square meter).
2. 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,
 - Furnishing and placing the patching material, including the asphalt binder,
 - Tack coat, curing, and joint sealing, and
 - Placing backfill material in the disturbed area.
3. Payment for overdepth patches will be made according to Article 2529.05, A, 2.

C. Partial Depth Repair Patches.

1. Per square yard (square meters).
2. Payment is full compensation for removal of old pavement according to Article 1104.08 and for all materials and other items involved in construction of these patches.

D. Patches by Count.

1. Each, in addition to payment described in Paragraph B, for the number of individual full depth patches placed.
2. Payment is full compensation for sawing or cutting necessary, for furnishing and installation of dowel bars at patch edges, and for traffic control associated with that patch.

E. HMA Surface Patches.

1. Per ton (megagram).
2. Payment includes compensation for asphalt binder in the mixture and tack coat.

F. Primer or Tack Coat Bitumen.

Incidental to the work item.

G. Hot Mix Asphalt (Composite Section).

According to Article 2529.05, C.

H. CD and CT Joints.

According to Article 2529.05, B.

I. Hot Mix Asphalt Mixture.

In addition to the payment described in Paragraph C, HMA for partial depth repair patches will be paid for according to Article 2530.05, B, 1, c.

Section 2213. Base Widening**2213.01 DESCRIPTION.**

Excavate shoulder material, remove existing curb and flumes, and construct widened portions of base prior to placement of a surface course, seal coat, or another base course as a part of the contract.

2213.02 MATERIALS.

Use materials meeting the following requirements:

A. Base Material.**1. HMA Base Widening.**

- a. Use mixture specified on the contract documents.
- b. Meet requirements of Section 2303, as specified.

2. PCC Base Widening.

Apply Article 2201.03.

B. Primer or Tack Coat Bitumen.

Apply Article 2303.02, E.

2213.03 CONSTRUCTION.**A. Equipment, General.**

Use equipment meeting requirements of Sections 2001, 2301, 2302, and 2303.

B. Widening Equipment.

Use widening equipment that complies with Section 2001 and the following:

1. Trench Machine.

Use a machine which can be operated in a manner so that the depth and width can be accurately controlled.

2. Compaction Equipment.

- a. Apply Article 2001.05, E, except that other types of equipment may be used when it has been demonstrated that required compaction will be secured.
- b. On subgrade and the final layer of widening, use a self propelled finish roller that is smooth and steel wheeled.

C. Removal of Curb.

1. When specified in the contract documents or directed by the Engineer, remove integral curb by methods which will not damage the concrete that is to remain.
2. Remove curb by grinding (or other methods approved by the Engineer) to provide complete removal of curb extending above the pavement surface and a safe and smooth surface to accommodate traffic. Other curb removal methods may include sawing and breaking, or chipping. If

removal is done by sawing and breaking, complete the work as shown in the contract documents and as follows:

- a. Make a vertical saw cut along the edge of the curb nearest the center line of pavement.
 - b. At the end of the curb section, extend the saw cut to the extreme end of the curb.
 - c. At this point, make a saw cut at a right angle extending to the pavement edge.
 - d. Where flumes occur in curb sections, extend the saw cut across the throat of the flume.
 - e. On resurfaced pavement, locate the saw cut 7 1/2 inches (190 mm) from the pavement edge. Cut to a depth of 3 inches (75 mm) below the surface of the resurfacing.
 - f. Immediately before breaking the curb, clean the sawed groove and ensure it is free of dirt, stones, or foreign matter to a depth of at least 1 inch (25 mm) below the pavement surface.
 - g. Remove concrete (including resurfacing concrete and concrete across the throats of flumes) to comply with the dimensions shown. Cut off loosened and exposed reinforcement.
3. Clean up broken concrete according to Article 1104.08. This broken concrete becomes the property of the Contractor.

D. Removal of Flumes.

Remove flumes according to Section 2514.

E. Preparation of Subgrade.

Prepare subgrade for base widening according to Article 2302.03, D, with the following exceptions:

1. Cut the trench to the width of the widening shown in the contract documents. If the existing pavement is HMA, saw or trim the edge of existing asphalt (if any) to a vertical line flush with the edge of the existing concrete. At the Contractors option, this trim line may be made at any uniform distance in from the edge of the existing concrete, but not to exceed 3 inches (75 mm).
2. For HMA base widening, tack coat the edge of the old pavement at a rate of 0.10 to 0.15 gallon per square yard (0.4 to 0.7 L/m²) according to Article 2303.03, C, 2, b. A waiting period will not be required before placing the widening.

