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PORTLAND CEMENT CONCRETE PAVEMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pavement

B. Curb and Gutter

C. Overlays

1.02 DESCRIPTION OF WORK

Includes the requirements for the construction of full depth PCC pavement, curb and gutter, and overlays.

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants, as well as the following:

A. Two weeks prior to commencing any PCC pavement placement, submit a paving mix design for each different source of aggregate to be used for review and approval by the Engineer. Submit mixes or mix designs approved by the Iowa Department of Transportation or an independent testing laboratory.

B. Maturity curves for paving mixes and maturity reading results.

C. Submit all testing and certifications according to Section 7010, 3.08.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants.

1.05 DELIVERY, STORAGE, HANDLING, AND SALVAGING

Comply with Division 1 - General Provisions and Covenants, as well as the following:

A. Aggregate Storage: Comply with Iowa DOT Article 2301.02, C.

B. Cement and Fly Ash: Comply with Iowa DOT Article 2301.02, C.

C. Admixtures: Store in suitable weather tight enclosures which will preserve quality.

D. Reinforcing Steel: Store off ground on timbers or other supports.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants, as well as the following:

Complete elements of the work that can affect line and grade in advance of other open cut construction unless noted on plans.

1.07 SPECIAL REQUIREMENTS

None

1.08 MEASUREMENT AND PAYMENT

A. PCC Pavement:

1. **Measurement:** Measurement will be in square yards for each different thickness of PCC pavement. The area of manholes, intakes, or other fixtures in the pavement will not be deducted from the measured pavement area.

2. **Payment:** Payment will be at the unit price per square yard for each thickness of PCC pavement.

3. **Includes:** Unit price includes, but is not limited to, final trimming of subgrade or subbase, integral curb, bars and reinforcement, joints and sealing, surface curing and pavement protection, safety fencing, concrete for rigid headers, boxouts for fixtures, and pavement smoothness testing.

B. Air Content Deficiency:

1. **Measurement:** Measurement will be in square yards for each different thickness of PCC pavement subject to a unit price reduction for air content deficiency according to Section 7010, 3.08.

2. **Payment:** Payment will be at the reduced unit price according to Table 7010.03 for each thickness of PCC pavement. If there is an air content deficiency on a privately contracted roadway project, the Jurisdiction ultimately accepting ownership of the roadway will receive the penalty payment prior to acceptance of the work.

C. Pavement Smoothness Deficiency:

1. **Measurement:** Measurement will be in square yards for each different thickness of PCC pavement subject to a unit price reduction for pavement smoothness according to Section 7010, 3.08.

2. **Payment:** Payment will be at the reduced unit price according to Table 7010.04 for each thickness of PCC pavement. If there is a pavement smoothness deficiency on a privately contracted roadway project, the Jurisdiction ultimately accepting ownership of the roadway will receive the penalty payment prior to acceptance of the work.

D. PCC Pavement Thickness Deficiency:

1. **Measurement:** Measurement will be in square yards for each different thickness of PCC pavement that has deficient pavement thickness as determined in Table 7010.05.

2. **Payment:** Payment will be at the percentage of the unit price indicated in Table 7010.05 for each different thickness of PCC pavement. If there is a pavement thickness deficiency on a privately contracted roadway project, the Jurisdiction ultimately accepting ownership of the roadway will receive the penalty payment prior to acceptance of the work.

E. Curb and Gutter:

1. **Measurement:** Measurement will be in linear feet measured along the face of the curb for each different width and thickness of curb and gutter.

2. **Payment:** Payment will be at the unit price per linear feet of curb and gutter.

3. **Includes:** Unit price includes, but is not limited to, final subgrade/subbase preparation, bars and reinforcement, joints and sealing, surface curing and pavement protection, and boxouts for fixtures.

1.08 MEASUREMENT AND PAYMENT (Continued)

F. Beam Curb:

1. **Measurement:** Measurement will be in linear feet measured along the face of the curb.

2. **Payment:** Payment will be at the unit price per linear feet of beam curb.

3. **Includes:** Unit price includes, but is not limited to, final subgrade/subbase preparation, bars and reinforcement, joints and sealing, surface curing and pavement protection, and boxouts for fixtures.

G. Concrete Median:

1. **Measurement:** Measurement will be in square yards of concrete median. When the curb is integral with the pavement, the width will be measured from back of curb to back of curb.

2. **Payment:** Payment will be at the unit price per square yard of concrete median.

3. **Includes:** Unit price includes, but is not limited to, final subgrade/subbase preparation, bars and reinforcement, joints and sealing, surface curing and pavement protection, and boxouts for fixtures.

H. Fixture Adjustment: Comply with Section 6010 for adjustment of manholes and intakes and Section 5020 for adjustment of water valves and fire hydrants.

I. PCC Pavement Samples and Testing:

1. **Measurement:** Lump sum item; no measurement will be made.

2. **Payment:** Payment will be at the lump sum price for PCC pavement samples and testing.

3. **Includes:** Lump sum price includes, but is not limited to, certified plant inspection, pavement thickness cores, profilograph pavement smoothness measurement (when required by the contract documents), and maturity testing.

J. Granular Surfacing: Comply with Section 7030, Granular Driveway Surfacing, for granular surfacing material placed at intersecting roads, driveways, and turnouts.

K. PCC Pavement Widening:

1. **Measurement:** Measurement will be in square yards for each different thickness of PCC pavement widening. The area of manholes, intakes, or other fixtures in the pavement will not be deducted from the measured pavement widening area.

2. **Payment:** Payment will be at the unit price per square yard for each thickness of PCC pavement widening.

3. **Includes:** Unit price includes, but is not limited to, final subgrade/subbase preparation, integral curb, bars and reinforcement, joints and sealing, surface curing and pavement protection, safety fencing, concrete for rigid headers, boxouts for fixtures, and pavement smoothness.

1.08 MEASUREMENT AND PAYMENT (Continued)

L. PCC Overlay:

1. PCC Overlay, Furnish Only:

a. Measurement: Measurement will be in cubic yards of PCC furnished and incorporated for PCC overlay, including widening sections, partial depth patches, and irregular sections.

b. Payment: Payment will be at the unit price per cubic yard of PCC furnished and incorporated for overlay.

c. Includes: Unit price includes, but is not limited to, furnishing the concrete mixture and delivery to the project site.

2. PCC Overlay, Place Only:

a. Measurement: Measurement will be in square yards of PCC overlay placed, including widening sections, partial depth patches, and irregular sections. The area of manholes, intakes, or other fixtures in the overlay will not be deducted from the measured overlay area.

b. Payment: Payment will be at the unit price per square yard of PCC overlay placed.

c. Includes: Unit price includes, but is not limited to, integral curb, bars and reinforcement, joints and sealing, surface curing and pavement protection, safety fencing, concrete for rigid headers, boxouts for fixtures, and pavement smoothness testing.

3. Surface Preparation for Bonded PCC Overlay:

a. Measurement: Measurement will be in square yards of pavement surface prepared for bonded PCC overlay.

b. Payment: Payment will be at the unit price per square yard of pavement surface prepared for bonded PCC overlay.

c. Includes: Unit price includes, but is not limited to, sandblasting, shot blasting, scarification, and surface cleaning.

4. Surface Preparation for Unbonded PCC Overlay:

a. Measurement: Measurement will be in square yards of pavement scarified for unbonded PCC overlay.

b. Payment: Payment will be at the unit price per square yard of pavement scarified for unbonded PCC overlay.

c. Includes: Unit price includes, but is not limited to, scarification and surface cleaning.

5. HMA Stress Relief Course for Unbonded PCC Overlay:

a. Measurement: Measurement will be in square yards of HMA stress relief course for unbonded PCC overlay.

b. Payment: Payment will be at the unit price per square yard of HMA stress relief course for unbonded PCC overlay.

c. Includes: Unit price includes, but is not limited to, HMA mix, including binder, and placement.

M. Pavement Removal: Comply with Section 7040.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cement: Meet the requirements of Iowa DOT Section 4101 and Materials I.M. 401, including Type I and Type II cements and blended hydraulic cements Type 1P, Type 1S, and Type 1L.

B. Supplementary Cementitious Materials (SCM):

1. Fly Ash: Comply with Iowa DOT Section 4108.

2. Ground Granulated Blast Furnace Slag (GGBFS): Comply with Iowa DOT Section 4108.

3. Limestone: Comply with Iowa DOT Materials I.M. 401.

C. Fine Aggregate for Concrete:

1. Meet the requirements of Iowa DOT Section 4110 and Materials I.M. 409, Source Approvals for Aggregates.

2. Comply with the following gradation:

Sieve Size	Percent Passing
3/8”	100
No. 4	90 to 100
No. 8	70 to 100
No. 30	10 to 60
No. 200	0 to 1.5
Iowa DOT Article 4109.02, Gradation No. 1 in the Aggregate Gradation Table.	

3. The Engineer may authorize a change in gradation, subject to materials available locally at the time of construction.

D. Coarse Aggregate for Concrete:

1. Crushed stone particles with Class 2 durability complying with Iowa DOT Section 4115 and Materials I.M. 409, Source Approvals for Aggregates.

2. Comply with one of the following gradations:

Sieve Size	Gradation No. 3 Percent Passing	Gradation No. 4 Percent Passing	Gradation No. 5 Percent Passing
1 1/2”	100	100	-----
1”	95 to 100	50 to 100	100
3/4”	-----	30 to 100	90 to 100
1/2”	25 to 60	20 to 75	-----
3/8”	-----	5 to 55	20 to 55
No. 4	0 to 10	0 to 10	0 to 10
No. 8	0 to 5	0 to 5	0 to 5
No. 200	0 to 1.5	0 to 1.5	0 to 1.5
Iowa DOT Article 4109.02, Gradation No. 3, 4, and 5 in the Aggregate Gradation Table.			

3. The Engineer may authorize a change in gradation, subject to materials available locally at the time of construction.

E. Water Requirements: Comply with Iowa DOT Section 4102. Potable water obtained from a municipal supply, suitable for drinking, may be accepted without testing.

2.01 MATERIALS (Continued)

F. Admixtures: Meet the requirements for the liquid admixtures shown below. Other admixtures may be used subject to the approval of the Engineer.

1. **Air Entrainment Admixture:** Comply with Iowa DOT Section 4103.

2. **Retarding and Water Reducing Admixtures:** Comply with Iowa DOT Section 4103.

3. **Accelerating admixtures (calcium chloride):** Comply with Iowa DOT Article 2529.02.

G. Bars: Comply with Iowa DOT Section 4151 for tie bars and dowel bars. Meet the tie bar requirements for bar mats. All bars must be epoxy coated.

H. Expansion Tubes: Comply with Iowa DOT Section 4191.

I. Metal Keyways: Comply with Iowa DOT Section 4191.

J. Supports for Bars: Comply with Iowa DOT Materials I.M. 451.01.

K. Joint Fillers and Sealers:

1. **Joint Sealers:** Comply with Iowa DOT Article 4136.02.

2. **Preformed Expansion Joint Fillers and Sealers:** Use the following types of preformed materials for filling expansion joints that comply with Iowa DOT Article 4136.03. When the type is not specified, use a resilient filler.
   - Resilient filler
   - Flexible foam expansion joint filler
   - Tire buffings expansion joint filler
   - Elastomeric joint seals

3. **Backer Rod:** Comply with Iowa DOT Section 4136.

L. Liquid Curing Compound: Comply with Iowa DOT Section 4105.

M. Covering:

1. **Burlap:** Comply with Iowa DOT Section 4104.

2. **Plastic Film:** Comply with Iowa DOT Section 4106.

3. **Insulating Cover:** Comply with Iowa DOT Section 4106.

N. Grout Systems: Use polymer grouts that comply with Iowa DOT Materials I.M. 491.11.

2.02 CONCRETE MIXES

A. Mix Design:

1. Comply with Iowa DOT Class C or Class M mix meeting the requirements of Materials I.M. 529.

2. Ensure compatibility of all material combinations. If the concrete materials are not producing a workable concrete mixture, a change in the material may be required. Changes will be at no additional cost to the Contracting Authority.

2.02 CONCRETE MIXES (Continued)

B. Consistency and Workability:

1. Slump:

a. Use an amount of mixing water that will produce workable concrete of uniform consistency. Unless specifically modified by the Engineer, ensure slump, measured according to Iowa DOT Materials I.M. 317, is no less than 1/2 inch or no more than 2 1/2 inches for machine finish and no less than 1/2 inch and no more than 4 inches for hand finish.

b. If it is not possible to produce concrete having the required consistency without exceeding the maximum allowable water to cement ratio specified, the cement content may be increased or water reducing admixture may be added. Obtain the Engineer's approval. Do not exceed the maximum water to cement ratio. Additional cement or water reducer will be added with no additional cost to the Contracting Authority.

c. The basic absolute volume of water per unit volume of concrete is based on average conditions. If material characteristics require that the total quantity of water used to secure the required consistency reduces the batch yield (computed on the basis of absolute volumes of the batch quantities used) by more than 2.0%, the Engineer may adjust the proportions to correct the yield. This adjustment will not be a basis for adjustment of the contract unit price.

2. Air Content: Use an approved air entraining agent.

a. For machine-placed pavement, use a target air content of 8% with a tolerance of plus or minus 2% when measured on the grade just prior to consolidation, as determined by Iowa DOT Materials I.M. 318. The target air content may be adjusted by the Engineer based on random tests of the consolidated concrete behind the paving machine. These additional tests will be used to consider the need for a target value change and will not be used in the acceptance decision.

b. For hand-placed pavement, use a target content for hand finish of 7% with a tolerance of plus or minus 1.5% when measured on the grade and just prior to consolidation, as determined by Iowa DOT Materials I.M. 318.

C. Use of Fly Ash and Ground Granulated Blast Furnace Slag (GGBFS) as Supplementary Cementitious Materials: Mix proportions for the various mixes using fly ash and GGBFS are included in Iowa DOT Materials I.M. 529. The maximum allowable fly ash substitution rate is 20%. Do not use a GGBFS substitution rate of more than 35% by weight (mass). The total supplementary cementitious material substitution rate is not to exceed 40%. When Type IP or IS cement is used in the concrete mixture, only fly ash substitution will be allowed. Substitution of Type I/II cement with both GGBFS and fly ash will be allowed in ready mix concrete mixtures only. Between October 16 and March 15, supplementary cementitious materials will be allowed only when maturity method is used to determine time of opening. Transport, store, haul, and batch fly ash and GGBFS in such a manner to keep it dry.

2.03 PCC OVERLAYS

Comply with Section 7010, 2.01 and 2.02, except as modified below:

A. PCC Bonded Overlays:

1. Concrete Mix Design: C-3WR or C-4WR for bonded overlays.

2. Aggregate: Comply with Iowa DOT Section 4115 and Article 4109.02, Gradation No. 3 and 5 in the Aggregate Gradation Table.

a. Use the same coarse aggregate type (crushed limestone or gravel) as the existing pavement as specified in the contract documents.

b. Use the maximum nominal coarse aggregate size that is no greater than one-third of the overlay thickness.

2.03 PCC OVERLAYS (Continued)

B. HMA Stress Relief Course for Unbonded PCC Overlays:

1. Asphalt Binder: PG 58-28.

2. Mixture: 300,000 ESAL, 3/8 inch mix, per Iowa DOT Section 2303.
a. Target air voids is 3%.
b. No maximum film thickness restriction.
c. No minimum filler/bitumen ratio restriction.

3. Aggregate:
a. Type B.
b. No percent crushed particle requirement.
c. Gradation cannot fall below the restricted zone.

PART 3 - EXECUTION

3.01 EQUIPMENT

A. Batching and Mixing Equipment:

1. General:

a. Weighing and Proportioning Equipment: Comply with Iowa DOT Article 2001.20.

b. Mixing Equipment: Comply with Iowa DOT Article 2001.21.

c. Material Bins: Involves any structure in which materials are stored. Each part of any bin, including foundations and supports, must be adequate to withstand any stress to which it might be subjected to while in use.

2. Batching:

a. Ensure the batching plant is Iowa DOT calibrated and approved. Provide copy of current calibrations and approvals.

b. Coordinate the batch plant operation and batch trucks with the paving operation in order to ensure a steady supply of materials.

c. Operate the batch plant and trucks to minimize dust, noise, or truck nuisances.

3. Mixing:

a. Construction or Stationary Mixer:

1) Ensure the concrete is uniform in composition and consistency. If this condition is not produced because of the size of the batch, the size of the batch may be reduced or the mixing time increased, or both, until this result is obtained. If non-uniform, corrective action must be taken.

2) Ensure the methods of delivering and handling the concrete are such that objectionable segregation or damage to the concrete will not occur, and they will facilitate placing with a minimum of handling.

b. Ready Mixed Concrete:

1) Ensure the concrete is uniform in composition and consistency. If non-uniform, concrete producers must take corrective action.

2) Ready mixed concrete is defined as concrete proportioned in a central plant and mixed in a stationary mixer for transportation in trucks without agitation, proportioned at a central plant, and only partially mixed in a stationary mixer for transportation and finish mixing in a transit mixer, or proportioned at a central plant, and then mixed in a transit mixer prior to or during transit.

3) When necessary to add additional mixing water at the site of placement, mix the batch at least an additional 30 revolutions of the drum at mixing speed.

4) Ensure each vehicle in which concrete will be delivered is capable of discharging concrete having a slump not over 2 inches at an overall rate for its entire load of not less than 1.25 cubic yards per minute. Ensure the concrete is delivered at a rate sufficient to maintain a sustained rate of progress of not less than 100 feet per hour for the width and depth of pavement to be placed.

c. All Methods: Identify each truck load by a plant charge ticket showing plant name, contractor, project data, quantity, class, time batched, and water added at site.

B. Concrete Placement Equipment:

1. Consolidating and Finishing Equipment:

a. Use a paving machine that meets all of the following:

1) Is designed for the specific purpose of placing, consolidating, and finishing concrete pavement.

2) Develops vertical edges on the pavement.

3) Is self propelled and equipped with a means for spreading the concrete to a uniform depth before it enters the throat.

3.01 EQUIPMENT (Continued)

4) Vibrates the concrete to the full width and depth being placed in a single passage. Use vibrating tubes or arms working in the concrete or a vibrating pan operating on the surface of the concrete.
5) Produces a surface reasonably free of voids and tears.
6) When the paver is operated on previously placed concrete, prevent damage to the pavement surface.
7) For slip form pavers, use a paver equipped with automatic horizontal and vertical grade controls.

b. Hand methods utilizing air screeds and vibrating screeds may be used for short pavement runs, cul-de-sacs, driveways, and some intersections.

2. Vibrators for Machine Paving:

a. Consolidate, with a single pass of an approved internal or surface vibrator, the full width and depth of concrete requiring a finishing machine. Operate internal vibrators within a frequency range of 4,000 to 8,000 vibrations per minute. The Engineer may authorize the minimum vibration frequency to be lowered to 3,500 vibrations per minute for particular sections of paving, such as superelevations. Operate surface vibrators within a frequency range of 3,500 to 6,000 vibrations per minute.
b. Avoid operating vibrators in a manner to cause a separation of the mix ingredients, either a downward displacement of large aggregate particles or an accumulation of laitance on the surface of the concrete. When forward motion of the paver is reduced, vibrator frequency may need to be reduced to avoid separation of the mix.
c. If a vibrator fails to operate within the specifications, repair or change the vibrator before the paving begins:
   - The following day, or
   - The same day if the continuous paving that day is stopped at a header or at the end of a session.
d. If two adjacent vibrators fail to operate within the specifications, stop the paving operation and repair or replace the vibrators.
e. Stop vibrators whenever forward motion of the paver is stopped.
f. Set the internal vibrator penetration depth into the concrete pavement to mid slab or as deep as possible while passing above reinforcing steel. Provide an operating position locking device so that no part of the vibrating unit can be lowered to the extent that it will come in contact with reinforcing steel or tie bars while paving.
g. Do not exceed the manufacturer's recommendations for vibrator horizontal spacing. Do not exceed 16 inches from center to center.
h. Mount the longitudinal axis of the vibrator body approximately parallel to the direction of paving. Tilt the trailing end of each vibrator downward to an approximate slope of 15 degrees below horizontal.
i. Use vibrators that meet or exceed the following specifications at the manufacturer's design frequency of 10,000 vpm:
   1) Amplitude (peak to peak) 0.070 inches.
   2) Centrifugal force 1,200 pounds.

3. Vibrators for Hand Methods: Use a vibration rate between 3,500 to 6,000 vibrations per minute, and use an amplitude sufficient to be perceptible on the surface of the concrete more than 12 inches from the vibrating unit.

4. Hand Finishing Equipment: Provide all finishing tools necessary for proper finishing of the concrete including straightedges for checking and correcting finished concrete surfaces.

3.01 EQUIPMENT (Continued)

5. Forms:

a. Rigid Forms: Steel, minimum thickness of 5 gage, height at least equal to design thickness of pavement with base width at least 6 inches.

1) Minimum section length of 10 feet, joint connections designed to allow horizontal and vertical adjustment with locking device to hold abutting sections firmly in alignment.
2) Bracing, support, and staking must prevent deflection or movement of forms.

b. Flexible Forms: Use steel or wood flexible forms for curves with a radius less than 100 feet.

1) Bracing, support, and staking must prevent deflection or movement of forms.
2) Ensure that forms used to shape back of curbs at returns have height at least equal to design thickness of pavement and curb height.
3) Forms must be free from scale and surface irregularities.

6. Curing Equipment: Use pressure sprayer capable of applying a continuous uniform film of curing compound. Use equipment with a shield if wind conditions do not allow proper coverage

7. Concrete Saws: Use power operated concrete saws capable of cutting hardened concrete neatly.

8. Joint Sealing Equipment: Use equipment capable of cleaning the joint and heating and installing sealant in joints according to manufacturer's recommendations.

3.02 PAVEMENT CONSTRUCTION

A. Removal of Pavement: Comply with Section 7040, 3.02.

B. Final Subgrade/Subbase Preparation:

1. General:

a. Meet the requirements of Section 2010 for subgrade construction, subgrade treatment, and subbase construction.
b. Trim the subgrade or subbase to the final grade for placement of concrete.
c. Unless otherwise ordered by the Engineer, the subgrade or subbase, at time of placing concrete for concrete pavement, must be in a uniformly moist but not muddy condition to a depth of not less than 1 inch.

2. Subgrade and Subbase Loading:

a. Travel of concrete delivery trucks on a subgrade or subbase must be approved by the Engineer. In such cases, watering of the subgrade or subbase must be limited to just ahead of the paving machine.
b. Enter and exit from side streets to minimize repetitive loading on the subgrade or subbase by concrete trucks.
c. Do not allow loads in excess of the legal axle load on the completed subgrade or subbase.
d. Partially loaded trucks may be required.
e. If subgrade or subbase failure occurs, coordinate the repair with the Engineer.

3. Paving Suspended:

a. Suspend the paving operation where subgrade or subbase stability has been lost.
b. Do not place concrete on a subgrade or subbase that has become unstable, bears ruts or tire marks of equipment, or that is excessively softened by rain until such subgrade or subbase has been reconsolidated and reshaped to correct the objectionable condition.

3.02 PAVEMENT CONSTRUCTION (Continued)

c. If necessary, scarify to a minimum depth of 6 inches, aerating, and recompacting at no additional cost to the Contracting Authority. Meet the compaction requirements of Section 2010, 3.06.

4. Maintenance of Subgrade or Subbase: Maintain the completed subgrade or subbase during subsequent construction activities.

C. Surface Fixture Adjustment:

1. Adjust manhole frames and other fixtures within area to be paved to conform to finished surface. Comply with Section 6010, 3.04 for manhole adjustments and Section 5020, 3.04 for water fixture adjustments.

2. Clean outside of fixture to depth of pavement before concrete placement.

3. Construct boxouts where allowed for later adjustment of fixtures. See Figure 7010.103 for the size and shape of the boxout.

D. Setting of Forms: When forms are used, meet the following requirements.

1. Ensure forms have sufficient strength to support paving operations being used.

2. Set base of forms at or below subgrade elevation with top of forms at pavement surface elevation. With Engineer approval, extra height forms may be used to shape the back of integral curb and edge of pavement; set base at or below subgrade elevation with top of form at top of curb elevation.

3. Place and secure forms to required grade and alignment. Do not vary the top face of the form from a true plane by more than 1/8 inch in 10 feet, and do not vary the vertical face from a true plane by more than 1/4 inch in 10 feet.

4. If the soil supporting the forms is softened by rain or standing water so that the forms are inadequately supported, or if voids occur under the forms, remove forms. Rework subgrade to proper elevation and density, and reinstall forms.

5. Ensure forms are free of latent concrete and coated with release agent before concrete is placed.

E. Bar and Reinforcement Placement: Ensure bars are clean, straight, free from distortion and rust, and are firmly secured in position as specified in the contract documents. Place all bars in approved storage to prevent damage; do not distribute along the work site except as needed to avoid delay in paving.

1. Tie Bars:

a. Place bars prior to vibration. For slip form paving, tie bars may be installed after vibration, provided the concrete is consolidated around the bars. Bars may be supported by approved chairs or may be placed in position by a machine or method approved by the Engineer.

b. Use approved continuous bolsters with runners to support reinforcement for bridge approach sections. Place the supports transversely across the approach and space them longitudinally no greater than 4 feet. For double reinforced approach sections the top layer of reinforcing may be chaired off the bottom layer of reinforcing using approved continuous high chairs with runners, provided they are positioned directly above the continuous bolsters with runners supporting the bottom layer of reinforcing. Hold epoxy coated reinforcing steel in place with epoxy or plastic coated bar supports and epoxy or plastic coated tie wires.

3.02 PAVEMENT CONSTRUCTION (Continued)

2. Dowel Bar Assemblies:

a. When dowel bar assemblies are required in the contract documents, accurately place these assemblies as shown. To prevent their movement during subsequent concrete paving operations, securely stake or fasten to the base to line and grade.

b. Do not use assemblies that are damaged prior to placement. If assemblies are damaged after placement, replace prior to paving. Ensure horizontal and vertical alignment of the load transfer bars does not exceed 1/4 inch from parallel to line and grade. Place each assembly so the bars are in a horizontal plane at T/2 ± 1/2 inch.

c. Check the placement of each assembly and the position of the bars within the assembly using a suitable template or other device approved by the Engineer. If the assembly is found to be placed outside of the above tolerances, correct the placement.

d. Cutting the tie wires of the load transfer assemblies is optional.

3. Bar Mats for Reinforced Pavement:

a. When reinforced pavement is specified, assemble bar mats accordingly and firmly fastened together at all bar intersections.

b. Place, secure, latch, and tie bar mats for a continuous mat as specified in the contract documents. Displacement during concrete placement operations is not allowed.

c. Use chairs to ensure proper placement of bar mats.

4. Tie Bars and Dowel Bars in Existing Pavement:

a. When anchoring in existing concrete, use a grout system according to the manufacturer's instructions. Obtain the Engineer's approval for the grout system.

b. For horizontal installations, use either a pressure injection system with mechanical proportioning and mixing, or use encapsulated chemical anchors. Install as follows:

1) Ensure drilled holes to receive the grout match the dimensions and spacing specified in the contract documents. When not specified in the contract documents, the maximum nominal diameter of the hole must be 1/8 inch larger than the outside diameter of the dowel or bar, or as recommended by the manufacturer. Drill holes for tie bars and dowel bars into the face of the existing pavement at midpoint. To ensure proper horizontal alignment, do not allow any hole misalignments to exceed 1/4 inch in the vertical or horizontal plane. Clean the hole with compressed air immediately prior to placing the grout.

2) Use a polymer grout to secure the dowels in the existing pavement. Inject the grout into the rear of the hole with pressure. Use sufficient grout so that when the bar to be grouted is placed in position, excess grout will be forced out the front of the hole. Rotate the bar during the insertion process to ensure complete coating with the grouting material. Hand proportioning and mixing is not allowed.

3) If using grout with approved encapsulated anchors, install according to the manufacturer's recommendations.

4) Use horizontal installation procedures for vertical or angled installations; however, pourable grouts may be used. Pourable grouts must be mechanically mixed.

F. Concrete Pavement Placement:

1. Use paving machine for all uniform width pavements 8 1/2 feet or more in width and 250 feet or more in length, unless alternate methods are approved by the Engineer. Screeds may be used on short pavement runs up to 250 feet.

2. Place, consolidate, and finish the concrete to the full depth and width conforming to the specified crown and cross-section in a single operation.

3.02 PAVEMENT CONSTRUCTION (Continued)

3. Keep a uniform pile of concrete in front of the paving machine, up to a maximum of 6 to 8 inches above the design surface elevation. Distribute and spread the concrete as soon as placed. A mechanical concrete spreader may be used.

4. Deposit the concrete upon the in-place bars keeping segregation to a minimum.

5. Use shovels, not rakes, to do necessary hand spreading and spading.

6. Do not allow the edges of pavement, including all longitudinal construction joints, to deviate from the line shown on the plans by more than 1/2 inch at any point.

7. If the paving machine operates on adjacent pavement, protect pavement from damage.

8. When placing by hand methods, consolidate the concrete by using vibrating units. Use a definite system or pattern in the operation of the vibrator so the full width of concrete in each linear foot of lane will receive adequate and uniform consolidation. The system and methods of vibrating is subject to approval of the Engineer. Do not use vibrating equipment as a tool for moving concrete laterally.

G. Integral Curbs: Integral curbs are placed with the pavement in a single paving machine operation; however, hand methods may be allowed for radius, returns, and sections of curb and gutter 100 feet or less in length or in other special sections where mechanical equipment cannot be used.

1. Pave, edge, protect, saw, and cure curb in same manner as pavement.

2. Finish curb as rapidly as finishing operations on pavement permit. Maximum distance behind paving machine is 100 feet.

3. Complete final finish on curbs by hand methods, including the use of a 6 foot straightedge.

4. Check surfaces of curb and gutter with 10 foot straightedge; correct variations greater than 1/8 inch.

5. For drop curb at driveways and where sidewalks intersect streets, use forms to shape the backs of such curbs.

6. When using hand methods for building curb, the following additional requirements will apply:
   a. Remove free water, latency, dust, leaves, or other foreign matter from the slab prior to placing concrete for curb.
   b. Use freshly mixed concrete; do not store concrete in receptacles at side of pavement for use in curb at a later time; do not use concrete requiring retempering.
   c. Consolidate curb concrete to obtain adequate bond with the pavement slab and to eliminate honeycomb in the curb. Avoid disturbing the alignment of forms or the gutter flow line.

H. Finishing:

1. Grade and Crown: Promptly after concrete has been placed and vibrated, strike off the surface to the true section by the screed. Finish the surface true to crown and grade.

2. Watering the Surface: The practice of lubricating the pavement surface by sprinkling water by spray, brush, or other methods to afford greater ease in finishing operation is not allowed.

3.02 PAVEMENT CONSTRUCTION (Continued)

3. Floats: Finish surface with wood or magnesium floats; finish from both sides simultaneously if pavement is placed to full width with one pass of paving machine.

4. Straightedging:

a. After the longitudinal floating has been completed and the excess water has been removed, and while the concrete is still plastic, test the pavement surface for trueness.

b. Immediately fill any depressions found with freshly mixed concrete, struck off, consolidated, and refinished.

c. Check surface longitudinally while concrete is still plastic; correct any surface deviations greater than 1/8 inch in 10 feet.

5. Surface Treatment:

a. Drag Surface Treatment: Unless otherwise specified, texture the finished surface with an artificial turf or burlap drag treatment.

1) Pull the artificial turf or burlap drag longitudinally over the finished surface to produce a tight, uniform, textured surface, and round the edges in a workmanlike manner.

2) Remove the artificial turf or burlap drag from the pavement surface at regular intervals and clean with water to remove accumulated concrete from the fabric in order to maintain a consistent finished texture.

3) When the desired texture is not attained, the Engineer may require the final finish be a broom finish.

b. Surface Tining: When surface tining is specified, use a longitudinal tining. Under special circumstances, when specified in the contract documents, transverse tining may be required.

1) Longitudinal:

a) Complete longitudinal surface tining using a machine with a wire broom or comb. For small or irregular areas, or during equipment breakdown, hand methods may be used. Use a broom or comb with a single row of tines 1/8 inch (+/- 1/64 inch) in width and uniformly spaced at 3/4 inch intervals. The depth of the grooves must be a minimum of 1/8 inch to a maximum of 3/16 inch in the plastic concrete.

b) Use equipment with horizontal and vertical string line controls to ensure straight grooves.

c) Conduct this operation at such time and in such manner that the desired surface texture will be achieved while minimizing displacement of the larger aggregate particles and before the surface permanently sets.

d) At longitudinal joints, leave a 2 to 3 inch wide strip of pavement surface (centered along the joint) that is not grooved for the length of the joint.

2) Transverse:

a) If transverse surface tining is required or allowed, use a machine with a wire broom or comb. For small or irregular areas, or during equipment breakdown, hand methods may be used. Use a broom or comb with a single row of tines 1/8 inch (+/- 1/64 inch) in width and randomly spaced from 3/8 inch to 1 5/8 inch with no more than 50% of the spacing exceeding 1 inch. The depth of the grooves must be a minimum of 1/8 inch to a maximum of approximately 3/16 inch in the plastic concrete.

b) Conduct this operation at such time and in such manner that the desired surface texture will be achieved while minimizing displacement of the larger aggregate particles and before the surface permanently sets.

c) Where abutting pavement is to be placed, the tining should extend as close to the edge as possible without damaging the edge.

d) If abutting pavement is not to be placed, do not tine the 6 inch area nearest the edge or 1 foot from the face of the curb.

3.02 PAVEMENT CONSTRUCTION (Continued)

6. Edge Finish: Before the concrete has taken its initial set, finish all edges of the pavement with an 1/8 inch radius edging tool.

I. Surface Curing:

1. Apply liquid curing compound in a fine spray to form a continuous, uniform film on the horizontal surface and vertical edges of pavement, curbs, and back of curbs immediately after surface moisture has disappeared, but no later than 30 minutes after finishing. With approval of the Engineer, the timing of cure application may be adjusted due to varying weather conditions and concrete mix properties to ensure acceptable macrotexture is achieved.
   a. Use a white pigment liquid curing compound for concrete not receiving an asphalt overlay. When specified in the contract documents, use a linseed oil solution.
   b. Use a dark-colored curing compound for concrete receiving an asphalt overlay.

2. Apply compound with power sprayer; rate of application not less than 15 square yards per gallon (0.067 gallon per square yard); do not dilute compound. For concrete receiving an asphalt overlay, use a minimum rate for dark-colored cure of 12.5 square yards per gallon (0.08 gallon per square yards).

3. Ensure liquid curing materials are well agitated in the supply drum or tank immediately before transfer to the sprayer. Keep curing materials well agitated during application.

4. Hand operated sprayers may be used for small and irregular areas.

5. If forms are used, apply to pavement edges and back of curbs within 30 minutes after forms are removed.

6. If, due to other operations, the coating is damaged within 72 hours after being applied, immediately re-coat the affected areas. Coating of the sawed surface with curing compound will not be allowed on joints that are to be sealed. When pavement is opened to traffic prior to 72 hours after application of the curing coating, a re-coating will not be required.

J. Construction of Joints:

1. General:
   a. Construct joints of the type, dimensions, and at the locations specified in the contract documents. See the 7010 figures.
   b. Place longitudinal joints coincident with or parallel to the pavement centerline.
   c. Place all transverse joints at right angles to the centerline and extend the full width of the pavement.
   d. Place all joints perpendicular to the finished grade of the pavement and do not allow the alignment across the joint to vary from a straight line by more than 1 inch.
   e. Exercise care in placing, consolidating, and finishing the concrete at all joints.

2. Saw Joints:
   a. Mark joint locations with a string line before sawing.
   b. Begin transverse joint sawing as soon as the concrete has hardened sufficiently to allow sawing without raveling or moving of aggregate. Saw joints before uncontrolled cracking takes place.
   c. Saw all joints in a single cutting operation for a specific joint. Make saw cuts true to line and to the dimensions specified in the contract documents.
   d. Discontinue sawing a joint if a crack develops ahead of the saw.
   e. Saw longitudinal joints within 24 hours of the concrete being placed.
   f. If necessary, continue the sawing operations both day and night.

3.02 PAVEMENT CONSTRUCTION (Continued)

g. The concrete must be capable of supporting the sawing operations to allow the use of an early green concrete saw.
h. Repair or replace pavement with uncontrolled or random cracking at no additional cost to the Contracting Authority. Use repair methods approved by the Engineer. Repair or replace at the direction of the Engineer.
i. Use wet sawing for dust control when specified in the contract documents.
j. Where boxouts occur in pavement, construct joints as shown on Figures 7010.103 and 7010.904.

3. Construction Joints:

a. Place longitudinal and transverse construction joints where specified in the contract documents, at boxouts, and at headers.
b. Locate and place forms for boxouts on grade prior to paving as shown on Figures 7010.103 and 7010.904.
c. If concrete placement is delayed for more than 30 minutes or at the end of each day, construct a Days Work (DW) or a Rigid Tie (RT) transverse construction joint within 5 feet of a planned transverse contraction joint.
d. Finish the edges of the pavement at construction joints with a 1/8 inch radius edging tool.

4. Expansion Joints:

a. Install expansion joints as specified in the contract documents.
b. Prevent movement of or damage to joint assembly when placing concrete; set joint material low enough to clear the finish machine.
c. Construct double width expansion joint in curb over expansion joint in pavement. The backside of the joint must be clear of concrete.
d. Align the expansion joint straight and true. After the mechanical finishing equipment has passed over the joint, check the joint for movement. If movement in excess of 1/2 inch has occurred, immediately correct the installation to its intended position.
e. If joint fillers are assembled in sections, or if joints as a whole are constructed in sections, do not allow offsets between adjacent fillers.
f. Where more than one section is used in a joint, securely lace or clip the sections together.
g. Supplemental vibration equipment is required for proper consolidation of the concrete.
h. After the surface finishing has been completed, finish the edge of the joint with a 1/8 inch edging tool.

K. Joint Sealing:

1. Timing:

a. Unless otherwise allowed or approved by the Engineer, before any portion of the pavement is opened to the Contractor's equipment or to general traffic, clean and seal joints that require sealing.
b. The Engineer may limit the wheel loads and axle loads of equipment operating on the pavement during this operation, if prior to the age and strength specified in Section 7010, 3.06. Additional tests to determine the pavement strength may be required.

2. Cleaning:

a. For those joints that are not to be sealed, cleaning is not required.
b. Within 3 hours after a joint has been wet sawed to the finished dimension, flush the wet sawing residue away from the sawed faces using a high pressure water blast operating with a minimum pressure of 1,000 pounds per square inch. Within 3 hours after a joint has been dry sawed to the finished dimension, blow the dry sawing residue from the joint using air compressors that provide moisture and oil free compressed air.

3.02 PAVEMENT CONSTRUCTION (Continued)

c. Immediately prior to installation of sealant, clean joints with an air blast. Do not perform sealing until visual examination verifies the joint surfaces appear dry, in addition to being clear of dust and contamination.

3. Sealing:

a. Prepare and install joint sealer in the joint and to the proper level specified in the contract documents and as recommended by the manufacturer.
b. Heat hot-poured sealers in a thermostatically controlled heating kettle; heat the material to the temperature required for use, but not above that recommended by the manufacturer. After sealing, remove excess sealer from the pavement surface.
c. Seal joints the same day they are cleaned. Apply sealant only when the joint surfaces appear dry by visual examination.
d. Place joint sealer only when the pavement and ambient air temperatures are 40°F or above. When near this minimum, additional air blasting or drying time, or both, may be necessary to ensure a satisfactory bond to the joint faces. When this sealer cannot be properly placed due to late fall work, submit a joint construction plan and sealing details to the Engineer for approval before commencing paving. Delay the cleaning, sealing, and, if required, resawing of joints until the following spring. This delay requires the Engineer's approval.
e. When surface correction is required, repair seals damaged from the corrective work. Joint preparation, cleaning, and sealing may be delayed until after corrective work, provided the pavement is not opened to traffic before corrective work is performed.

L. Pavement Backfill: Following slipform paving operations, place backfill material along the pavement within 48 hours of pavement attaining opening strength or as directed by the Engineer to prevent flow of water and any subsequent damage caused by undermining of the pavement. Prior to placement of full backfill material, construct check dams or other protection as appropriate to ensure no damage to the subgrade and/or subbase occurs.

M. Form Removal:

1. Timing:

a. Remove forms after the initial set of the concrete has taken place.
b. Remove stakes and forms with care to prevent cracking, spalling, or over stressing concrete. If damage does occur, repairs will be made as required by the Engineer.

2. Honeycomb Repair:

a. When the forms are removed, fill honeycombs with mortar composed of 1 part cement and 2 parts fine aggregate by weight.
b. If the honeycombing is to the degree and nature that it is considered by the Engineer as defective work, remove and replace at no additional cost to the Contracting Authority.

3. Paving Protection: In the area adjacent to the curbs and pavement edge, immediately place backfill after the forms are removed. Construct dams or other protection to ensure that no saturation or erosion of the subgrade under or near the pavement occurs. This may include check dams, pumping, etc.

3.03 CURB AND GUTTER CONSTRUCTION (See Figure 7010.102)

A. Complete the construction of curb and gutter separate from pavement in the same manner as for pavement in Section 7010, 3.02.

B. Use a paving machine for curb and gutter. For curb and gutter sections less than 250 feet, hand finish methods may be used.

3.04 OVERLAY CONSTRUCTION

Construct overlays in the same manner as PCC pavement, except as modified herein.

A. Bonded Overlays:

1. Surface Preparation:

a. Over PCC:

1) Remove dirt, oil, foreign material, or concrete laitance from existing pavement surface by shot blasting or sandblasting.
2) Scarify to a nominal depth of 1/4 inch.
3) Sweep and air blast surface to remove any loose dirt or debris. Keep air blasting operations as close to overlay operations as possible to prevent any resettlement of debris onto previously cleaned area.

b. Over HMA:

1) Scarify to the depth specified in the contract documents, but no less than 1/4 inch. Trim high spots in the existing asphalt surface at the direction of the Engineer.
2) Sweep and air blast surface to remove any loose dirt or debris. Keep air blasting operations as close to overlay operations as possible to prevent any resettlement of debris onto previously cleaned area.

2. Placing and Finishing:

a. Surface Condition: Ensure the prepared surface is dry to allow some absorption of the concrete mortar.

b. Jointing:

1) Over PCC: Use a reliable method to mark the location of all joints to be matched.

a) Longitudinal: Saw directly over existing joints full depth.

b) Transverse: Saw directly over existing joints full depth of the overlay plus 0.5 inches.

2) Over HMA:

a) Longitudinal: Saw to a depth of one third the overlay thickness.

b) Transverse: Saw to a depth of one fourth the overlay thickness with a conventional saw or no less than 1.25 inches with an early entry saw.

c. Curing: Apply cure material at twice the normal rate of application.

d. Restrictions:

1) Air Temperature: Do not place overlay concrete when air or existing pavement surface is below 40°F.

2) Pavement Temperature: Do not place overlay on HMA when the pavement surface temperature exceeds 120°F. If the surface of the HMA is above 110°F, the Contractor may apply water to the surface of the HMA ahead of the paving operation in order to cool the surface. Apply water far enough in advance of the paving operation so that the surface will dry from evaporation before concrete is placed. Do not apply water to the surface of the pavement when the HMA surface temperature is below 100°F.

3) Time of Year: Do not place bonded overlays from October 1 to May 31.

B. Unbonded Overlays:

1. Surface Preparation: Clean the existing pavement surface immediately prior to paving to remove dirt or debris. Trim high spots in the existing asphalt surface as specified in the contract documents. Do not scarify the existing PCC surface if an HMA stress relief course will be constructed.

3.04 OVERLAY CONSTRUCTION (Continued)

2. Placing and Finishing:

a. Surface Condition: Ensure the prepared surface is dry to allow some absorption of the concrete mortar.

b. HMA Stress Relief Course: Place HMA stress relief course over existing PCC pavement when specified in the contract documents. Ensure a minimum compaction of 94% of laboratory density for the HMA layer. Use static steel wheeled rollers only.

c. Jointing:

1) Longitudinal: Saw to a depth of one third the overlay thickness.

2) Transverse: Saw to a depth of one fourth the overlay thickness with a conventional saw or no less than 1.25 inches with an early entry saw.

d. Curing: Apply cure material at twice the normal application rate.

e. Restrictions:

1) Air Temperature: Do not place concrete overlay when air or existing pavement surface is below 40°F.