F. Base Widening Construction.

The contract documents will show the total thickness of base widening to be placed.

1. HMA Base Widening.

- a. Limit the compacted thickness of the top layer to no more than 2 inches (50 mm). The maximum thickness of lower layers may exceed 3 inches (80 mm) if the Contractor demonstrates the thicker layers have compaction and riding characteristics within conformance to that expected from a 3 inch (80 mm) thick layer.

Avoid dumping base material on the surface of the pavement. Immediately remove, by brooming, base material spilled on pavement.

- b. Spread base material so that after compaction, the constructed width conforms to the design dimension.
- c. Promptly and thoroughly compact each layer. Compact to the density specified in Article 2303.03, C, 5, for Class IC compaction.
- d. The percent of compaction will be based on the laboratory density obtained for that day's mixture.
- e. Succeeding layers of base material may be placed as soon as the previous layer has been compacted. Take density samples from the compacted material and test according to Article 2303.03, D.
- f. When the contract for base widening does not include resurfacing, ensure the final surface of the widening is flush with, or not more than 1/8 inch (3 mm) below, the surface of the old pavement.
- g. Do not open the widening to traffic until it has cooled sufficiently to provide stability.

2. PCC Base Widening.

Prepare PCC base widening according to Article 2302.03, E, and the following exceptions:

a. Concrete Filler.

- 1) Clean depressed areas from which the curb has been removed. Clean using a stream of water or air under sufficient pressure to remove loose and foreign matter from the groove.
- 2) Fill with PCC of the same composition as the concrete used for widening. Immediately before concrete is placed, sprinkle the concrete surface with water and cover with a thin layer of dry Portland cement thoroughly broomed into the surface. Place the filler at the same time the adjacent widening is placed. Thoroughly tamp the concrete for the filler into place.
- 3) Finish and cure the filler in the same manner as for the widening.

b. Curing.

If asphalt surface is a part of the contract, a dark colored curing compound may be used.

c. Joint.

Joints need not be sealed for PCC base widening.

G. Limitations of Operations.

1. When full depth repair patches are part of the contract, complete this work before base widening is placed.
2. Unless the road is closed, perform base widening construction on one side of the pavement at a time. Open widening to traffic on one side before removing the curb on the opposite side.
3. Allow traffic to use the pavement during construction operations. Conduct operations to minimize inconvenience to traffic.
4. Apply Articles 1107.08, 1107.09, and 2303.03, C, 4.

H. Maintenance of Base.

Maintain the completed base widening prior to and during subsequent construction activities.

I. Winter Seal.

1. Prime HMA base which is not covered with upper base or surface in the same construction season in which it is built. The Engineer may require an application of a winter seal consisting of:
 - The bituminous material used as the primer or tack coat applied at 0.12 gallon per square yard (0.5 L/m^2), and
 - A sand cover applied at 10 to 15 pounds per square yard (5 kg/m^2 to 8 kg/m^2), according to Section 2307.
2. Winter seal that the Engineer requires will be paid for as provided in Article 1109.03, B.
3. Except where road closure is provided in the contract documents, traffic will be allowed to use the road from the time construction is stopped until work is resumed the following season. Make required repairs to the base when construction is resumed, at no additional cost to the Contracting Authority.

J. Rebuilding Shoulders.

Apply Article 2302.03, F.

K. Samples.

Apply Article 2303.03, D, 5, c.

2213.04 METHOD OF MEASUREMENT.

Measurement will be as follows:

A. Removal of Curb.

Stations (meters) to the nearest foot (meter) shown in the contract documents.

B. Removal of Flumes.

Shown in the contract documents.

C. Excavation, Class 13, for Widening.

Shown in the contract documents.

D. Base Widening.**1. Hot Mix Asphalt Base Widening.****a. Measurement by Weight (Mass).**

Determined according to Article 2303.04, A, 2.

b. Measurement by Area.

Determined according to Article 2303.04, A, 3.

2. Portland Cement Concrete Base Widening.

Shown in the contract documents for the depth specified.

E. Asphalt Binder.

Article 2303.04, B, applies when HMA is measured by weight.

F. Primer or Tack Coat Bitumen.

Will not be measured separately.

G. Samples.

Article 2303.04, H, applies for HMA base widening.

2213.05 BASIS OF PAYMENT.

Payment will be the contract unit price as follows:

A. Removal of Curb.

Per station (meter).

B. Removal of Flumes.

Per unit.

C. Excavation, Class 13, for Widening.

1. Per cubic yard (cubic meter).
2. Payment includes removal of bituminous fragments, boulders, and broken concrete according to Article 1104.08.

D. Base Widening.**1. Hot Mix Asphalt Base Widening.****a. Measurement by Weight (Mass).**

According to Article 2303.05.

b. Measurement by Area.

According to Article 2303.05 for the depth specified.

2. Portland Cement Concrete Base Widening.

Per square yard (square meter) for the depth specified.

E. Asphalt Binder.

Article 2303.05, B, applies when HMA is measured by weight.

F. Primer or Tack Coat Bitumen.

Incidental to HMA.

G. Samples.

HMA base widening samples: according to Article 2303.05, H.

Section 2214. Pavement Scarification**2214.01 DESCRIPTION.**

- A. Scarify asphalt or PCC pavement to improve surface profile and cross section in preparation for resurfacing.
- B. For this specification, scarifying refers to removal of a pavement surface according to the contract documents using cold planning equipment.

2214.02 MATERIALS.

None.

2214.03 CONSTRUCTION.**A. Equipment.**

1. Use scarifying equipment that is:
 - Wide enough so no more than two passes will be necessary in each traffic lane, and
 - Suitable for the method of operation.
2. Except for very short or irregular sections, use equipment controlled automatically by a two point control with a minimum distance between control points of 15 feet (4.5 m).
3. Use a rotary broom described in Article 2001.14 to clean the surface.
4. When complete removal of asphalt material to an underlying PCC surface is intended, the contract documents may allow this removal by other methods and equipment.

B. Pavement Scarification.

1. The contract documents will show the intended depth of scarification and/or the taper or cross section. Scarify the surface as required. Make scarification cuts in straight lines.
2. Continue scarification across bridges only if required in the contract documents.
3. Immediately remove scarification debris from the pavement surface and handle as specified in the contract documents
4. Use water to minimize airborne dust particles.
5. Promptly sweep the scarified surface with a rotary broom before opening to public traffic.
6. For resurfacing:
 - a. Scarify the entire area designated and leave a surface with a smooth profile. For extremely irregular areas or where channeling,

corner breaks, or settlements have occurred, occasional skips will be allowed. However, at least 95% of each 100 feet (30 m) of traffic lane (or equivalent) must have a newly scarified surface.

- b. When a cross section of the scarified surface is shown in the contract documents, scarify the surface accordingly. Control scarifying operations to provide a surface that is true within a nominal tolerance of 1/4 inch (5 mm), and 1/4 inch (5 mm) at longitudinal joints where adjacent passes meet. The profile may be inspected by checking with a 10 foot (3 m) surface checker placed parallel to the center line. Correct variations greater than 1/4 inch (5 mm).
- c. When asphalt material is salvaged for recycling, comply with the following additional requirements:
 - 1) Scarify the pavement to the depth designated. This is an approximate depth which may be adjusted to assure adequate salvaged material. When wire mesh is present in the asphalt pavement, as indicated in the contract documents, scarify without disturbing the wire mesh, unless complete removal of wire mesh is specifically indicated.
 - 2) Perform scarification in a manner that minimizes aggregate degradation.
 - 3) Furnish a scale meeting the requirements of Article 2001.07. Weigh the scarified and salvaged material. Determine the quantity stockpiled as directed by the Engineer.
 - 4) Stockpile salvaged material according to Article 2303.02.
 - 5) When Blading and Shaping of Shoulder Material is not required, blade the existing shoulder material away from the pavement edge, if necessary to provide for safety and drainage. This material may be placed on the foreslope. This work is incidental, and no separate payment will be made.