2) Pavement Temperature: Do not place overlay on HMA when the pavement surface temperature exceeds 120°F. If the surface of the HMA is above 110°F, the Contractor may apply water to the surface of the HMA ahead of the paving operation in order to cool the surface. Apply water far enough in advance of the paving operation so that the surface will dry from evaporation before concrete is placed. Do not apply water to the surface of the pavement when the HMA surface temperature is below 100°F.

3.05 PAVEMENT PROTECTION

A. Weather Conditions: Do not place concrete when stormy or inclement weather or temperature prevents good workmanship. Temperature restrictions and protection requirements may be modified by the Engineer under unusual conditions.

1. Cold Weather:

a. Paving: Do not place aggregates containing frozen lumps, and do not place concrete on a frozen subgrade or subbase. Take all necessary actions to prevent the pavement from freezing.

1) Concrete mixing and placement may be started, if weather conditions are favorable, when the air temperature is at least 34ºF and rising. At the time of placement, concrete must have a temperature of at least 40ºF.

2) Stop mixing and placing when the air temperature is 38ºF or less and falling or if the temperature stops rising and does not reach 38ºF.

b. Protection: Prior to applying protection, cure all concrete pavement and curb/gutters, including exposed edges of the pavement and curb. In addition, protect concrete less than 36 hours old as follows:

Night Temperature Forecast	Type of Protection[1]
35°F to 32°F	One layer of burlap for concrete.
31°F to 25°F	Two layers of burlap or one layer of plastic on one layer of burlap.
Below 25°F	Four layers of burlap between layers of 4 mil plastic or equivalent commercial insulating material approved by the Engineer.

[1] Keep protection in place until one of the following conditions is met:
a. The pavement is 5 calendar days old.
b. Opening strength is attained.
c. Forecasted low temperatures exceed 35°F for the next 48 hours.
d. Forecasted high temperatures exceed 55°F for the next 24 hours and subgrade temperatures are above 40°F.

3.05 PAVEMENT PROTECTION (Continued)

1) Shut down paving operations in time to comply with protection requirements outlined above. During cold weather, allow more time for finishing and protection. Perform all finishing and covering operations prior to darkness. Temperature restrictions and protection requirements may be modified by the Engineer.
2) Equivalent commercial insulating material approved by the Engineer may be used. This material must be waterproof and have a minimum R value of 1.0. If initial set has not yet occurred, place a layer of burlap on top of concrete prior to placing insulating blankets.
3) Use a method of protection and materials that will maintain the concrete temperature above 40°F.

2. Hot Weather: Hot weather condition is defined as any combination of the following conditions that tend to impair the quality of plastic concrete by accelerating the rate of moisture loss and rate of cement hydration causing thermal shrinkage and resulting in plastic shrinkage cracking:

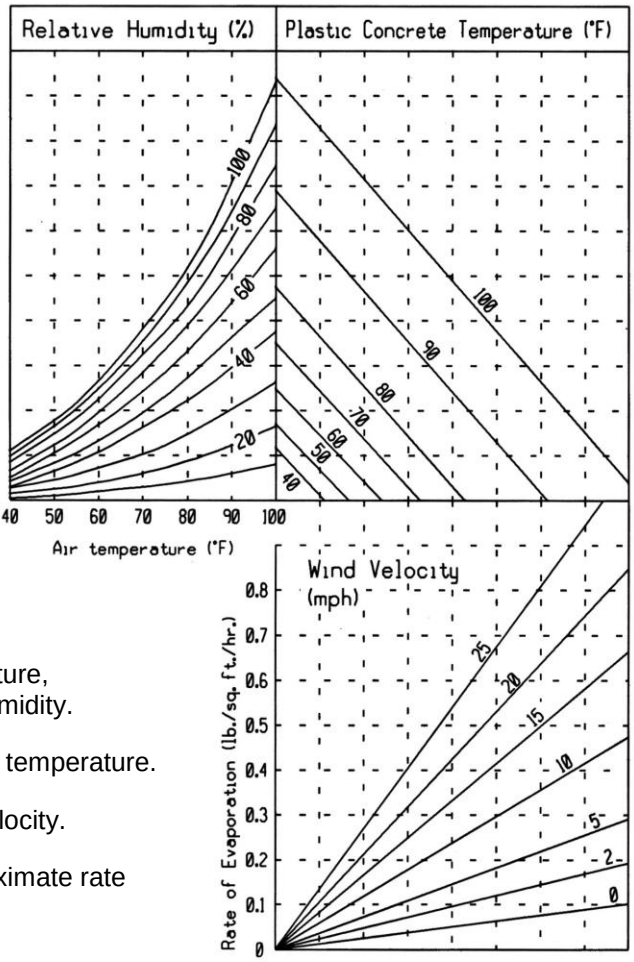
- High Ambient Temperature
- High Concrete Temperature
- Low Relative Humidity
- High Wind Velocity
- Solar Radiation

a. General:
   1) During hot weather conditions, the Engineer may restrict concrete placement to early morning or evening hours.
   2) During hot weather conditions, advise the Engineer of the results of the theoretical evaporation rate throughout paving operations.

b. Determine the Theoretical Rate of Evaporation: Use the following chart and the National Weather Service's predicted maximum air temperature, relative humidity, and maximum steady wind velocity without gusts, for the date and the location of the paving pour.

3.05 PAVEMENT PROTECTION (Continued)

Theoretical Rate of Evaporation Chart



To Use this Chart:

1. Enter with air temperature, move up to relative humidity.
2. Move right to concrete temperature.
3. Move down to wind velocity.
4. Move left , read approximate rate of evaporation

c. If the evaporation rate exceeds 0.1 pounds per square foot per hour but is less than 0.3 pounds per square foot per hour, provide the following concrete evaporation protection.
   1) Immediately apply an approved evaporation retarder to the concrete pavement and curbs or increase the surface cure application to 1.5 times the standard specified rate.
   2) Take special precautions to ensure that the forms and subgrade are sufficiently moist or protected to avoid lowering the water content at the pavement/subgrade interface. In hot weather conditions, moisten the subgrade the evening before operations.
   3) Ensure that the time between placing and curing is minimized and eliminate delays.
   4) Moisten concrete aggregates that are dry and absorptive.
   5) Use a fog spray to raise the relative humidity of the ambient air if there is a delay in immediately applying the curing compound.
   6) Minimize solar heat by shading, wetting, or covering concrete chutes or other equipment that comes in contact with plastic concrete.

d. If the evaporation rate is 0.3 pounds per square foot per hour or greater, discontinue placement of concrete.

3.05 PAVEMENT PROTECTION (Continued)

3. Rain Protection:

a. Have materials available, near the work site, for proper protection of the edges and surface of concrete. Protective material may consist of sheets of burlap or plastic film. Also have planks or other material with suitable stakes that can be used as temporary forms available.
b. If initial set has not occurred, take every precaution necessary to protect the surface texture of the concrete.
c. If so determined by the Engineer, failure to properly protect concrete will constitute cause for removal and replacement of defective pavement.

B. Night Conditions: Perform all finishing and covering operations prior to darkness (half an hour after sunset). Do not commence construction until half an hour before sunrise. Do not place or finish concrete under artificial light, unless approved by the Engineer.

C. Protection from Traffic:

1. General:

a. Protect the new pavement and its appurtenances from traffic, both public and that caused by the Contractor's own employees and agents, at no additional cost to the Contracting Authority. This includes the erection and maintenance of warning signs, lights, barricades, watchmen to direct traffic, and pavement bridges or crossovers.
b. Do not operate equipment with metal tracks, metal bucket blades, or metal motor patrol blades directly on new paving. Do not unload soil or granular materials, including base rock for storage and future reloading directly onto new paving.

2. End of Day's Run:

a. At the end of each day's run and at all side streets, erect and maintain safety barriers and fencing as necessary to protect the pavement from damage.
b. Install safety fences within 1 hour of the completion of finishing and curing operations. Leave fences in place and maintained until the concrete has attained the minimum strength or age.
c. Intermediate safety fences may be required for the purpose of opening the pavement for access to a side road, side street, or entrance.

3. Repair of Damages: At the discretion of the Engineer, and at no additional cost to the Contracting Authority, repair or replace any part of the pavement damaged by traffic or other causes occurring prior to final acceptance of the pavement.

3.06 USE OF PAVEMENT

Time for opening pavement for use is determined by maturity method complying with Iowa DOT Materials I.M. 383 or age and test results. The minimum age and test results needed for opening are shown in Table 7010.01.

Table 7010.01: Minimum Age and Tested Strength of Pavement Before Opening

Class of Mix	Type of Cement	Minimum Age For Opening[1]	Minimum Compressive Strength (psi)	Minimum Flexural Strength Center Point (psi)
C	Type I	7 Days[2]	3,000	575
M	Type I	48 Hours	3,000	575

[1] Opening without testing only allowed upon approval of Engineer
[2] Five calendar days for concrete 9 inches thick or more.

3.07 TRANSPORTATION RESTRICTIONS

A. Do not use concrete transported with continuous agitation when the cement has been in contact with the aggregate more than 90 minutes before it is placed. With the approval of the Engineer, an approved retarding admixture may be used at the rates required in Iowa DOT Materials I.M. 403.

B. Do not use concrete transported without continuous agitation if the period elapsed between the time the concrete is mixed and the time it is placed is greater than 30 minutes. With the approval of the Engineer, an approved retarding admixture may be used at the rates required in Iowa DOT Materials I.M. 403 and the mixed-to-placed time may be extended.

C. Ensure the methods of delivering and handling the concrete are such that objectionable segregation or damage to the concrete will not occur, and concrete placing will occur with a minimum of rehandling.

D. Thoroughly clean the truck compartment in which concrete is transported and flush with water to ensure that hardened concrete will not accumulate. Discharge the flushing water from the truck compartment to the designated discharge point before it is charged with the next batch.

3.08 QUALITY CONTROL

A. Testing: Provide the following material certifications and testing required to be performed by Supplier or Contractor.

Table 7010.02: Material Certifications and Testing

Material or Construction Item	Tests	Applicable Standard[1]	Methods of Acceptance of Sampling and Testing	Field Sampling and Testing	
				Frequency (minimum)	Responsible Party
Fine Aggregates	Gradation	I.M. 302, 306, 336	Cert. Plant Insp.[2]	1/250 CY or min 1/day	Supplier/ Contractor
	Moisture	I.M. 308, 527	Cert. Plant Insp.[2]	1 per 1/2 day	
	Specific Gravity	I.M. 307	Cert. Plant Insp.[2]	1/250 CY or min 1/day	
	Quality	I.M. 209	Approved Source	Prior to use	
Coarse Aggregates	Gradation	I.M. 302, 306, 336	Cert. Plant Insp.[2]	1/250 CY or min 1/day	
	Moisture	I.M. 308, 527	Cert. Plant Insp.[2]	1 per 1/2 day	
	Specific Gravity	I.M. 307	Cert. Plant Insp.[2]	1/250 CY or min 1/day	
	Quality	I.M. 209	Approved Source	Prior to use	
Portland Cement	Quality	I.M. 401	Approved Source	Prior to use	
Fly Ash	Quality	I.M. 491.17	Approved Source	Prior to use	
GGBFS	Quality	I.M. 491.14	Approved Source	Prior to use	
Curing Compound	Quality	Iowa DOT Section 4105	Approved Source	Prior to use	
Joint Sealer	Quality	I.M. 436.01	Approved Source	Prior to use	
Epoxy Dowel Bars and Assemblies	Quality	I.M. 451.03B	Approved Source	Prior to use	
Tie Bars	Quality	I.M. 451	Approved Source	Prior to use	
Plastic Concrete	Air Content	I.M 318, 327	Field Test	1/200 CY or min. 1/day	Engineer
	Slump	I.M. 317	Field Test	1/200 CY or min. 1/day	
	Cylinders 6"	I.M. 315	Field Test	Set of 3/500 CY or two sets/day	
	Beams	I.M. 316, 327, 328	Field Test	Set of 3/500 CY or two sets/day	
	Thickness	----------	Field Test	1/200 CY	
Hardened Concrete	Smoothness	SUDAS 7010, 3.08	Field Test - Straightedge	Project length	
	Smoothness	SUDAS 7010, 3.08	Field Test - Profilograph	Project length	Contractor
	Thickness	SUDAS 7010, 3.08	Field Test	1 core/1000 SY or 3 cores/project	
	Strength	I.M. 383	Maturity Tests[3]	Prior to placement	

[1] Refers to the Iowa DOT Materials I.M.s, Iowa DOT Standard Specifications, or SUDAS Standard Specifications.
[2] Certified plant inspection per Iowa DOT Materials I.M. 527.
[3] The Contractor is responsible for developing the maturity curve for the specified mix, taking maturity readings, and delivering a copy of the results to the Engineer.

3.08 QUALITY CONTROL (Continued)

B. Air Content:

1. Air content of the concrete will be evaluated according to Iowa DOT Materials I.M. 318 and 327.

2. When a test result is outside the tolerance for the target air content, the contractor will be notified immediately. An air test will then be immediately run behind the paver to aid in identifying the limits of the non-complying air. A test result between 5% and 8% behind the paver will be considered complying. This test will represent all concrete from the back of the paver back to the last documented complying test. Make immediate adjustments to the mix production and placement process to bring the air content back within tolerance. Do not use succeeding loads below the lower target air content tolerance by more than 0.5%. Each subsequent load will be tested until air content is within tolerance for two consecutive loads. For all incorporated, non-complying concrete that is out of tolerance, the Engineer will determine if removal and replacement is required or if a price adjustment, according to Table 7010.03, will be applied.

Table 7010.03: Concrete Air Content Price Adjustments

Air Content Range			% Payment of Unit Price
Minimum		**Maximum**	
1.1*	and	below	0%
0.6	to	1.0*	50%
0.1	to	0.5*	75%
Low air tolerance limit			100%
Target			100%
High air tolerance limit			100%
0.1	to	0.5**	95%
0.6	to	1.0**	85%
1.1	to	1.5**	75%
1.6	to	2.0**	60%
2.1**	and	above	0%

*Air content deviation below the acceptable limits
** Air content deviation above the acceptable limits

C. Pavement Smoothness: Evaluate pavement smoothness for all PCC pavement and overlay surfaces.

1. Straightedge: The Engineer will check PCC pavement surfaces with a 10 foot straightedge placed parallel to the centerline. Areas showing high spots of more than 1/4 of an inch in 10 feet will be marked. Complete surface corrections according to the procedures in Iowa DOT Section 2316 to an elevation where the area or spot will not show surface deviations in excess of 1/8 inch when tested with a 10 foot straightedge. Surface corrections will be completed at the direction of the Engineer with no additional cost to the Contracting Authority.

2. Profilograph:

a. If specified in the contract documents, comply with Iowa DOT Section 2316 to measure pavement smoothness with a profilograph.
b. Evaluate according to the smoothness requirements of Table 7010.04 and make surface corrections and price reductions. Surface corrections will be completed with no additional cost to the Contracting Authority. No incentive for pavement smoothness will be made.

3.08 QUALITY CONTROL (Continued)

Table 7010.04: Pay Factor if Profilograph Used

Segment Index (inch/mile)	Pay Factor
0 - 22.0	100%
22.1 - 30.0	97%
30.1 and over	Grind as directed by Engineer

c. Smoothness measurements will be suspended for structures and through intersections.

D. Pavement Thickness:

1. At locations determined by the Engineer, cut samples from the pavement by drilling with a core bit that will provide samples with a 4 inch outside diameter. Restore the surface by tamping low slump concrete into the hole, finishing, and texturing. The Engineer will witness the core drilling, identify, and take possession of the cores. The Engineer will determine the core locations, measure the cores, and determine the thickness index according to Iowa DOT Materials I.M. 346 and 347, except as modified as follows:
   a. For regular or irregular shaped areas, use a lot size of 1,000 square yards. Include remnants less than 500 square yards in the last lot and remnants greater than 500 square yards in a separate lot. Take a minimum of three cores per project.
   b. For any core with a deficiency greater than 0.15 inch, take two additional cores in that pavement lot and use the average of the three cores.

2. Coring of pavement or other work for thickness determination may be waived by mutual agreement for sections of the same design thickness less than 2,500 square yards.

3. Based on the thickness index determined by the Engineer, the pavement payment will be as shown in Tables 7010.05 and 7010.06.

4. If the thickness index deficiency is greater than 0.51 for pavements thinner than 9 inches or 0.91 for pavements 9 inches or thicker, the Engineer will study the extent and severity of the deficiency of the pavement areas. The Engineer will require one of the following based on a review on the level of deficiency, the amount of the payment penalty, and the estimated reduction in the design life of the deficient pavement:
   a. Removal and replacement of the deficient areas with pavement complying with the contract documents at no additional cost to the Contracting Authority.
   b. Completion of an agreement that provides a combination of an extended guarantee period and payment penalty and allows the deficient pavement to be left in place.

Table 7010.05: Pay Factor for PCC Pavement for Design Thickness less than 9"

Thickness Index Range	Percent Payment
More than 0 to -0.15	100
-0.16 to -0.25	95
-0.26 to -0.50	85
-0.51 or less	As determined by the Engineer

3.08 QUALITY CONTROL (Continued)

Table 7010.06: Pay Factor for PCC Pavement for Design Thickness 9" or Greater

Thickness Index Range	Percent Payment
More than 0.00 to -0.15	100
-0.16 to -0.20	99
-0.21 to -0.25	98
-0.26 to -0.30	97
-0.31 to -0.35	96
-0.36 to -0.40	95
-0.41 to -0.45	94
-0.46 to -0.50	93
-0.51 to -0.55	92
-0.56 to -0.60	91
-0.61 to -0.65	90
-0.66 to -0.70	89
-0.71 to -0.75	88
-0.76 to -0.80	87
-0.81 to -0.85	86
-0.86 to -0.90	85
-0.91 or less	As determined by the Engineer

E. Defects or Deficiencies: Remove and replace or repair pavement containing excessive cracks, fractures, spalls, or other defects at no additional cost to the Contracting Authority. The method of replacement or repair will be determined by the Engineer.

END OF SECTION

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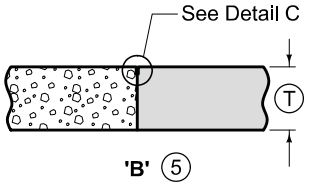
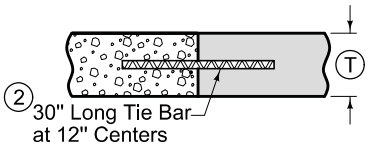
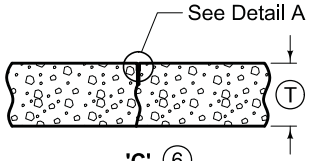


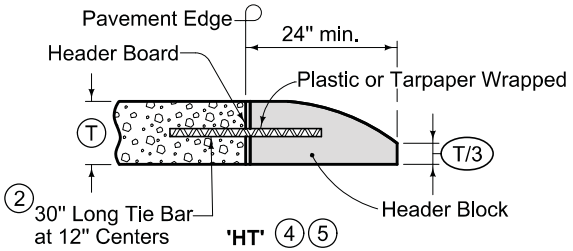
'B' (5)
PLAIN JOINT
(Abutting Pavement Slabs)



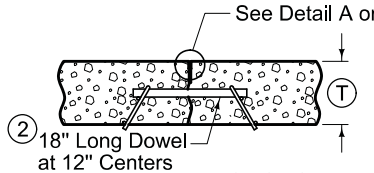
'DW' (3)(4)(7)
DAY'S WORK JOINT(Non-working)



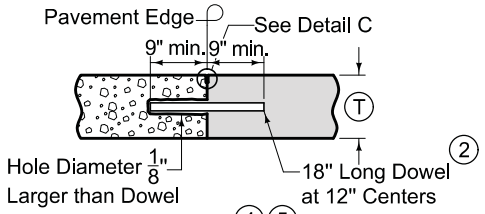
'C' (6)
CONTRACTION JOINT



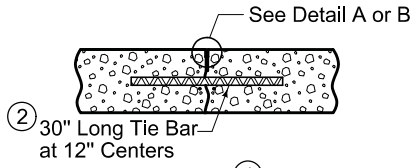
'HT' (4)(5)
HEADER JOINT
(End Rigid Pavement)



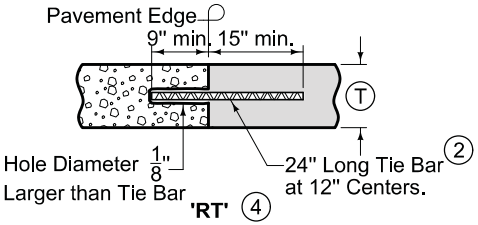
'CD' (1)(4)(6)
DOWELED CONTRACTION JOINT



'RD' (4)(5)
ABUTTING PAVEMENT JOINT



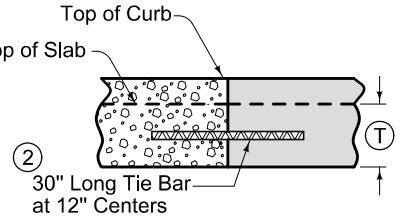
'CT' (4)
TIED CONTRACTION JOINT



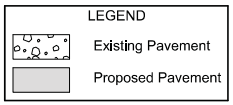
'RT' (4)
ABUTTING PAVEMENT JOINT
RIGID TIE

TRANSVERSE CONTRACTION

1. See dowel assemblies for fabrication details.
2. See Bar Size Table.
3. Locate 'DW' joint at a mid-panel location between future 'C' or 'CD' joints. Place no closer than 5 feet to a 'C' or 'CD' joint.
4. Place bars within the limits shown under dowel assemblies.
5. Edge with 1/8 inch tool for length of joint. For HT joint, remove header block and board when second slab is placed.
6. Unless otherwise specified, use 'CD' transverse contraction joints in mainline pavement when (T) is greater or equal to 8 inches. Use 'C' joints when (T) is less than 8 inches.
7. 'RT' joint may be used in lieu of 'DW' joint at the end of the days work. Remove any pavement damaged due to the drilling at no additional cost to the Contracting Authority.



'DW - CG' (3)(4)
DAY'S WORK JOINT
CURB AND GUTTER UNIT



SUDAS | IOWADOT | REVISION 6 04-19-16

FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101

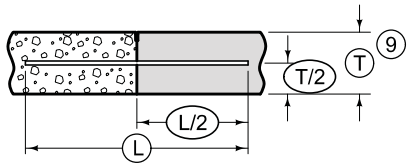
SHEET 1 of 8

REVISIONS: Revised note 5 on page 1. Revised notes 19, 22, and 23 on pages 6, 7, and 8. Added shading and a Legend to define existing and proposed pavement.

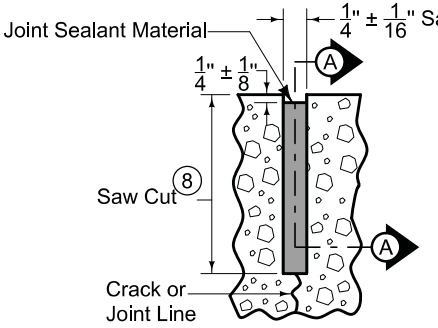
Paul D. Wigant — SUDAS DIRECTOR
Brian J. Smith — DESIGN METHODS ENGINEER

JOINTS

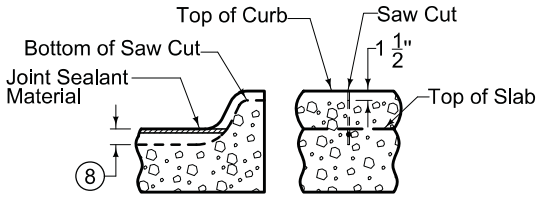
FIGURE 7010.101 SHEET 1 OF 8



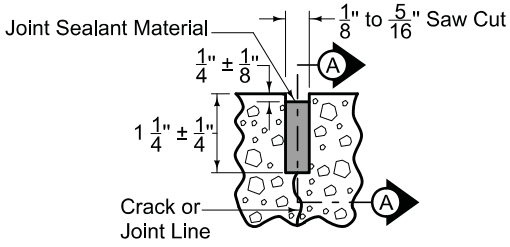
BAR PLACEMENT
(Applies to all joints unless otherwise detailed.)



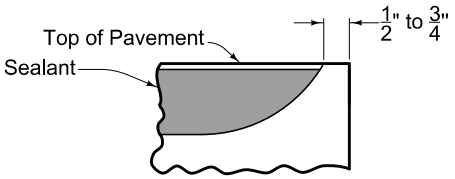
DETAIL A
(Saw cut formed by conventional concrete sawing equipment.)



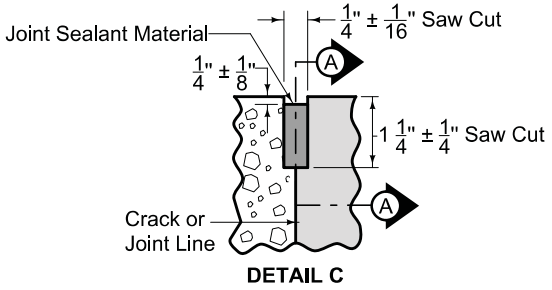
'C' JOINT IN CURB
(Match 'CT', 'CD', or 'C' joint in pavement.)



DETAIL B
(Saw cut formed by approved early concrete sawing equipment.)



SECTION A-A
(Detail at Edge of Pavement)

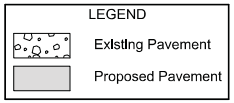


DETAIL C

(8) Saw 'CD' joint to a depth of T/3 ± 1/4"; saw 'C' joint to a depth of T/4 ± 1/4".

(9) When tying into old pavement, (T) represents the depth of sound PCC.

BAR SIZE TABLE		
(T)	Dowel Diameter	Tie Bar Size
< 8"	3/4"	#6
≥ 8" but < 10"	1 1/4"	#10
≥ 10"	1 1/2"	#11



TRANSVERSE CONTRACTION

FIGURE 7010.101 | SHEET 2 OF 8

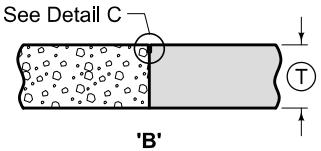
SUDAS | IOWADOT | REVISION 6 | 04-19-16

FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101 | SHEET 2 of 8

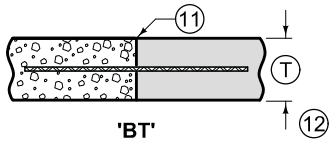
REVISIONS: Revised note 5 on page 1. Revised notes 19, 22, and 23 on pages 6, 7, and 8. Added shading and a Legend to define existing and proposed pavement.

Paul D. Wigand, SUDAS DIRECTOR | Brian Smith, DESIGN METHODS ENGINEER

JOINTS

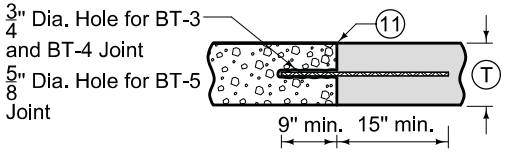


'B'
PLAIN JOINT
(Abutting Pavement Slabs)



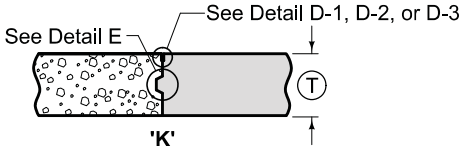
'BT'
ABUTTING PAVEMENT JOINT - RIGID TIE

Ⓣ	Joint	Bars	Bar Length and Spacing
< 8"	'BT-1'	#4	36" Long at 30" Centers
≥ 8"	'BT-2'	#5	36" Long at 30" Centers

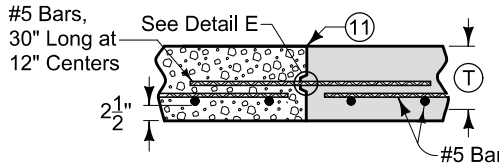


'BT'
ABUTTING PAVEMENT JOINT - RIGID TIE (Drilled)

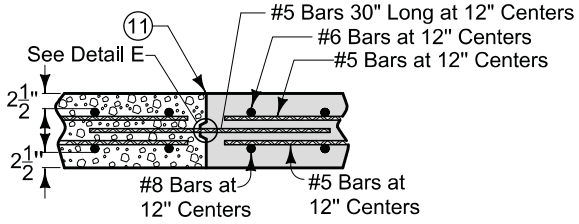
Ⓣ	Joint	Bars	Bar Length and Spacing
< 8"	'BT-5'	#4	24" Long at 30" Centers
≥ 8"	'BT-3'	#5	24" Long at 30" Centers
	'BT-4'		24" Long at 15" Centers



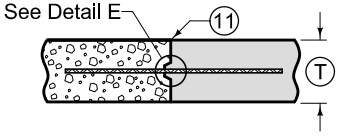
'K'
KEYED JOINT FOR ADJACENT SLABS
(Where T is 8" or more)



'KS-1'
[Single Reinforced Pavement (Bridge Approach)]



'KS-2'
[Double Reinforced Pavement (Bridge Approach)]



'KT' ⑩⑫
ABUTTING PAVEMENT JOINT - KEYWAY TIE

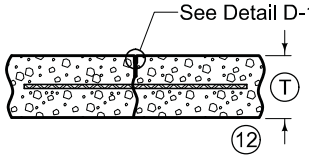
Ⓣ	Joint	Bars	Bar Length and Spacing
< 8"	'KT-1'	#4	30" Long at 30" Centers
≥ 8"	'KT-2'	#5	30" Long at 30" Centers
	'KT-3'		30" Long at 15" Centers

LONGITUDINAL CONTRACTION

⑩ Bar supports may be necessary for fixed form paving to ensure the bar remains in a horizontal position in the plastic concrete.

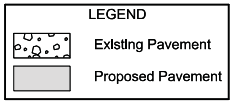
⑪ Sawing or sealing of joint not required.

⑫ The following joints are interchangeable, subject to the pouring sequence:
'BT-1', 'L-1', and 'KT-1'
'KT-2' and 'L-2'
'KT-3' and 'L-3'



'L'
CONTRACTION JOINT

Ⓣ	Joint	Bars	Bar Length and Spacing
< 8"	'L-1'	#4	36" Long at 30" Centers
≥ 8"	'L-2'	#5	36" Long at 30" Centers
	'L-3'		36" Long at 15" Centers



SUDAS | IOWADOT | REVISION 6 04-19-16

FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101

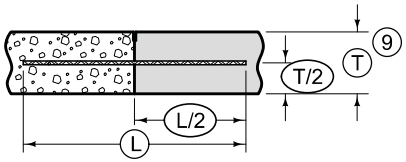
SHEET 3 of 8

REVISIONS: Revised note 5 on page 1. Revised notes 19, 22, and 23 on pages 6, 7, and 8. Added shading and a Legend to define existing and proposed pavement.

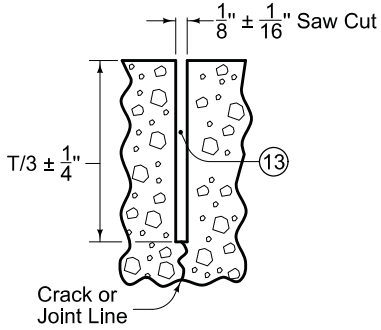
Paul D. Wigant, SUDAS DIRECTOR — Brian J. Smith, DESIGN METHODS ENGINEER

JOINTS

FIGURE 7010.101 SHEET 3 OF 8



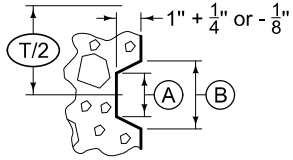
TIE BAR PLACEMENT
(Applies to all joints unless otherwise detailed.)



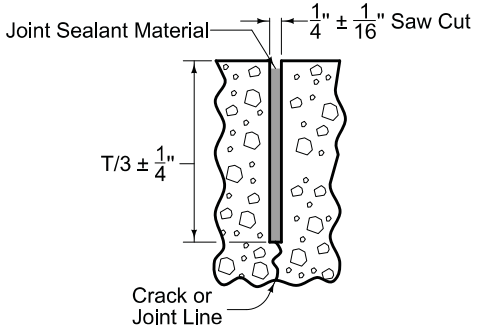
DETAIL D-1
(Required when specified in the contract documents.)

⑨ When tying into old pavement, Ⓣ represents the depth of sound PCC.

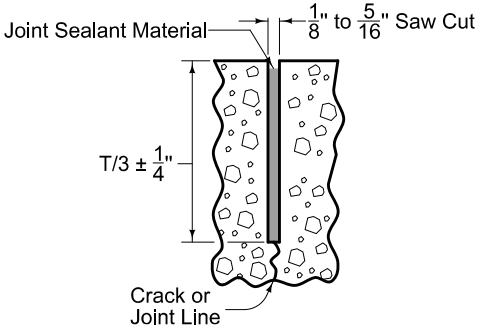
⑬ Sealant or cleaning not required.



DETAIL E

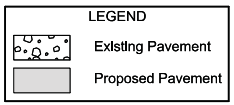


DETAIL D-2
(Required when the Department of Transportation is not the Contracting Authority, or when specified in the contract documents)



DETAIL D-3
(Required when the Department of Transportation is the Contracting Authority, or when specified in the contract documents)

KEYWAY DIMENSIONS			
Keyway Type	Pavement Thickness Ⓣ	Ⓐ	Ⓑ
Standard	8" or greater	1 3/4"	2 3/4"
Narrow	Less than 8"	1"	2"



SUDAS | IOWADOT | REVISION 6 | 04-19-16
FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101 | SHEET 4 of 8

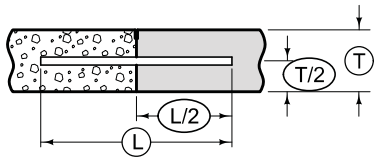
REVISIONS: Revised note 5 on page 1. Revised notes 19, 22, and 23 on pages 6, 7, and 8. Added shading and a Legend to define existing and proposed pavement.

Paul D. Wigand, SUDAS DIRECTOR — Brian Smith, DESIGN METHODS ENGINEER

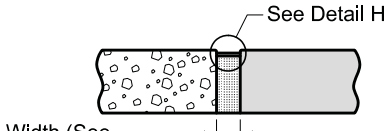
JOINTS

LONGITUDINAL CONTRACTION

FIGURE 7010.101 | SHEET 4 OF 8

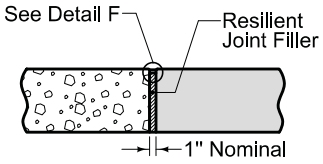


DOWEL PLACEMENT
(Applies to all joints unless otherwise detailed.)

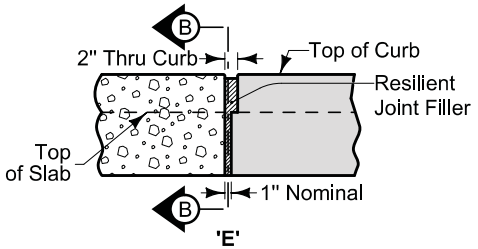


'CF' JOINT

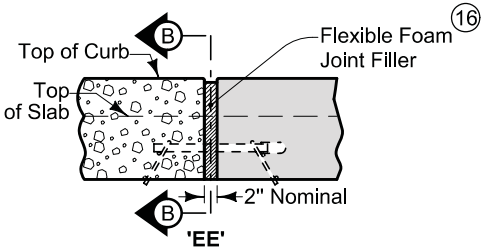
TYPE	WIDTH
CF-1	2"
CF-2	$2\frac{1}{2}$"
CF-3	3"
CF-4	$3\frac{1}{2}$"



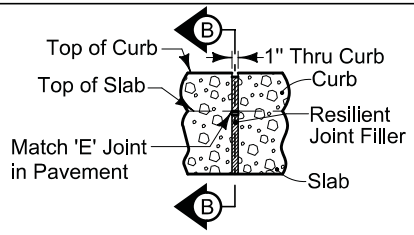
'E'
1" EXPANSION JOINT



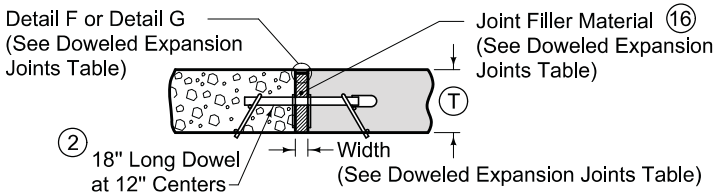
'E'
JOINT IN CURB
(View at Back of Curb)



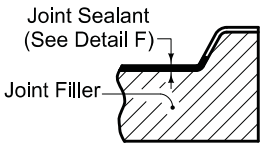
'EE'
JOINT IN CURB
(View at Back of Curb)



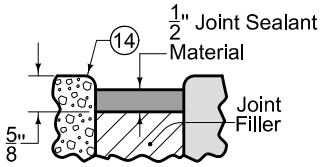
'ES'
JOINT IN CURB
(View at Back of Curb)



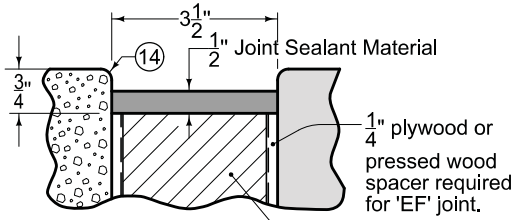
'ED', 'EE', 'EF' 15
DOWELED EXPANSION JOINT



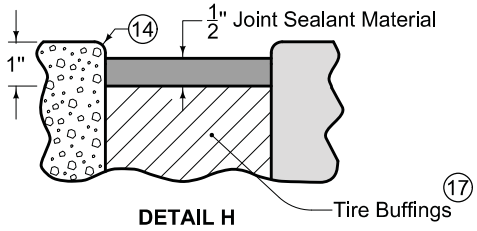
SECTION B-B



DETAIL F



DETAIL G



DETAIL H

EXPANSION JOINTS

2 See Bar Size Table.

14 Edge with 1/4 inch tool for length of joint indicated if formed; edging not required when cut with diamond blade saw.

15 See Dowel Assemblies for fabrication details and placement limits. Coat the free end of dowel bar to prevent bond with pavement. At intake locations, dowel bars may be cast-in-place.

16 Predrill or preform holes in joint material for appropriate dowel size.

17 Compact tire buffings by spading with a square-nose shovel.

DOWELED EXPANSION JOINTS		
TYPE	WIDTH	FILLER MATERIAL 16
ED	1"	Resilient (Detail F)
EE	2"	Flexible Foam (Detail F)
EF	$3\frac{1}{2}$"	Flexible Foam (Detail G)

BAR SIZE TABLE			
T	< 8"	≥ 8" but < 10"	≥ 10"
Dowel Diameter	$\frac{3}{4}$"	$1\frac{1}{4}$"	$1\frac{1}{2}$"

LEGEND
Existing Pavement
Proposed Pavement

SUDAS | IOWADOT | REVISION 6 04-19-16
FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101
SHEET 5 of 8

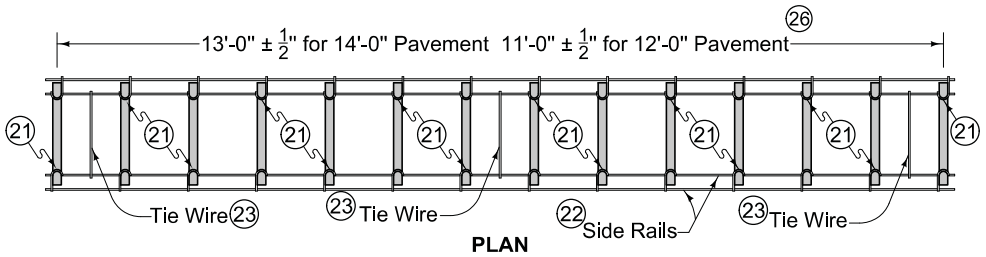
REVISIONS: Revised note 5 on page 1. Revised notes 19, 22, and 23 on pages 6, 7, and 8. Added shading and a Legend to define existing and proposed pavement.

Paul D. Wigand, SUDAS DIRECTOR
Brian J. Smith, DESIGN METHODS ENGINEER

JOINTS

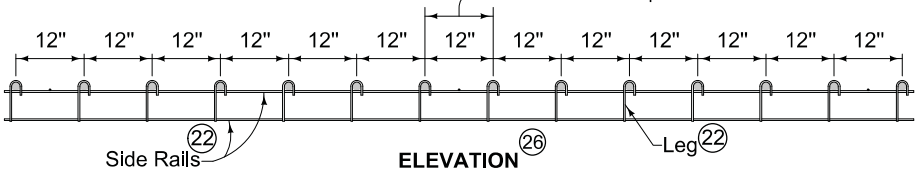
FIGURE 7010.101 SHEET 5 OF 8

CONTRACTION JOINTS

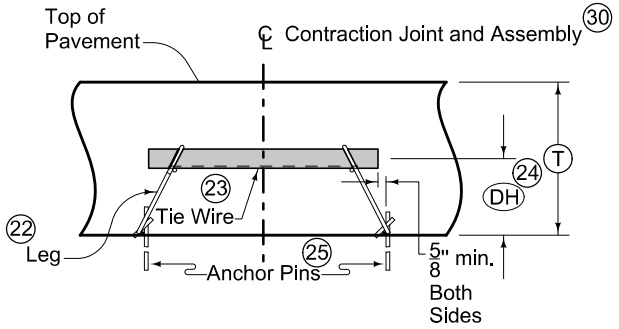


PLAN

Spaces between dowel bars are nominal dimensions with a $\frac{1}{4}$" allowable tolerance.



ELEVATION



LONGITUDINAL SECTION

DOWEL ASSEMBLIES (18)(19)(20)

DOWEL HEIGHT AND DIAMETER		
(T)	(DH)(24)	Diameter
7" to 7 1/2"	3 1/2"	3/4"
8" to 9 1/2"	4 1/4"	1 1/4"
10" to 11 1/2"	5 1/4"	1 1/2"
12" to 13"	6 1/4"	1 1/2"

(18) Use 18 inch long dowel bars with a tolerance of ± 1/8 inch. Ensure the centerlines of individual dowels are parallel to the other dowels in the assembly within ± 1/8 inch.

(19) Use wires with a minimum tensile strength of 50 ksi.

(20) Details apply to both transverse contraction and expansion joints.

(21) Weld alternately throughout.

(22) #1/0 gauge (0.306 inch diameter) wire. Wire sizes shown are the minimum required.

(23) #10 gauge (0.177 inch diameter) wire, welded or friction fit to upper side rail, both sides.

(24) Measured from the centerline of dowel bar to bottom of lower side rail + 1/4 inch.

(25) Per lane width, install a minimum of 8 anchor pins evenly spaced (4 per side), to prevent movement of assembly during construction. Anchor assemblies placed on pavement or PCC base with devices approved by the Engineer.

(26) If dowel basket assemblies are required for curbed pavements, the assembly length is based on the jointing layout. See PV-101, sheet 8.

(30) Ensure dowel basket assembly centerline is within 2 inches of the intended joint location longitudinally and has no more than 1/4 inch horizontal skew from end of basket to end of basket.

FIGURE 7010.101 | SHEET 6 OF 8

SUDAS | IOWADOT | REVISION 6 | 04-19-16

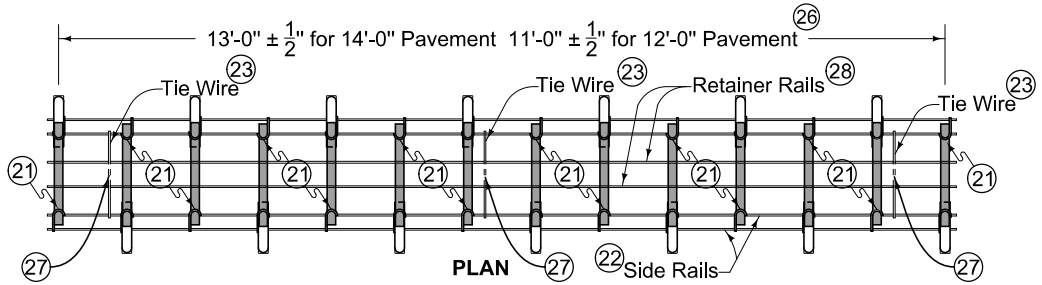
FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101 | SHEET 6 of 8

REVISIONS: Revised note 5 on page 1. Revised notes 19, 22, and 23 on pages 6, 7, and 8. Added shading and a Legend to define existing and proposed pavement.