C. Blading and Shaping of Shoulder Material.

- 1. At the locations shown in the contract documents, blade the existing shoulder material away from the pavement. Store the material in a windrow on the outer portion of the shoulder area. Make provisions for drainage through the windrow, satisfactory to the Engineer. Complete this before or in conjunction with removal of HMA surface in that area.
- 2. After the overlay is completed or as it progresses, return the windrowed aggregate adjacent to the pavement. Some additional granular surfacing of the shoulder material is anticipated. Shaping and compaction as specified for granular surfacing of shoulders will be required. Moistening may be required. If the total thickness of the combination of materials exceeds approximately 3 inches (80 mm), separately compact the material returned from the windrow. The finish rolling will only be required on the final surface.
- 3. Place barricades, as described in Article 1107.09, B, 5, along the windrowed material.

D. Limitations.

1. Ensure persons and vehicles are protected from injury or damage that might occur during the construction period. During construction, provide the traffic control required by the contract documents. Apply Articles 1107.08, 1107.09, and 1108.03.
2. Keep the road open to traffic unless otherwise indicated. Do not allow equipment to extend into an open lane, except as allowed by the traffic control requirements in the contract documents.
3. Remove foamed material in existing pressure relief joints prior to removal of the HMA surface. Remove this material from the project location according to Article 1104.08.
4. Scarify to full lane width, with a runout at the end, before the lane is opened to public traffic.
5. Plan and complete scarification so no vertical drop-off at the center line or lane line is left overnight. Where an overnight drop-off results from unforeseen conditions, sign the approaches with a ROAD WORK AHEAD sign. Mark the drop-off with vertical panels. Place the panels at 150 foot (45 meter) intervals in rural areas and at 50 foot (15 m) intervals in urban areas. Use a minimum of three vertical panels at each drop-off location.
6. When resurfacing is part of the contract, sign the approaches to scarified areas on Primary Roads with ROUGH ROAD signs. Repeat the signs for traffic that may enter within the scarified area from intersecting public roads. Erect, move (if appropriate), and maintain these signs until the scarified areas are covered with new mixture.
7. Preliminary scarifying may be done to obtain representative samples. Patch these areas after scarifying. Patching should be done daily. Complete patching necessary to bring the scarified surface to the tolerance specified within 2 working days of the scarifying operation. Additional patching may be necessary to maintain this temporary surface.
8. Perform scarification following full-depth patching.
9. Commence HMA or PCC placement operations within 10 working days after completion of the scarification operation. Once started, continue placement operations each working day until the scarified surface is completely covered. Failure to comply with these requirements will result in the assessment of a price adjustment equal to the liquidated damages stated in the contract documents. Repair damage to the scarified surface during the time period for which liquidated damages are being assessed.

10. When HMA resurfacing is part of the contract, cover all scarified surfaces with at least one full lift of HMA prior to winter shutdown. Leave no vertical edges or fillets.
11. Take additional precautions necessary for safety during the operation. The Contractor shall hold the Contracting Authority harmless of damage or loss resulting from an accident, during the scarifying operation, caused by failure to fulfill the obligations as outlined in these requirements.

2214.04 METHOD OF MEASUREMENT.

A. Pavement Scarification.

1. **Measurement by Weight (Mass).**
Tons (megagrams) determined by the Engineer from the quantity of scale weights (mass) of the material salvaged.
2. **Measurement by Area.**
Square yards (square meters) shown in the contract documents.

B. Blading and Shaping Shoulder Material.

Stations (meters) shown in the contract documents along each edge of the pavement.

2214.05 BASIS OF PAYMENT.

Payment will be the contract unit price as indicated below. Payments are full compensation for furnishing materials, (including water), equipment, and labor necessary to complete the work according to the contract documents including salvaging, stockpiling, and removal of excess material and debris according to Article 1104.08. Payment for scarifying will not include areas scarified to obtain preliminary samples, but patching of these areas will be included with patching for payment.

A. Pavement Scarification.

1. **Measurement by Weight (Mass).**
Per ton (megagram).
2. **Measurement by Area.**
Per square yards (square meters).

B. Blading and Shaping Shoulder Material.

Per station (meter).

Section 2216. Cracking and Seating PCC Pavement

2216.01 DESCRIPTION.

- A. Crack and seat existing PCC pavement prior to HMA resurfacing.