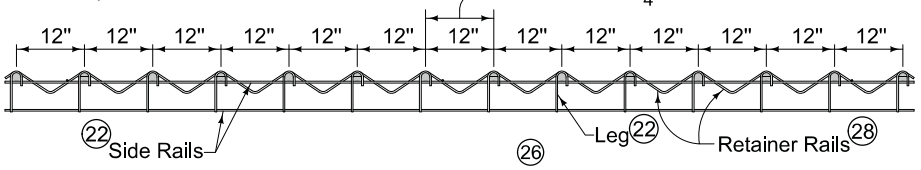
Paul D. Wigand, SUDAS DIRECTOR | Brian Smith, DESIGN METHODS ENGINEER

JOINTS

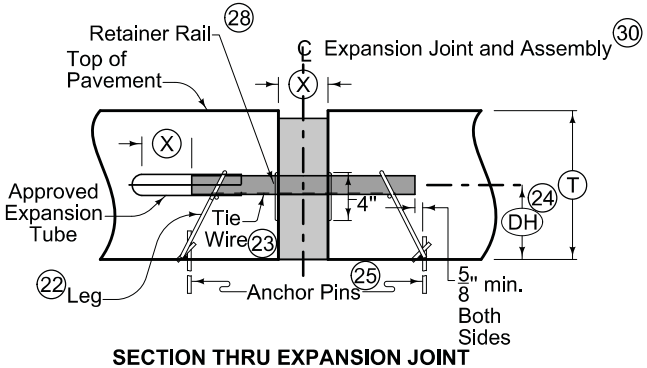
EXPANSION JOINTS



Spaces between dowel bars are nominal dimensions with a 1/4" allowable tolerance.



ELEVATION



SECTION THRU EXPANSION JOINT

JOINT OPENING AND EXPANSION TUBE EXTENSION		
Joint Type	(X)	Minimum Tube Length
"ED"	1"	6"
"EE"	2"	7"
"EF"	3 1/2"	9"

DOWEL HEIGHT AND DIAMETER		
(T)	(DH) (24)	Diameter
7" to 7 1/2"	3 1/2"	3/4"
8" to 9 1/2"	4 1/4"	1 1/4"
10" to 11 1/2"	5 1/4"	1 1/2"
12" to 13"	6 1/4"	1 1/2"

DOWEL ASSEMBLIES (18) (19) (20)

(18) Use 18 inch long dowel bars with a tolerance of ± 1/8 inch. Ensure the centerlines of individual dowels are parallel to the other dowels in the assembly within ± 1/8 inch.

(19) Use wires with a minimum tensile strength of 50 ksi.

(20) Details apply to both transverse contraction and expansion joints.

(21) Weld alternately throughout.

(22) #1/0 gauge (0.306 inch diameter) wire. Wire sizes shown are the minimum required.

(23) #10 gauge (0.177 inch diameter) wire, welded or friction fit to upper side rail, both sides.

(24) Measured from the centerline of dowel bar to bottom of lower side rail + 1/4 inch.

(25) Per lane width, install a minimum of 8 anchor pins evenly spaced (4 per side), to prevent movement of assembly during construction. Anchor assemblies placed on pavement or PCC base with devices approved by the Engineer.

(26) If dowel basket assemblies are required for curbed pavements, the assembly length is based on the jointing layout. See PV-101, sheet 8.

(27) Clip and remove center portion of tie during field assembly.

(28) 1/4 inch diameter wire.

(30) Ensure dowel basket assembly centerline is within 2 inches of the intended joint location longitudinally and has no more than 1/4 inch horizontal skew from end of basket to end of basket.

FIGURE 7010.101 SHEET 7 OF 8

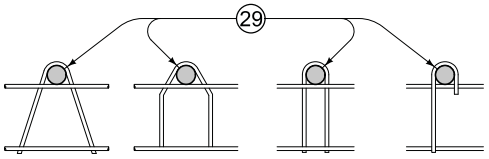
SUDAS | IOWADOT | REVISION 6 04-19-16

FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101 | SHEET 7 of 8

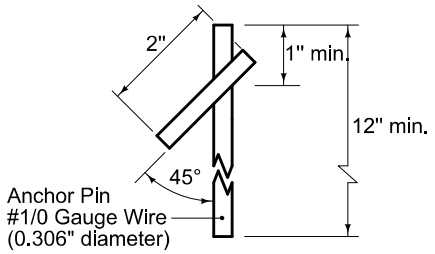
REVISIONS: Revised note 5 on page 1. Revised notes 19, 22, and 23 on pages 6, 7, and 8. Added shading and a Legend to define existing and proposed pavement.

Paul D. Wigant, SUDAS DIRECTOR — Brian J. Smith, DESIGN METHODS ENGINEER

JOINTS



OPTIONAL LEG SHAPES



ANCHOR PIN

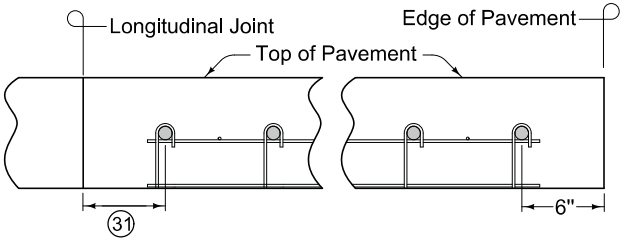
(18) Use 18 inch long dowel bars with a tolerance of ± 1/8 inch. Ensure the centerlines of individual dowels are parallel to the other dowels in the assembly within ± 1/8 inch.

(19) Use wires with a minimum tensile strength of 50 ksi.

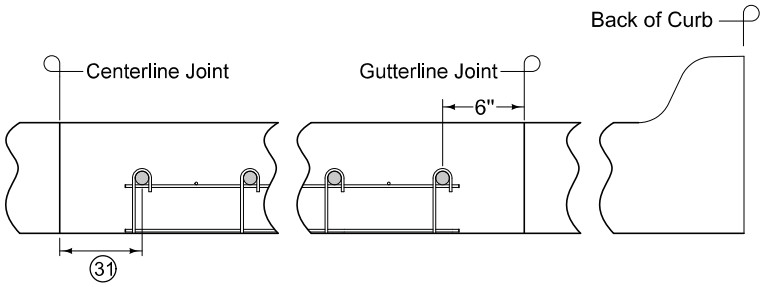
(20) Details apply to both transverse contraction and expansion joints.

(29) Diameter of bend around dowel is dowel diameter + 1/8 to 3/16 inches.

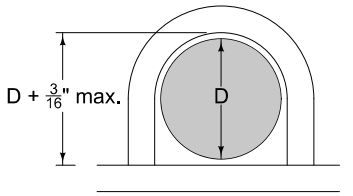
(31) For uniform lane widths: 3" - 6". For taper and variable width pavements: 3" - 12".



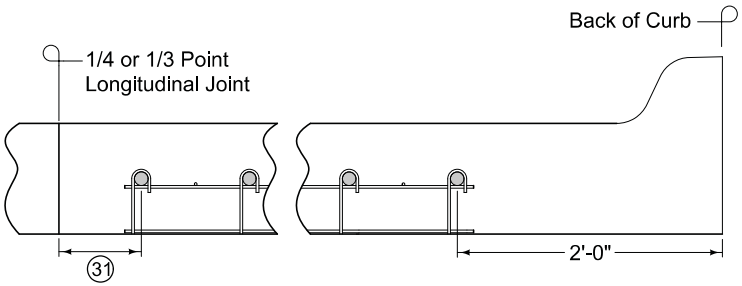
PLACEMENT LIMITS
(Rural Section)



PLACEMENT LIMITS
(Curb and Gutter - Gutterline Jointing)



BEND AROUND DOWEL (29)



PLACEMENT LIMITS
(Curb and Gutter - 1/4 or 1/3 Point Jointing)

DOWEL ASSEMBLIES (18) (19) (20)

FIGURE 7010.101 | SHEET 8 OF 8

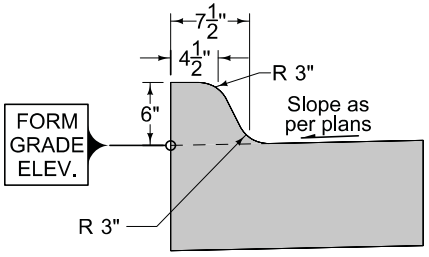
SUDAS	IOWA DOT	REVISION 6	04-19-16
FIGURE 7010.101	STANDARD ROAD PLAN	PV-101	
		SHEET 8 of 8	

REVISIONS: Revised note 5 on page 1. Revised notes 19, 22, and 23 on pages 6, 7, and 8. Added shading and a Legend to define existing and proposed pavement.

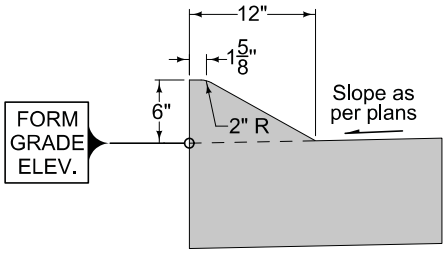
Paul D. Wigand
SUDAS DIRECTOR

Brian Smith
DESIGN METHODS ENGINEER

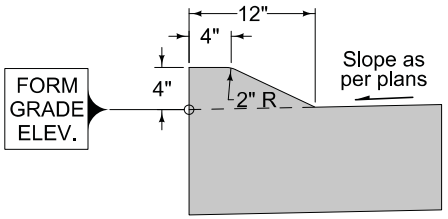
JOINTS



6" STANDARD CURB



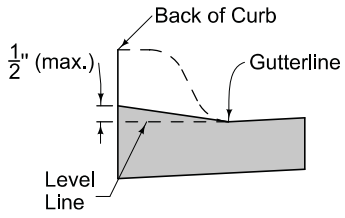
6" SLOPED CURB



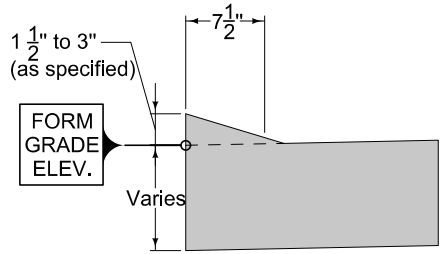
4" SLOPED CURB

For joint details, see PV-101.

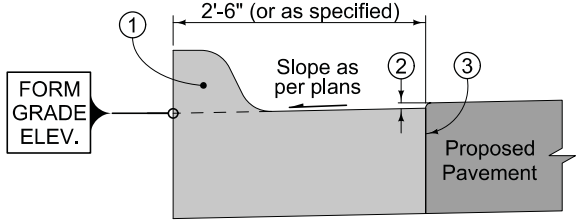
1. 6" Standard Curb, 6" Sloped Curb, or 4" Sloped Curb as specified.
2. 1/8" if Proposed Pavement is HMA. No elevation difference if Proposed Pavement is PCC.
3. 'BT' , 'KT', or 'L' joint if Proposed Pavement is PCC. 'B' joint if Proposed Pavement is HMA.



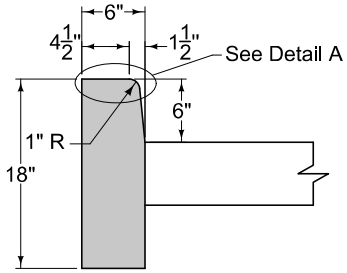
DROP CURB AT SIDEWALK



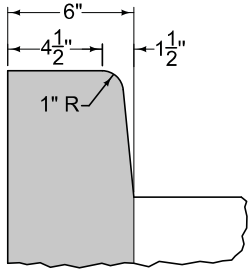
DRIVEWAY DROP CURB



CURB AND GUTTER UNIT



BEAM CURB*
*For short replacement sections, match existing curb profile



DETAIL A

FIGURE 7010.102 SHEET 1 OF 2

SUDAS | Iowa Department of Transportation

REVISION 3 04-15-14

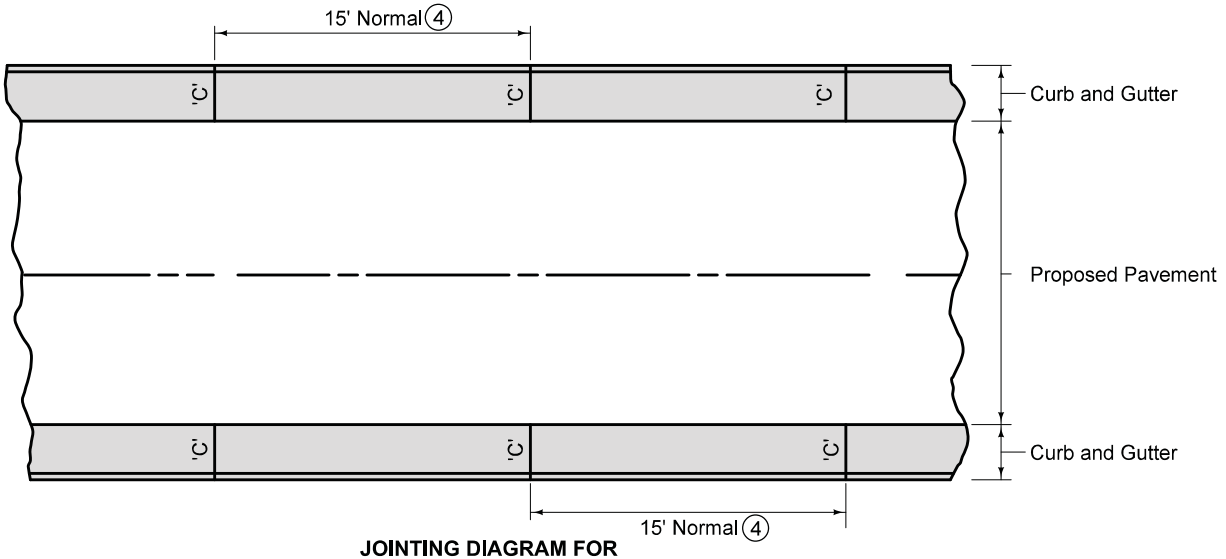
FIGURE 7010.102 | STANDARD ROAD PLAN | PV-102

SHEET 1 of 2

REVISIONS: Added the Jointing Diagram for Curb and Gutter and page 2.

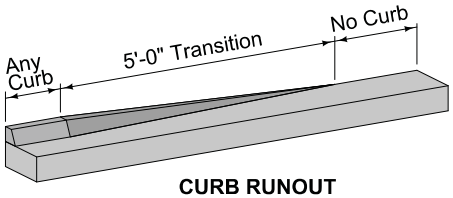
Paul D. Wigant, SUDAS DIRECTOR | Brian J. Smith, DESIGN METHODS ENGINEER

PCC CURB DETAILS

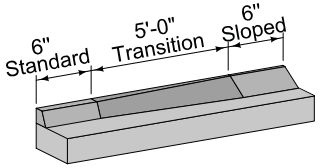


JOINTING DIAGRAM FOR CURB AND GUTTER UNIT

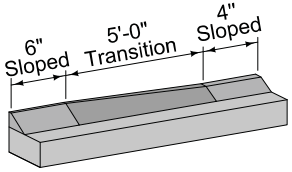
④ If proposed pavement is PCC, match joint spacing for proposed pavement. Place 'E' joints in curb and gutter section where expansion joints are to be placed in proposed pavement.



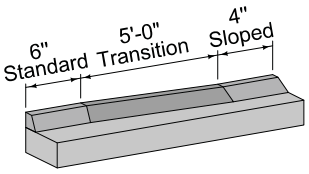
CURB RUNOUT FOR ALL CURBS



CURB TRANSITION FROM 6" STANDARD TO 6" SLOPED



CURB TRANSITION FROM 6" SLOPED TO 4" SLOPED



CURB TRANSITION FROM 6" STANDARD TO 4" SLOPED

FIGURE 7010.102 | SHEET 2 OF 2

SUDAS | Iowa Department of Transportation

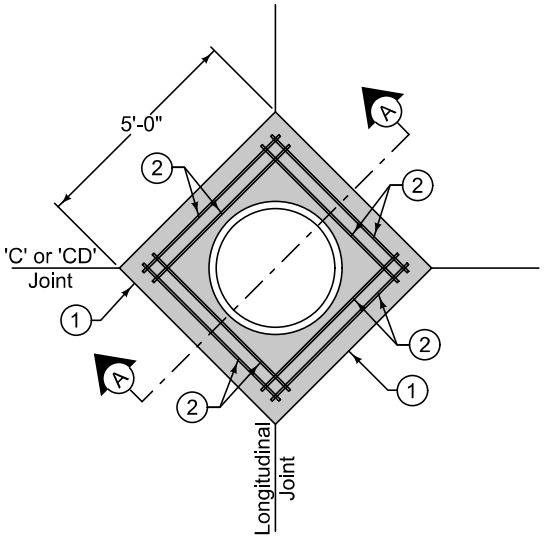
REVISION 3 04-15-14

FIGURE 7010.102 | STANDARD ROAD PLAN | PV-102 | SHEET 2 of 2

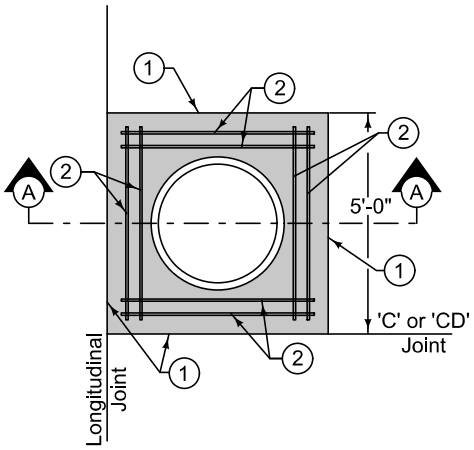
REVISIONS: Added the Jointing Diagram for Curb and Gutter and page 2.

Paul D. Wigand, SUDAS DIRECTOR | Brian Smith, DESIGN METHODS ENGINEER

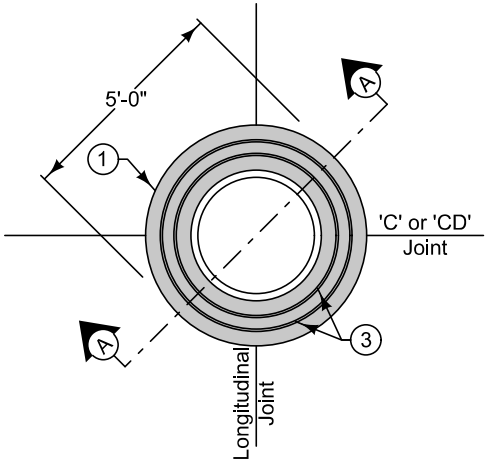
PCC CURB DETAILS



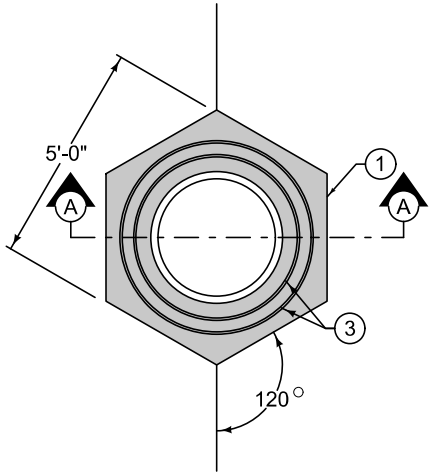
AT JOINT INTERSECTION



OFFSET AT JOINT INTERSECTION



CIRCULAR



AT A SINGLE JOINT

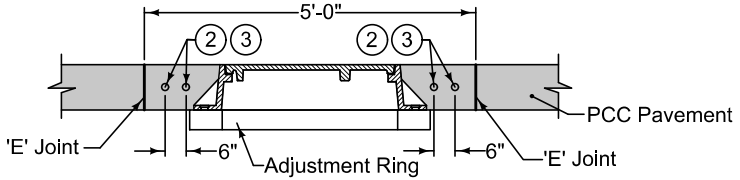
Construct boxout with Class C concrete or match pavement class. Minimum 2 inches clear on reinforcement. Center casting within boxout area.

(1) 'KT-1', 'KT-2', 'BT-1', or 'BT-2' joint if three-piece floating casting (SW 601 Type B and D or SW-602 Type F) is used. 'E' joint if two-piece fixed casting (SW 601 Type A and C or SW-602 Type E) is used.

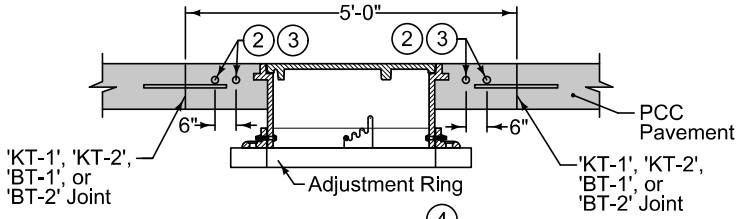
(2) 4 foot 8 inch (typ.) #4 bar. Place at mid-slab.

(3) #4 hoops (variable length). Place at mid-slab.

(4) No boxout is required for three-piece floating castings (SW 601 Type B and D or SW-602 Type F). If a boxout is used with a three-piece casting, construct as detailed in Section A-A for three-piece floating casting.



SECTION A-A
(For two-piece fixed casting)



SECTION A-A (4)
(For three-piece floating casting)

FIGURE 7010.103 | SHEET 1 OF 1

SUDAS | Iowa Department of Transportation

REVISION: New 04-19-11

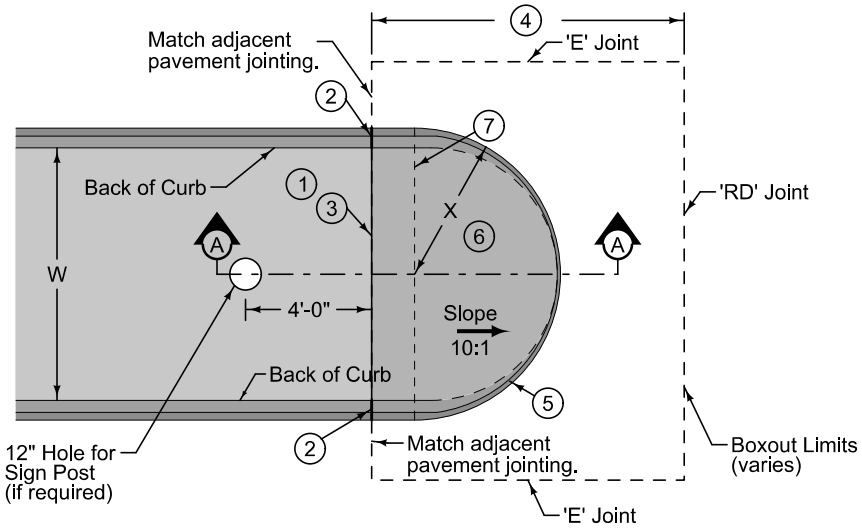
PV-103

FIGURE 7010.103 | STANDARD ROAD PLAN | SHEET 1 of 1

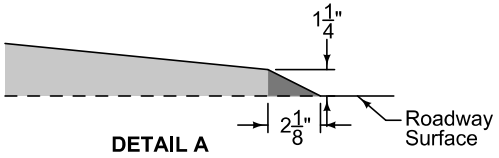
REVISIONS: New. Joint Standard with SUDAS.

Paul D. Wiegand, SUDAS DIRECTOR
Deanna Maifield, DESIGN METHODS ENGINEER

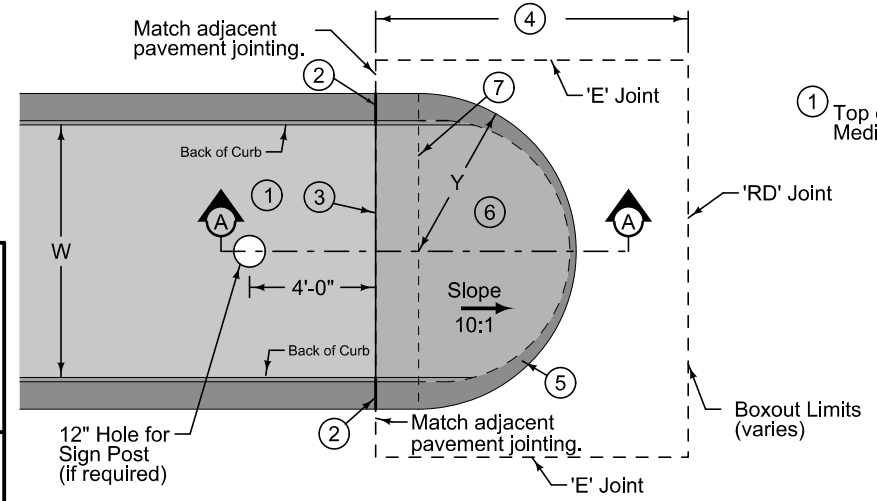
MANHOLE BOXOUTS IN PCC PAVEMENT



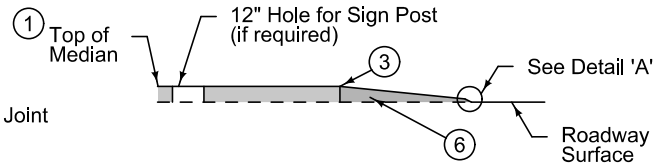
6" STANDARD
PLAN



DETAIL A



6" SLOPED
PLAN



SECTION A-A

1. For details of paved median, see contract documents.
2. 'EE' Joint. Expansion joints located at the end of normal curb.
3. 'E'Joint. If median is paved, place expansion joints at the end of normal curb.
4. If boxout length is less than or equal to 12 feet, provide 'C' Joint. If boxout length is greater than 12 feet, provide 'RD' joint.
5. Special shaping of curb.
6. Quantities for ramped median nose area is included in roadway pavement quantities.
7. When X or Y is 4 feet or greater the expansion joints will be at the begining of the rounded median.

W = Width from back of curb to back of curb

X = W/2 + 7.5"

Y = W/2 + 12"

RAMPED MEDIAN NOSE
(Median Width 8'-0" or Less)

FIGURE 7010.104 | SHEET 1 OF 1

SUDAS | Iowa Department of Transportation

REVISION: New 04-19-11

FIGURE 7010.104 | STANDARD ROAD PLAN | PV-104 | SHEET 1 of 1

REVISIONS: New. Previously page 2 of PV-2.

Paul D. Wigand, SUDAS DIRECTOR | Deanna Maifield, DESIGN METHODS ENGINEER

RAMPED MEDIAN NOSE

For joint details, see PV-101.
For curb details, see PV-102.

(1) If more than 20 feet, add extra joint at midpoint.

(2) 'BT' Joint.

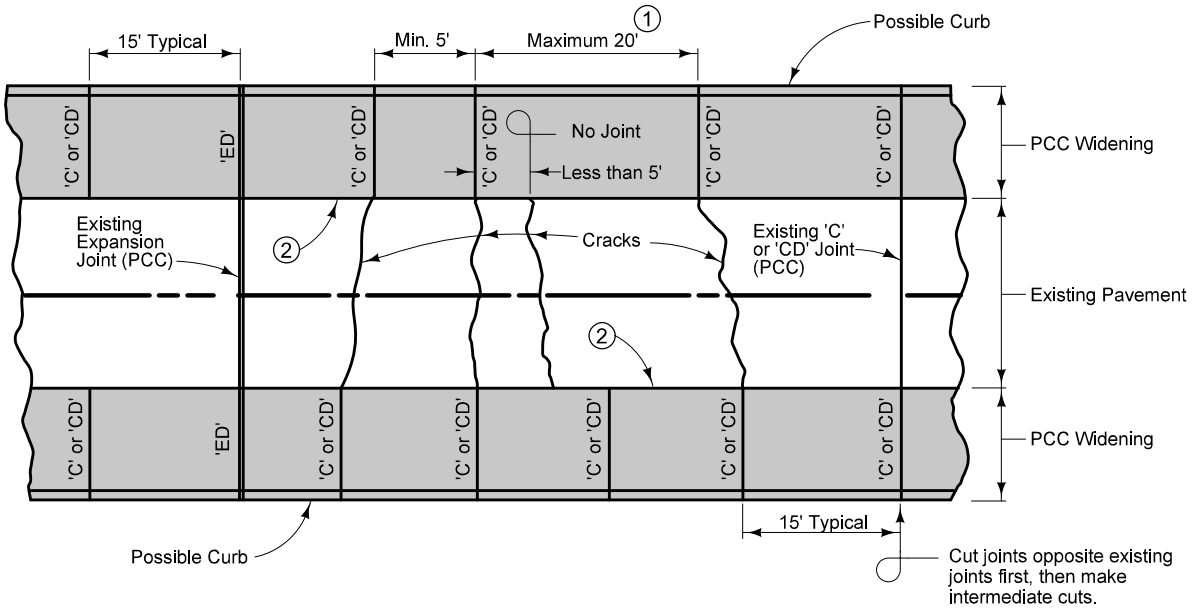


FIGURE 7010.121 | SHEET 1 OF 1

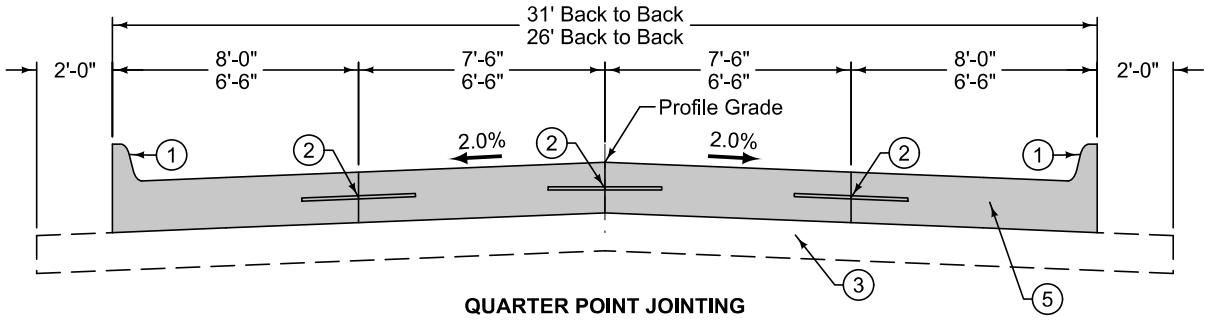
SUDAS | IOWADOT | REVISION 1 04-21-15

FIGURE 7010.121 | STANDARD ROAD PLAN | PV-121 | SHEET 1 of 1

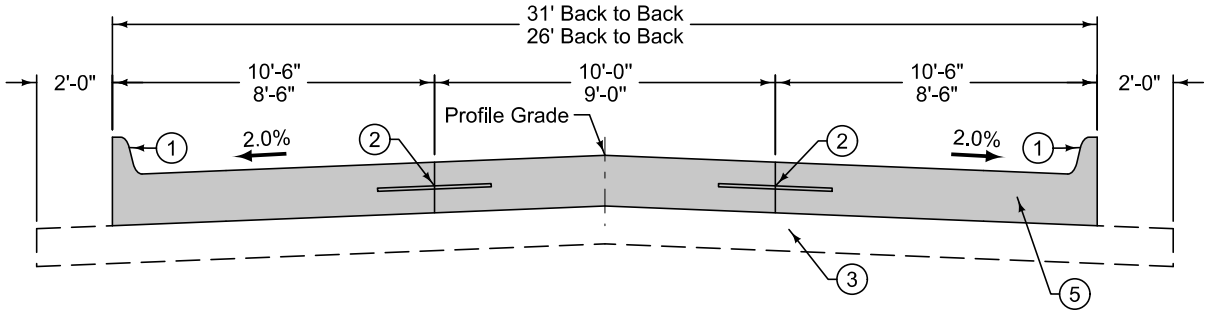
REVISIONS: Added circle note 2 and replaced the DOT logo in the title block with the new version.

Paul D. Wigand, SUDAS DIRECTOR | Brian Smith, DESIGN METHODS ENGINEER

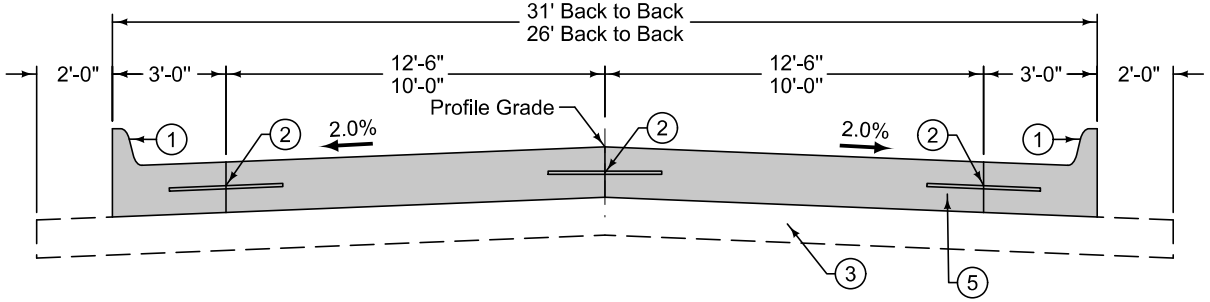
JOINTING PCC PAVEMENT WIDENING



QUARTER POINT JOINTING



THIRD POINT JOINTING



GUTTERLINE JOINTING

(1) 6 inch standard curb.

(2) BT, KT, or L joint depending on pavement thickness and construction staging.

(3) Subbase or subgrade as specified.

(4) Unless otherwise specified in the contract documents.

(5) No dowels within 24" of the back of curb. With gutterline joint, place first dowel 6 inches from the joint. See Figure 7010.101, Sheet 8.

TRANSVERSE JOINT REQUIREMENTS (4)		
Pavement Thickness	Transverse Joint Type	Transverse Joint Spacing
6"	C	12'
7"	C	15'
8"	CD (5)	15'
9"	CD (5)	15'
≥10"	CD (5)	20'

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7010.901

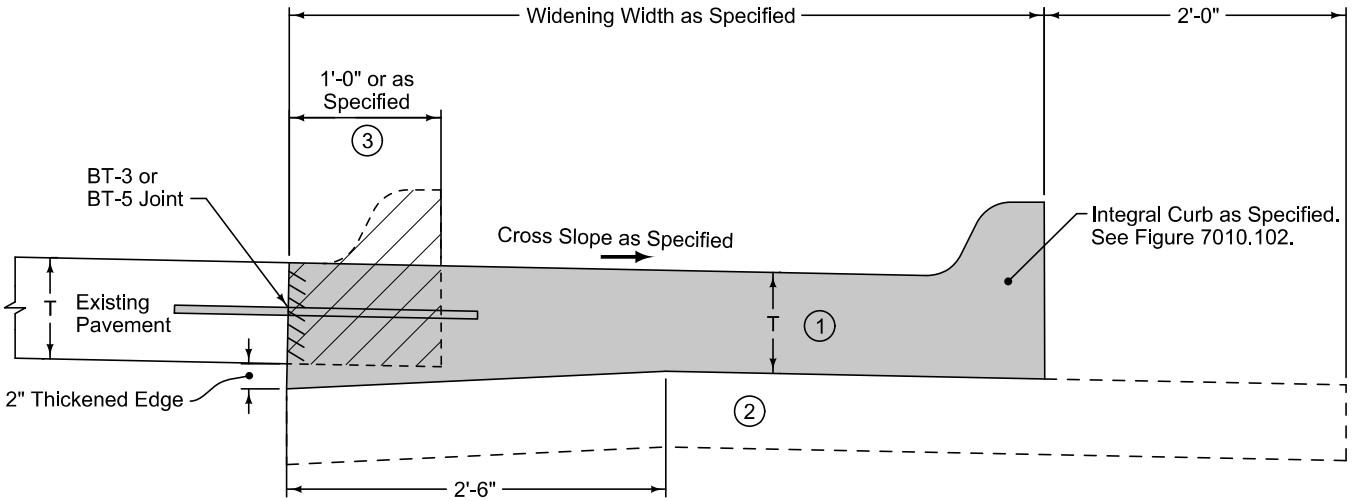
SHEET 1 of 1

SUDAS Standard Specifications

PCC PAVEMENT JOINTING

FIGURE 7010.901

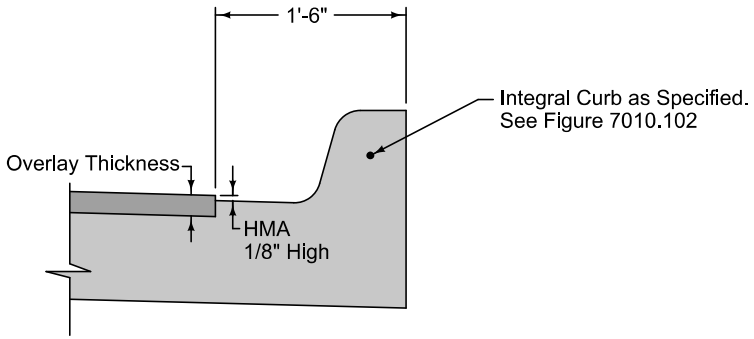
SHEET 1 OF 1



TYPICAL SECTION

See Figure 7010.121 for typical joint layout.

1. Match existing pavement thickness or as specified in the contract documents.
2. Subgrade or subbase material as specified.
3. Remove existing curb using full depth saw cut.



CURB FOR WIDENING WITH HMA OVERLAY

FIGURE 7010.902

SHEET 1 OF 1

SUDAS

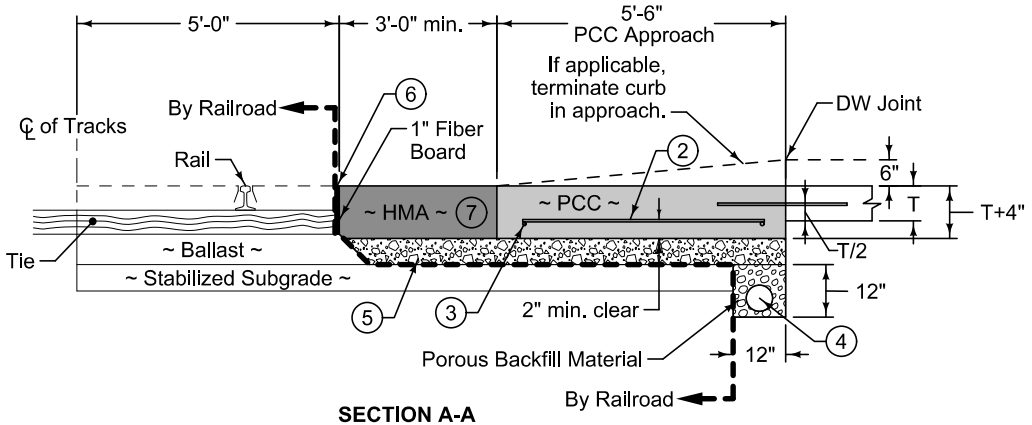
REVISION 1 10-15-13

7010.902

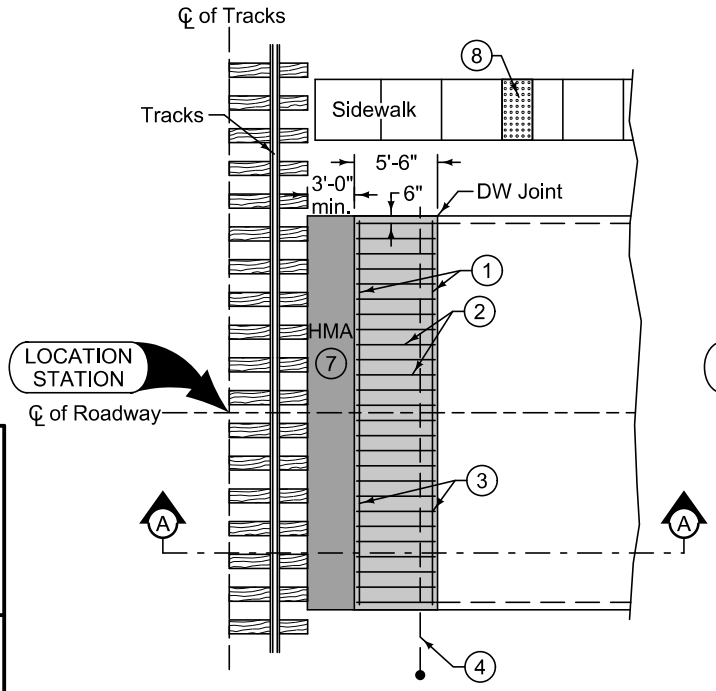
SHEET 1 of 1

SUDAS Standard Specifications

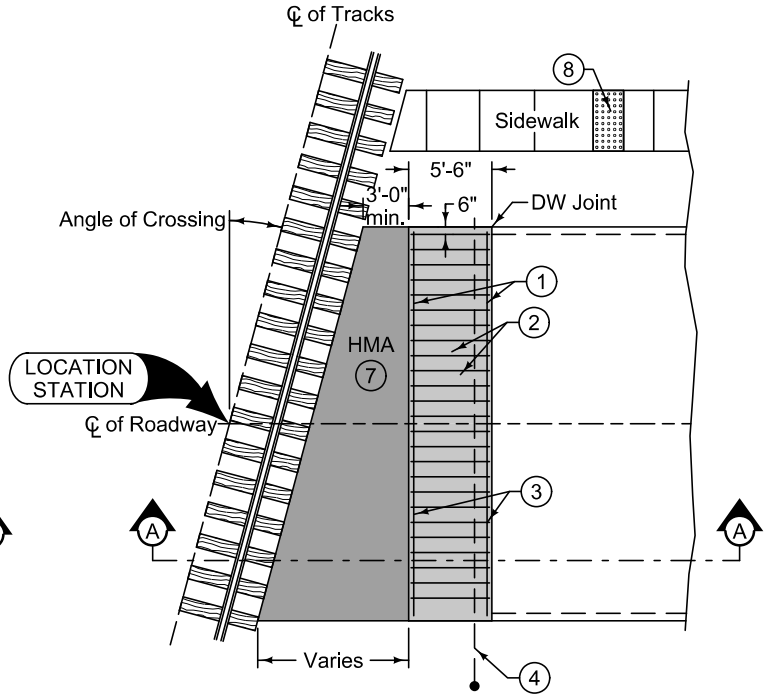
PCC PAVEMENT WIDENING



SECTION A-A



PLAN VIEW - STRAIGHT CROSSING



PLAN VIEW - SKEWED CROSSING

1. Tie reinforcing bars with wire at all intersections with other bars. Lap reinforcing bars a minimum of 12 inches when necessary and tie securely.
2. 5 foot 2 inch (typ.) #5 bar or pavement length minus 4 inches, at 12 inches on center.
3. #5 bars X (approach width minus 4 inches).
4. Install 6 inch perforated CMP subdrain, if specified. Include rodent guard per Iowa DOT Materials I.M. 443.01.
5. Granular subbase, modified subbase, or ballast meeting railroad specifications.
6. For new crossings, construct pavement 1/2 inch to 1 inch below top of rail. For existing crossings, construct pavement level to 1/2 inch below top of rail.
7. HMA full depth patch per Section 7040.
8. Refer to Figure 7030.205 for detectable warning location.

FIGURE 7010.903 | SHEET 1 OF 1

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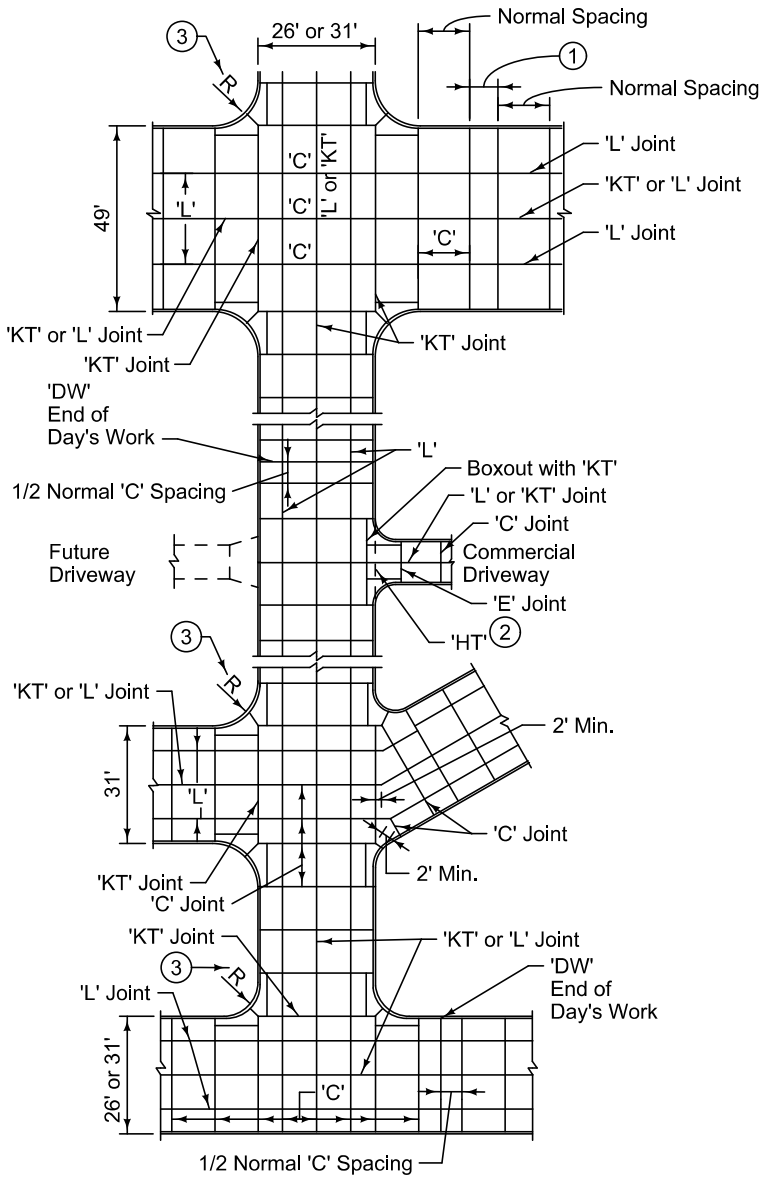
2	10-20-15

7010.903

SHEET 1 of 1

SUDAS Standard Specifications

PCC RAILROAD CROSSING APPROACH



PLAN VIEW

Refer to Figure 7010.901 for maximum transverse joint spacing.