- B. Associated work may include removal of an existing HMA overlay if present, subdrain construction, HMA resurfacing, and shoulder work.

2216.02 MATERIALS.

None.

2216.03 CONSTRUCTION.

A. Equipment.

1. Cracking Equipment.

Use equipment capable of producing the desired cracking pattern by providing a broad striking surface. Do not use equipment that punches holes in the pavement or results in excessive spalling of otherwise sound sections. A blade or spade type breaker is recommended and may be required.

2. Seating Equipment.

- a. Use a pneumatic rubber tired roller meeting the following requirements:
 - 1) Four rubber tires equally spaced across the full width.
 - a) The roller tires shall be mounted in line on a rigid steel frame such that all wheels carry equal loads regardless of surface irregularities.
 - b) The roller tires shall be capable of satisfactory operation at a minimum inflation pressure of 100 psi (700 kPa).
 - c) The roller tires shall be inflated to the pressure necessary to obtain proper surface contact pressure to satisfactorily seat pavement slabs.
 - d) At the Contractor's option, the roller tires may contain liquid.
 - 2) Weight body suitable for ballasting to a gross load of 50 tons (45 Mg). The ballast shall allow gross roller weight (mass) to be readily determined and controlled to maintain a gross roller weight (mass) of 50 tons (45 Mg).
- b. Tow the roller with a rubber tired prime mover.

3. Other Equipment.

- a. Equipment that provides a means to dampen cracked pavement with water.
- b. Equipment that provides compressed air with 100 psi (700 kPa).
- c. Rotary broom described in Article 2001.14.
- d. Various hand tools as needed.

B. Removal of Existing Asphalt Overlay.

- 1. Before cracking, remove all asphalt and other bituminous material existing on the pavement surface from the area to be cracked. Perform removal using a continuous operation. Remove to the underlying PCC pavement and according to the requirements of Section 2214, excluding Article 2214.03, D. Removal of full depth patches is not required.

2. Remove foamed material in existing pressure relief joints prior to removal of the HMA overlay.
3. Scarify to the full width of the lane, with a runout at the end, before the lane is opened to public traffic. Plan and complete scarification to leave no vertical drop-off at the center line or lane line overnight. Where an overnight drop-off results from unforeseen conditions, sign the approaches with a ROAD WORK AHEAD sign. Mark the drop-off with vertical panels. Place the panels at 150 foot (45 meter) intervals in rural areas and at 50 foot (15 m) intervals in urban areas. Use a minimum of three vertical panels at each drop-off location.
4. Additional scarification of the existing PCC pavement may be required at bridge approaches and other fixed objects, as designated in the contract documents.

C. Pavement Cracking.

1. Crack the existing PCC pavement to produce full depth, transverse hairline cracks at a nominal spacing designated in the contract documents. When not designated, use a spacing of 1 1/2 feet to 3 feet (0.5 m to 1 m). Avoid inducing cracking closer than 2 1/2 feet (0.8 m) from an existing crack or joint or deteriorated concrete. Prevent the formation of a continuous longitudinal crack.
2. When cracking operations begin, the Engineer will designate test sections of approximately 100 feet (30 m). Crack test sections using varying energy and striking patterns until a satisfactory cracking pattern is established. Use this energy and striking pattern for the remainder of the project, unless the Engineer determines that a satisfactory cracking pattern is no longer being produced. In this case, adjust the energy or striking pattern, or both, as necessary to re-establish a satisfactory cracking pattern.
3. Furnish and apply water to the test area to dampen the pavement following cracking to enhance visual determination of the cracking pattern. Furnish and supply water to check stations, as directed by the Engineer, to verify that the specified crack pattern is being maintained. This will normally be once a day. Furnishing and applying this water is incidental and will not be paid for separately.
4. Do not operate cracking equipment on a bridge. Do not crack areas in a bridge approach section or within 3 feet (1 m) of a fixed object.
5. Before opening to traffic, seat cracked pavement and then remove loose or spalled material by sweeping and by blowing joints and cracks with compressed air. Repeat cleaning as necessary until the HMA resurfacing is placed.