Where new and existing pavements meet, and no existing dowels, tie bars, or keyed joints are present, provide a 'BT', 'RT', or 'RD' joint.

1. Shorten jointing pattern on either side of openings to allow joints to intersect round castings and fall at the edges of intake boxouts.
2. Where pavement abuts an unimproved street, terminate with a type 'HT' joint.
3. When radius exceed 20 feet, add one additional 'C' joint at radius intersections.

SUDAS

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New 10-19-10

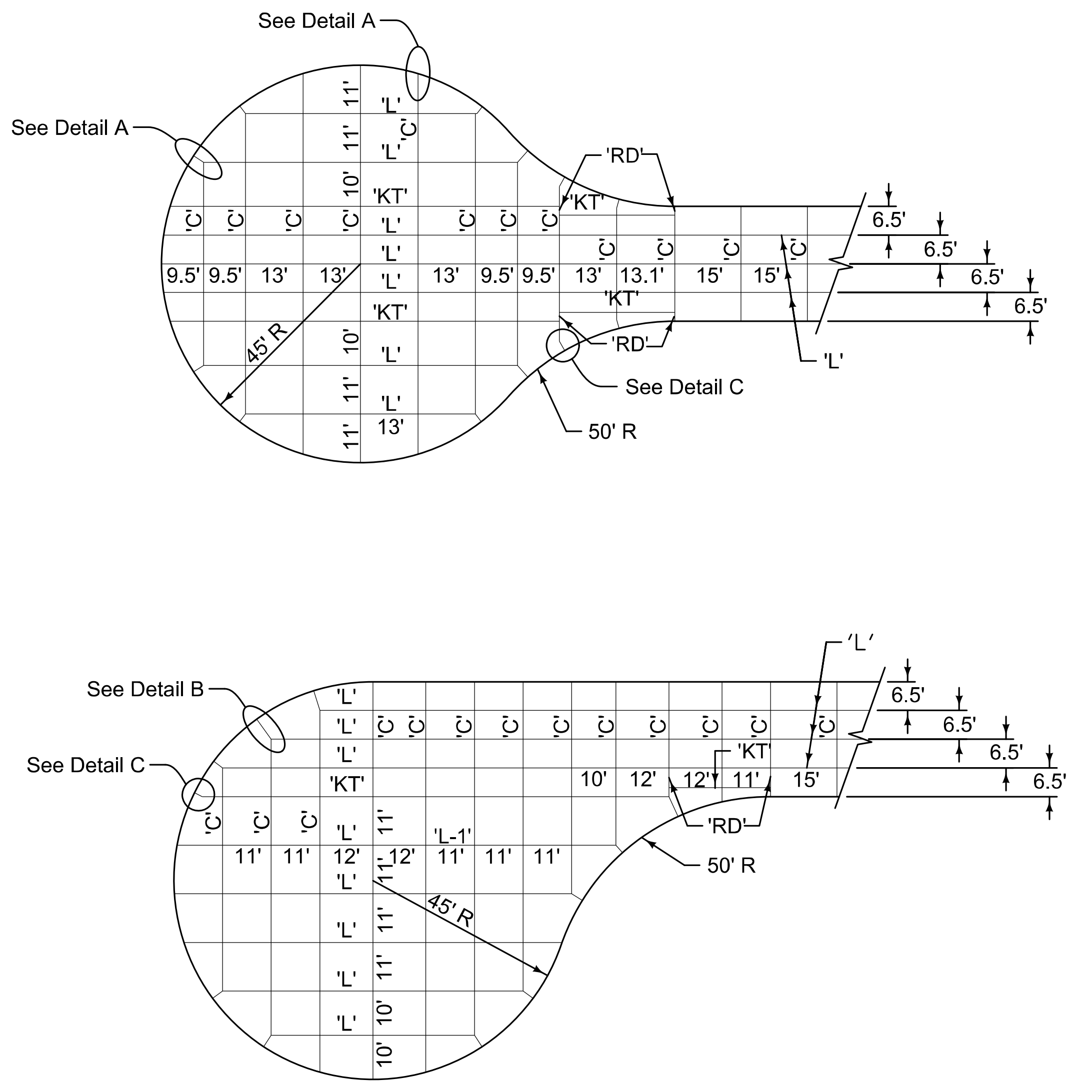
7010.904

SHEET 1 of 1

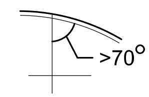
SUDAS Standard Specifications

TYPICAL JOINTING LAYOUT

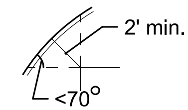
FIGURE 7010.904 | SHEET 1 OF 1



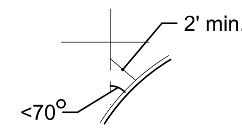
QUARTER POINT JOINTING



DETAIL A



DETAIL B

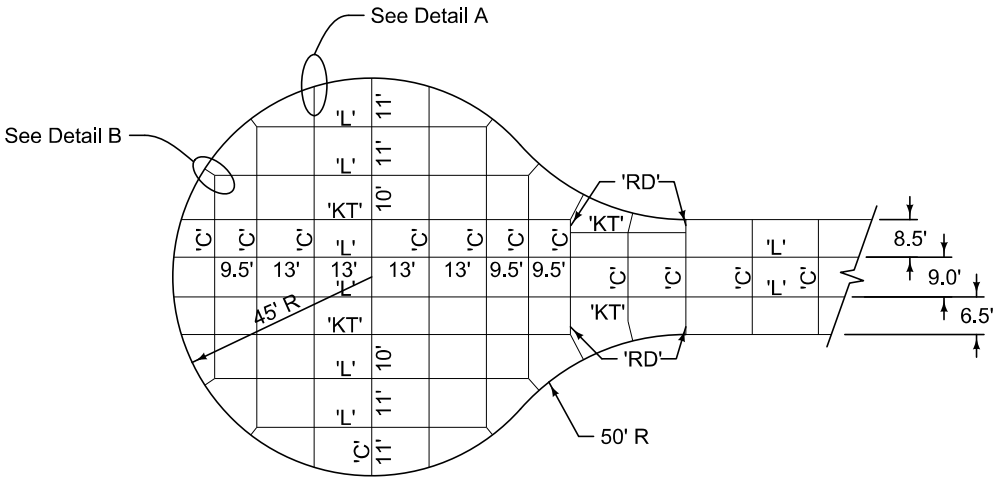


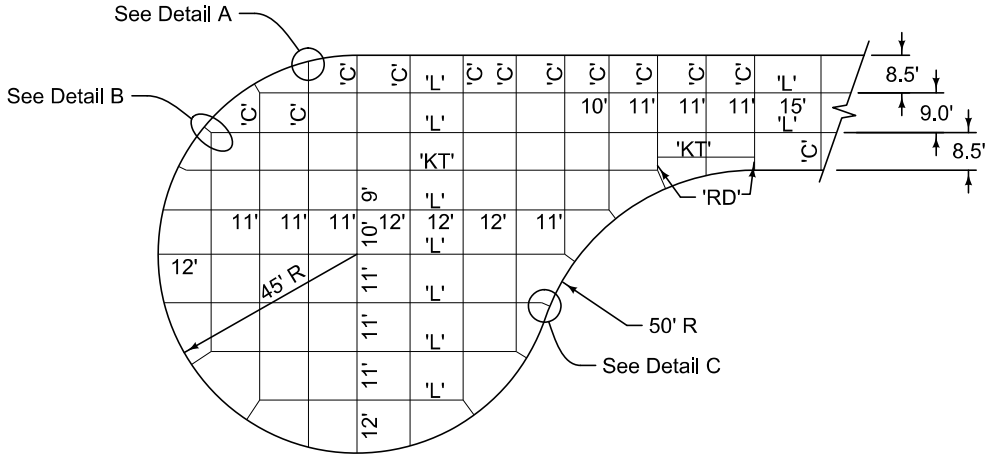
DETAIL C

SUDAS	REVISION
	New 10-19-10
	7010.905
	SHEET 1 of 3

SUDAS Standard Specifications

PCC CUL-DE-SAC JOINT LOCATIONS





THIRD POINT JOINTING

FIGURE 7010.905 SHEET 2 OF 3

SUDAS

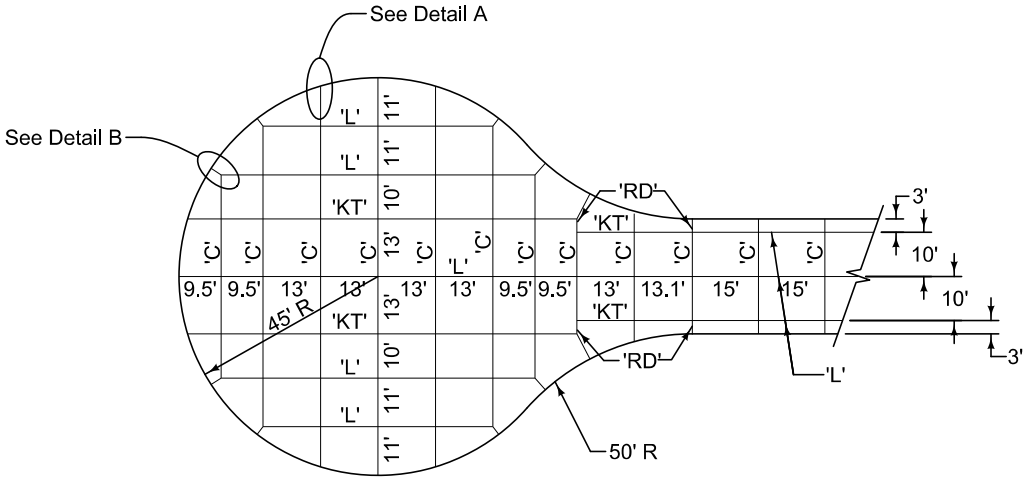
REVISION
New 10-19-10

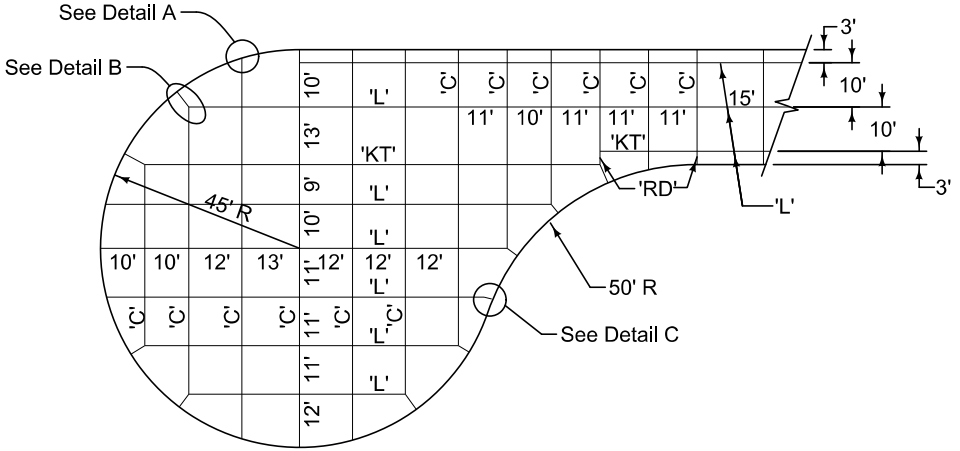
7010.905

SHEET 2 of 3

SUDAS Standard Specifications

PCC CUL-DE-SAC JOINT LOCATIONS





GUTTERLINE JOINTING

FIGURE 7010.905 SHEET 3 OF 3

SUDAS

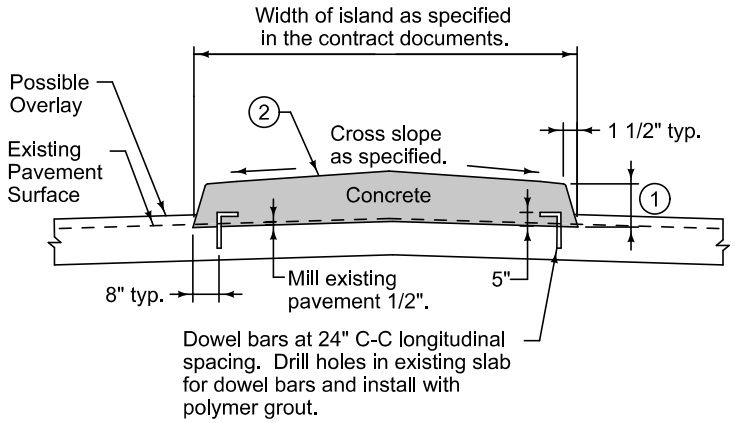
REVISION
New 10-19-10

7010.905

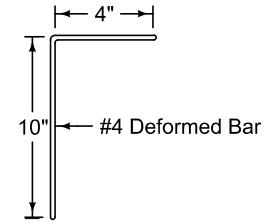
SHEET 3 of 3

SUDAS Standard Specifications

PCC CUL-DE-SAC JOINT LOCATIONS



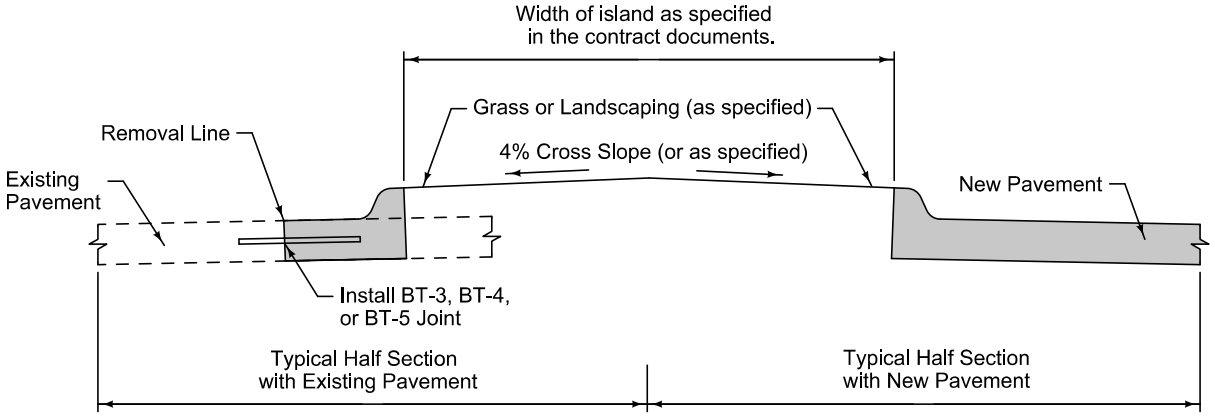
DOWELED MEDIAN



DOWEL BAR DETAIL

(1) Median height as specified in the contract documents.

(2) Construct 'C' joints at a maximum spacing of 15'. Match the joint pattern of the existing pavement. Install expansion joints as directed by the Engineer. Construct expansion joints with 1 inch expansion material. Seal all joints.



LANDSCAPE MEDIAN

FIGURE 7010.906

SHEET 1 OF 1

SUDAS

REVISION
New 10-19-10

7010.906

SHEET 1 of 1

SUDAS Standard Specifications

MEDIANS

HOT MIX ASPHALT PAVEMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Hot Mix Asphalt (HMA) Pavement

B. Base Widening

1.02 DESCRIPTION OF WORK

A. Includes the requirements for the construction of HMA surface, intermediate, and base courses placed upon a prepared subgrade, subbase, base, or pavement and HMA base widening.

B. Comply with Iowa DOT Section 2303 for construction of HMA pavement and base widening, except as modified herein.

1. Provide Quality Management - Asphalt (QM-A) for bid items with HMA quantities exceeding 1,000 tons. Provide quality control for bid items with HMA quantities of 1,000 tons or less according to Section 7020, 3.06.

2. Refer to Table 7020.01 for gyratory mixture design criteria. Note - this table was copied from the SUDAS Design Manual, Section 5D-1.

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants, as well as the following:

A. Prepare and submit the job mix formula to the Engineer for approval prior to HMA production.

B. Provide quality control test results.

C. Submit all pavement smoothness testing and certifications according to Section 7020, 3.05.

D. Upon request, provide material certifications to the Engineer.

E. Submit HMA certifications for all bid items with HMA quantities of 1,000 tons or less, according to Section 7020, 3.06.

F. Weight receipts should include mix size and type and/or correlate to the bid item.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants, as well as the following:

Table 7020.01: SUDAS HMA Mixture Design Criteria
(derived from Iowa DOT Materials I.M. 510)

Mix Designation	Gyratory Density					Friction[2]			Aggregate[3]			
	N_{ini} - N_{des} - N_{max}	Initial % G_{mm} (max)	Design % G_{mm} (target)	Maximum % G_{mm} (max)	VFA	Film Thickness	Filler: Binder	Type 4 (min)	Type 3 (min)	Type 2 (min)	Quality Type	Crush (min)	FAA (min)	Sand Equiv. (min)
HMA 100K S-I	7 - 68 - 104	92.5	97.0	98.5	75-85	8.0-13.0	0.6-1.4				A[1]	60[1]	---	40
HMA 100K B											B	45	---	
HMA 300K S-I	7 - 68 - 104	92.0	96.5	98.0	70-80	8.0-13.0	0.6-1.4				A[1]	60[1]	---	40
HMA 300K B		92.5	97.0	98.5	75-85						B	45	---	
HMA 1M S L-4	7 - 76 - 117	90.5	96.0	98.0	65-78	8.0-15.0	0.6-1.4	50			A	75[1]	40	40
HMA 1M S														
HMA 1M I											A[1]	60[1]		
HMA 1M B	7 - 68 - 104	92.0	96.5	98.0	70-80						B	45	---	
HMA 3M S L-4	7 - 86 -134	89.5	96.0	98.0	65-78	8.0-15.0	0.6-1.4	50			A	75	40	40
HMA 3M S L-3								80	45	(25)				
HMA 3M S												60		
HMA 3M I											B	45		
HMA 3M B	7 - 76 - 117	90.5	96.5	98.0	65-78									
HMA 10M S L-3	8 - 96 - 152	89.0	96.0	98.0	65-78	8.0-15.0	0.6-1.4	80	45	(25)	A	75	43	45
HMA 10M I														
HMA 10M B	7 - 86 - 134	89.5	96.0	98.0	65-78						B	75	40	
For mix design levels exceeding 10M ESALs, see Iowa DOT Materials I.M. 510.														
For 100K, 300K, and 1M ESAL mixes, the Engineer may designate Type B quality aggregate due to local availability														

[1] Requirements differing from Iowa DOT Materials I.M. 510; for surface and intermediate mixes, aggregate quality improved from B to A and percent crushed aggregate increased by 15%.
[2] See Iowa DOT Standard Specifications Article 2303.02
[3] Flat & Elongated 10% maximum at a 5:1 ratio

1.05 DELIVERY, STORAGE, HANDLING, AND SALVAGING

Comply with Division 1 - General Provisions and Covenants, as well as the following:

A. Aggregate Storage: Prevent contamination and intermingling per Iowa DOT Section 2303.

B. Salvaged or Reclaimed Materials: Classification of RAP will be as determined by the Iowa DOT. If RAP stockpile classification has not been determined by the Iowa DOT, the Contractor is responsible for obtaining the classification from an outside testing firm using the same tests as the Iowa DOT.

C. Disposal: Dispose of excess HMA according to applicable local, state, and federal regulations in a manner that does not cause damage or harm to adjacent properties or public facilities.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants, as well as the following:

Complete elements of the work that can affect line and grade in advance of other open cut construction unless noted on plans.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT AND PAYMENT

A. HMA Pavement or Overlay by Ton:

1. Measurement: Measurement will be in tons of HMA pavement or overlay.

2. Payment: Payment will be at the unit price per ton of HMA pavement or overlay.

3. Includes: Unit price includes, but is not limited to, asphalt binder, tack coats between layers, construction zone protection, and quality control.

B. HMA Pavement or Overlay by Square Yards:

1. Measurement: Measurement will be in square yards for each different thickness of HMA pavement or overlay. The area of manholes, intakes, or other fixtures in the pavement will not be deducted from the measured pavement area.

2. Payment: Payment will be at the unit price per square yard for each thickness of HMA pavement or overlay.

3. Includes: Unit price includes, but is not limited to, asphalt binder, tack coats between layers, construction zone protection, and quality control.

1.08 MEASUREMENT AND PAYMENT (Continued)

C. HMA Base Widening by Ton:

1. **Measurement:** Measurement will be in tons of HMA base widening.

2. **Payment:** Payment will be at the unit price per ton of HMA base widening.

3. **Includes:** Unit price includes, but is not limited to, asphalt binder, tack coat between layers, construction zone protection, and quality control.

D. HMA Base Widening by Square Yard:

1. **Measurement:** Measurement will be in square yards for each different thickness of HMA base widening. The area of manholes, intakes, or other fixtures in the pavement will not be deducted from the measured base widening area.

2. **Payment:** Payment will be at the unit price per square yard for each thickness of HMA base widening.

3. **Includes:** Unit price includes, but is not limited to, asphalt binder, tack coat between layers, construction zone protection, and quality control.

E. Density Deficiency:

1. **Measurement:** Measurement will be in square yards for each different density of HMA pavement subject to a unit price reduction for density deficiency according to Section 7020, 3.04.

2. **Payment:** Payment will be at the reduced unit price according to Table 7020.02 for each density of HMA pavement. If there is a density deficiency on a privately contracted roadway project, the Jurisdiction ultimately accepting ownership of the roadway will receive the penalty payment prior to acceptance of the work.

F. HMA Pavement Thickness Deficiency:

1. **Measurement:** Measurement will be in square yards for each different thickness of HMA pavement that has deficient pavement thickness as determined in Section 7020, 3.04.

2. **Payment:** Payment will be at the percentage of the unit price indicated in Table 7020.03 for each different thickness of HMA pavement. If there is a pavement thickness deficiency on a privately contracted roadway project, the Jurisdiction ultimately accepting ownership of the roadway will receive the penalty payment prior to acceptance of the work.

G. HMA Pavement Smoothness Deficiency:

1. **Measurement:** Measurement will be in square yards for each different segment of HMA pavement subject to a unit price reduction for pavement smoothness according to Section 7020, 3.05.

2. **Payment:** Payment will be at the reduced unit price according to Table 7020.04 for each segment of HMA pavement. If there is a pavement smoothness deficiency on a privately contracted roadway project, the Jurisdiction ultimately accepting ownership of the roadway will receive the penalty payment prior to acceptance of the work.

1.08 MEASUREMENT AND PAYMENT (Continued)

H. HMA Pavement Samples and Testing:

1. Measurement: Lump sum item; no measurement will be made.

2. Payment: Payment will be at the lump sum price for HMA pavement samples and testing.

3. Includes: Lump sum price includes, but is not limited to, certified plant inspection, pavement thickness cores, density analysis, profilograph pavement smoothness measurement (when required by the contract documents), and air void testing.

I. Fixture Adjustment: Comply with Section 6010 for adjustment of manholes and intakes and Section 5020 for adjustment of water valves and fire hydrants.

J. Pavement Removal: Comply with Section 7040.

K. Subgrade and Subbase: For excavation and construction of subgrade and subbase, comply with Section 2010.

PART 2 - PRODUCTS

2.01 HMA MATERIALS

Comply with Iowa DOT Section 2303, with the following exception:

Follow the procedure outlined in Iowa DOT Materials I.M. 510 for HMA mixture designs, except replace Table 1, HMA Mixture Design Criteria with the SUDAS HMA Mixture Design Criteria (Table 7020.01).

2.02 WARM MIX ASPHALT MATERIALS

If use of warm mix asphalt (WMA) is approved by the Jurisdiction, comply with Iowa DOT Section 2303.

2.03 RECYCLED ASPHALT MATERIALS

A. Recycled Asphalt Pavement: If use of recycled asphalt pavement (RAP) is approved by the Jurisdiction, comply with Iowa DOT Section 2303.

B. Recycled Asphalt Shingles: If use of recycled asphalt shingles (RAS) is approved by the Jurisdiction, comply with Iowa DOT Section 2303.

2.04 SUBGRADE AND SUBBASE

Comply with Section 2010.

PART 3 - EXECUTION

3.01 HMA PAVEMENT

Construct according to Iowa DOT Section 2303 and the following:

A. Preparation of Pavement Foundation: Construct subgrade and subbase according to Section 2010.

B. Compaction: Compact to a minimum of 94% of laboratory density. Do not exceed 8% average air void level for roadway density specimens.

C. Tack Coats: Apply tack coats according to Iowa DOT Section 2303 and the following:

1. If the emulsion is diluted, the dilution must be done by the manufacturer and certified. Provide the Engineer with the new application rate required to achieve the specified undiluted application rate.

2. On overlay projects, if required by the contract documents, apply an additional tack coat prior to each lift in the following areas:
   a. Within 2 feet of the face of curbs, headwalls of culverts, and curbs or handrails of bridges.
   b. All runouts and fillets, including depressed areas around drainage inlets.

D. Fillets and Runouts: Rake out coarse aggregate prior to shaping and compaction of fillets and runouts.

E. Fixtures in the Pavement Surface:

1. Adjust manhole frames and other fixtures within area to be paved to conform to finished surface. Comply with Section 6010, 3.04 for manhole adjustments and Section 5020, 3.04 for water fixture adjustments.

2. Clean outside of fixture to depth of pavement before asphalt placement.

3. Construct boxouts where allowed for later adjustment of fixtures. See Figure 7020.201 for the size and shape of the boxout.

F. Samples and Testing: Take samples from the compacted material and test according to Section 7020, 3.04. Randomly locate samples in the pavement area Notify the Jurisdiction the day prior to coring and testing to give the Jurisdiction the opportunity to witness coring and testing.

3.02 BASE WIDENING

A. Equipment: Use equipment complying with Iowa DOT Section 2213.

B. Conditions:

1. Resurfacing over Concrete Base Widening: When the existing pavement is HMA material over concrete pavement, saw or mill the old asphalt to the full depth of the proposed resurfacing or to depth of sound material producing a reasonable vertical line at the edge of the underlying concrete.

2. HMA Base Widening: Apply a tack coat to the vertical edge of the old pavement at a rate of 0.10 to 0.15 gallon per square yard according to Section 7020, 3.01. No waiting period will be required before placing the widening.

3.02 BASE WIDENING (Continued)

C. Preparation of Subgrade:

1. Cut the width of the trench for the widening at least 6 inches greater than the base width of the widening according to the contract documents. If widening roadways with open ditches, provide ditches or drains from the widening trench at frequent intervals to allow subgrade drainage to side ditches.

2. Construct subgrade and subbase according to Section 2010.

3. Bring the subgrade to an elevation and cross-section such that, after being compacted to a minimum of 95% of maximum Standard Proctor Density, the surface will be at the required elevation.

4. Remove material, other than sand, that will not readily compact. Replace with material that will readily compact and roll that portion of the subgrade again. Use an appropriate roller complying with Iowa DOT Article 2001.05.

5. While constructing the subgrade, maintain the soil in a condition sufficiently moist to facilitate compaction.

6. Check the finished subgrade with a template supported on the surface of the adjacent pavement. Clean the edge of the old pavement.

D. Construction:

1. Place the HMA mixture in the number of lifts required to produce the required thickness. Do not allow the compacted thickness of the top lift to exceed 2 inches.

2. The maximum compacted thickness of lower lifts may exceed 3 inches if the thicker lifts demonstrate satisfactory compaction. Maximum lift thickness shall be 4 inches.

3. Do not place HMA on the surface of the existing pavement, and immediately remove any spilled base material.

4. Ensure that, after compaction, the constructed width conforms to the required width.

5. Promptly and thoroughly compact each lift. Comply with Section 7020, 3.01.

6. Place succeeding lifts of HMA material as soon as the previous lift has been compacted.

7. Obtain the lab density for that day's HMA paving from an Iowa DOT-approved testing lab and based on the job mix formula design criteria.

8. Take density samples from the compacted material and test according to Section 7020, 3.04. Randomly locate samples in the area 6 inches from the base being widened to 6 inches from the outside edge of a given pass of the placing equipment. Notify the Jurisdiction the day prior to coring and testing to give the Jurisdiction the opportunity to witness coring and testing.

9. When the contract for base widening does not include resurfacing, construct the final surface of widening flush with, or no more than 1/8 inch below, the surface of the old pavement.

10. Do not open the widening to traffic until it has cooled sufficiently to support the traffic without displacement or movement.

3.03 PROTECTION FROM TRAFFIC

A. General:

1. Protect the new pavement and its appurtenances damages caused by traffic, both public and that of the Contractor's own employees and agents, at no additional cost to the Contracting Authority. This includes the erection and maintenance of warning signs, lights, fence, and barricades; flaggers to direct traffic; and pavement bridges or crossovers as appropriate.

2. Do not operate equipment with metal tracks, metal bucket blades, or metal motor patrol blades directly on new paving. Do not unload soil or granular materials, including base rock for storage and future reloading directly onto new paving.

B. End of Day's Run:

1. At the end of each day's run and at all side streets, erect and maintain safety barriers and fencing as necessary to protect the pavement from damage.

2. Install construction zone protection upon completion of paving operations. Leave protection in place and maintained until the pavement has cooled sufficiently to withstand traffic without damage.

3. Intermediate construction zone protection may be required for the purpose of opening the pavement for access to a side road, side street, or entrances.

C. Repair of Damages: At the discretion of the Engineer, and at no additional cost to the Contracting Authority, repair or replace any part of the pavement damaged by traffic or other causes occurring prior to final acceptance of the pavement.

3.04 DEFECTS OR DEFICIENCIES

A. Repairs Required:

1. Remove and replace or repair pavement containing excessive cracks, deformities, deficiencies, or other defects at no additional cost to the Contracting Authority. The method of replacement or repair will be determined by the Engineer. Extended warranty may be approved by the Engineer.

2. Areas to be replaced will be determined by the Engineer. Complete all repairs according to Section 7040.

B. Density Deficiencies:

1. The Engineer will obtain and test 7 samples for each lot according to Iowa DOT Materials I.M. 204 Appendix F. The quality index for density of each lot will be determined by the following formula:

$$\text{Density (Q.I.)} = \frac{(\text{Average } G_{mb})_{\text{Field Lot}} - ((\%\ \text{Density})_{\text{Specified}} \times (\text{Average } G_{mb})_{\text{Lab Lot}})}{(\text{Standard Deviation } G_{mb})_{\text{Field Lot}}}$$

where G_{mb} = bulk Specific Gravity of the mixture

3.04 DEFECTS OR DEFICIENCIES (Continued)

2. Payment will be adjusted according to the density requirements of Table 7020.02 for the quality index for density determined for the lot:

Table 7020.02: Pay Factor for HMA Pavement Density

Density Index 7 Samples[1]	Percent Payment
greater than 0.72	100
0.40 to 0.72	95
0.00 to 0.39	85
less than 0.00	75 Maximum

[1]Or 6 samples and 1 outlier. Only one outlier will be allowed.

No incentive payment for pavement density will be made.

C. Thickness Deficiencies:

1. The Engineer will measure the cores according to Iowa DOT Materials I.M. 337. All areas of uniform and similar thickness and width for the project will be divided into lots.
2. The thickness of the completed course will be measured to the nearest 1/8 inch, exclusive of seal coat. All areas of uniform and similar thickness and width for the project will be divided into lots. The frequency specified for taking density samples from the surface lift will be used when measuring for completed thickness. However, samples that may not be tested for density because they are less than 70% of the intended thickness will be used for thickness, and in these particular instances, the additional samples of sufficient thickness that are used for density tests will not be measured for thickness. Thickness samples will be taken full depth of the completed course and after measurement; remove the density samples for the top layer from the core. If any of the measurements for a lot is less than the designated thickness, the quality index for thickness of that lot will be determined by the following formula:

$$\text{Thickness (Q.I.)} = \frac{\text{Avg. Thickness - (Design Thickness - 0.50)}}{\text{Max Thickness - Minimum Thickness}}$$

3. Payment will be further adjusted by the appropriate percentage according to the quality index for thickness determined for that lot and the following table:

Table 7020.03: Pay Factor for HMA Pavement Thickness

Thickness Index 7 Samples	Percent Payment (Previously Adjusted for Density)
greater than 0.34	100
0.14 to 0.34	95
0.00 to 0.13	85
less than 0.00	75 Maximum

No incentive payment for pavement thickness will be made.

3.05 PAVEMENT SMOOTHNESS

A. Straightedge: The Engineer will check HMA pavement surfaces with a 10 foot straightedge placed parallel to the centerline. Areas showing high spots of more than 1/4 of an inch in 10 feet will be marked. Complete surface corrections according to the procedures in Iowa DOT Section 2316 to an elevation where the area or spot will not show surface deviations in excess of 1/8 inch when tested with a 10 foot straightedge. Surface corrections will be completed at the direction of the Engineer with no additional cost to the Contracting Authority.

3.05 PAVEMENT SMOOTHNESS (Continued)

B. Profilograph:

1. If specified in the contract documents, comply with Iowa DOT Section 2316 to measure pavement smoothness with a profilograph. Ensure the evaluation is certified according to Iowa DOT Materials I.M. 341. Position the center wheel of the profilometer 6 feet from the centerline or the lane line.

2. Evaluate according to the smoothness requirements of Table 7020.04 and make surface corrections and/or price reductions. Surface corrections will be completed with no additional cost to the Contracting Authority. No incentive for pavement smoothness will be made.

Table 7020.04: Price Reduction for Pavement Smoothness

Initial Profile Index (inch/mile/segment)	New Pavements ($/segment)	Resurfaced Pavements ($/segment)
12.1 - 22.0	Unit price	Unit price
22.1 - 30.0	$500	$250
30.1 and over[1]	Grind only	Grind only

[1] For segments with an initial index of 30.1 and over, grind the surface to a finish index of 22.0 or better. In lieu of accepting a price reduction and grinding the surface to a final index of 22.0 or better, the Contractor may elect to replace part or the entire segment.

3.06 QUALITY CONTROL

A. Provide Quality Management - Asphalt (QM-A) for bid items with HMA quantities exceeding 1,000 tons. On locally let projects, all testing normally conducted by the Iowa DOT may be performed by the Jurisdiction or an independent testing laboratory hired by the Jurisdiction.

1. General: Follow the procedures and meet the criteria established in Iowa DOT Article 2303.03, B; Section 2521; and Materials I.M. 510 and 511. Percent within Limits (PWL) stipulations in these documents is not required.

2. Mix Design - Job Mix Formula (JMF):
   a. The Contractor is responsible for the JMF for each mixture.
   b. Submit a completed JMF for approval to the materials lab designated by the Contracting Authority. Submit supporting documentation demonstrating the design process was followed and how the recommended JMF was determined. Include an economic evaluation when required. Include trial and final proposed aggregate proportions and corresponding gyratory data. In addition, submit sufficient loose mixture and individual material samples for approval of the design.
   c. Ensure personnel preparing the JMF is Iowa DOT certified in bituminous mix design.
   d. If the JMF is not satisfactory, submit another JMF for review. An approved JMF will be required prior to beginning plant production. The Contractor will be charged $1,000 for each JMF approval requested and performed that exceeds two per mix size, type, and proposal item on any individual project or group of tied projects.

3. Plant Production:
   a. General:
      1) Perform sampling and testing to provide the quality control of the mixture during plant production. Certified Plant Inspection according to Iowa DOT Section 2521 is required.
      2) Ensure personnel performing production quality control testing is Iowa DOT certified for the duties performed.
      3) Provide easy and safe access to the location in the plant where samples are taken.

3.06 QUALITY CONTROL (Continued)

4) A "significant mix change" is defined as a single occurrence of an aggregate interchange of greater than 5%, a single occurrence of an asphalt content change greater than 0.2%, or any deletion or introduction of a new material into the mix.

b. Sampling and Testing:
   1) Sample and test asphalt binder to verify the quality of the binder grade. Take asphalt binder samples at random times as directed and witnessed by the Engineer according to Iowa DOT Materials I.M. 204.
   2) Use cold feed or ignition oven gradation for aggregate gradation control to assure materials are being proportioned according to the specifications. Take aggregate samples at random times as directed and witnessed by the Engineer according to Iowa DOT Materials I.M. 204. The Engineer will secure the samples according to Iowa DOT Materials I.M. 511.
   3) Sample the hot HMA mixture at random locations as directed and witnessed by the Engineer according to Iowa DOT Materials I.M. 322. Secure the samples according to Iowa DOT Materials I.M. 511.
   4) Assist the Engineer with material sampling for verification testing. When the Engineer provides notification that a sample is to be taken, obtain sample within 15 minutes.
   5) Each day's production of a mix design will be considered a lot.
      a) When the anticipated quantity for the day is 2,000 tons or more, divide that day's production into four sublots, with the first sublot being the first 500 tons produced. The Engineer will divide the remaining anticipated quantity for the day into three equally sized sublots.
      b) When the anticipated quantity for the day is less than 2,000 tons, use the first 500 tons produced for the first daily sublot. The Engineer will establish 750 ton daily sublots for mix production exceeding the first 500 tons.
   6) No more than four paired hot HMA mixture samples will be required for acceptance of a lot.
   7) Do not take paired samples from the first 100 tons of mix produced each day or the first 100 tons of mix following a significant mix change. When paving operations are staged so each day of placement is less than 100 tons for the entire production of a bid item, establish a sampling plan with the Engineer that includes a minimum of one sample per 2,500 tons.
   8) Test the quality control sample of each production paired sample as follows:
      a) Prepare and compact two gyratory specimens according to Iowa DOT Materials I.M. 325G.
      b) Determine the density for each specimen according to Iowa DOT Materials I.M. 321. Average the results to determine sample density.
      c) Use the field quality control laboratory compaction for field density control. The laboratory density for field control will be the bulk specific gravity of compacted mixture (Gmb) at Ndesign. Bulk specific gravity at Ndesign will be determined by compacting specimens to Nmax and back calculating the bulk specific gravity at Ndesign.
      d) Determine the Theoretical Maximum Specific Gravity of the uncompacted mixture according to Iowa DOT Materials I.M. 350 or other test methods recognized by AASHTO or ASTM.
      e) Determine laboratory air voids for each sample according to Iowa DOT Materials I.M. 501.
   9) When liquid anti-strip additives are used, satisfy one of the following methods to regulate the quantity of additive:
      a) Present certification that the equipment used to measure and blend the liquid anti-strip additive:
         - Meets the anti-strip supplier's recommended practice,
         - Is directly tied to the asphalt binder supply system, and
         - Has been calibrated to the equipment manufacturer's guidelines.

3.06 QUALITY CONTROL (Continued)

b) Test the binder to measure the quantity of liquid anti-strip additive in the binder for every 5,000 tons of HMA production. Obtain the Engineer's approval for the supplier's test method prior to use of the test.
c) Run the test method in Iowa DOT Materials I.M. 319 during production. If unable to certify or test for the presence and quality, run the test method in Iowa DOT Materials I.M. 319 each 10,000 tons of production to measure the effectiveness of the additive. Ensure test results satisfy the minimum requirements of Iowa DOT Article 2303.02, E.

c. Production Control:
1) After the JMF is established, the combined aggregate furnished for the project, the quantity of asphalt binder, and the laboratory air voids should consistently comply with the JMF, as target values. Control them within the production tolerance given in Table 7020.05.

Table 7020.05 Production Tolerances

Measured Characteristic	Target Value (%)	Specifications Tolerance (%)[1]
Cold feed gradation No. 4 (4.75 mm) and larger sieves	by JMF	± 7.0
Cold feed gradation No. 8 (2.36 mm)	by JMF	± 5.0
Cold feed gradation No. 30 (600 µm)	by JMF	± 4.0
Cold feed gradation No. 200 (75 µm)	by JMF	± 2.0[2]
Daily asphalt binder content	by JMF	± 0.3
Field laboratory air voids	4.0[3]	-0.5/+1.0[4]
VMA[5]	by JMF	± 1.0[6]

[1] Based on single test unless otherwise specified.
[2] Maintain the filler/bitumen ratio of the plant produced mixture between 0.6 and 1.4.
[3] Unless otherwise specified.
[4] Based on the moving average of four test values.
[5] Restricted to an asphalt film thickness as specified for the level of HMA mixture.
[6] Based on the daily lot average.

2) Control plant production so that the plant produced HMA mixture will meet mixture design criteria (within the test tolerances given in Table 7020.05) for Air Voids and VMA at Ndesign gyrations of the gyratory compactor. Monitor the slope of the gyratory compaction curve of plant produced material. Slope variations in excess of ±0.40 of the mixture design gyratory compaction curve slope may indicate potential problems with uniformity of the mixture.
3) The gyratory mix design gradation control points for the size mixture designated in the project plans will not apply to plant production control.
4) Strive for the target value of the percent air void and asphalt binder by adjusting gradation and asphalt binder content.
5) Produce a uniform composition mixture complying with the JMF.
6) Adjustments to the JMF target gradation and asphalt binder content values may be made.
a) Determine from quality control testing that adjustments are necessary to achieve the specified properties.
b) Consult with the Engineer regarding adjustments to the JMF.
c) The Contractor's adjustment recommendations prevail, provided all specifications and established mix criteria are being met for plant production.
7) Measure estimated film thickness and voids in the mineral aggregate (VMA) for specifications compliance every day of HMA production.

3.06 QUALITY CONTROL (Continued)

8) Prepare quality control charts according to Iowa DOT Materials I.M. 511. Keep the charts current and available showing both individual sample results and moving average values. Base moving average values on four consecutive sample results. Moving averages may restart only in the event of a mandatory plant shutdown for failure to maintain the average within the production tolerance. Include the target value and specifications tolerances on control charts.
9) Calculate laboratory voids for individual samples according to Iowa DOT Materials I.M. 501. Use the individual density and individual maximum specific gravity determined for each sample. To determine the moving average of laboratory voids, use the average of the last four individual sample laboratory voids.
10) Monitor the test results and make mix adjustments, when appropriate, to keep the mixture near the target values. Notify the Engineer whenever the process approaches a specification tolerance limit. Cease operations when the moving average point for laboratory air voids is outside the specification tolerance limit. Assume responsibility to cease operations, including not incorporating material which has not been placed. Do not start the process again until notifying the Engineer of the corrective action proposed.

B. Provide quality control for bid items with HMA quantities of 1,000 tons or less as follows:

1. Mix Design: Prepare the job mix formula. Prior to HMA production, obtain the Engineer's approval for the job mix formula. Comply with Iowa DOT Article 2303.02 and Iowa DOT Materials I.M. 510. Submit for approval.

2. Plant Production: Use a current calibration of the HMA production plant for the job mix formula no more than 12 months old. Maintain an asphalt binder log to track when the binder was delivered. Identify the job mix formula on the HMA delivery ticket. Use certified asphalt binder and approved aggregate sources meeting the job mix formula. Monitor the quality control test results and make adjustments to keep the mixture near the target job mix formula values.

3. Construction: Take density measurements of the compacted mixture. Use the field quality control laboratory compaction for field density control as specified in Section 7020, 3.04. The Engineer may accept the density of the compacted layer based on cores or density gauge. The Engineer may waive density measurement provided the compaction has been thorough and effective. Take density measurements of the compacted mixture no later than the next working day following placement and compaction. For small quantities, a lot is the entire quantity of each HMA mixture bid item. The quality index for density will not apply to small quantities.

4. Sampling and Testing: Material sampling and testing is for production quality control only. Acceptance of mixture is based on Contractor certification. Perform a minimum of one aggregate cold-feed and one loose HMA test per lot. Sampling and testing of loose HMA is only required for mechanically placed mixture. All sampling and testing procedures will follow the Iowa DOT Specifications and Materials I.M.s using certified technicians and qualified testing equipment. The Engineer may approve alternative sampling procedures, or may approve sampling of uncompacted mix and gradation if Contractor can provide plant reports for other recent projects(s) demonstrating the job mix formula has been produced according to the specifications. Take the sample between the first 100 to 200 tons of production. No split samples for agency correlation testing are required. Asphalt binder will be accepted based on the asphalt supplier's shipment certification. No binder sampling or testing is required. No material sampling or testing is required for daily HMA production of less than 100 tons on any project.

3.06 QUALITY CONTROL (Continued)

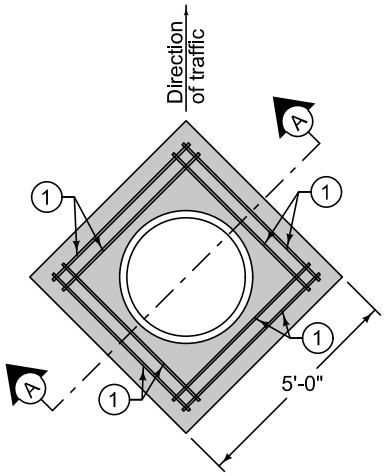
5. Certification: Provide a certification for the production of any mixture in which the requirements in this section for small quantities or are applied. Place the test results and certification statement on the Iowa DOT Daily HMA Plant Report (Form 800241). The Daily HMA Plant Report for certified HMA may be submitted at the end of the project for all certified HMA quantities, or submitted at intervals for portions of the certified quantity. Use the following certification statement:

   "The certified HMA was produced in compliance with the provisions of Section 7020, of the SUDAS Standard Specifications. The certified HMA was produced with certified asphalt binder and approved aggregates as specified in the approved mix design."

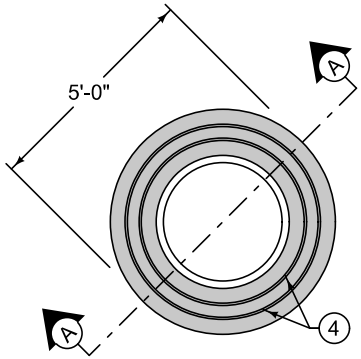
3.07 REMOVAL OF PAVEMENT

Comply with Section 7040.

END OF SECTION



RECTANGULAR



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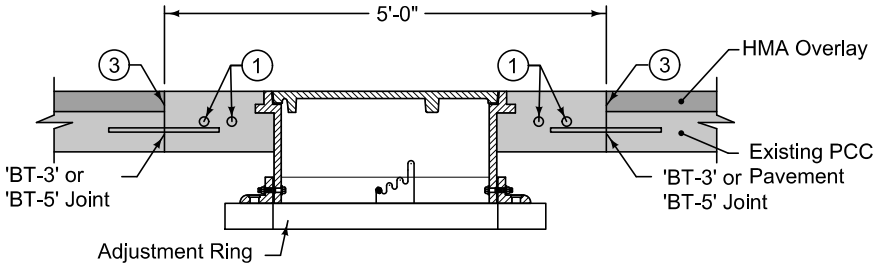
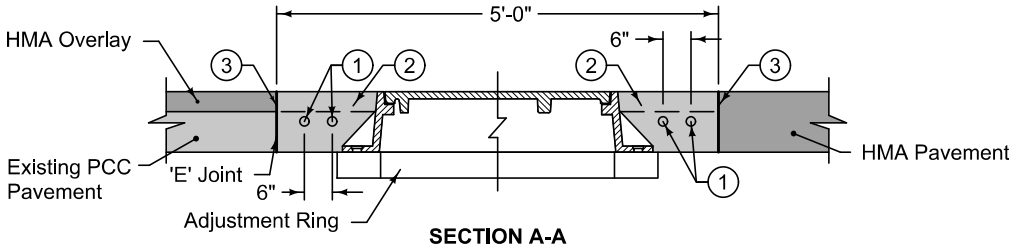


SECTION A-A
(For three-piece floating casting)



SECTION A-A
(For two-piece fixed casting)

Construct boxout with Class C concrete. Minimum 2 inches clear on reinforcement. Center casting within boxout area.

(1) 4 foot 8 inch (typ.) #4 bar. Place at mid-slab.

(2) If boxout is constructed prior to placement of HMA overlay or final lift of HMA pavement, boxout may be constructed low and then final lift or overlay placed.

(3) Apply tack coat.

(4) #4 hoops (variable length). Place at mid-slab.

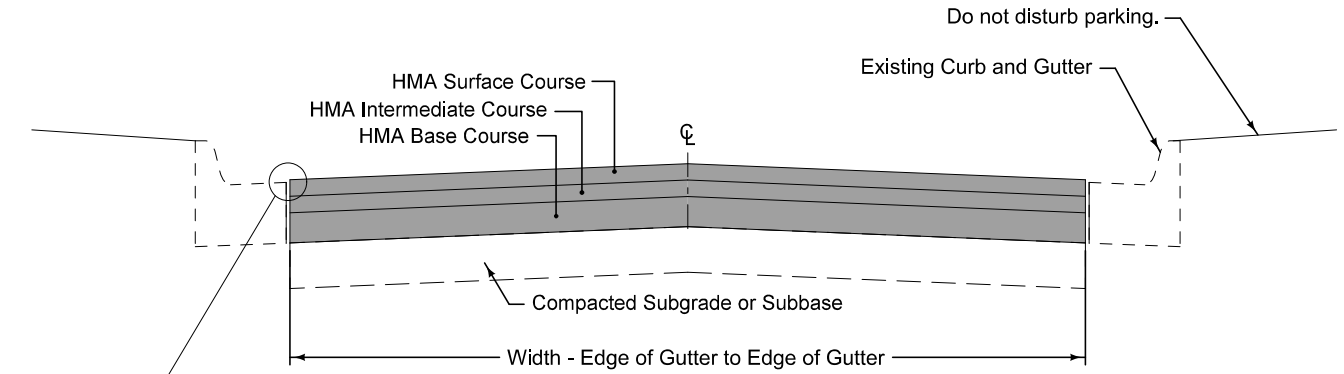
SUDAS	Iowa Department of Transportation	REVISION: New 04-19-11
FIGURE 7020.201	STANDARD ROAD PLAN	PV-201
		SHEET 1 of 1

REVISIONS: New. Joint Standard with SUDAS.

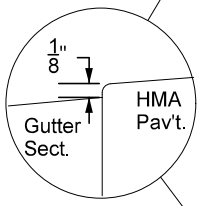
Paul D. Wiegand, SUDAS DIRECTOR — Deanna Maifield, DESIGN METHODS ENGINEER

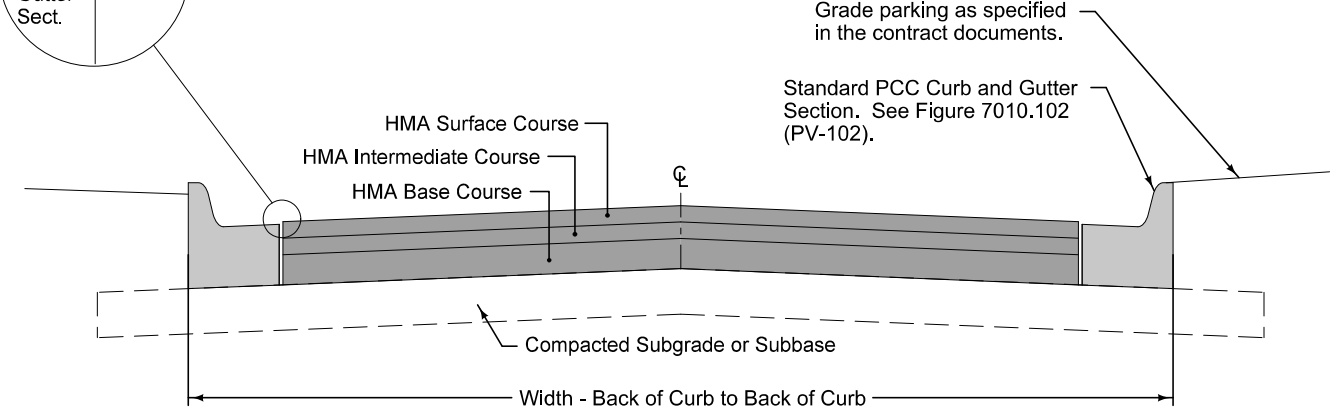
MANHOLE BOXOUTS IN HMA PAVEMENT AND HMA OVERLAYS

FIGURE 7020.201 | SHEET 1 OF 1



HMA PAVEMENT SECTION
(With Existing Curb and Gutter)





HMA PAVEMENT SECTION
(With New Curb and Gutter)

FIGURE 7020.901

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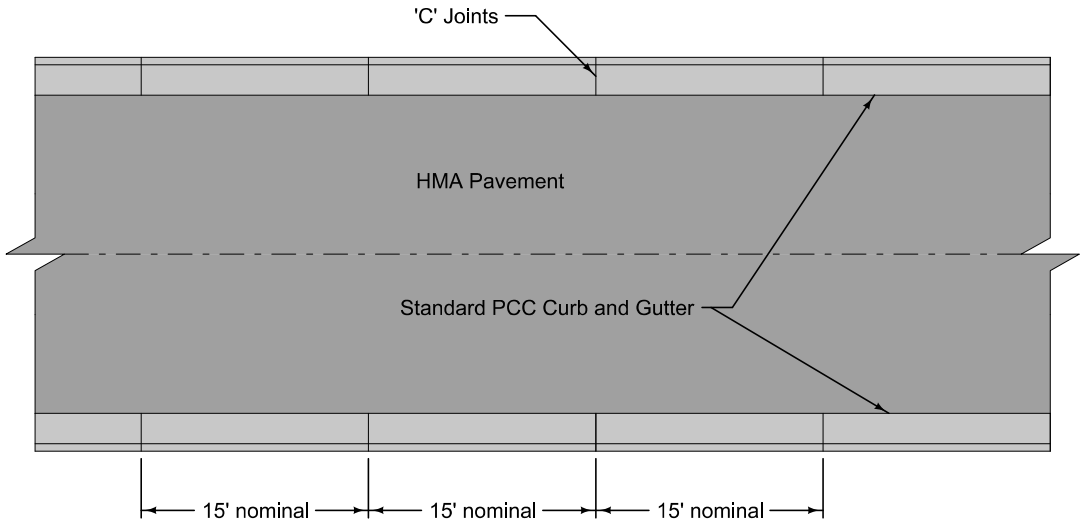
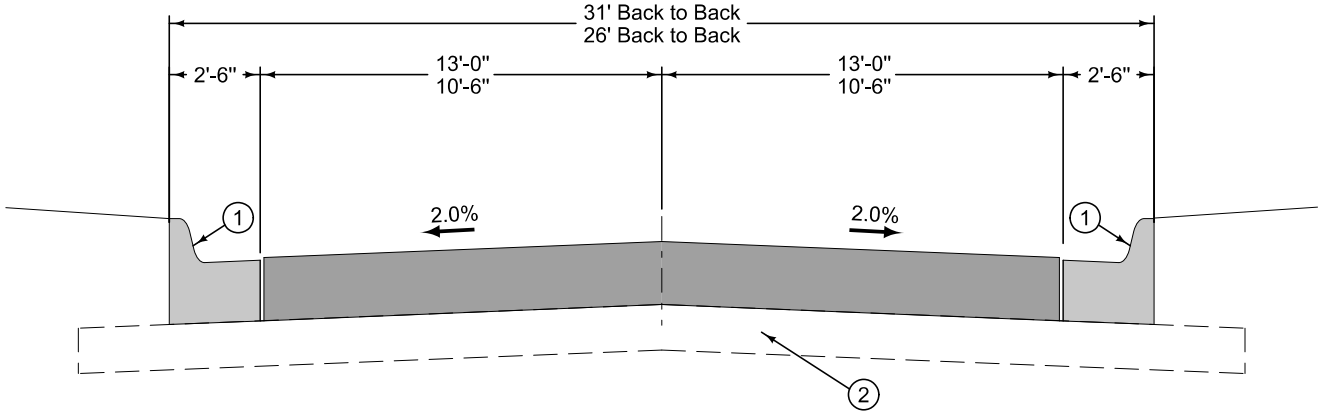
SUDAS Standard Specifications

HMA PAVEMENT



1. 6 inch standard curb and gutter.
2. Subbase or subgrade as specified.



TYPICAL CROSS-SECTION

FIGURE 7020.901 | SHEET 2 OF 2

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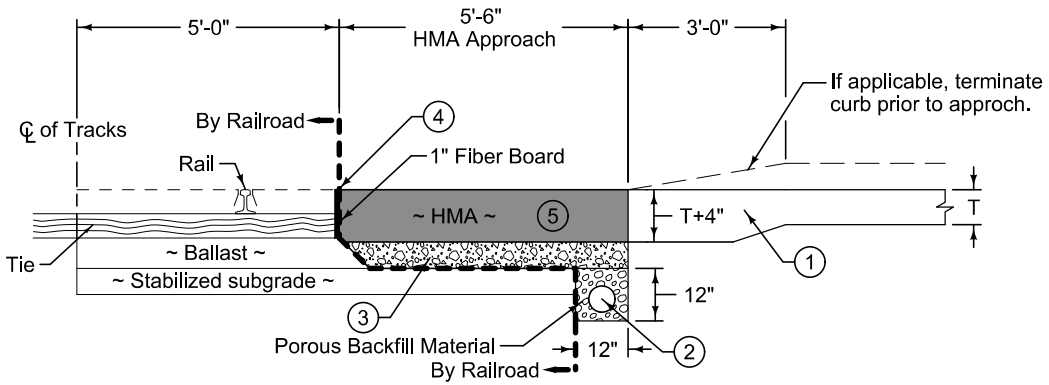
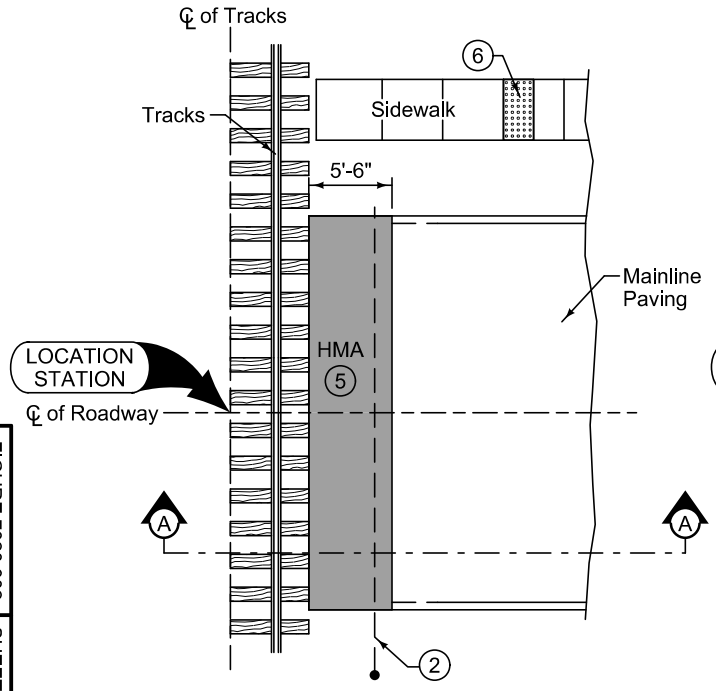
SUDAS Standard Specifications

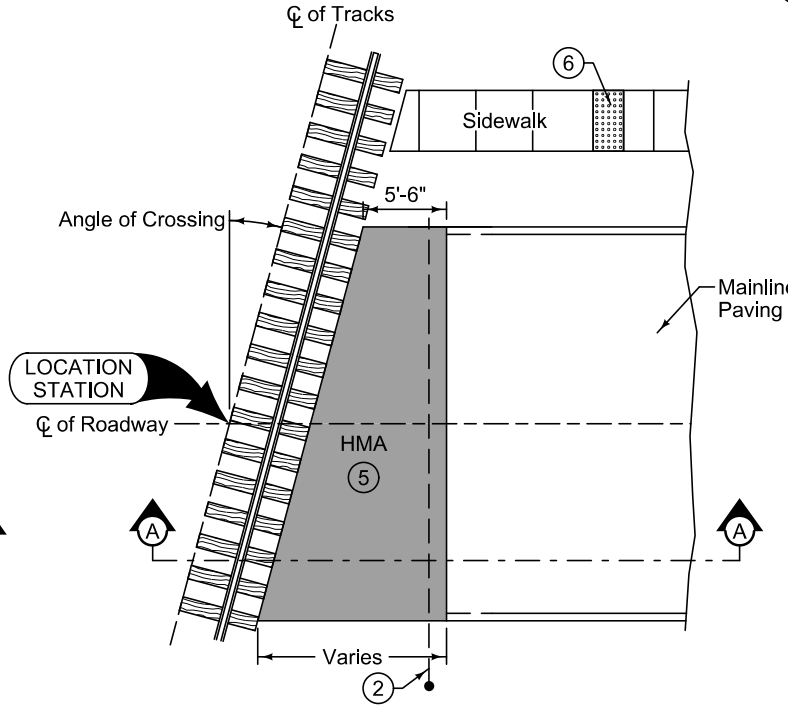
HMA PAVEMENT



SECTION A-A



PLAN VIEW - STRAIGHT CROSSING



PLAN VIEW - SKEWED CROSSING

1. HMA or composite mainline paving.
2. Install 6 inch perforated CMP subdrain, if specified. Include rodent guard per Iowa DOT Materials I.M. 443.01.
3. Granular subbase, modified subbase, or ballast meeting railroad specifications.
4. For new crossings, construct pavement 1/2 inch to 1 inch below top of rail. For existing crossings, construct pavement level to 1/2 inch below top of rail.
5. Construct HMA approach according to full depth HMA patch requirements, or requirements for mainline paving if constructed with HMA mainline.
6. Refer to Figure 7030.205 for detectable warning location.

FIGURE 7020.902

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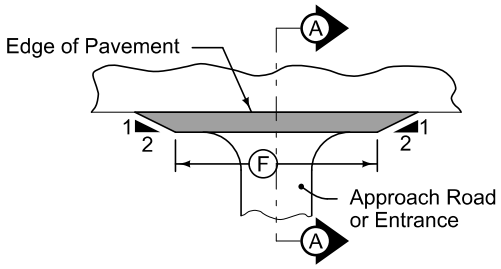
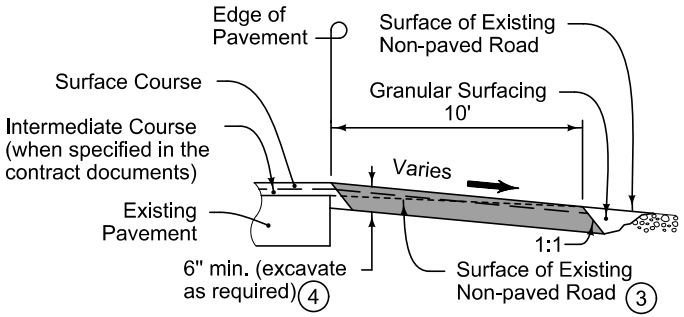
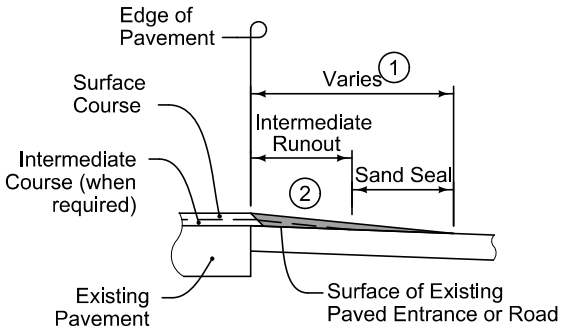
HMA RAILROAD CROSSING APPROACH



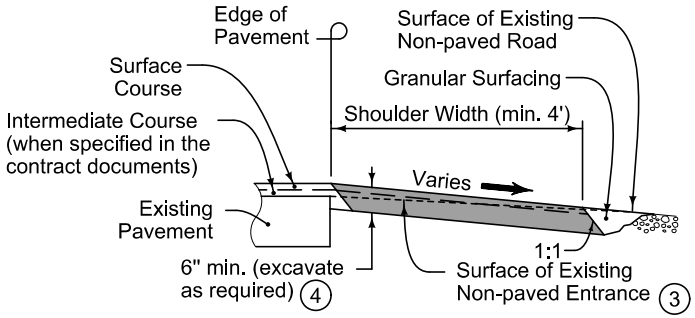
TYPICAL PLAN FOR FILLET AT
ENTRANCE OR INTERSECTING ROAD



SECTION A-A
(Full Thickness Fillet - Non-paved Road)



SECTION A-A
(Wedge Shaped Fillet - Paved Entrance or Road)



SECTION A-A
(Full Thickness Fillet - Non-paved Entrance)

MINIMUM FILLET WIDTH		
TYPE OF ACCESS	PRIMARY ROADS (F) ft.	SECONDARY AND LOCAL ROADS (F) ft.
Residential Entrance	40	12
Farm Entrance	60	18
Commercial Entrance	80	24
Non-paved Road	100	30
Paved Road	Variable 5	Variable 5

For temporary runouts and wedges, place subgrade paper, burlap, or similar material over adjacent surfaces to facilitate removal. Construct temporary runout at a length of 10 feet for each 1 inch of resurfacing thickness.

Construct wedge shaped asphalt fillets at all paved entrances and paved roads. Construct full thickness fillets at all non-paved entrances and non-paved roads.

1. Width of fillet is 4 feet for each inch of overlay thickness.
2. The runout length of the intermediate course is equal to the total runout length, multiplied by the intermediate course thickness, divided by the total resurfacing thickness.
3. Excavate and shape road or entrance as required to accommodate proposed fillet.
4. For existing fillets at non-paved roads and entrances, construct a wedge shaped fillet matching the thickness of the resurfacing.
5. Match width and shape of existing pavement.

RUNOUT LENGTH	
POSTED SPEED LIMIT (mph)	RUNOUT RATIO (ft. per inch)
45 or More	50
20 to 45	25

GENERAL DETAILS

FIGURE 7020.903

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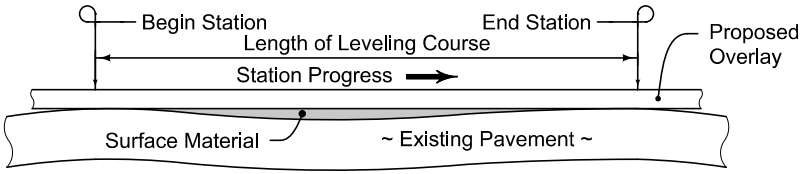
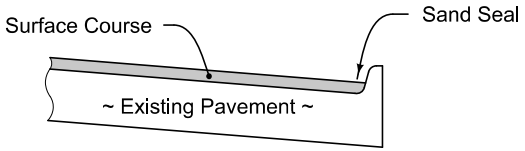
SUDAS Standard Specifications

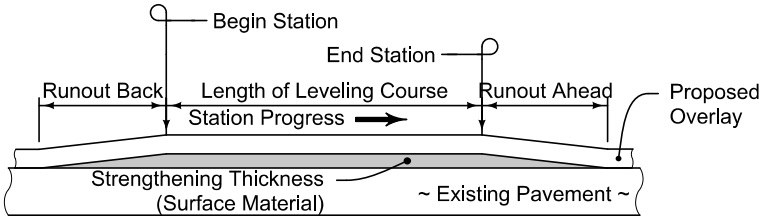
DETAILS FOR
ASPHALT RESURFACING



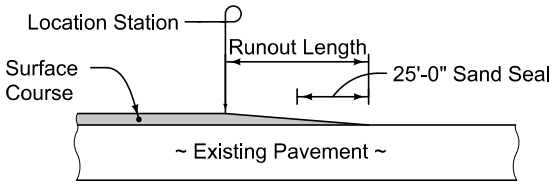
TYPICAL LEVELING COURSE



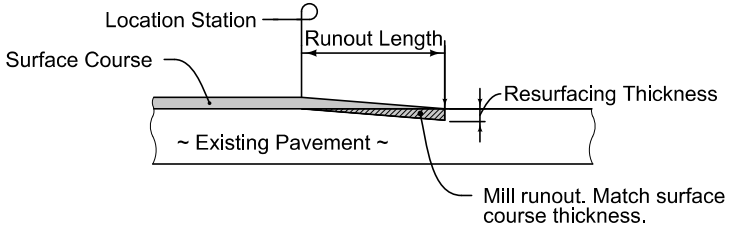
GUTTERLINE EDGE - MATCH



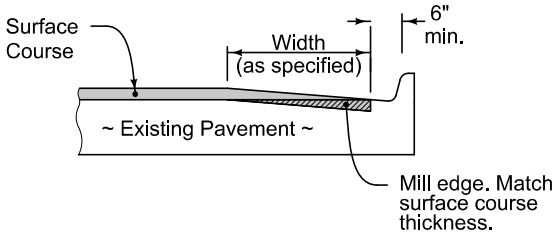
TYPICAL STRENGTHENING COURSE



WEDGE SHAPED RUNOUT
(When Milling is not Specified)



MILLED SURFACE NOTCH FOR RUNOUT



GUTTERLINE EDGE - NOTCH

SINGLE COURSE RESURFACING

FIGURE 7020.903

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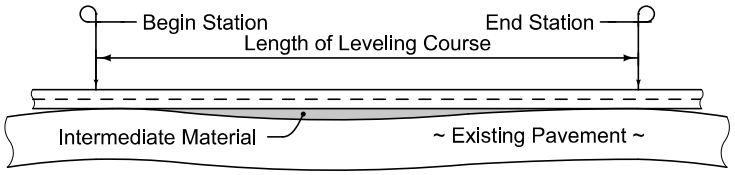
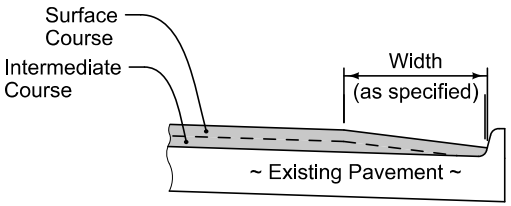
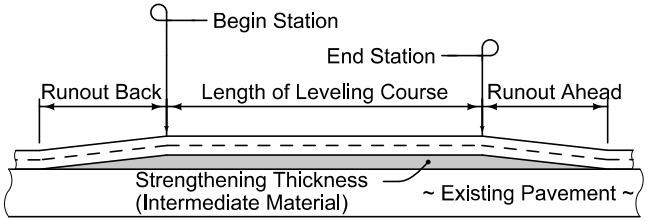
DETAILS FOR
ASPHALT RESURFACING



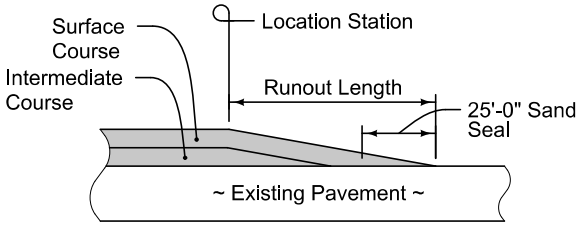
TYPICAL LEVELING COURSE



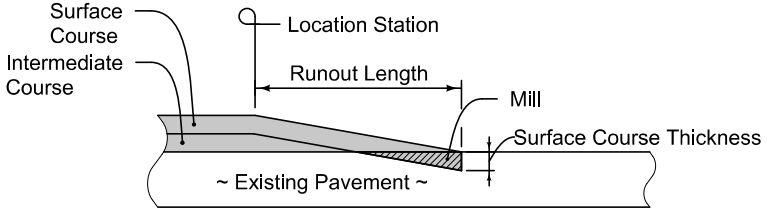
GUTTERLINE EDGE - MATCH



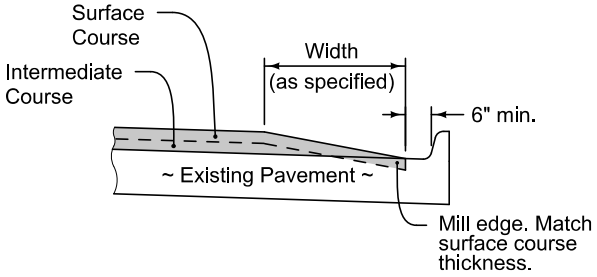
TYPICAL STRENGTHENING COURSE



WEDGE SHAPED RUNOUT
(When Milling is not Specified)



MILLED SURFACE NOTCH RUNOUT



GUTTERLINE EDGE - NOTCH

DOUBLE COURSE RESURFACING

FIGURE 7020.903

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DETAILS FOR
ASPHALT RESURFACING

SIDEWALKS, SHARED USE PATHS, AND DRIVEWAYS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Removal of Sidewalks, Shared Use Paths, and Driveways

B. Installation of Sidewalks, Shared Use Paths, and Driveways

1.02 DESCRIPTION OF WORK

A. Remove existing sidewalks, shared use paths, and driveways.

B. Install shared use paths.

C. Install sidewalk.

D. Install driveway.

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants, as well as the following:

A. PCC mix design.

B. HMA mix design.

C. Brick source, absorption, compressive strength; samples of brick showing texture and color.

D. Submit type and color of detectable warnings.

E. Results of required testing.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 - General Provisions and Covenants, as well as the following:

A. Portland Cement Concrete: See Section 7010.

B. Hot Mix Asphalt: See Section 7020.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants.

1.07 SPECIAL REQUIREMENTS

Provide 10 calendar days advance notification of a pedestrian path closure to the Engineer and the National Federation of the Blind of Iowa (www.nfbi.org).

1.08 MEASUREMENT AND PAYMENT

A. Removal of Sidewalk, Shared Use Path, or Driveway:

1. **Measurement:** Measurement will be in square yards for the area of sidewalks, shared use paths, or driveways removed.

2. **Payment:** Payment will be at the unit price per square yard for the area of sidewalk, shared use path, or driveway removal.

3. **Includes:** Unit price includes, but is not limited to, sawing, hauling, and disposal of materials removed.

B. Removal of Curb:

1. **Measurement:** Measurement will be in linear feet for removal of curb by grinding or sawing, measured along the back of curb.

2. **Payment:** Payment will be at the unit price per linear foot for the removal of curb.

3. **Includes:** Unit price includes, but is not limited to, hauling and disposal of materials removed.

C. Shared Use Paths:

1. **Measurement:** Each type and thickness of shared use paths will be measured in square yards. The area of manholes, intakes, or other fixtures in the pavement will not be deducted from the measured pavement area.

2. **Payment:** Payment will be at the unit price per square yard for each type and thickness of shared use path.

3. **Includes:** Unit price includes, but is not limited to, subgrade preparation, jointing, sampling, smoothness testing and correction, and testing.

D. Special Subgrade Preparation for Shared Use Paths:

1. **Measurement:** Measurement will be in square yards for special subgrade preparation. Measured area will include 2 feet outside of the pavement on either side of the path.

2. **Payment:** Payment will be at the unit price per square yard for the area of special subgrade preparation.

3. **Includes:** Unit price includes, but is not limited to, water required to bring subgrade moisture content to within the required limits.

1.08 MEASUREMENT AND PAYMENT (Continued)

E. PCC Sidewalk:

1. **Measurement:** Each thickness of PCC sidewalk will be measured in square yards. The area of manholes, intakes, or other fixtures in the pavement will not be deducted from the measured pavement area.

2. **Payment:** Payment will be at the unit price per square yard for each thickness of PCC sidewalk.

3. **Includes:** Unit price includes, but is not limited to, minor grade adjustments at driveways and other intersections, subgrade preparation, formwork, additional thickness at thickened edges, jointing, sampling, smoothness testing and correction, and testing.

F. Brick Sidewalk:

1. **Brick Sidewalk with Sand Base:**
   a. **Measurement:** Measurement will be in square yards for the area of brick sidewalk placed on a sand base.
   b. **Payment:** Payment will be at the unit price per square yard for the area of sidewalk.
   c. **Includes:** Unit price includes, but is not limited to, subgrade preparation, brick edge restraints, furnishing and placing compacted sand base, and sand/cement joint filler.

2. **Brick Sidewalk with Concrete Base:**
   a. **Measurement:** Measurement will be in square yards for the area of brick sidewalk placed on a concrete base. The area of concrete base will not be measured separately.
   b. **Payment:** Payment will be at the unit price per square yard for the area of sidewalk.
   c. **Includes:** Unit price includes, but is not limited to, subgrade preparation, concrete base, HMA setting bed, neoprene asphalt adhesive for asphalt setting bed, and sand/cement joint filler.

G. Detectable Warnings:

1. **Measurement:** Measurement will be in square feet for the area of detectable warnings installed. Paved area beneath detectable warnings will be measured with sidewalk or shared use path item.

2. **Payment:** Payment will be at the unit price per square foot for the area of detectable warnings installed.

3. **Includes:** Unit price includes, but is not limited to, steel bar supports and manufactured detectable warning panels.

1.08 MEASUREMENT AND PAYMENT (Continued)

H. Driveways:

1. **Paved Driveways:**
   - **a. Measurement:** Each type and thickness will be measured in square yards. The area of manholes, intakes, or other fixtures in the pavement will not be deducted from the measured pavement area.
   - **b. Payment:** Payment will be at the unit price for each type and thickness of driveway.
   - **c. Includes:** Unit price includes, but is not limited to, excavation, subgrade preparation, jointing, sampling, and testing.

2. **Granular Surfacing for Driveways:**
   - **a. Measurement:** Measurement will be in square yards or tons, as specified in the contract documents, for the quantity of granular surfacing placed.
   - **b. Payment:** Payment will be at the unit price per square yard or ton, as specified.
   - **c. Includes:** Unit price includes, but is not limited to, excavation and preparation of subgrade.

I. Sidewalk, Shared Use Path, and Driveway Assurance Testing:

1. The Contractor will not be responsible for concrete compression or HMA density testing unless otherwise specified in the contract documents.

2. If the contract documents specify that the Contractor is responsible for concrete compression and HMA density testing, performed by an independent testing laboratory hired by the Contractor, measurement and payment will be as follows:
   a. Measurement: Lump sum item; no measurement will be made.
   b. Payment: Payment will be at the contract lump sum price.

3. The Contractor will be responsible for payments associated with all retesting resulting from failure of initial tests.

PART 2 - PRODUCTS

2.01 PORTLAND CEMENT CONCRETE

A. Class B or C concrete with materials complying with Section 7010. Use coarse aggregate of Class 2 durability or better.

B. Comply with the following for PCC mixes for sidewalks, shared use paths, and driveways unless otherwise approved by the Engineer.

Table 7030.01: PCC Mixes

	Machine Finish	Hand Finish
Type of Concrete	Class B or C	Class B or C
Slump Minimum	1/2 in.	1/2 in.
Slump Maximum	2 1/2 in.	4 in.
Percent Air Content		
• Target	7%	7%
• Minimum	6%	6%
• Maximum	8 1/2%	8 1/2%

2.02 HOT MIX ASPHALT

Comply with Section 7020 for mix design.

A. Use 100,000 ESAL, 1/2 inch or 3/8 inch mix.

B. For shared use paths adjacent to pavement that also functions as the pavement shoulder, use 300,000 ESAL, 1/2 inch mix.

C. Use asphalt binder complying with Section 7020 with a performance grade of PG 58-28 or 64-22.

2.03 BRICK PAVERS

A. Clay: Use 8 inch by 4 inch by 2 1/4 inch thick clay paving bricks manufactured to comply with ASTM C 902, Class SX, Type I. Color selection and surface texture as approved by the Engineer.

B. Concrete: Supply as specified in the contract documents.

2.04 HMA SETTING BED FOR BRICK

A. Mixture: Proportion mix using 7% asphalt binder and 93% fine aggregate. Apportion each ton in the approximate ratio of 145 pounds asphalt binder to 1,855 pounds sand. Maintain mix temperature at approximately 250°F during placement.

B. Asphalt Binder: Use asphalt binder complying with Section 7020 with a performance grade of PG 58-28 or 64-22.

C. Fine Aggregate: Use clean, hard sand with durable particles free from adherent coating, lumps of clay, alkali salts, and organic matter. Use sand that is uniformly graded from coarse to fine with all passing the No. 4 sieve and meeting AASHTO T 27.

2.05 NEOPRENE MODIFIED ASPHALT ADHESIVE FOR BRICK

A. Mastic (Asphalt Adhesive):

Solids (Base):	74% to 76%
Pounds per Gallon:	8 to 8 1/2 pounds
Solvent:	Mineral spirits with a flash point above 100° F

B. Base (2% Neoprene, 10% Asbestos-free Fiber, 88% Asphalt):

Melting Point:	200° F minimum according to ASTM D 36
Penetration:	23 to 27 according to ASTM D 5
Ductility:	1250 mm minimum according to ASTM D 113 @ 25° C, and a rate of 50 mm/minute

2.06 BRICK JOINT FILLER

Dry sand-cement mixture consisting of one part masonry cement complying with ASTM C 91 and three parts sand complying with ASTM C 144 and passing the No. 16 sieve. Provide colored cement to match bricks.

2.07 DETECTABLE WARNINGS

Use manufactured detectable warning panels or brick pavers with a non-slip surface and raised truncated domes. Comply with the Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (also known as PROWAG) for contrast and dimension requirements. Also comply with Iowa DOT Materials I.M. 411.

2.08 GRANULAR DRIVEWAY SURFACING

Class A crushed stone or Class C gravel complying with Iowa DOT Section 2315.

2.09 ISOLATION AND EXPANSION JOINT SEALANT

Use a polyurethane, self-leveling sealant complying with ASTM C 920. Application temperature range of 40 to 120°F. Minimum elongation 700%.

PART 3 - EXECUTION

3.01 REMOVALS

A. Remove sidewalks, shared use paths, driveways, bricks, and curbs to the removal limits specified in the contract documents.

B. Saw pavement full depth in straight lines to the specified removal limits.

C. Remove to the specified removal limits without damage to adjacent property, trees, utilities, or pavement that are to remain in place.

D. Salvage and stockpile all bricks removed.

E. Grind or saw existing curbs at locations specified in the contract documents to install sidewalks, shared use paths, and driveways.

F. Dispose of rubble and debris resulting from removal operations.

3.02 SUBGRADE PREPARATION

A. Shared Use Paths:

1. Subgrade Preparation: Comply with Iowa DOT Section 2109.

2. Special Subgrade Preparation:
   a. Construct subgrade to final elevation.
   b. Scarify and mix the top 6 inches of subgrade material to a width equal to that of the proposed pavement, plus 2 feet on each side.
   c. Compact loose subgrade material with Type A compaction complying with Section 2010.
   d. Proof roll compacted subgrade according to Section 2010.

B. Sidewalks and Driveways:

1. Remove all vegetation and roots from ground surface.

2. Construct grade to final subgrade elevation.
   a. Cut area: Remove all material that will be displaced by the sidewalk.
   b. Fill area: Scarify the surface to be covered with embankment to a depth of at least 6 inches and compact. Construct embankment in lifts of 6 inches or less and compact each lift. Tamp surface with a mechanical tamper until firm and unyielding.

3. Remove all soft, spongy, or yielding spots and fill the void with suitable backfill material.

3.03 ADJUSTMENT OF FIXTURES

A. Adjust fixtures to conform to the finished pavement surface. Cooperate and coordinate with the utility agency to ensure proper fixture adjustment.

B. Comply with Sections 5020, 6010, or 8010 as appropriate.

3.04 PCC SIDEWALKS, SHARED USE PATHS, AND DRIVEWAYS

A. Form Setting: Comply with Section 7010 with the following additional requirements and exceptions.

1. Slip form paving equipment may be allowed in lieu of setting forms, if approved by the Engineer.

2. Wood forms are allowed.

3. Use of an automated subgrade trimmer is not required.

4. Set forms true to line and grade and hold them rigidly in place by stakes placed outside the forms and flush with or below the top edge of the forms.

B. Concrete Pavement Placement:

1. Shared Use Paths: Comply with Section 7010.

2. Sidewalk:
   a. Maintain moist subgrade in front of paving operation
   b. Deposit concrete on the subgrade as required to minimize rehandling to prevent segregation.
   c. Hand spread with shovels, not rakes.
   d. Place concrete as required to slightly overfill the space between the forms.
   e. Consolidate with vibrators and smooth by use of a straightedge.
   f. Do not contaminate freshly mixed concrete with earth or other foreign materials.

3. Driveways: Comply with Figures 7030.101 and 7030.102 and Section 7010. The use of a paving machine is not required.

C. Finishing:

1. Shared Use Paths and Driveways:
   a. Comply with Section 7010.
   b. Provide a burlap drag or broom finish.

2. Sidewalks:
   a. Use a wood float to depress the large aggregate and create a dense surface.
   b. Allow concrete to set until all shine has disappeared from the surface.
   c. Smooth with a metal trowel until surface is free from defects and blemishes.
   d. Construct joints by sawing or by using a jointer or groover tool.
   e. Finish edges of sidewalk or driveway with an edging tool having a radius of approximately 1/2 inch. Ensure tool marks do not appear on the finished surface.
   f. Brush with a soft broom at right angles to the side forms to provide a non-skid surface.

D. Curing: When curing is specified in the contract documents, comply with Section 7010.

E. Form Removal: Comply with Section 7010.

3.04 PCC SIDEWALKS, SHARED USE PATHS, AND DRIVEWAYS (Continued)

F. Jointing:

1. Construction Joints:
a. Locate construction joints to provide uniform joint spacing.
b. Place a construction joint at the close of each day's work or when depositing of concrete is stopped for 45 minutes or more.
c. Form construction joint by using a header board. Set perpendicular to the surface and at right angles to the centerline.

2. Transverse Contraction Joints:
a. Shared Use Paths:
1) Space transverse joints equal to the width of the shared use path, or as specified in the contract documents.
2) Saw contraction joints according to Section 7010.
b. Sidewalks and Driveways:
1) Space sidewalk contraction joints equal to the width of the sidewalk.
2) Space driveway contraction joints so panel length does not exceed 12 feet.
3) Form transverse contraction joints to a depth of 1 1/4 inches with a pointed trowel or jointing tool. In lieu of forming, joints may be sawed within 12 hours of placement with a 1/8 inch blade saw to a depth of 1/3 the pavement thickness. Use a straightedge if joints are sawed with a hand-held saw.

3. Longitudinal Contraction Joints:
a. Shared Use Paths and Sidewalks: Saw joint to 1/8 inch wide and to a depth of 1/3 the pavement thickness.
b. Driveways:
1) Space longitudinal contraction joints so panel width does not exceed 12 feet.
2) Form longitudinal contraction joints to a depth of 1 1/4 inches with a pointed trowel or jointing tool. In lieu of forming, joints may be sawed with a 1/8 inch blade saw to a depth of 1/3 the pavement thickness. Use a straightedge if joints are sawed with a hand-held saw.

4. Isolation Joints:
a. Install isolation joints where sidewalks, shared use paths, or driveways abut roadway pavement, parking lots, buildings, and structures.
b. For a sidewalk constructed with a driveway, install an isolation joint on the property side of the sidewalk and a 'C' or 'E' joint on the street side of the sidewalk.
c. Install a 1/2 inch or 3/4 inch thick strip of preformed resilient joint material, according to Section 7010, to the full depth of concrete. Trim any isolation joint material protruding above the finished work to the level of the abutting concrete.
d. If the isolation joint is to be sealed, place the preformed material 1/2 inch below the level of the abutting concrete.

5. Joint Sealing:
a. Do not seal construction or contraction joints in sidewalks, shared use paths, or driveways.
b. If sealing of expansion or isolation joints is specified in the contract documents, trim preformed joint material to a depth of 1/2 inch below the concrete surface. Ensure the joint is clean and dry. Install joint sealant per manufacturer's recommendations.

3.05 HMA SHARED USE PATHS AND DRIVEWAYS

Comply with Section 7020.

3.06 BRICK SIDEWALKS

A. Brick Sidewalk with a Sand Base:

1. Comply with Figure 7030.203.

2. Use a cross-section and patterns as specified in the contract documents or approved by the Engineer.

3. Do not use broken bricks or materials with stained faces in the paving areas.

4. Set edge restraints true to line and grade along both edges of brick sidewalk.

5. Place bricks on smooth, compacted bedding sand and tightly set in place without gaps.

6. Compact bricks using a 3 to 5 ton roller or machine with a vibratory plate weighing a minimum of 100 pounds.

7. Tightly compact joints with brick sand/cement.

B. Brick Sidewalks with a Concrete Base:

1. General:

a. Comply with Figure 7030.203.
b. Use a cross-section and patterns as specified in the contract documents or approved by the Engineer.
c. Do not use broken bricks or materials with stained faces in the paving areas.
d. Construct the concrete base to comply with PCC sidewalk construction specifications.