D. Pavement Seating.

1. Seat the cracked pavement as shown in the contract documents.

2. Roll the cracked pavement until seated to the Engineer's satisfaction. The intent is to:
 - Load the roller so that satisfactory seating can be reasonably assured by one complete coverage by the roller, and
 - Accomplish seating with a minimum damage to aggregate interlock at the cracks.
3. The Engineer will approve the weight (mass) of the roller and the rolling pattern, including laps, based on one or more initial test sections.

E. Limitations.

1. Ensure persons and vehicles are protected from injury or damage that might occur during the construction period. During construction, provide the traffic control required by the contract documents. Apply Articles 1107.08, 1107.09, and 1108.03.
2. Keep the road open to traffic unless otherwise indicated. Do not allow equipment to extend into an open lane, except as allowed by the traffic control requirements in the contract documents.
3. This work shall be carefully staged to minimize the time public traffic is to drive on pavement where the pavement work is only partially completed. Do not start removing existing HMA overlay more than 14 calendar days before the succeeding operation is scheduled to begin. Do not start pavement cracking more than 14 calendar days before the overlay operation of the cracked and seated area is scheduled to begin.
4. Overlay cracked and seated areas with the full thickness of HMA, required by the contract, before a winter suspension.
5. Examine Article 1105.12. If the operation of the seating roller over a culvert is to be restricted according to Article 1105.12, G, this will be designated in the contract documents.

2216.04 METHOD OF MEASUREMENT.

The Engineer will calculate the area of Cracking and Seating of PCC Pavement, satisfactorily completed, from the length and the nominal width.

2216.05 BASIS OF PAYMENT.

- A. Payment for Cracking and Seating of PCC Pavement will be the contract unit price per square yard (square meter).
- B. Payment is full compensation for cracking and seating and for furnishing all materials, equipment, and labor.

Section 2217. Rubblizing Existing Portland Cement Concrete Pavement

2217.01 DESCRIPTION.

Rubblize and compact the PCC pavement as shown in the contract documents.

2217.02 MATERIALS.

None.

2217.03 CONSTRUCTION.**A. Equipment.**

1. Use equipment capable of uniformly breaking the existing pavement without causing change to its cross slope or profile. Equip the unit with a water system to suppress dust generated by the operation.
2. Use a standard steel drum vibratory roller having a minimum gross weight (mass) of 10 tons (9 Mg) operated in the vibration mode to compact the rubblized pavement.

B. Rubblizing Existing PCC Pavement.

1. Saw to full depth at the beginning and end of the work. Sever tie bars on the mainline where the rubblizing abuts concrete which shall remain in place.
2. Operate the breaker unit at a speed such that the existing pavement is reduced into particles with a nominal maximum size of 4 inches (100 mm), based on a visual inspection of the rubblized pavement surface. Additional passes may be required if larger sizes remain after the initial rubblizing pass. Do not operate the breaker unit within 50 feet (15 m) of bridge abutments and other locations designated by the Contracting Authority.
3. Begin the rubblizing procedure at a free shoulder edge and work towards the centerline joint.
4. Operate the vibratory steel drum roller close behind the rubblizing operation at a speed not to exceed 6 feet (2 m) per second. Compact and seat with a minimum of 4 coverages. In addition, roll the surface immediately ahead of the paving equipment to remove distortion that may occur from batch trucks or other equipment.
5. Leave reinforcement in the rubblized pavement in place. However, cut off reinforcement exposed at the surface as a result of rubblizing operations or compaction operations, or both, and remove it from the project.
6. The roadway will be closed to thru traffic during construction, except at crossings designated in the contract documents. Keep all traffic to a minimum before the placement of the initial HMA course or the PCC pavement. Do not allow more than 2 working days to elapse between rubblizing pavement segments and placement of initial HMA course or PCC pavement. In the event of rain, this time limitation may be extended to allow sufficient time for the rubblized pavement to dry to the Engineer's satisfaction.

2217.04 METHOD OF MEASUREMENT.

The quantity of Rubblized Pavement, in square yards (square meters), will be the quantity shown in the contract documents.

2217.05 BASIS OF PAYMENT.

- A. Payment for Rubblized Pavement will be the contract unit price per square yard (square meter).
- B. Payment is full compensation for furnishing all equipment and materials, including water, and labor to rubblize the pavement, suppress dust, remove exposed reinforcement, and compact the rubblized pavement.