2. HMA Setting Bed:

a. Place 3/4 inch depth control bars on the base to serve as guides for the striking board. Shim depth control bars as necessary to adjust bedding thickness and to ensure the top surface of pavers will be at the required finished grade.
b. Place HMA bedding material between the parallel depth control bars. Pull striking board over bars several times. After each pass, spread fresh bedding material over low or porous spots to produce a smooth and even setting bed. After placing and smoothing each section, advance depth control bars to next section. After removal of depth control bars and shims, carefully fill any depressions that remain.
c. While still hot, roll the HMA bedding with a power roller to a nominal depth of 3/4 inch.
d. Ensure the joints in the concrete base do not project through the HMA setting bed.
e. Apply neoprene modified asphalt adhesive over the top surface of the cooled asphalt setting bed with notched trowel with serration not exceeding 1/16 inch. Allow adhesive to dry to the touch before placing pavers.

3. Brick Pavers:

a. Place the pavers by hand in straight courses with hand tight joints and uniform top surface.
b. Sweep dry joint filler into joints until the joints are completely filled.
c. Fog surface lightly with water to cure cement.
d. Clean any cement stains from brick surface. Remove stains from other concrete surfaces.

3.06 BRICK SIDEWALKS (Continued)

4. **Protection:** Protect newly laid pavers at all times using panels of plywood. Panels can be advanced as work progresses; however, keep the plywood protection in areas that will be subjected to movement of materials, workers, and equipment. Take precautions in order to avoid depressions and protect paver alignment until cured and ready for pedestrian or vehicle traffic.

3.07 DETECTABLE WARNING INSTALLATION

A. Manufactured Panels:

1. Comply with Figure 7030.210.

2. Install according to manufacturer's recommendations.

3. Set panels in fresh concrete.

B. Brick Pavers:

1. Comply with Figure 7030.203.

2. Install according to Section 7030, 3.06.

3.08 TOLERANCES FOR SHARED USE PATHS AND DRIVEWAYS

A. Check finished surface with a 10 foot straightedge placed parallel to the centerline.

B. Ensure the cross-section and profile of the pavement is constructed to within a tolerance of 1/4 inch in 10 feet (0.2%) of the design grades. This does not allow maximum slopes to be exceeded.

C. Mark areas showing bumps of more than 1/4 inch in 10 feet and grind down with an approved grinding tool to an elevation where the area will not show deviations in excess of 1/8 inch.

3.09 GRANULAR DRIVEWAY SURFACING

Comply with Iowa DOT Section 2315.

3.10 CLEANING

A. Remove all litter and construction materials or tools immediately after the end of the curing period.

B. Remove excess dirt from the site.

C. Broom clean completed sidewalks, shared use paths, and driveways.

3.11 TESTING

A. General: When testing is specified in the contract documents as the Contractor's responsibility, provide testing using the services of an independent testing laboratory approved by the Engineer.

B. Concrete Compression Tests: When the concrete volume placed on a single day exceeds 20 cubic yards, comply with the following test requirements. When deficiencies are encountered, comply with Section 7010, 3.08, E.

1. Prepare at least two test cylinders per day.

2. If the concrete volume placed on a single day exceeds 200 cubic yards, prepare two test cylinders for each 200 cubic yards placed.

3. Provide 7 and 28 calendar day tests according to ASTM C 39. Minimum compressive strength is 2,000 psi at 7 days and 4,000 psi at 28 days.

C. HMA Density and Thickness Tests: When the area of HMA placed on a single day exceeds 100 square yards, comply with the following test requirement. When deficiencies are encountered, comply with Section 7020, 3.04, A.

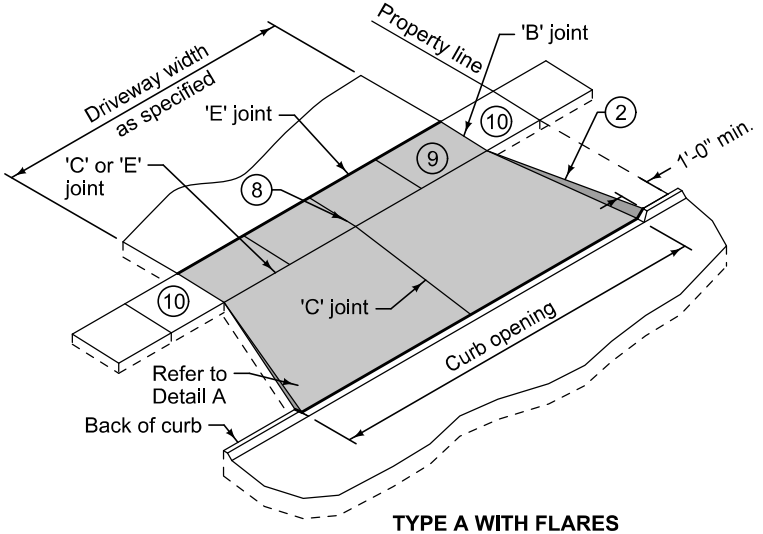
1. Prepare at least two cores per day.

2. If the area of HMA placed on a single day exceeds 2,000 square yards, prepare two cores for each 2,000 square yards placed.

3.12 SIDEWALK AND CURB RAMP COMPLIANCE

Compliance with cross slopes and grades, as well as all other elements, for sidewalks and curb ramps is crucial. If the construction cannot be completed as specified in the contract documents, it may be necessary to adjust slopes within the accepted legal limitations. Contact the Engineer prior to placement of the concrete if changes from the values specified in the contract documents are being made.

END OF SECTION



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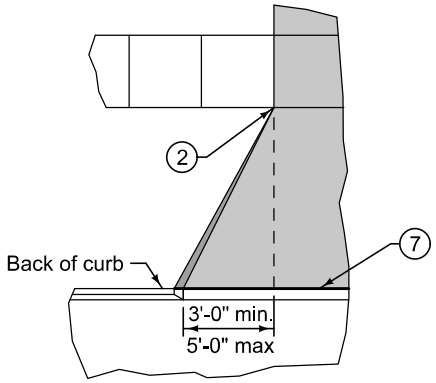
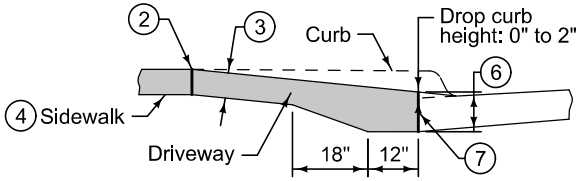


DETAIL A



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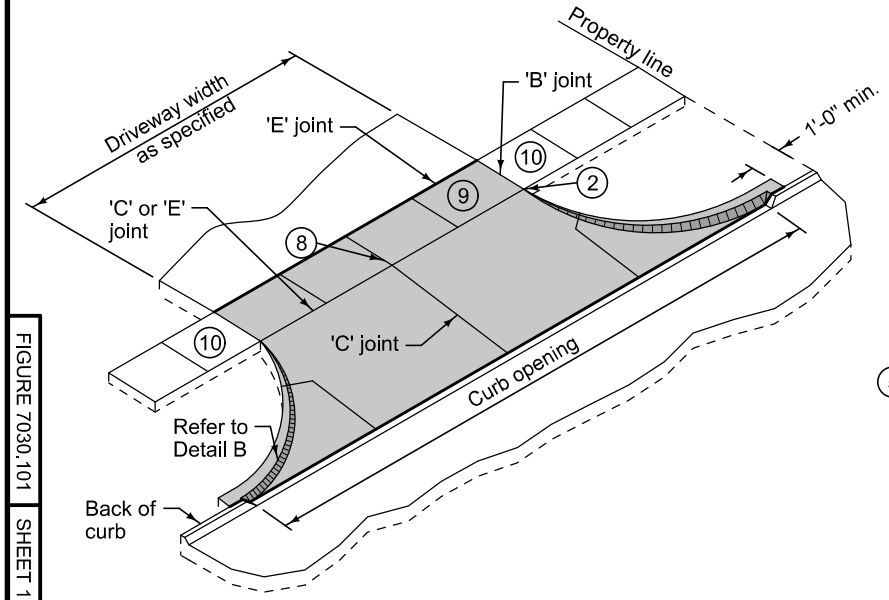

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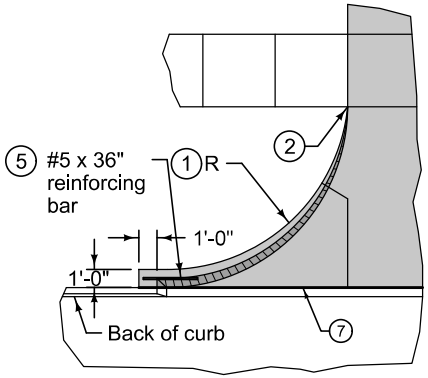

DETAIL B

1. Driveway radius (R).
   Residential: 10 foot minimum,15 foot maximum.
   Commercial and industrial: As specified in the contract documents.
2. Transition the curb height to 0 inches at end of taper/radius or at the front edge of sidewalk. Do not extend raised curb across sidewalk.
3. Pavement thickness.
   Residential: 6 inches minimum.
   Commercial and industrial: 7 inches minimum.
4. Sidewalk thickness through driveway to match thickness of driveway.
5. Center reinforcing bar vertically in the pavement.
6. Match thickness of adjacent roadway, 8 inches minimum.
7. Provide 'E' joint at back of curb unless 'B' joint is specified.
8. For alleys, invert the pavement crown 2% toward center of alley.
9. Target cross slope of 1.5% with a maximum cross slope of 2.0%. If specified in the contract documents, construct the sidewalk through the driveway 5 feet wide to serve as a passing space.
10. If cross slope of adjacent sidewalk panel exceeds 2.0%, remove and replace to transition from existing sidewalk to sidewalk through driveway. If elevation change requires a curb ramp, comply with Figure 7030.205; verify need for detectable warning panel with Engineer.

FIGURE 7030.101 | SHEET 1 OF 1

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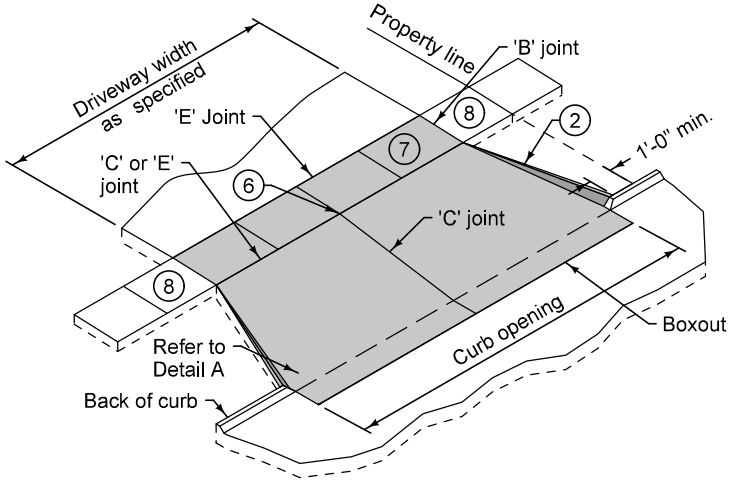
CONCRETE DRIVEWAY, TYPE A



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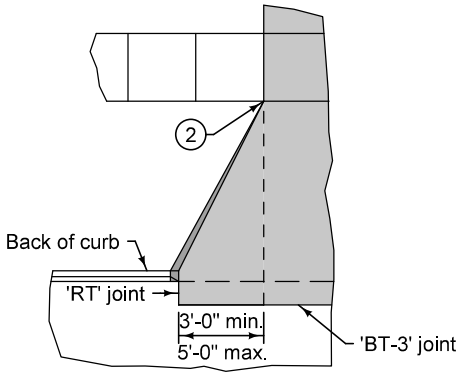
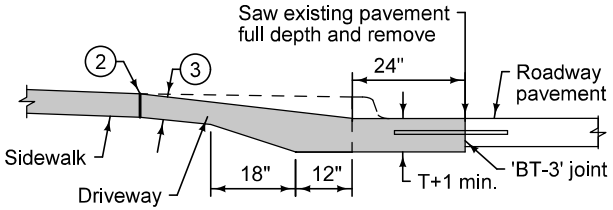
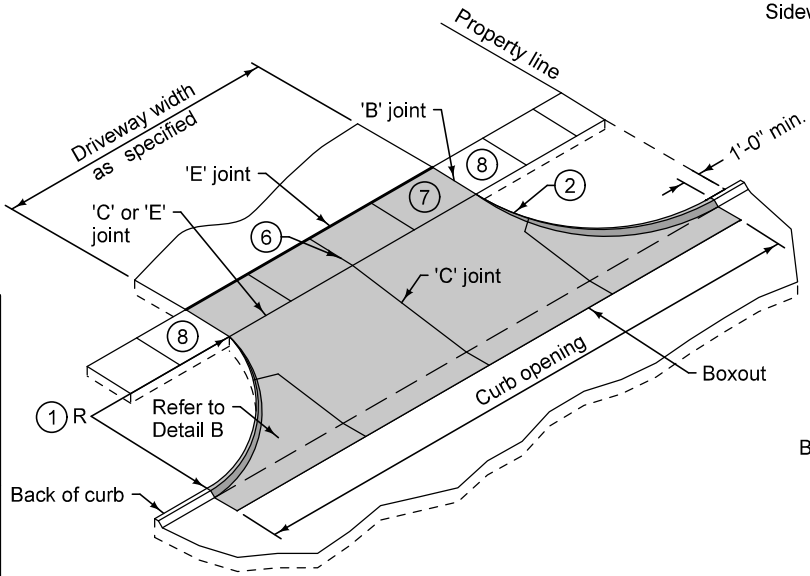


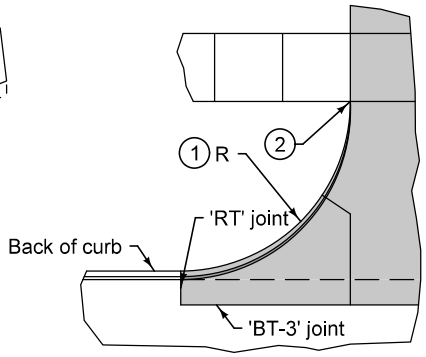
DETAIL A



SECTION A-A



TYPE B WITH RADII



DETAIL B

1. Driveway radius (R).
   Residential: 10 foot minimum, 15 foot maximum.
   Commercial and industrial: As specified in the contract documents.
2. Transition the curb height to 0 inches at end of taper/radius or at the front edge of sidewalk. Do not extend raised curb cross sidewalk.
3. Pavement thickness.
   Residential: 6 inches minimum.
   Commercial and industrial: 7 inches minimum.
4. Sidewalk thickness through driveway to match thickness of driveway.
5. If longitudinal joint is located 48 inches or less from the back of curb, extend boxout to joint line. Full depth saw cut is still required.
6. For alleys, invert the pavement crown 2% toward the center of the alley.
7. Target cross slope of 1.5% with a maximum cross slope of 2.0%. If specified in the contract documents, construct the sidewalk thorugh the driveway 5 feet wide to serve as a passing space.
8. If cross slope of adjacent sidewalk panel exceeds 2.0%, remove and replace to transition from existing sidewalk to sidewalk through driveway. If the elevation change requires a curb ramp, comply with Figure 7030.205; verify need for detectable warning panel with Engineer.

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CONCRETE DRIVEWAY, TYPE B

FIGURE 7030.102

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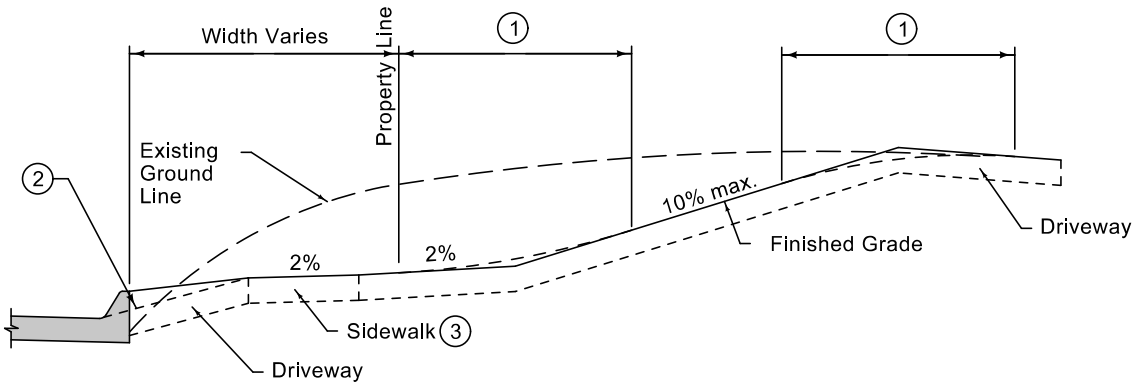
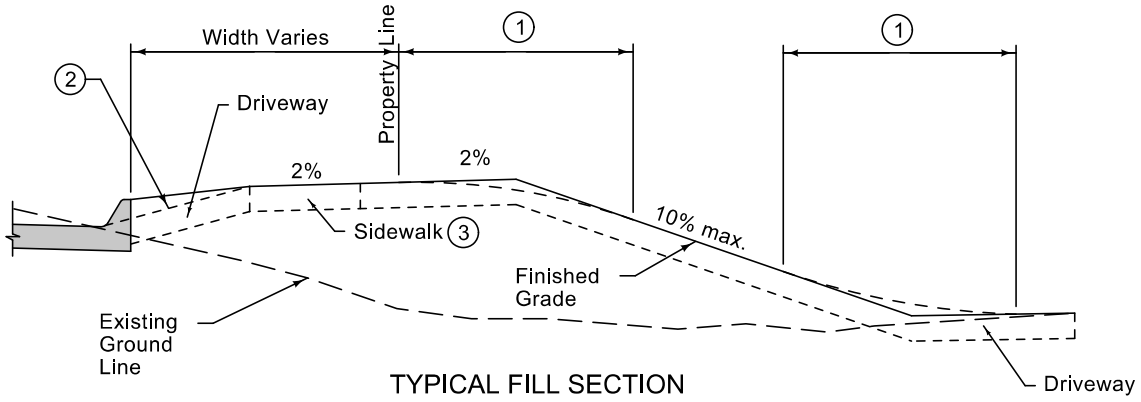


TYPICAL CUT SECTION



TYPICAL FILL SECTION

1. 10 foot vertical curve required for 5% or greater change in grade.
2. Slope varies. See contract documents.
3. Target cross slope of 1.5% with a maximum cross slope of 2.0%.

FIGURE 7030.103 | SHEET 1 OF 1

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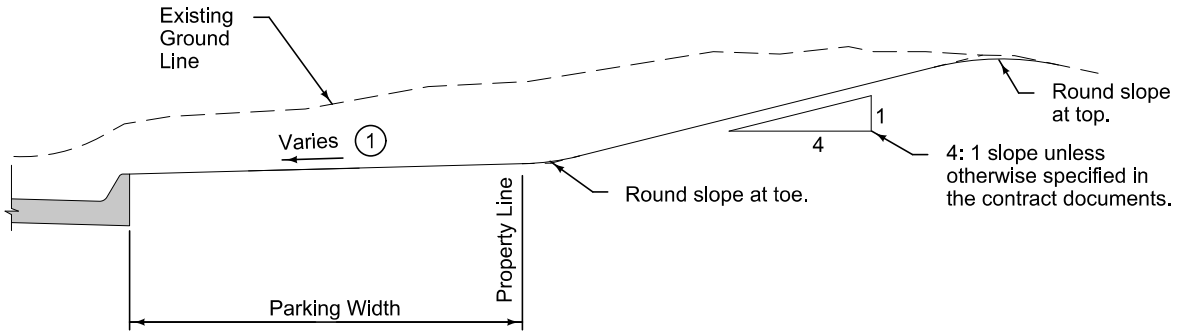
DRIVEWAY GRADING

(1) Parking Slope:
If parking width is less than 10 feet wide, slope at 1/4 inch per foot.

If parking width is 10 feet wide and greater, slope at 1/2 inch per foot.



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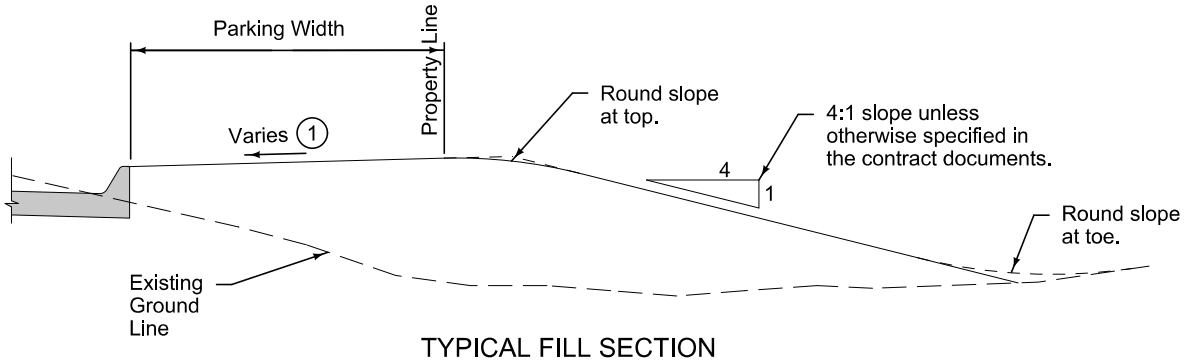

TYPICAL FILL SECTION

FIGURE 7030.104 | SHEET 1 OF 1

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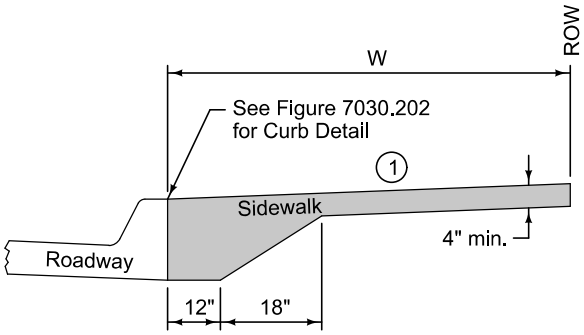
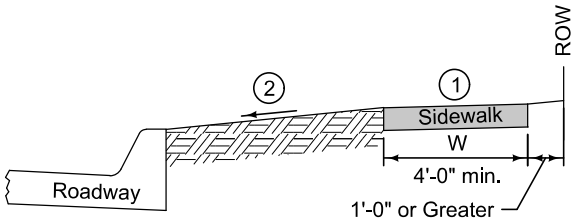
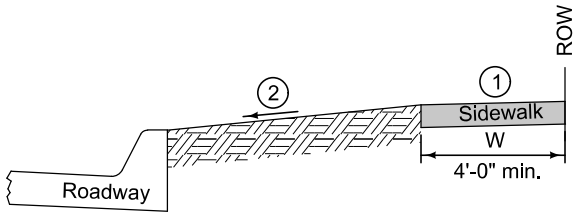
RIGHT-OF-WAY GRADING



CLASS A SIDEWALK
(Sidewalk extends from back of curb to ROW)



CLASS B SIDEWALK



CLASS C SIDEWALK

(1) Target cross slope of 1.5% with a maximum cross slope of 2.0% (including sidewalk through driveway).

(2) Parking Slopes:
If parking width is less than 10 feet wide, slope at ¼ inch per foot.

If parking width is 10 feet wide and greater, slope at ½ inch per foot.

Special grade may be specified in the contract documents.

W = Sidewalk width as specified in the contract documents.

FIGURE 7030.201 | SHEET 1 OF 1

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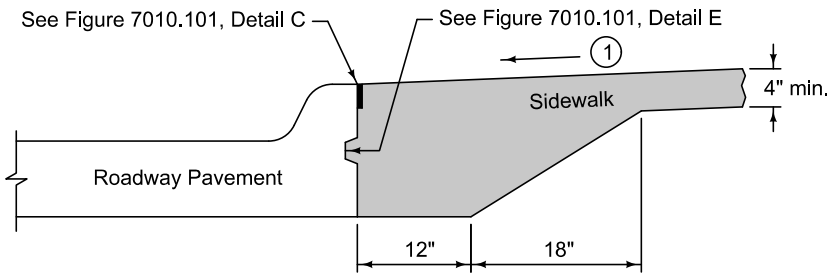
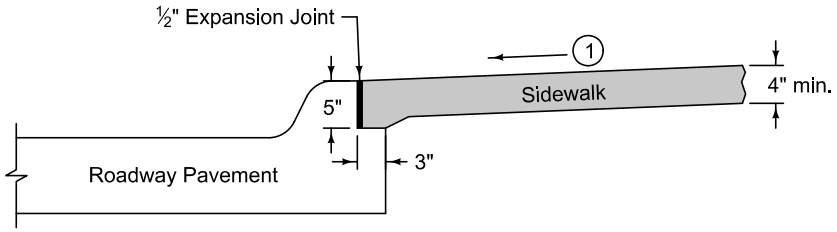
CLASSES OF SIDEWALKS



DETAIL 1



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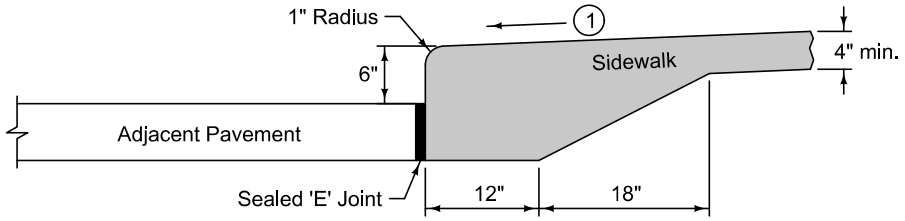

DETAIL 3

For new sidewalk with new curb and gutter, comply with Detail 1 or Detail 2. Comply with Detail 3 for new sidewalk adjacent to existing pavement or when specified in the contract documents.

(1) Target cross slope of 1.5% with a maximum cross slope of 2.0%.

FIGURE 7030.202

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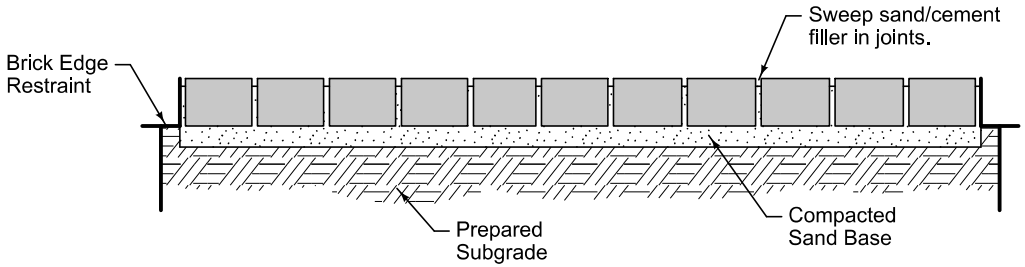
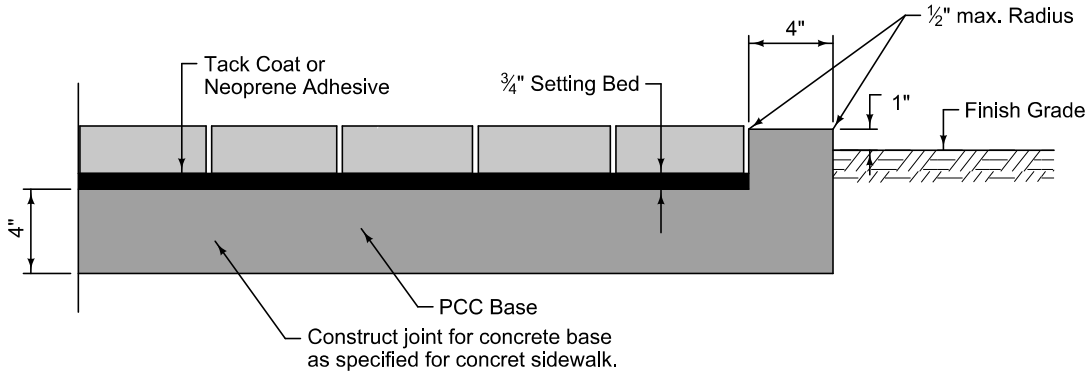
SUDAS Standard Specifications

CURB DETAILS FOR CLASS A SIDEWALK

Install brick sidewalk with pattern specified in the contract documents.



BRICK SIDEWALK WITH SAND BASE



BRICK SIDEWALK WITH CONCRETE BASE

FIGURE 7030.203

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7030.203

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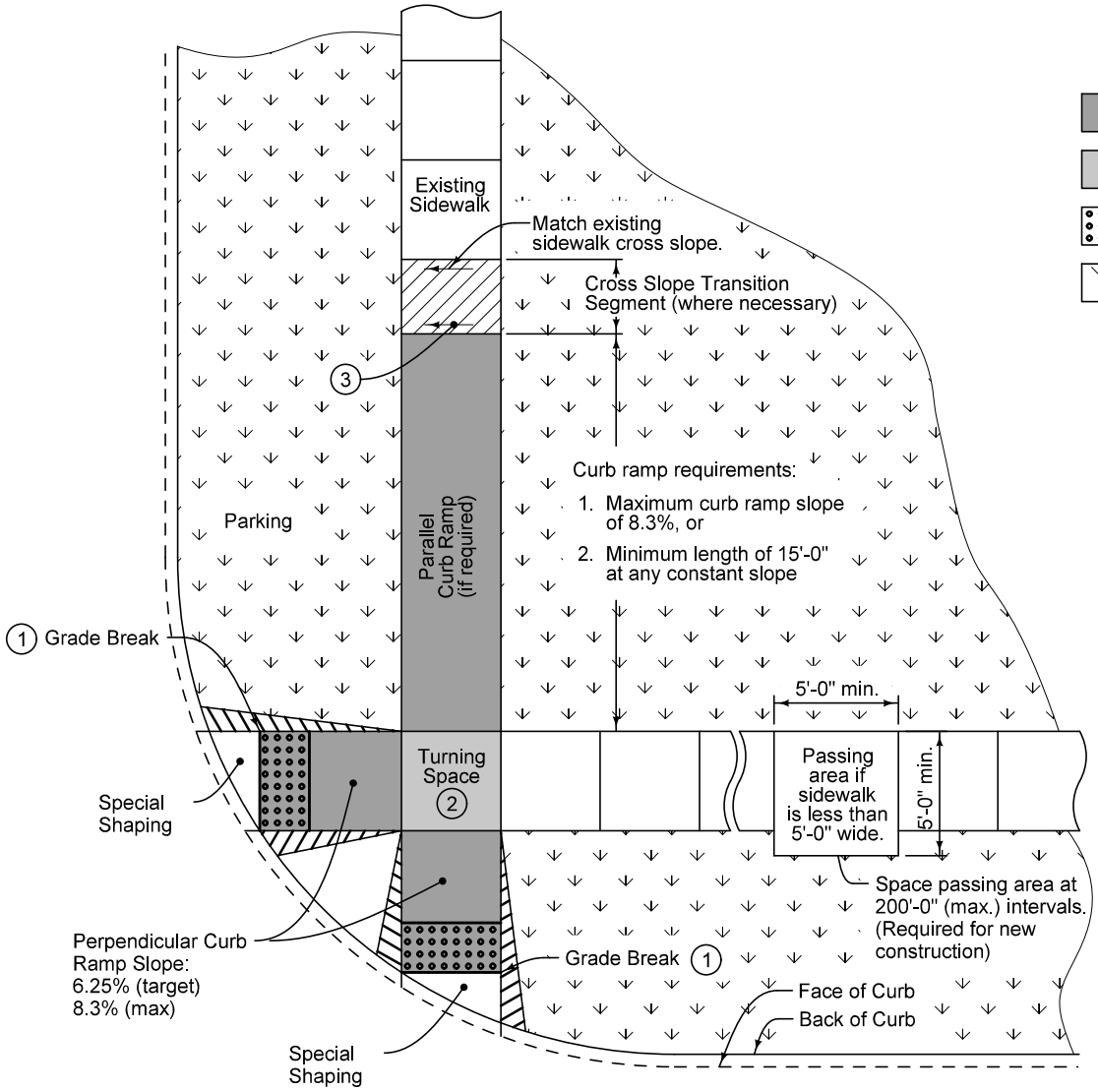
SUDAS Standard Specifications

BRICK SIDEWALK



Key

- Curb Ramp
- Turning Space
- Detectable Warning
- Grass

1. Match pedestrian street crossing slope, or flatter.
2. Minimum 4 feet by 4 feet. Target cross slope of 1.5% with a maximum cross slope of 2.0%.
3. Target cross slope of 1.5% with a maximum cross slope of 2.0%.

FIGURE 7030.204 | SHEET 1 OF 1

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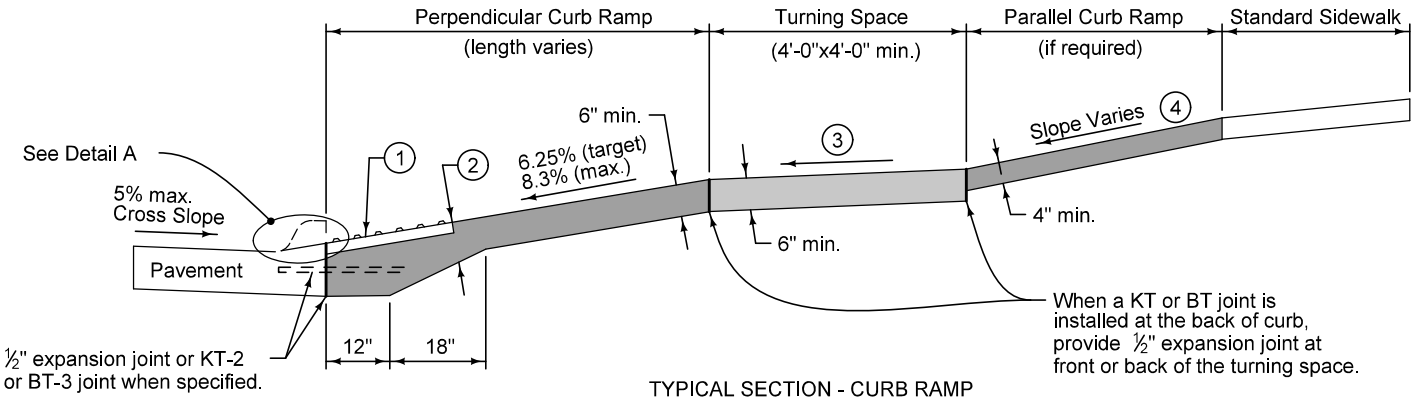
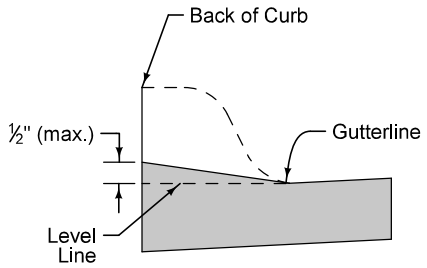
GENERAL FEATURES OF AN ACCESSIBLE SIDEWALK



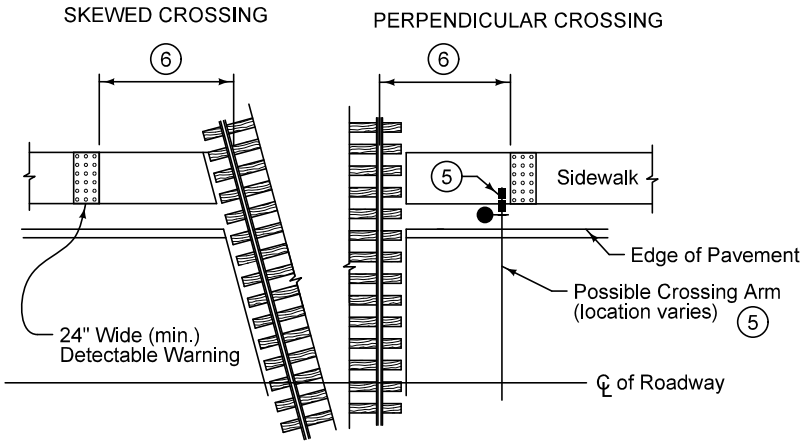
TYPICAL SECTION - CURB RAMP

Key

- Curb Ramp
- Turning Space
- Detectable warning



DETAIL A



DETECTABLE WARNING LOCATION AT RAILROAD CROSSING

1. Provide a minimum 2 foot width of detectable warning surfaces in the direction of pedestrian travel across the full width of the curb ramp or turning space, exclusive of curbs or flares.
2. Provide a minimum of 6 inches of concrete below the detectable warning panel.
3. Minimum 4 feet by 4 feet. Target cross slope of 1.5% with a maximum cross slope of 2.0%.
4. If normal sidewalk elevation cannot be achieved with the perpendicular ramp between the street and landing due to limited ramp length, provide a parallel ramp to make up the elevation difference between the landing and the standard sidewalk.

   The length of the parallel ramp is not required to exceed 15 feet, regardless of the resulting slope. Do not exceed 8.3% slope for parallel ramps shorter than 15 feet.
5. If crossing gate conflicts with location of detectable warning or if pedestrian crossing gate is provided, place detectable warning panel in advance of the crossing gate.
6. Locate front edge of detectable warning panel 12 to 15 feet from centerline of nearest rail. Orient truncated domes parallel to the direction of pedestrian travel.

FIGURE 7030.205 | SHEET 1 OF 1

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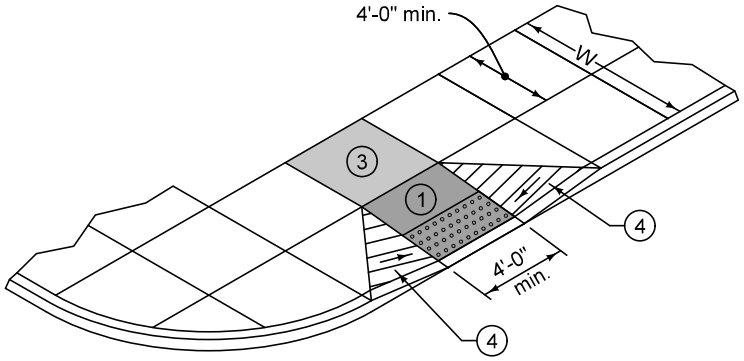
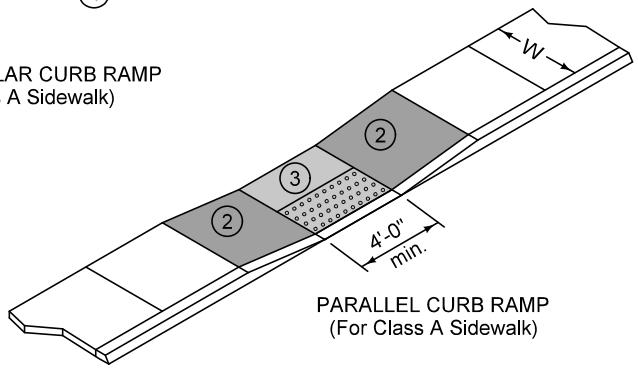
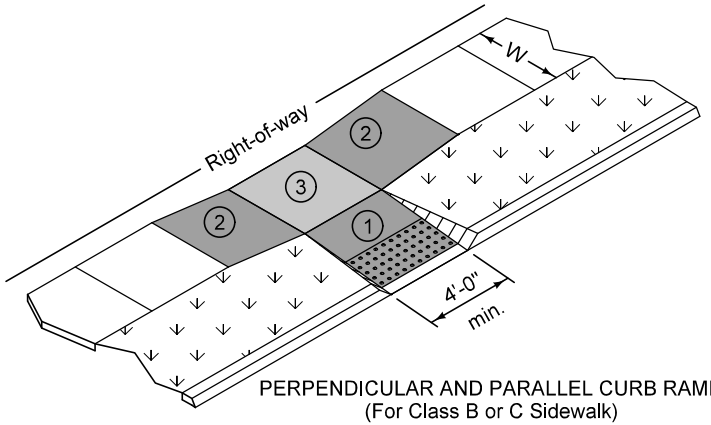
GENERAL SIDEWALK AND CURB RAMP DETAILS



PERPENDICULAR CURB RAMP
(For Class A Sidewalk)



PARALLEL CURB RAMP
(For Class A Sidewalk)



PERPENDICULAR AND PARALLEL CURB RAMP
(For Class B or C Sidewalk)

Key

- Curb Ramp
- Turning Space
- Detectable Warning

1. Perpendicular Curb Ramp: Target running slope of 6.25% with maximum running slope of 8.3%. Match pedestrian street crossing cross slope at back of curb. At mid-block crossings, cross slope may exceed 2.0% to match roadway grade.
2. Parallel Curb Ramp: Target cross slope of 1.5% with a maximum cross slope of 2.0%. The length of the parallel ramp is not required to exceed 15 feet, regardless of resulting slope. Do not exceed 8.3% slope for parallel ramps shorter than 15 feet.
3. Turning Space: Target slope of 1.5%, with a maximum slope perpendicular to the travel directions of 2.0%. At mid-block crossings, cross slope of landing may exceed 2.0% to match roadway grade. Minimum 4 feet by 4 feet.
4. Flare (10:1 max.) required if ramp is contiguous with sidewalk.

FIGURE 7030.206 | SHEET 1 OF 1

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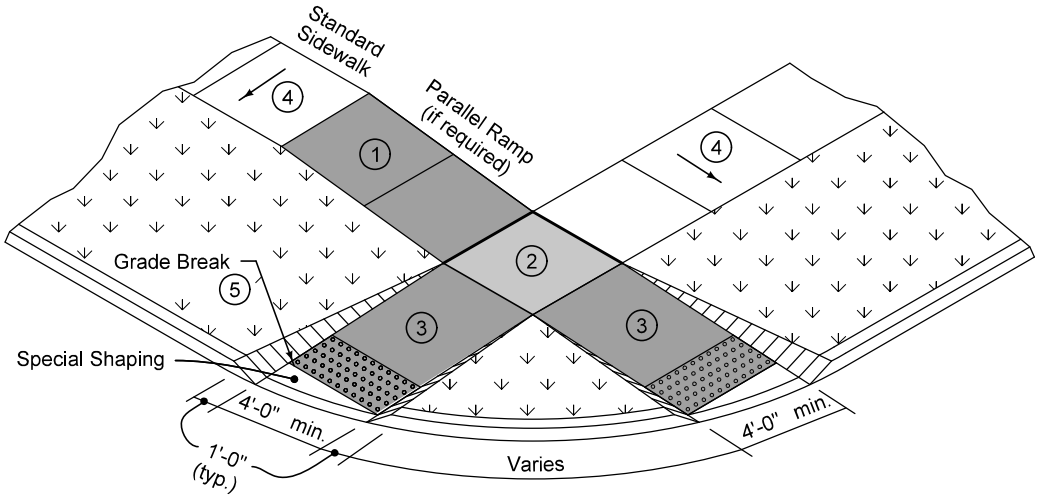
CURB RAMPS OUTSIDE OF INTERSECTION RADIUS



1. Parallel Curb Ramp: If normal sidewalk elevation cannot be achieved with the perpendicular ramp between the street and landing due to limited ramp length, provide a parallel ramp to make up the elevation difference between the landing and the standard sidewalk.

   The length of the parallel ramp is not required to exceed 15 feet, regardless of the resulting slope. Do not exceed 8.3% slope for parallel ramps shorter than 15 feet.

2. Turning Space: Target slope of 1.5% with maximum slope perpendicular to the travel directions of 2.0%. Minimum 4 feet by 4 feet.

3. Perpendicular Curb Ramp: Target running slope of 6.25% with maximum running slope of 8.3%.

4. Target cross slope of 1.5% with a maximum cross slope of 2.0%.

5. Match pedestrian street crossing cross slope or flatter.

Key

- Curb Ramp
- Turning Space
- Detectable warning
- Grass

SUDAS

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7030.207

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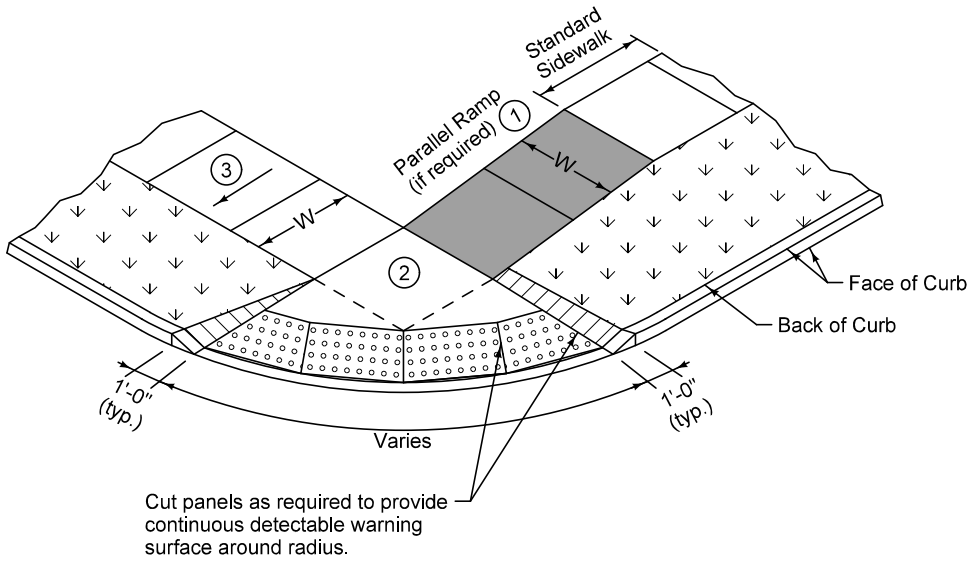
SUDAS Standard Specifications

CURB RAMP FOR
CLASS B OR C SIDEWALK

FIGURE 7030.207 | SHEET 1 OF 1



1. Parallel Curb Ramp: If normal sidewalk elevation cannot be achieved with the perpendicular ramp between the street and landing due to limited ramp length, provide a parallel ramp to make up the elevation difference between the landing and the standard sidewalk.

   The length of the parallel ramp is not required to exceed 15 feet, regardless of the resulting slope. Do not exceed 8.3% slope for parallel ramps shorter than 15 feet.

2. Turning Space: Target slope of 1.5% with maximum slope perpendicular to the direction of travel of 2.0%. Minimum 4 feet by 4 feet.

3. Target cross slope of 1.5% with a maximum cross slope of 2.0%.

Key

- Curb Ramp
- Turning Space
- Detectable warning
- Grass

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7030.208

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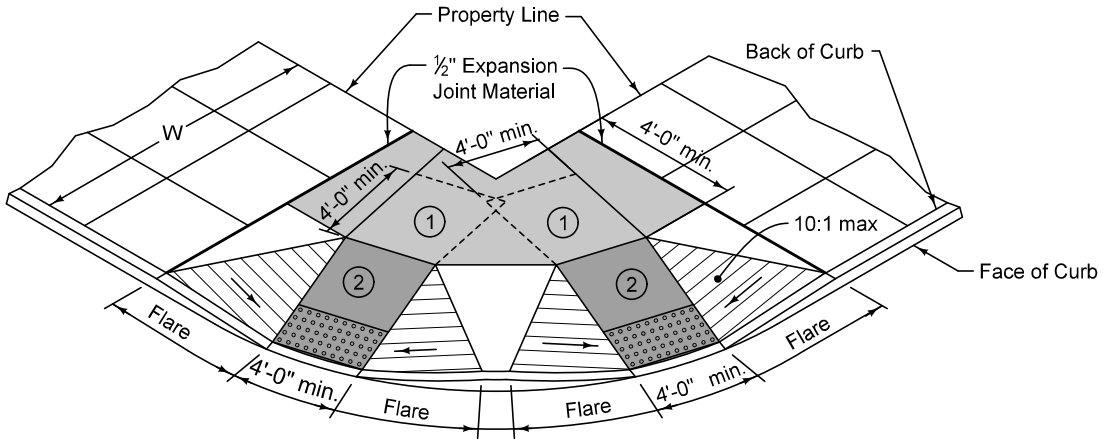
SUDAS Standard Specifications

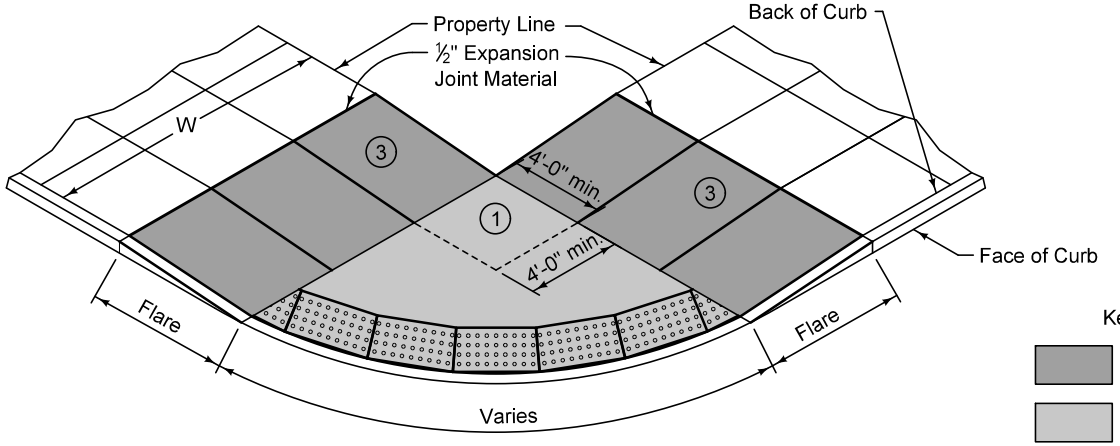
ALTERNATIVE CURB RAMP FOR CLASS B OR C SIDEWALK

FIGURE 7030.208

SHEET 1 OF 1



CLASS A SIDEWALK CURB RAMP



CLASS A SIDEWALK CURB RAMP ALTERNATIVE

Key

- Curb Ramp
- Turning Space
- Detectable Warning

1. Turning Space: Target slope of 1.5% with maximum slope perpendicular to the travel direction of 2.0%. Minimum 4 feet by 4 feet (turning spaces may overlap).
2. Perpendicular Curb Ramp: Target running slope of 6.25% with maximum running slope of 8.3%.
3. Parallel Curb Ramp: Target running slope of 6.25% with maximum running slope of 8.3%. The length of the parallel ramp is not required to exceed 15 feet, regardless of the resulting slope. Do not exceed 8.3% for parallel ramps shorter than 15 feet.

FIGURE 7030.209 | SHEET 1 OF 1

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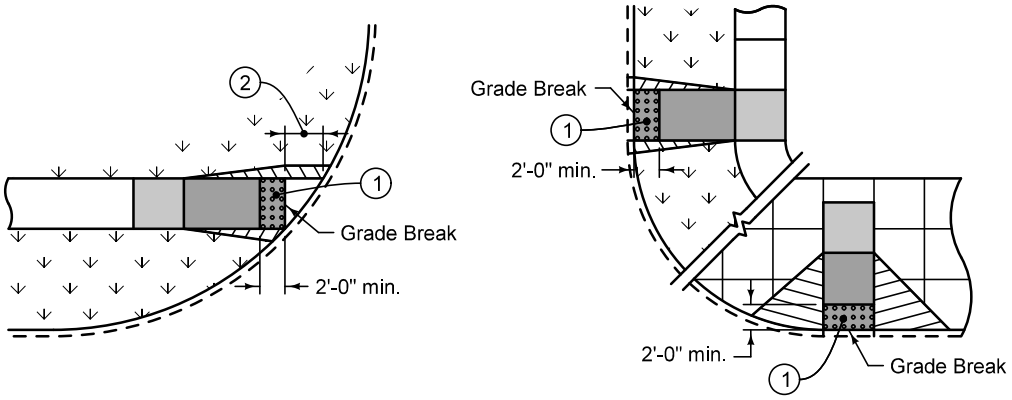
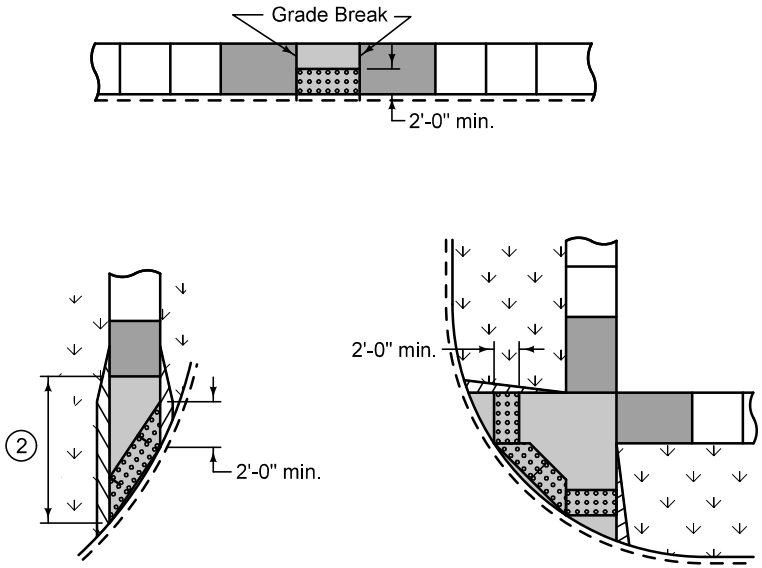
SUDAS Standard Specifications

CURB RAMPS FOR CLASS A SIDEWALK



PERPENDICULAR RAMPS



PARALLEL RAMPS

Provide a minimum 2 foot width of detectable warning surfaces in the direction of pedestrian travel across the full width of the curb ramp or turning space, exclusive of curbs or flares.

(1) When detectable warning is located on curb ramp surface, orient domes in the direction of pedestrian travel.

(2) When the distance between the grade break and the back of curb is less than 5 feet, place detectable warning surface at the bottom of the curb ramp.

Where one corner of the curb ramp is more than 5 feet from the back of curb, construct curb ramp as a parallel curb ramp. Move grade break back as required to place detectable warning on turning space at the back of curb.

Key

- Curb Ramp
- Turning Space
- Detectable Warning

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DETECTABLE WARNING PLACEMENT

FIGURE 7030.210

SHEET 1 OF 1

PAVEMENT REHABILITATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Full and Partial Depth PCC Patches

B. Full and Partial Depth HMA Patches

C. Full Depth Composite Patches

D. Diamond Grinding

E. Milling

F. Cleaning and Filling Joints and Cracks

G. Curb and Gutter Replacement

1.02 DESCRIPTION OF WORK

A. Construct full depth PCC, HMA, and composite patches.

B. Construct partial depth PCC and HMA patches.

C. Grind existing PCC pavement surface for profile improvement using a diamond grinder.

D. Mill the surface of HMA or PCC pavement to improve the surface profile and cross-section in preparation for resurfacing.

E. Clean and fill longitudinal and transverse joints and random cracks in PCC and HMA pavement.

F. Remove existing pavement and curb and gutter.

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants, as well as the following:

A. PCC mix design.

B. HMA mix design.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants.

1.05 DELIVERY, STORAGE, HANDLING, AND SALVAGING

Comply with Division 1 - General Provisions and Covenants, as well as the following:

A. PCC: See Section 7010.

B. HMA: See Section 7020.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT AND PAYMENT

A. Full Depth Patches

1. **Measurement:** Measurement will be in square yards for each type of full depth patch. Patches less than 2 square yards in area will be considered 2 square yards.

2. **Payment:** Payment will be made at the unit price per square yard for each type of full depth patch.

3. **Includes:** Unit price includes, but is not limited to, sawing, removing, and disposing of existing pavement and reinforcing; restoring the subgrade; furnishing and installing tie bars and dowel bars; furnishing and placing the patch material, including the asphalt binder and tack coat; forming and constructing integral curb; surface curing and pavement protection; joint sawing and filling; and placing backfill and restoring disturbed surfaces.

B. Subbase Over-excavation:

1. **Measurement:** Measurement will be in tons of subbase material placed for authorized over-excavation.

2. **Payment:** Payment will be made at the unit price per ton of subbase material.

3. **Includes:** Unit price includes, but is not limited to, removal of existing subbase or subgrade, disposal of materials removed, furnishing and placing subbase material, and any additional excavation required for subbase placement.

C. Partial Depth Patches:

1. **Measurement:** Measurement will be in square feet for each type of partial depth patch. Patches less than 1 square foot in area will be considered 1 square foot.

2. **Payment:** Payment will be made at the unit price per square foot for each type of partial depth patch.

3. **Includes:** Unit price includes, but is not limited to, sawing, removing, and disposing of existing pavement; furnishing tack coat or bonding agent; furnishing and placing the patch material; curing; joint filling (PCC patches only); placing backfill; and restoring disturbed surfaces.

4. **Extra Payment:** When partial depth patches are constructed to full depth at the direction of the Engineer, payment will be at 2 times the unit price per square foot for each type of partial depth patch.

1.08 MEASUREMENT AND PAYMENT (Continued)

D. Crack and Joint Cleaning and Filling, Hot Pour:

1. **Measurement:** Measurement will be in linear feet measured along the cracks or joints.

2. **Payment:** Payment will be made at the unit price per linear foot of crack and joint cleaning and filling.

3. **Includes:** Unit price includes, but is not limited to, furnishing crack and joint filler material and routing, sawing, cleaning, and filling joints or cracks.

E. Crack Cleaning and Filling, Emulsion:

1. **Crack Cleaning and Filling, Emulsion:**
   a. **Measurement:** Measurement will be in linear feet measured along the cracks. Map cracked areas will not be measured.
   b. **Payment:** Payment will be made at the unit price per linear foot of crack cleaning and filling.
   c. **Includes:** Unit price includes, but is not limited to, furnishing emulsified crack filler material, cleaning cracks, placing soil sterilant, and filling cracks.

2. **Hot Mix Asphalt for Crack Filling:**
   a. **Measurement:** Measurement will be in tons of HMA used for filling cracks greater than 1 inch. Quantity will be based upon scale tickets. Mixture not used in the work will be deducted based upon scaled weights.
   b. **Payment:** Payment will be made at the unit price per ton for HMA used in filling cracks over 1 inch.
   c. **Includes:** Unit price includes, but is not limited to, cleaning, applying tack coat, and furnishing and placing HMA for crack filling.

F. Diamond Grinding:

1. **Measurement:** Measurement will be in square yards for the area of diamond grinding.

2. **Payment:** Payment will be made at the unit price per square yard of diamond grinding.

3. **Includes:** Unit price includes, but is not limited to, diamond grinding pavement, testing for smoothness according to the contract documents, and removal of slurry and residue from the project site.

G. Milling:

1. **Measurement:** Measurement will be in square yards for the area of milling.

2. **Payment:** Payment will be made at the unit price per square yard of milling.

3. **Includes:** Unit price includes, but is not limited to, milling pavement; furnishing water; and salvaging, stockpiling, and removing cuttings and debris.

1.08 MEASUREMENT AND PAYMENT (Continued)

H. Pavement Removal:

1. **Measurement:** Measurement will be in square yards. No deduction in area will be made for manholes, storm sewer intakes, valve boxes, or other structures less than 2 square yards in area. Pavement removal for patching is included as part of the patching item and will not be measured separately.

2. **Payment:** Payment will be made at the unit price per square yard.

3. **Includes:** Unit price includes, but is not limited to, sawing, breaking, removing, and disposing of existing pavement and reinforcing steel.

I. Curb and Gutter Removal:

1. **Measurement:** Measurement will be in linear feet measured along the back of curb.

2. **Payment:** Payment will be made at the unit price per linear foot of curb and gutter removed.

3. **Includes:** Unit price includes, but is not limited to, sawing, breaking removing, and disposing of existing curb and gutter.

J. Sampling and Testing: Required sampling and testing for pavement repair and rehabilitation work is incidental to other project costs and will not be paid for separately.

PART 2 - PRODUCTS

2.01 MATERIALS

A. PCC:

1. **Standard Patching:** Use Class C mix complying with Section 7010. Comply with Iowa DOT Materials I.M. 401. Construct all patches as standard patches unless otherwise specified in the contract documents.

2. **High Early Strength Patching:** Use Class M mix complying with Section 7010. Do not use calcium chloride unless otherwise specified in the contract documents.

3. **Partial Depth Patching:** Use a coarse aggregate in concrete mix complying with Iowa DOT Article 4109.02, Gradation No. 5 in the Aggregate Gradation Table.

B. HMA: Provide a minimum 300,000 ESAL mixture complying with Iowa DOT Article 2303.02, unless otherwise specified in the contract documents. Provide mixture with a PG 64-22 asphalt binder.

C. Crack and Joint Filler Material:

1. **Hot Pour Crack and Joint Filler:** Comply with Iowa DOT Section 4136.

2. **Emulsified Asphalt Crack Filler:** Provide CRS-2 or CRS-2P emulsions complying with Iowa DOT Section 4140.

3. **HMA for Filling Cracks:**
   a. Provide a 3/4 inch, 1/2 inch, or 3/8 inch HMA mixture complying with Section 7020, or a similar mixture from a commercial source subject to approval from the Engineer.
   b. Upon approval of the Engineer, a high performance bituminous cold premix may be used, depending on the availability of the specified hot mix asphalt.

4. **Blotting Material:** Provide sand complying with Iowa DOT Sections 4124 or 4125, or similar sand approved by the Engineer.

5. **Soil Sterilant:** Provide soil sterilant as specified in the contract documents.

D. Primer or Tack Coat Bitumen: Comply with Iowa DOT Article 2303.02.

E. Epoxy for Bonding Dowel and Tie Bars: Comply with Iowa DOT Materials I.M. 491.11.

F. Tie Bars and Dowel Bars: Provide epoxy coated bars complying with Iowa DOT Section 4151.

G. Subbase Material: Unless otherwise specified in the contract documents, use modified subbase complying with Section 2010.

H. Liquid Curing Compound: Comply with Iowa DOT Section 4105.

I. Cement Grout: Provide a water cement grout mixture with a ratio of one part water to one part cement.

PART 3 - EXECUTION

3.01 GENERAL

A. Conduct all operations to minimize inconvenience to traffic. Confine operations to one traffic lane, unless the road is to be closed to traffic. Minor encroachment into the adjacent lane, such as for sawing and installing forms, will be acceptable with the use of a flagger according to MUTCD.

B. Do not remove pavement for either full depth or partial depth patching unless the patch can be completed before the end of the working day.

C. Construct full depth and partial depth patches to the dimensions specified in the contract documents or as marked by the Engineer in the field. Construct all full depth patches to full panel width.

D. Make saw cuts parallel or perpendicular to the centerline.

E. Remove and dispose of materials not designated for salvage.

F. Restore the area outside the pavement by placing and compacting backfill material, placing topsoil, and sodding or seeding as specified in the contract documents.

3.02 FULL DEPTH PATCHING

A. Pavement Removal:

1. Saw pavement to full depth at the edges of the patch. A second saw cut, 2 inches inside the initial saw cut, may be required to prevent damage to adjacent pavement.

2. Do not damage pavement that is to remain. Do not use heavy equipment adjacent to new concrete until the opening strength is achieved.

B. Restoring Subgrade or Subbase:

1. Excavate 2 inches below the bottom of the existing pavement. If more than 2 inches is excavated, place and compact new subbase material as required to bring the subbase to a level 2 inches below the bottom of the existing pavement. Correct unauthorized over-excavation at no additional cost to the Contracting Authority.

2. Compact the exposed subgrade or subbase by a minimum of four complete passes with a plate-type vibratory compactor with a minimum force rating of 3,500 pounds.

3. When unstable material or excessive moisture is encountered, the Engineer may order removal and replacement of the unstable material.
   a. Remove existing unstable subgrade or subbase, or both, to the depth directed by the Engineer.
   b. Place and compact new subbase material as required to bring the subbase to a level 2 inches below the bottom of the existing pavement.

C. Placing PCC Patches:

1. Equipment: Comply with Iowa DOT Article 2301.03, A, specifications on equipment for standard concrete pavement.

3.02 FULL DEPTH PATCHING (Continued)

2. Tie Bars and Dowel Bars: Comply with Section 7010 and the figures in Sections 7010 and 7040.
   a. When there is a common line between two adjacent patches, a bent bar may be placed in a keyway and later straightened.
   b. Coat dowel bars extending into the patch area with a bond breaker. Do not coat tie bars.

3. Forms: Comply with Section 7010, 3.02, D, as well as the following.
   a. Use forms on all exposed edges and along the centerline for patches that extend into an adjacent lane, unless full pavement width patches are constructed.
   b. Rigid wood forms may be used in lieu of steel.

4. Placing, Consolidation, and Finishing the Concrete:
   a. Moisten the subbase or subgrade, or cover with a single layer of polyethylene film lapped at 12 inches for large areas.
   b. Except for preplanned joints, place the patch continuously until the patch is completed.
   c. When a delay of 45 minutes cannot be avoided, construct a day's work ('DW') joint.
   d. Carefully place concrete into the patch area to avoid segregation; spread into place and consolidate with a mechanical vibrator. Place full lane width patches over 25 feet in length with a suitable finishing machine that has at least one vibrating screed. Avoid excessive vibrating.
   e. Finish patches per Section 7010, 3.02, H.
   f. For joints with tie bars, tool the edge. For joints with dowel bars, saw to a depth of approximately 1 1/8 inch, leaving an opening of at least 3/8 inch in width to provide a reservoir for joint filler.
   g. Texture the patch to match the adjacent surface.

5. Curing: Comply with Section 7010, 3.02, I. Cure the concrete, including exposed vertical edges, immediately after the concrete has been finished and the surface water has evaporated.

6. Joints: Construct and fill joints according to Section 7010, 3.02. Place joints at locations specified in the contract documents.

7. Pavement Protection: Comply with Section 7010, 3.05.

8. Use of Pavement: Comply with opening strength requirements of Section 7010, 3.06. Maturity testing is not required.

D. Placing HMA Patches:

1. Use equipment complying with Iowa DOT Article 2303.03. Use of a paving machine is not required.

2. Apply tack coat to the vertical edges of the remaining pavement at a rate of 0.10 to 0.15 gallons per square yard.

3. Place HMA patch mixture in lifts that will not exceed 3 inches in thickness after compaction, with the top lift not exceeding 2 inches in thickness when compacted.

4. Compact each lift while hot by rolling or compacting with a vibratory compactor. Subsequent lifts may be placed as soon as the preceding lift has been properly compacted.

3.02 FULL DEPTH PATCHING (Continued)

5. Smooth the final lift with a steel-tired finish roller. Ensure the final compacted surface is level with, or no more than 1/8 inch above, the adjacent pavement and has a smooth riding surface. If the patch becomes distorted for any reason, smooth the surface by blading, scraping, grinding, filling, or other approved means.

6. Do not extend patch material beyond the edge of the existing pavement; remove patch material that extends outside the patch limits.

7. Do not open to traffic until the mixture has cooled sufficiently to provide stability.

3.03 PARTIAL DEPTH PATCHING

A. Pavement Removal:

1. Ensure all patches are square or rectangular in shape.

2. Saw to a depth of 2 inches at the removal limits.

3. Using a 15 pound maximum size pneumatic hammer, remove the deteriorated pavement down to sound pavement.

4. In lieu of sawing and removal with a pneumatic hammer, the designated patch area may be milled to the prescribed depth. Saw edges of milled removal areas to create vertical face, unless otherwise specified in the contract documents.

5. Remove pavement to the appropriate depth. If the required depth to sound pavement exceeds the maximum removal depth, construct a full depth patch.
   a. PCC Pavement: Minimum removal depth of 2 inches or a maximum depth of 1/3 of the pavement thickness.
   b. HMA Pavement: Minimum removal depth of 2 inches or a maximum depth of 1/2 of the pavement thickness.

B. PCC Patch Placement:

1. Clean removal area by sandblasting, followed by airblasting, until the area is clean and dry. Ensure the compressed air used for cleaning is oil and moisture free. Place concrete the same day as sandblasting.

2. Place resilient filler material complying with Iowa DOT Article 4136.03 along existing joints. Filler material is to extend 1 inch below the patch and 3 inches beyond the patch boundaries.

3. Thoroughly coat the bottom and sides of the patch area with a cement grout immediately prior to placement of concrete. Do not allow grout to set prior to placement of concrete. Remove grout set by sandblasting and reapply.

4. Deposit concrete in the patch; finish patch from the center outward. Ensure concrete does not infiltrate into existing cracks or joints.

5. Apply joint filler material to expansion joints. At the interface between the patch and the slab, apply cement grout to fill.

6. Texture the patch similar to the adjacent surface.

7. Cure patch according to Section 7040, 3.02.

3.03 PARTIAL DEPTH PATCHING (Continued)

C. HMA Patch Placement:

1. Clean removal area by airblasting until the area is clean and dry. Ensure the compressed air used for cleaning is moisture free.

2. Cover the entire removal area with tack coat at a rate of 0.10 to 0.15 gallons per square yard.

3. Place HMA patch mixture in lifts that will not exceed 3 inches in thickness after compaction, with the top lift not exceeding 2 inches in thickness when compacted.

4. Compact each lift while hot by rolling with an adequately weighted pneumatic tire roller or by tamping with a mechanical tamper. Succeeding lifts may be placed as soon as the preceding lift has been properly compacted.

5. Smooth the final lift with a steel-tired finish roller. Ensure the final compacted surface is level with, or no more than 1/8 inch above, the adjacent pavement and has a smooth riding surface. If the patch becomes distorted for any reason, smooth the surface by blading, scraping, grinding, filling, or other approved means.

6. Do not open to traffic until the mixture has cooled sufficiently to provide stability.

3.04 DIAMOND GRINDING

A. Use equipment complying with Iowa DOT Article 2532.03, A.

B. Grind and texture the entire surface of the pavement parallel to the centerline until the pavement surface on both sides of transverse joints and all cracks are in the same plane with no greater than 1/16 inch difference between adjacent sides of joints and cracks and the pavement surface meets the required smoothness. Feather grind into existing structures such as manholes and water valves in a manner that eliminates abrupt edges or drops and provides a uniform texture.

C. Ensure the ground surface is of uniform texture. In each lane, ensure at least 95% of the area in each 100 foot section has a newly textured surface. Depressed pavement areas due to subsidence or other localized causes and areas containing feathering due to pavement structures will be exempted from texturing requirements.

D. Except at joints and cracks, ensure grinding depth does not exceed 1/2 inch. At joints and cracks, ensure grinding depth does not exceed 3/4 inch.

E. For multiple passes, ensure overlaps do not exceed 1 inch. Begin at the crown of the roadway, proceeding toward the pavement edge with each subsequent pass. Ensure each subsequent pass is at least as deep as the previous pass in order to provide transverse drainage. All passes are to begin and end at the same station location. Ensure no unground areas are left between passes. For grinding adjacent to an unground turn lane or other pavement surface, feather smoothly from the edge of the ground surface to the unground surface leaving no more than a 1/8 inch ridge. If street surface to be ground includes a curb and gutter section, extend grinding to within 4 inches of the curb face and feather to provide proper drainage.

3.04 DIAMOND GRINDING (Continued)

F. Assemble and adjust the grinding head as necessary during the project to produce the following tolerances on pavements with the indicated coarse aggregates. Both the distance between grooves and the texture depth must be within the specified range to be in compliance. Assemble the grinding head to produce the tolerances indicated below for the type of coarse aggregate in the pavement.

	Crushed Stone	Gravel/Quartzite
Width of Land Area Between Grooves*	0.090" to 0.110"	0.080" to 0.095"
Texture Depth**	Target of 1/8" with average between 1/16" and 3/16"	

*Based on an average of a minimum of ten measurements across the ground width for one pass.
**Based on an average of a minimum of six measurements across the ground width for one pass.

G. Prior to enforcement of the tolerances listed above, a test area 300 feet long and the width of the grinding head will be allowed for a new head that has been restacked, provided a surface texture in reasonable conformance with the specifications, as determined by the Engineer, is being produced.

H. Ensure the transverse slope of the ground pavement is uniform to a degree that there are no depressions or misalignment of slope greater than 1/4 inch in 12 feet when tested by string line or straightedge placed perpendicular to the centerline.

I. Continuously remove all slurry or residue resulting from the grinding operations with a well-maintained vacuum system and remove from the project limits. Ensure residue from grinding operations does not flow across lanes occupied by public traffic or into gutters, storm sewers, ditches, or other drainage facilities.

J. Measure smoothness with a 10-foot straightedge. Regrind high spots to ensure no surface deviations greater than 1/8 inch remain. When profilograph testing is specified in the contract documents, comply with Iowa DOT Materials I.M. 341 and the following requirements:

1. Prior to performing any grinding work, provide a control profilogram for each lane and/or segment over 50 feet in length that is to be ground. Ensure pavement is relatively clean and free of debris prior to establishing the control profilogram.

2. Ensure each segment of the finished ground surface has a final profile index less than or equal to 35% of the control profilogram trace or 22 inches per mile, whichever is greater, and does not include any bumps exeeding 1/2 inch in 25 feet.

3. Depressed pavement areas due to subsidence or other localized causes and areas where the maximum cut restricts further grinding will be excluded from testing with the profilograph when approved by the Engineer.

K. Recheck smoothness following any regrinding activities to ensure compliance with the above requirements.

3.05 MILLING

A. Use equipment complying with Iowa DOT Article 2531.03, A.

B. Mill the entire pavement area designated to the depth specified in the contract documents. Mill in straight lines. Make sufficient passes, or cuts, such that all irregularities or high spots are eliminated.

C. Control milling operations to provide a surface that is true within a nominal tolerance of 1/4 inch and 1/4 inch at longitudinal joints where adjacent passes meet. The profile may be inspected by checking with a 10 foot surface checker placed parallel to the centerline. Correct variations greater than 1/4 inch.

D. Load cuttings directly into dump trucks and remove the remaining small cuttings and debris from the street. Sweep the scarified surface with a rotary broom before opening to traffic. Unless otherwise specified in the contract documents, all materials removed are property of the Contractor.

E. Do not operate metal tracked equipment on streets, other than those being milled.

F. Ensure excessive dust does not become airborne during construction. Additional water may be required at any time for dust control.

G. Mill around manholes and utility valves. Correct any damage to manholes or valves by the milling operation at no additional cost to the Contracting Authority.

H. Do not leave a vertical drop of more than 2 inches at the centerline or lane line overnight. Taper the ends of milled sections subject to traffic to provide a uniform and gradual transition.

3.06 CRACK AND JOINT CLEANING AND FILLING, HOT POUR

A. General:

1. Use equipment complying with Iowa DOT Articles 2541.03 (HMA) and 2542.03 (PCC).

2. Rout or saw joints and cracks with an average opening of 3/8 inch or less to provide a minimum sealant reservoir of 3/8 inch wide by a nominal 1/2 inch deep. For joints and cracks less than 3/8 inch wide, widen by routing or sawing to a minimum width of 3/8 inch and depth of 1/2 inch.

B. Crack and Joint Cleaning:

1. Clean cracks or joints of existing joint filler material, backer rod, vegetation, dirt, and other foreign material.

2. Clean joints or cracks by air blasting or by other methods as necessary to remove debris.

3. If specified in the contract documents, clean wet sawn joints with high pressure water immediately after sawing to remove residue produced by the sawing operation.

4. When cleaned joints or cracks are contaminated before being filled, clean them again before filling.

3.06 CRACK AND JOINT CLEANING AND FILLING, HOT POUR (Continued)

C. Crack and Joint Filling:

1. Ensure cracks and joints are dry prior to placement of filler material.

2. Heat, handle, and apply joint filler material to the proper level as specified in the contract documents and as recommended by the manufacturer.
   a. PCC Pavement: Do not overfill joint or crack with filler material. Immediately remove filler material placed on the pavement surface.
   b. HMA Pavement: Slightly overfill the entire crack reservoir with filler material. Smooth with a narrow V-shaped squeegee immediately after placement of the filler material to within 1/2 inch on each side of the crack edge.

4. Place joint filler material when the pavement and ambient air temperatures are 40°F or higher. When near this minimum, additional air blasting or drying time, or both, may be necessary to ensure a satisfactory bond to the joint surfaces.

5. Lanes may be opened to traffic only after the filler material has set sufficiently so it will not pick up under traffic. Blotting material may be applied to the filler material, but only after the surface has set to avoid penetration of the blotting material into the filler material.

3.07 CRACK CLEANING AND FILLING, EMULSION

Use emulsified asphalt for filling cracks in HMA surfaces only. Do not use on PCC pavements.

A. General:

1. Clean cracks with either high pressure air or water equipment. Do not use water when freezing temperatures exist or are forecasted.

2. Ensure vegetation is removed from cracks. Alternative cleaning methods may be necessary to remove vegetation.

3. When specified in the contract documents, apply a soil sterilant in crack prior to placing the filler material.

4. For filling cracks, use a hand operated wand or pouring pot, capable of placing the filler material into the crack and filling to the adjacent surface. Use a spout or nozzle small enough to place the filler material into the crack without soiling the adjacent surface.

5. Immediately after placement of the filler material, tightly spread the emulsion using a 2 inch, or less, V-shaped rubber-edged squeegee. Take proper measures to hold the filler in place and prevent runout at edge of pavement or at low areas.

B. Cracks Wider Than 1 inch:

1. Clean the cracks of loose and spalled material, sand, and other foreign debris to a depth of 3 inches using high pressure water.

2. When specified in the contract documents, utilize additional methods to clean cracks of old crack filler.

3. Blow the cleaned cracks free of water with high pressure air.

4. Lightly apply a tack coat to the crack surfaces.

3.07 CRACK CLEANING AND FILLING, EMULSION (Continued)

5. Fill the cracks with hot mix asphalt.
   a. Ensure mix is warm and pliable when placed.
   b. Rod and tamp the mix into place level with the adjacent surface.
   c. Place mixture prior to filling cracks with emulsion.

6. Place a thin application of emulsion over the hot mix asphalt and tightly spread with a squeegee.

C. Cracks 1/4 inch to 1 inch in Width:

1. Clean the cracks of loose and spalled material, sand, and other foreign debris with high pressure air or high pressure water. Clean crack down to sound material, but a depth greater than 3 inches will not be required.

2. When specified in the contract documents, utilize additional methods to clean cracks of old crack filler.

3. Fill cracks with emulsion filler material.

D. Cracks Less Than 1/4 inch in Width:

1. Clean sufficiently to remove sand and other foreign debris.

2. Fill cracks with emulsion filler material.

E. Map-cracked (Alligator) Areas:

1. Cover area with emulsion filler material.

2. Spread emulsion over area with squeegee, working emulsion into cracks. Provide a thin, smooth application.

3. Promptly cover the filler material with a light application of blotter material.

3.08 PAVEMENT REMOVAL

A. Saw full depth at pavement removal limits.

B. Extend pavement removal limits to existing joint lines as directed by the Engineer.

C. Protect existing pavement, beyond removal limits, from damage. Remove to a new saw line and replace, at no additional cost to the Contracting Authority, all concrete broken or damaged beyond the removal limits designated by the Engineer.

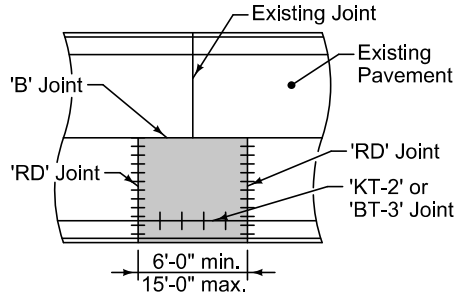
3.09 CURB AND GUTTER REMOVAL

A. Saw longitudinally along the existing gutter joint or at a location directed by Engineer. Saw transversely at the curb and gutter removal limits.

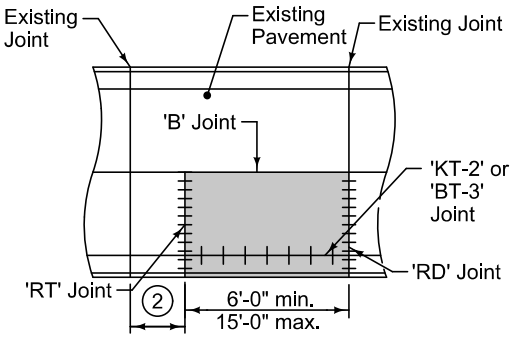
B. Remove existing curb and gutter without damaging the existing pavement to remain.

END OF SECTION

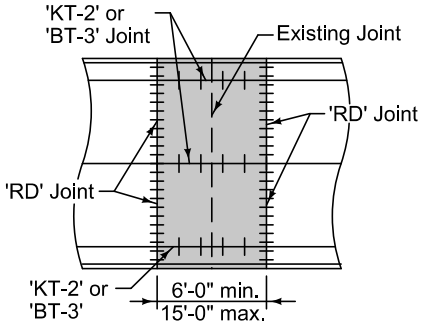
GUTTERLINE JOINTING



ONE PANEL WIDTH PATCH WITH OPPOSING JOINT

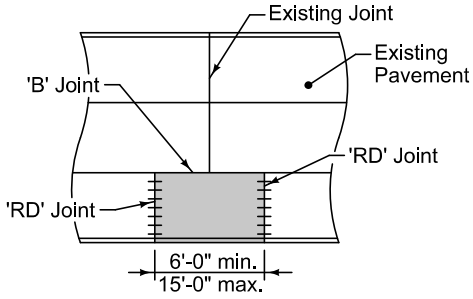


ONE PANEL WIDTH PATCH NO OPPOSING JOINT

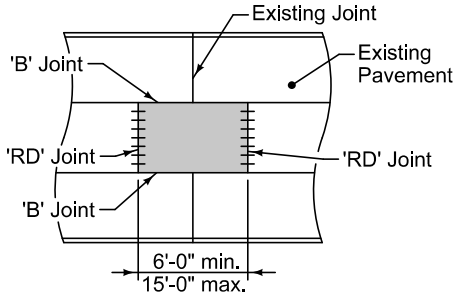


FULL ROADWAY WIDTH PATCH

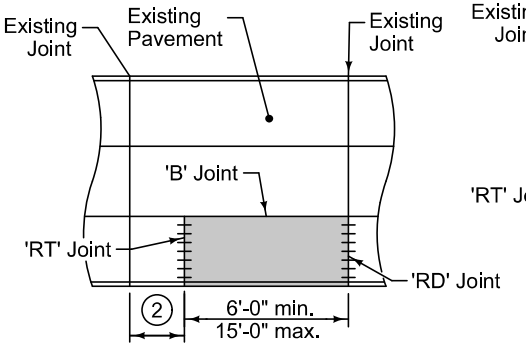
THIRD POINT JOINTING (1)



OUTSIDE PANEL PATCH WITH OPPOSING JOINT



CENTER PANEL PATCH WITH OPPOSING JOINTS



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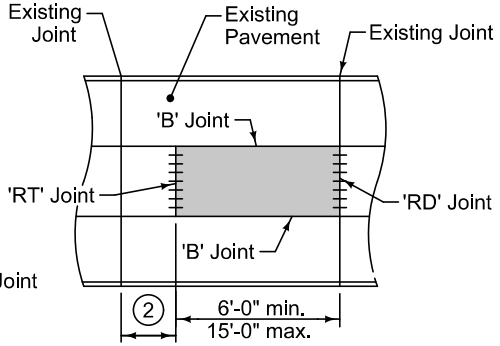

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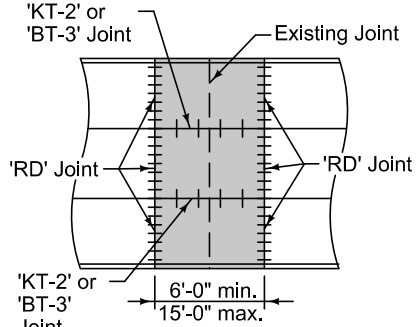
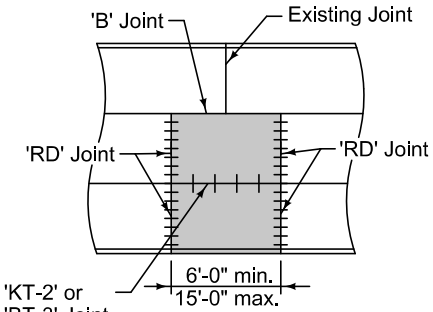


FULL ROADWAY WIDTH PATCH



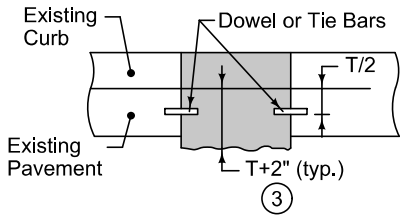
ADJACENT PANELS PATCH

(1) Patches on roadways with quarter point jointing will be similar to third point jointing details.

(2) Minimum distance between existing joint and patch is 6 feet. If distance is less than 6 feet, extend patch to existing joint.

(3) If subgrade or subbase material is required below patch, bring material to bottom of pavement.

LONGITUDINAL SECTION THRU PCC PATCH



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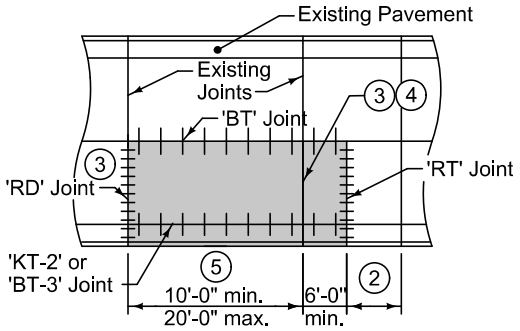
FULL DEPTH PCC PATCHES
LESS THAN OR EQUAL TO 15' LONG

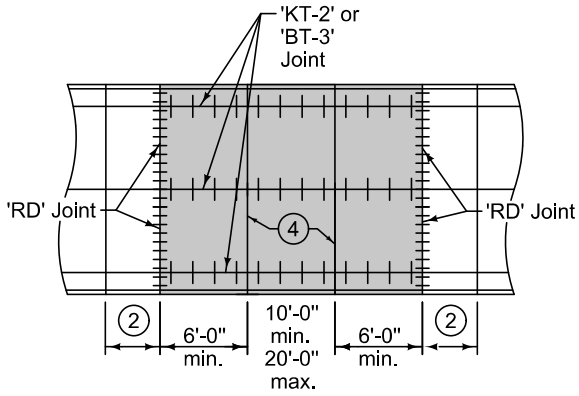
FIGURE 7040.101

SHEET 1 OF 1

GUTTERLINE JOINTING

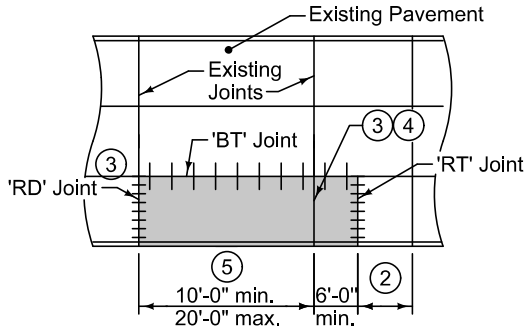


ONE PANEL WIDTH PATCH

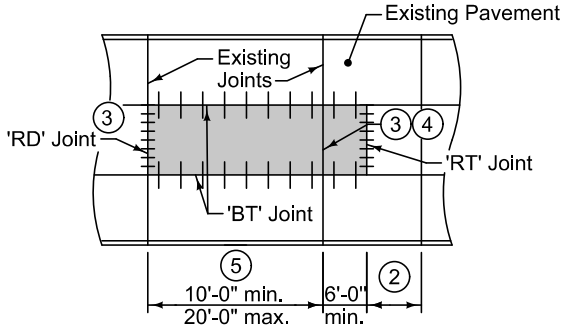


FULL ROADWAY WIDTH PATCH

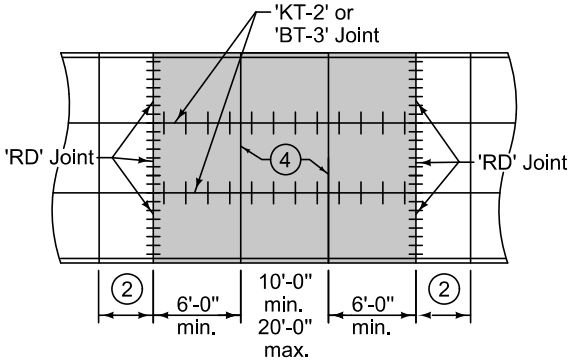
THIRD POINT JOINTING (1)



OUTSIDE PANEL PATCH



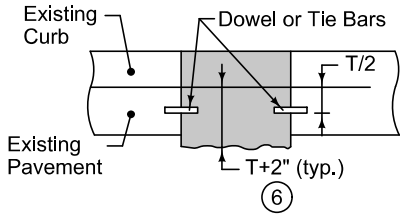
CENTER PANEL PATCH



FULL ROADWAY WIDTH PATCH

1. Patches on roadways with quarter point jointing will be similar to third point jointing details.
2. Minimum distance between existing joint and patch is 6 feet. If distance is less than 6 feet, extend patch to existing joint.
3. Match existing joint type and locations.
4. 'C' joint unless 'CD' joint is specified.
5. If existing joint spacing is greater than 20 feet, add a 'CT' joint at mid-panel.
6. If subgrade or subbase material is required below patch, bring material to bottom of pavement.

LONGITUDINAL SECTION THRU PCC PATCH



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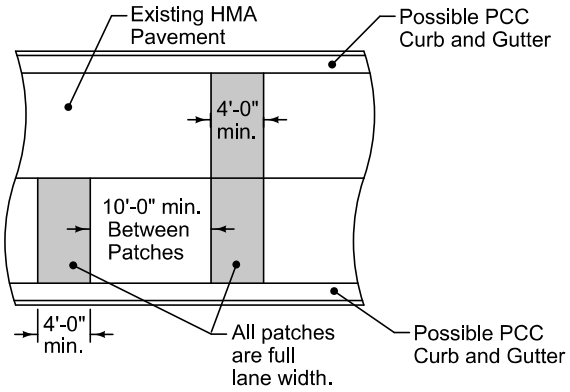
FULL DEPTH PCC PATCHES GREATER THAN 15' LONG

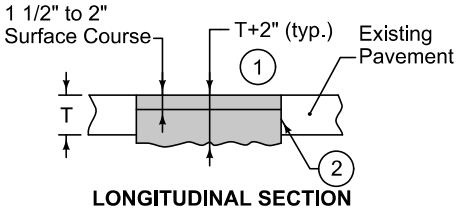
FIGURE 7040.102 | SHEET 1 OF 1

(1) If subgrade or subbase material is required below patch, bring material to bottom of pavement.

(2) When removing pavement, saw to full depth or 10 inches, whichever is less.



HMA PATCHES



LONGITUDINAL SECTION THRU HMA PATCH

FIGURE 7040.103

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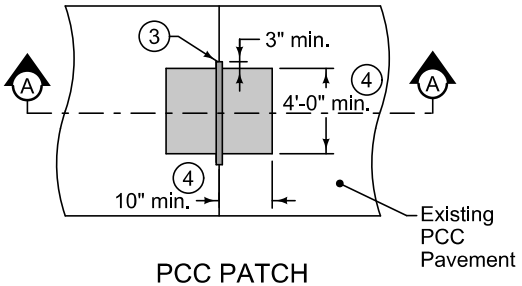
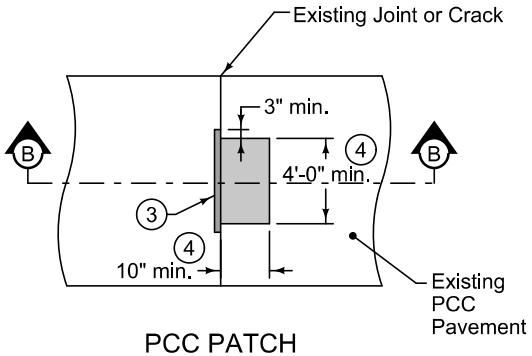
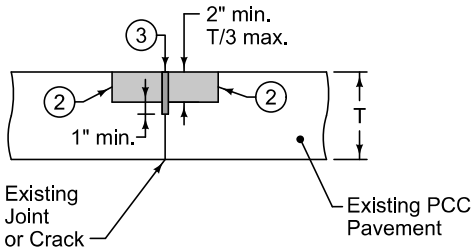
FULL DEPTH HMA PATCHES



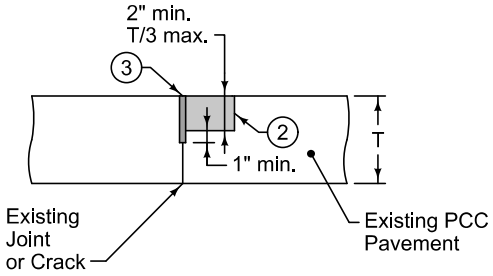
PCC PATCH
ACROSS JOINT



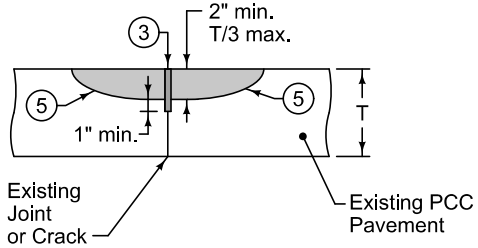
PCC PATCH
ABUTTING JOINT



SECTION A-A
(Option 1: Sawed Edges)

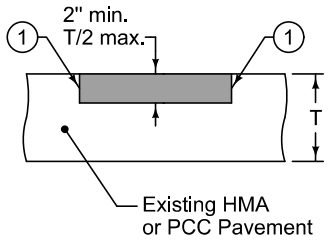


SECTION B-B



SECTION A-A
(Option 2: Milled Edges)

1. Vertical saw cut (typical). Apply tack coat to sides and bottom.
2. Vertical saw cut (typical). Apply cement grout to sides and bottom.
3. Saw and seal existing joint.
4. Extend patch limits at least 3 inches beyond distressed area.
5. When milled removal is allowed, sawed vertical edges are not required. Apply cement grout to milled area.



HMA PATCH

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PARTIAL DEPTH PATCHES

FIGURE 7040.104

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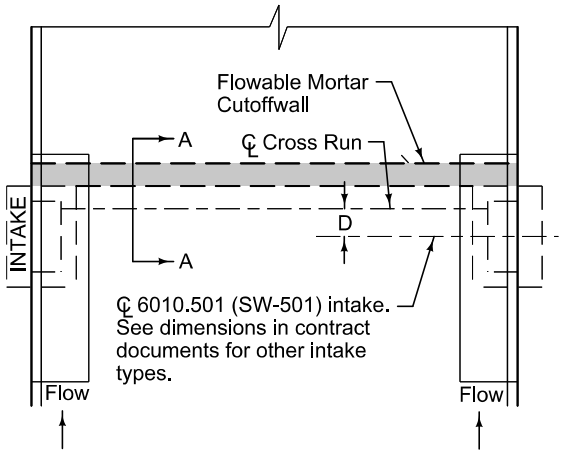
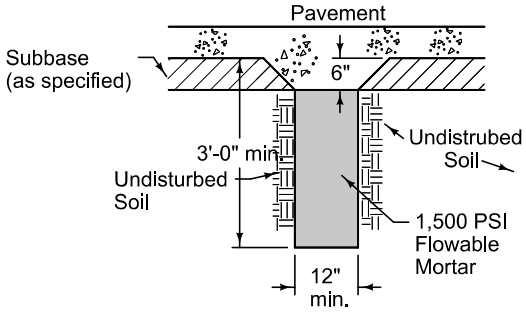
Length of cutoffwall to be back of curb to back of curb.

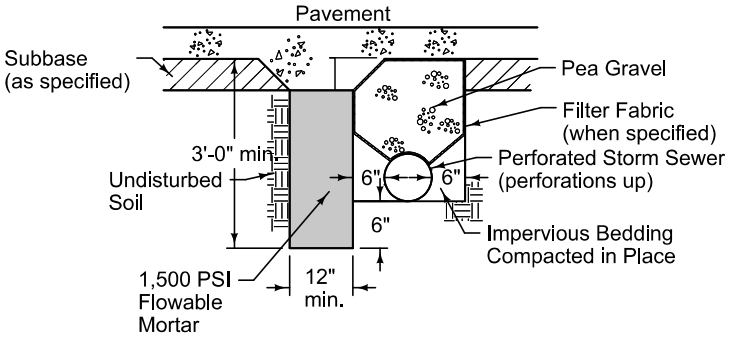


PLAN VIEW
(Flowable mortar cutoffwall and cross run location.)

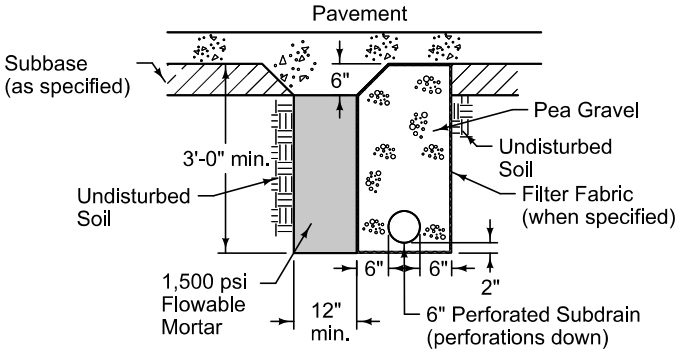


FLOWABLE MORTAR CUTOFFWALL
(Without Sewer)

DISTANCE FROM ℄ INTAKE TO ℄ CROSSRUN	
Size	D
15" RCP	0.7'
15" CMP	0.8'
18" RCP	0.5'
18" CMP	0.7'



SECTION A-A
(Flowable mortar cutoffwall and storm sewer)



FLOWABLE MORTAR CUTOFFWALL
(With Subdrain)

FIGURE 7040.105 | SHEET 1 OF 1

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FLOWABLE MORTAR CUTOFFWALL

ASPHALT STABILIZATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

Asphalt Stabilization for existing unpaved roadways

1.02 DESCRIPTION OF WORK

Asphalt stabilization consists of a mixture of emulsified asphalt, imported mineral aggregate, and existing roadway material; properly proportioned, mechanically mixed, spread evenly on the surface specified, compacted in place and surfaced to the thickness, width, and crown specified in the plans.

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 - General Provisions and Covenants.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT AND PAYMENT

A. Asphalt Stabilization:

1. **Measurement:** Measurement will be in square yards for asphalt stabilization.

2. **Payment:** Payment will be at the unit price per square yard of asphalt stabilization.

3. **Includes:** Unit price includes, but is not limited to, furnishing and spreading imported material, applying and incorporating asphalt stabilization, blending of the materials, grading and compacting the blended materials, and final clean up.

B. Fixture Adjustment: Comply with Section 6010 for adjustment of manholes and intakes and Section 5020 for adjustment of water valves and fire hydrants.

C. Re-shaping Ditches: Comply with Section 2010 for Class 10, Class 12 or Class 13 Excavation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Asphalt Emulsion: Comply with the slow setting cationic emulsified asphalt; CSS-1 per ASTM D 2397.

B. Aggregate: Pitrun gravel, crushed stone, or reclaimed material as specified in the contract documents.

PART 3 - EXECUTION

3.01 EQUIPMENT

Comply with Iowa DOT Section 2001 for all equipment, tools, and machines used in the performance of this work.

A. Motor Grader: Include attachments for scarifying, shaping, ditching, grading, and sloping. A basic motor grader does not weigh less than 22,000 pounds.

B. Asphalt Distributor: Ensure the tank is insulated and range in capacity from 500 to 1,500 gallons. The truck mounted asphalt distributor must have a circulating system, spray bar (fully circulating), and calibration controls.

C. Pug-mill Mixer: Use a road reclaiming machine or similar tractor mounted or towed mechanical mixers for blending, emulsion, and roadway aggregates.

D. Rollers: A vibratory type roller compactor, minimum static weight 10,000 pounds, and minimum dynamic force of 15,000 pounds is recommended. Rollers must be capable of compacting a 6 inch lift of blended asphalt stabilized material to a minimum density of 95% of maximum Standard Proctor Density.

3.02 RE-SHAPING DITCHES

A. Remove excess and undesirable material from side ditches and properly dispose of material.

B. Shape ditches as shown on typical cross-section. Do not place excess material excavated from ditch on the roadway but dispose of material off of the roadway.

3.03 PREPARE / PLACE BASE MATERIAL

A. Reclaim present surface material by pulverizing the existing roadway surface to a minimum depth of 4 inches or the depth specified by the Engineer for the full length and width of the designated roadway.

B. Spread the imported aggregate as uniformly as possible on center 15 feet of roadway at the rate of 10 pounds per square foot for the full length of designated roadway.

3.04 SURFACE FIXTURE ADJUSTMENT

Adjust manhole frames and other fixtures within area to be paved to conform to finished surface. Comply with Section 6010, 3.04 for manhole adjustments and Section 5020, 3.04 for water fixture adjustments.

3.05 APPLICATION AND MIXING OF ASPHALT EMULSION

A. Do not apply asphalt stabilization during rainfall, when excessive moisture content exists, when the air temperature is below 50^{o} F in the shade, or during night conditions.

B. Incorporate asphalt emulsion with a pug-mill mixer, road reclaimer, or similar machine, capable of thoroughly mixing and/or incorporating the emulsion in a single pass.

C. Alternately, a distributor truck may be used to apply the asphalt emulsion. Apply one-half of the required emulsion. Thoroughly blade mix to incorporate the emulsion into the aggregate. Once the emulsion is worked into the aggregate, windrow the mixture and apply the second half of the emulsion and incorporate as noted above.

D. Adjust the application rate to obtain a minimum of 3% residual asphalt.

3.06 GRADE AND COMPACT MATERIAL

A. Blade blended material on the roadway to form a uniform mat over the final design cross-section.

B. Obtain final cross-section and smoothness by compaction with a sheepsfoot and subsequent rolling with vibratory and pneumatic rollers and alternating final blade shaping. Continue rolling until compacted to a minimum of 95% of maximum Standard Proctor Density.

C. Following compaction, open roadway to traffic.

3.07 SURFACE TREATMENT

After a minimum of 48 hours, re-close the roadway and apply the surface treatment specified in the contract documents. Comply with Section 7060, Bituminous Seal Coat; Section 7070, Emulsified Asphalt Slurry Seal; or Iowa DOT Article 2306, Bituminous Fog Seal. Blot fog seal with sand prior to reopening of the roadway to prevent tracking of the asphalt emulsion.

END OF SECTION

BITUMINOUS SEAL COAT

PART 1 - GENERAL

1.01 SECTION INCLUDES

Bituminous Seal Coat Surface

1.02 DESCRIPTION OF WORK

Includes preparation of surface, heating of bituminous materials and placing of the seal coat bitumen, spreading aggregate, and rolling the aggregate.

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 - General Provisions and Covenants.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT AND PAYMENT

A. Bituminous Seal Coat by Area:

1. **Measurement:** Measurement will be in square yards for bituminous seal coat.

2. **Payment:** Payment will be at the unit price per square yard of bituminous seal coat.

3. **Includes:** Unit price includes, but is not limited to, surface preparation including protection of street fixtures; furnishing and placing of materials, including fillets at intersecting streets, driveways, and turnouts; and final clean up.

B. Bituminous Seal Coat by Units:

1. **Cover Aggregate:**
   a. **Measurement:** Measurement will be in tons of cover aggregate. If sand is required for bleeding control, it will be measured the same as cover aggregate.
   b. **Payment:** Payment will be at the unit price per ton of cover aggregate. If sand is required for bleeding control, it will be paid at 75% of the unit price as cover aggregate.
   c. **Includes:** Unit price includes, but is not limited to, surface preparation including protection of street fixtures; furnishing and placing of materials, including fillets at intersecting streets, driveways, and turnouts; and final clean up.

1.08 MEASUREMENT AND PAYMENT (Continued)

2. Binder Bitumen:

a. Measurement: Measurement will be in gallons of binder bitumen furnished and incorporated, including street surface, fillets, and turnouts.

b. Payment: Payment will be at the unit price per gallon of binder bitumen furnished and incorporated.

c. Includes: Unit price includes, but is not limited to, furnishing and placing of materials, including fillets at intersecting streets, driveways, and turnouts; and final clean up.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aggregates: Use an aggregate cover that is washed and composed of crushed, hard durable gravel, crushed stone, or mixture with abrasion loss by AASHTO T 96 not exceeding 40%. Gradation complying with the following:

Percent Passing										
Sieve Size	**1/2”**		**3/8”**		**1/4”**		**No. 4**		**Sand**	
	Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
3/4”	100									
1/2”	97	100	100							
3/8”	40	90	90	100	100				100	
1/4”							100			
No. 4	0	30	10	55	55	85	85	100		
No. 8	0	15	0	20	0	10	10	40	60	90
No. 30			0	7			0	85		40
No. 200	0	2	0	1.5	0	1.5	0	1.5	0	1.5

B. Bituminous Material: Unless the contract documents specify a specific grade, use cationic emulsion CRS-2P binder bitumen complying with Iowa DOT Section 4140. Other grades include CRS-2 according to Iowa DOT Section 4140 or HFRS-2 complying with AASHTO T 59.

Use cut back asphalt MC-800 or MC 3000, meeting Iowa DOT Section 4138, if specified in the contract documents.

Use grade CSS-1, CSS-1H, or SS-1H, meeting Iowa DOT Section 4140, if specified in the contract documents for dust control. Dilute with water prior to application. Use an initial dilution rate of seven parts water to one part emulsion.

PART 3 - EXECUTION

3.01 EQUIPMENT

A. Aggregate Spreaders:

1. Spreader:
- Self propelled, mounted on pneumatic tires, with a width of spread not less than 12 feet.
- Capable of spreading aggregate specified above at a rate desired from 3 to 50 pounds per square yard of surface covered without contact of the wheels of the spreader with the treated surface until the aggregate has been spread.
- Sufficient power to propel itself at uniform speed on gradients up to 6%.
- Have cutoff plates to allow the width of spread to be reduced in increments of 1 foot from the maximum width down to 4 feet wide.

2. Hopper: Minimum capacity of 5 tons.

B. Bitumen Distributors:
- Mount on dependable motor trucks equipped with pneumatic tires.
- Provided with burners with heating coils and an accurate thermometer indicating temperature of the bitumen in the tank.
- Supply bitumen to spray bars to produce an even spray at rates varying from 0.03 gallon to 0.5 gallon per square yard in a smooth uniform coating at a forward speed of up to 20 mph.
- Adjust the spray bars vertically and provide a total spray width of no less than 12 feet.
- When emulsion binder bitumen is used, use a distributor spray bar equipped with nozzles specifically designed to apply emulsion.
- Before the work is started, provide the Engineer with a written statement indicating the size or part number of the nozzles recommended by the manufacturer and certifying the nozzles are installed on the distributor.
- Operate distributors according to manufacturer's instructions for use for spray bar height above surface, nozzle size, angle of spray fan, and tables of rates of distribution in gallons per square yard for tachometer readings. Verify distributor before using.

C. Brooms: A power-driven rotary or pick-up broom is required for cleaning surfaces before the bitumen is applied.
- Driven by an auxiliary motor or by power take-off.
- When using a power broom to remove loose aggregate from a newly seal coated surface, ensure it is capable of exerting uniform down pressure (for the full width of the broom and without vibration or bounce) sufficient to remove loose aggregate without dislodging particles that are stuck in the binder bitumen.

D. Rollers:
- Self-propelled, pneumatic tire rollers, with tires no smaller than 7.50 by 15 size.
- Load rollers to produce a compressive force of no less than 200 pounds per inch width of the roller.
- Ensure tire inflation is no less than 60 psi.
- Do not use steel rollers unless authorized by the Engineer.

3.02 SURFACE PREPARATION

A. Hard Surfaced Streets:

1. If specified, complete patching and joint filling according to Section 7040.

2. Immediately before bitumen is applied, clean the entire surface to be treated, as well as the adjacent gutters, of all foreign material, including dust and weeds.

3. Sweep, clean, and perform work required to produce a clean surface. If the power broom fails to remove dust from depressions and pockets, use hand brooms.

4. Remove the material that was cleaned from the surface. This material becomes the property of the Contractor.

5. Use a suitable covering to protect the items below from being soiled by bitumen. Leave the protective covering in place until the bitumen has set and no splashing occurs under traffic.
   - Curbs and handrails of bridges
   - Guardrails
   - Headwalls of culverts
   - Pavements
   - Curbs and gutters
   - Manholes and utility accesses
   - Intakes
   - Water and gas valves
   - Railroad flangeways
   - Other installations requiring protection

6. Place suitable covering, as required, to prevent cover aggregate from entering intakes or other similar structures during placement and while brooming excess cover aggregate.

B. Rock Surfaced Streets: Comply with Section 7050.

3.03 HEATING BITUMINOUS MATERIAL

Heat bituminous materials to the temperature that allows uniform spreading. It is estimated that temperatures between the following limits will produce the desired viscosity. Material that has been damaged by overheating will be rejected.

Designation	Temperature
CRS-2	125-185
CRS-2P	125-185
HFRS-2	125-185
MC 800	175-255
MC 3000	215-290
MC 70	145-165

3.04 SPREADING BITUMINOUS MATERIAL

A. General: Do not apply seal coats after September 15 unless temperatures in the shade are 60°F and rising and the work is approved by the Engineer. Do not spread until the distributor has been tested to ensure a uniform distribution of bitumen. Minimize longitudinal overlap of adjacent bitumen applications. Spread between 95% and 105% of the bituminous material the Engineer prescribes. Correct the rate of application for temperature to deliver the desired volume at 60°F.

3.04 SPREADING BITUMINOUS MATERIAL (Continued)

B. Spreading Binder Bitumen: Do not place seal coat on a wet surface or in night conditions. Apply bitumen to the prepared base at the rate shown in the table below, if not otherwise specified in the contract documents.

Aggregate	Application rate (Gal/SY)
1/2”	0.27
3/8”	0.24
1/4”	0.21
No. 4	0.18
Sand	0.15

Close adjacent applications of bitumen with a minimum longitudinal lap. For CRS-2P and CRS-2, spread the binder bitumen on an area no greater than can be covered with aggregate and initially rolled within 2 minutes. Place the bitumen spreader and aggregate spreader as close as possible, but no more than 150 feet apart. Do not allow the length of spread to be greater than can be completely rolled within 30 minutes after the bitumen spread has been completed. Maintain initial roller coverage as close to the aggregate spreader as possible, not to exceed 200 feet.

For HFRS-2 emulsions, allow a slight skim to be formed on the surface before spreading aggregate.

C. Joints:

1. Secure binder bitumen distribution at the specified rate of application using paper placed at the start of each distributor run. Use commercial grade building paper that is approved by the Engineer and is no less than 36 inches wide.

2. When the end of the run joins newly placed seal coat, place paper at that joint also. Cut the joint straight along the off edge of the paper. Remove the seal coat material on the paper adjacent to the off edge from the roadbed surface. Ensure a smooth ride is obtained.

D. Spreading Cover Aggregate: Promptly after spreading bitumen on any section, spread cover aggregate of the size specified uniformly over the treated area as noted in the table below, if not otherwise specified in the contract documents.

Aggregate	Application Rate (lbs/SY)
1/2”	24
3/8”	21
1/4”	18
No. 4	18
Sand	18

E. Maintenance During Construction Period: If bleeding occurs during construction, cover area with 15 pounds of sand per square yard to control bleeding. Rolling is not required.

3.05 ROLLING

A. Complete initial pass of pneumatic tired roller within 2 minutes after spreading the cover aggregate. Complete rolling operations within 30 minutes after binder bitumen has been sprayed. Operate rollers at a speed of no more than 5 mph.

B. Five passes of a roller is required for cover aggregate; one pass is required for sand applied as cover.

3.05 ROLLING (Continued)

C. Do not apply succeeding applications of binder bitumen until rolling operations are completed for the previous course.

3.06 TWO COURSE SEAL COATS

A. First Course Construction: Complete as specified above.

B. Second Course Construction:

1. Preparation of Roadbed:

a. After completing the first course, prepare the roadbed for the second course either:
- With a vacuum machine, or
- By lightly brooming the full surfaced width with the power sweeper to remove all loose material.

b. After cleaning, roll the entire surface once with a roller.

c. Complete the preparation of the roadbed in sections just prior to application of bitumen for the second course.

2. Spreading Binder Bitumen: Spread bitumen on the prepared surface at the rate specified in the contract documents.

3. Spreading Cover Aggregate: Spread cover aggregate of the size specified over the treated area at the rate specified in the contract documents, promptly after spreading bitumen on any section of roadbed.

3.07 CLEAN UP

After final rolling operation, use a sweeper with a dust suppressant system to pick up loose aggregate. Complete clean up as directed by the Engineer, but no more than 21 days after application. For rural-type pavements, the Engineer may determine that sweeping is not necessary.

END OF SECTION

EMULSIFIED ASPHALT SLURRY SEAL

PART 1 - GENERAL

1.01 SECTION INCLUDES

Emulsified Asphalt Slurry Seal

1.02 DESCRIPTION OF WORK

Includes the requirements for surface treatment of an existing pavement with an application of an emulsified asphalt slurry seal. In addition, the work may involve the following items:

A. Slurry Leveling: Use fine slurry mixtures to fill shallow depressions in the pavement and over cracks.

B. Strip Slurry Treatment: Applications of fine or coarse slurry mixtures as specified in the contract documents

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 - General Provisions and Covenants, as well as the following:

Keep the various aggregate products separate, and make adequate provisions to prevent intermingling. Handle stockpiling and processing in a manner that will ensure uniform incorporation of the aggregate into the mix.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT AND PAYMENT

A. Emulsified Asphalt Slurry Seal by Area:

1. Measurement: Measurement will be in square yards for emulsified asphalt slurry seal.

2. Payment: Payment will be at the unit price per square yard of emulsified asphalt slurry seal.

3. Includes: Unit price includes, but is not limited to, surface preparation and furnishing and placing of materials, including fillets at intersecting streets, driveways, and turnouts.

1.08 MEASUREMENT AND PAYMENT (Continued)

B. Emulsified Asphalt Slurry Seal by Units:

1. Aggregate:

a. Measurement: Measurement will be in tons of aggregate.

b. Payment: Payment will be at the unit price per ton.

c. Includes: Unit price includes, but is not limited to, surface preparation and furnishing and placing of materials, including fillets at intersecting streets, driveways, and turnouts.

2. Asphalt Emulsion:

a. Measurement: Measurement will be in gallons of asphalt emulsion furnished and incorporated, including street surface, fillets, and turnouts.

b. Payment: Payment will be at the unit price per gallon of asphalt emulsion furnished and incorporated.

c. Includes: Unit price includes, but is not limited to, surface preparation and furnishing and placing of materials, including fillets at intersecting streets, driveways, and turnouts.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Asphalt Emulsion: Use a Grade CSS-1H (AASHTO M 208) or SS-1H (AASHTO M 140) emulsified asphalt meeting the requirements of Iowa DOT Section 4140.

B. Aggregate:

- Mineral aggregate consisting of natural or manufactured sand, slag, crusher fines, and others, or a combination thereof.
- Smooth-textured sand not exceeding 50% of the total combined aggregate.
- Clean and free from vegetable matter and other deleterious substances.
- When tested according to ASSHTO 96, shows a loss of no more than 40.
- When specified, use crushed aggregates meeting the requirements of Iowa DOT Section 4124

Mineral fillers such as portland cement, limestone dust, fly ash, and others are considered part of the blended aggregate; use in minimum required amounts. Only use fillers if needed to improve the workability of the mix or gradation of the aggregate.

C. Mixture Gradation: Use composite aggregate, excluding mineral filler that complies with the following gradation limits for the specified slurry mixture required:

1. Fine Slurry Mixture: Use aggregate meeting the requirements of Iowa DOT Article 4109.02, Gradation No. 22 of the Aggregate Gradation Table.

2. Coarse Slurry Mixture: Use aggregate meeting the requirements of Iowa DOT Article 4109.02, Gradation No. 23 of the Aggregate Gradation Table.

D. Water: Use water that is potable and free of harmful soluble salts in the slurry mixture.

2.02 COMPOSITION OF THE SLURRY MIX

A. Blend the amount of asphalt emulsion with the aggregate as specified in the contract documents and as adjusted in the field.

B. A minimum amount of water may be added as necessary to obtain a fluid and homogeneous mixture. Mix until the consistency is such that it “rolls” in the spreader box in a continuous mass.

C. Slurry that segregates in the spreader box, so that flowing of liquids (water and emulsion) is evident, is not acceptable.

D. Provide the Engineer with a copy of the certified gradations of aggregate proposed for use.

E. Asphalt Binder Content:

1. Estimated Asphalt Residue Content: 7% to 14% of the dry weight of the aggregate.

2. Mixture Design Film Thickness: 7.5 microns (target value) with a ± 0.75 microns permissible range.

F. Handling and Sampling Slurry Materials:

1. Stockpiling of Aggregate:
   a. Take precautions to prevent stockpile contamination with oversized rock, clay, silt, or moisture in excess of which would interfere with the amount of asphalt emulsion required in producing the desired homogeneous slurry mixture.

2.02 COMPOSITION OF THE SLURRY MIX (Continued)

b. Place the stockpile in a well drained area. Do not allow the aggregate to become segregated.
c. Control the moisture in the aggregate to be within ± 1.5% of the moisture content of the aggregate at the time of calibration.

2. Storage:
   a. Provide suitable storage facilities for the asphalt emulsion. Use a container equipped to prevent water from entering the emulsion.
   b. Provide suitable and adequate heat to prevent freezing and to facilitate handling of the asphalt emulsion.

3. Sampling: Furnish samples of materials during the process of the work as directed by the Engineer.

2.03 MIX DESIGN

A. General: Develop the mix design for the slurry mixture using the services of an independent testing laboratory that is certified by the International Slurry Surfacing Association (ISSA). Verify the functioning of the set regulating additives and present certified test results for the Engineer's approval prior to the work commencing. The Engineer will verify the laboratory tests required in ISSA A105 have been conducted.

B. Proportions: Meet following limits.

Mineral Aggregate, dry weight lb/sq yd	15 to 25
Emulsified Asphalt Residue, % by weight of aggregate	7.5 to 13.5%
Latex Base Modifier (if required)	As required with % by weight of binder, min. of 5.0
Mix Set Additive	As required
Mineral Filler, % by weight of aggregate	0.5 to 2.0% depending on weather conditions

C. Compatibility: Verity the compatibility of the aggregate, emulsified asphalt, mineral filler, and other additives with the mix design. Meet the following requirements for ISSA A105:

ISSA Test No.	Description	Specifications
ISSA TB-139	Wet Cohesion @ 30 minutes min. (set) @ 60 minutes min. (traffic)	 12 kg-cm min. 20 kg-cm min. or Near Spin min.
ISSA TB-109	Excess Asphalt by LWT Sand Adhesion	50 gm/sq ft max.
ISSA TB-114	Wet Stripping	Pass (90% min.)
ISSA TB-100	Wet-Track Abrasion Loss One-hour Soak	 75 gm/sq ft max.
ISSA TB-113	Mix Time @ 77°F	Controllable to 180 seconds, min.
ISSA TB 106	Consistency	0.79-1.18 inches
ISSA TB 113	Mix Time at 77°F	Controllable to 180 seconds, min.

Check the mixing test and set time test at the highest temperatures expected during construction.

2.03 MIX DESIGN (Continued)

D. Submittal: In the mix design, report the quantitative effects of moisture content on the unit weight of the aggregate (bulking effect). Clearly show the proportions of aggregate, mineral filler (minimum and maximum), water (minimum and maximum), additive usage, and asphalt emulsion based on the dry weight of the aggregate.

For the aggregate blend in the mix design, provide the test results for AASHTO T 176 with the mix information to the Engineer. The Engineer's review and approval will be required for aggregate test values below 45.

E. Approval: Show the percentages of each individual material required in the laboratory report. Obtain approval from the Engineer for the mix design prior to its use. After approval, substitutions will not be allowed unless approved by the Engineer. Maintain continuous control of the emulsified asphalt to dry aggregate proportioning to conform to the approved mix design within a tolerance of ± 2 gal/ton.

PART 3 - EXECUTION

3.01 EQUIPMENT

A. Slurry Mixing Equipment:

1. Use a continuous flow mixing unit capable of accurately delivering a predetermined proportion of aggregate, water, control additives, and asphalt emulsion to the mixing chamber, and discharging the thoroughly mixed product on a continuous basis.

2. Pre-wet the aggregate immediately prior to mixing with the emulsion. Use a pugmill capable of thoroughly blending all ingredients together.

3. When required, use a mixing machine equipped with an approved fines feeder that provides an accurate metering device, or method, to introduce a predetermined proportion of mineral filler into the mixer at the same time and location that the aggregate is fed.

4. Use an aggregate feed to the mixer equipped with a revolution counter or similar device so the amount of aggregate used may be determined at any time.

5. Use a positive displacement type emulsion pump equipped with a revolution counter or similar device so that the amount of emulsion used may be determined at any time.

6. For adding water to the mixer, use a pump equipped with a valve to establish the required water flow.

7. Mechanically tie all controls to ensure accurate proportioning of all materials at all times, including starts and stops. On some machines, this can be a simultaneous start and stop of all materials. On other machines, depending on where the materials are introduced into the mixing chamber, the feeds must be properly synchronized.

8. Use a one-lever or one-button operation with no means for the operator to adjust the mix proportions, except for the water.

9. Use revolution counters that count 0.1 revolutions on mechanisms that turn less than 100 rpm.

10. Attach a metering device to the slurry machine for the addition of additive to the mixture or any component material. Use a device that has positive, quick-acting controls, is easily calibrated, and maintains accurate and uniform flow.

11. Provide a means for calibrating the mixer. Calibrate and properly mark the controls for proportioning each material to be added to the mix. Use equipment with controls placed so they are readily accessible for calibration and so the Engineer may determine the amount of each material being used at any time. A minimum of three aggregate gate settings will be required for calibration and, if changes in emulsion delivery are necessary, a minimum of three pump changes will be required.

12. Use a mixing machine that:
    - Is equipped with a water pressure system and fog type spray bar adequate for complete fogging of the surface preceding spreading equipment,
    - Is controllable to an application range of 0.05 gallon per square yard, and
    - Provides sufficient machine storage capacity to properly mix and apply a minimum of 5 tons of the slurry, except when the mixing machine is operated in a continuous manner and is supplied by separate nurse type equipment.

3.01 EQUIPMENT (Continued)

B. Slurry Spreading Equipment:

1. Full Width, Slurry Wedge, Strip Slurry Treatment:

a. Use a mixer machine with an attached mechanical type squeegee distributor equipped with flexible material in contact with the surface to prevent loss of slurry from the distributor. Maintain the squeegee to prevent loss of slurry on varying grades and crown. Include a steering device and a flexible strike off.

b. Use a spreader box capable of placing the slurry mixture to the width specified in the contract documents. Use a spreader box equipped with vertical adjustment devices attached to horizontal support devices (such as runners) located a minimum of 6 inches inside both ends at the side of the box. This is to ensure uniform distribution on varying grades and crowns. Use vertical adjustment devices of sufficient weight (mass) to keep the horizontal support devices in contact with the roadway surface during operation. Use flexible strike off material of sufficient stiffness to produce the desired texture and rate of application.

c. Keep the spreader box clean. Do not allow build up of asphalt and aggregate on the box.

2. Slurry Leveling: Use metal lutes of varying widths for spreading the slurry mixture in the depressed areas. Ensure the face of each lute is indented (arched) slightly (1/8 inch to 3/16 inch) to aid in controlling the spread.

C. Cleaning Equipment: Use power brooms, power blowers, air compressors, water flushing equipment, or hand brooms for cleaning the surface and cracks.

D. Auxiliary Equipment: Furnish hand squeegees, shovels, and other equipment as necessary to perform the work.

E. Screening Unit: Use a screening unit to remove objectionable oversize and foreign material that may be encountered. Screen material before loading the slurry machine and/or weighing for payment.

3.02 SURFACE PREPARATION

A. If specified, complete pavement patches and joint or crack filling per Section 7040.

B. Immediately prior to applying the slurry, clean the surface of all loose material, mud spots, vegetation, and other objectionable material.

C. Any standard cleaning method used to clean pavements such as power brooms, compressed air, high-pressure water, and hand tools will be acceptable, except water flushing will not be allowed in areas where considerable cracks are present in the pavement surface. The surface preparation is subject to approval of the Engineer prior to placement of the slurry material.

D. Use a suitable covering to protect the items below from being soiled by bitumen. Leave the protective covering in place until the bitumen has set.

- Pavements adjacent to the beginning and end of placement.
- Manholes and Utility accesses.
- Intakes.
- Water and gas valves.
- Railroad flange ways.
- Other installations requiring protection.

3.03 APPLYING SLURRY MATERIAL

A. When directed by the Engineer, fog the surface of the pavement with water immediately preceding the pass of the spreader. Apply the water fog at such a rate that the entire surface is damp (approximately 0.05 gallon per square yard) with no apparent flowing water in front of the slurry box.

B. Ensure the slurry mixture is of the desired consistency such that it “rolls” in the spreader in a continuous mass prior to deposit on the surface. Do not exceed 4 minutes for the total time of mixing.

C. Ensure a sufficient amount of slurry is carried in all parts of the spreader at all times so complete coverage is obtained. Avoid overloading of the spreader. Apply the slurry seal at a rate of 10 to 18 pounds per square yard for fine aggregate and 15 to 22 pounds per square yard for coarse aggregate or as specified in the contract documents. Spread the paving mixture to fill minor cracks and shallow potholes and leave a uniform surface. Verify the application rate from daily readings taken from the proportioning devices during the progress of the work.

D. No lumping, balling, or unmixed aggregate is allowed. No segregation of the emulsion and aggregate fines from the coarse aggregate is allowed. If the coarse aggregate settles to the bottom of the mix, remove the slurry from the pavement.

E. Avoid buildup on longitudinal or transverse joints.

F. Apply a burlap drag to the surface when specified in the contract documents.

G. Apply strip slurry treatment parallel to the centerline, edge line, or other reference using a guide extending at least 3 feet ahead of the application equipment.

H. A mechanical device, such as an auger, may be used to distribute the slurry in the spreader box. The use of a mechanical device in the slurry distribution box for strip slurry treatment and slurry wedge application will generally not be required.

I. Ensure the finished product is uniform in color and composition. Do not leave streaks, such as those caused by oversized aggregate, in the finished surface. If excess streaking develops, the job will be stopped until the Contractor proves to the Engineer that the situation has been corrected. Excessive streaking is defined as more than four drag marks greater than 1/2 inch wide and 4 inch long, or 1 inch wide and 3 inches long, in any 30 square yard area. No transverse ripples or longitudinal streaks of 0.25 inch in depth will be allowed, when measured by placing a 10 feet straightedge over the surface.

J. Ensure the slurry seal possesses sufficient stability so that premature breaking of the material in the spreader box does not occur. Ensure the mixture is homogeneous during and following mixing and spreading. It must be free of excess water or emulsified asphalt and free of segregation of the emulsified asphalt and aggregate fines from the coarser aggregate. Do not spray water directly into the laydown box while placing slurry seal material.

K. Provide a smooth, neat seam where two passes meet. Immediately remove excess material from the ends of each run. Repair any damage to, or irregularities in, the slurry seal, as directed by the Engineer. Make all repairs with a paver box, except areas designated as hand work areas.

3.03 APPLYING SLURRY MATERIAL (Continued)

L. Those areas inaccessible to the spreader box and approved by the Engineer may be designated as hand work areas. Use approved squeegees to spread slurry in areas inaccessible to the slurry machine. Adjustments to the additive will be allowed to provide a slower setting time when hand spreading is needed. If hand spreading is necessary, pour the mixture in a small windrow along one edge of the surface to be covered and then spread uniformly by a hand squeegee or lute. Ensure hand work areas have an appearance consistent with the areas placed with a spreader box.

M. Remove the slurry seal mix from all areas, such as manholes, gutters, and intersections, as directed by the Engineer. On a daily basis, remove any debris associated with the performance of the work.

N. Check the yield of the application after the first 1,000 feet and throughout each day's paving, with a minimum of three tests per day. Furnish the yield check results to the Engineer daily.

O. Submit a daily "run sheet" for each day's work as soon as all the data is available. On the run sheet, provide a breakdown of the actual meter numbers and quantities of all materials actually used each day, as well as the respective locations.

3.04 SLURRY LEVELING

A. Ensure the surface to which the slurry leveling is to be applied is moist and clean of dust and foreign material. Scraping and sweeping may be necessary.

B. Spread the slurry leveling mixture in depressions at and over cracks in the pavement. Spread to the full width of the depression. Level the slurry with a metal lute of the proper width to provide a smooth riding surface. Ensure the slurry leveling is neat in appearance. Do not allow spillage around and between leveled areas. Keep excess material at the pavement edge to a minimum. Scatter excess material across the adjacent shoulder.

C. Allow the slurry leveling to cure until the area may be open to traffic without pick up or raveling of the leveling mixture.

D. Ensure the cured slurry has a homogeneous appearance and a uniform texture, fills all cracks in the application area, and adheres to the surface.

3.05 LIMITATIONS

A. Schedule slurry placement to ensure the traffic lanes are opened to traffic 30 minutes before sundown of the same working day. When traffic is maintained, keep the entire roadbed free of construction equipment during non-working hours.

B. Place slurry mixture between May 1 and October 15, when the temperature is at least 50°F and rising, and the forecast for the next 24 hours is above 40°F.

C. When this work is done in conjunction with crack cleaning and filling, clean and fill cracks before performing slurry work. The application of slurry and the crack cleaning and filling activity may be done as one coordinated operation.

D. When placing a strip slurry treatment, both edges of the slurry box must run on the pavement surface.

E. When the installation of strip slurry treatment is required at a pavement centerline or lane line, the Engineer may require such placement in two separate applications.

3.06 CURING AND OPENING TO TRAFFIC

Allow the treated area to cure until it may be opened to traffic without pick up or raveling of the slurry mixture. Repair or replace any damaged caused to the slurry surface by premature opening to traffic at no additional cost to the Contracting Authority.

END OF SECTION

PERMEABLE INTERLOCKING PAVERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Subgrade Preparation

B. Placement of Storage Aggregate

C. Placement of Filter Aggregate

D. Placement of Bedding Course

E. Placement of Permeable Interlocking Pavers

F. Quality Control

G. Protection of the Pavement

1.02 DESCRIPTION OF WORK

Construct permeable interlocking pavement for mitigation of stormwater runoff.

1.03 SUBMITTALS

A. Sample Pavers: Representative of the type and color proposed for the project.

B. Installation Instructions: Manufacturer's published installation instructions.

C. Material Certification: Submit certification letter from paver manufacturer indicating compliance with the ASTM specifications and the contract documents.

D. Bedding, Filter, and Storage Aggregates: Submit 5 pound samples of each aggregate type. Include aggregate type, source, gradation, and compacted void content.

E. Project Details: Include schedule, construction procedures, and quality control plan that describes material staging; paving direction; details of placement and compaction of the storage, filter, and bedding aggregate; and the paver installation procedures.

F. Involved Parties: Submit a list of all subcontractors, material suppliers, and testing laboratories.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 - General Provisions and Covenants.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants.

1.07 SPECIAL REQUIREMENTS

A. Qualifications of Paver Installer:

1. **Experience:** Successful completion of paver installations similar in design, material, and extent. Provide project location, owner name, and email contact information.

2. **Certification:** Successful completion of a permeable paver installation certification course developed by the Interlocking Concrete Paver Institute or the School for Advanced Segmental Paving.

B. Test Section: Install a 5 foot by 5 foot mock-up paver area on the prepared substrate to determine joint sizes, lines, laying patterns, paver edge treatments, colors, and texture of the project. If approved by the Engineer, it may be incorporated into the project.

1.08 MEASUREMENT AND PAYMENT

A. Class 10, Class 12, or Class 13 Excavation: Comply with Section 2010, 1.08, E.

B. Engineering Fabric:

1. **Measurement:** Measurement will be in square yards for the surface area covered with engineering fabric. Both horizontal and vertical areas covered with engineering fabric will be measured.

2. **Payment:** Payment will be made at the unit price per square yard of engineering fabric.

3. **Includes:** Unit price includes, but is not limited to, placing and securing filter fabric and any overlapped areas.

C. Underdrain:

1. **Measurement:** Each type and size of pipe installed will be measured in linear feet from end of pipe to end of pipe along the centerline of pipe, exclusive of outlets. The vertical height of cleanouts; the vertical height of observation wells; and lengths of elbows, tees, wyes, and other fittings will be included in the length of pipe measured.

2. **Payment:** Payment will be made at the unit price of each type and size of pipe.

3. **Includes:** Unit price includes, but is not limited to, furnishing and placing pipe, cleanouts, observation wells, and pipe fittings.

D. Storage Aggregate:

1. **Measurement:** Measurement will be in tons based upon scale tickets for the material delivered and incorporated into the project.

2. **Payment:** Payment will be made at the unit price per ton of storage aggregate.

3. **Includes:** Unit price includes, but is not limited to, furnishing, hauling, placing, and compacting storage aggregate.

1.08 MEASUREMENT AND PAYMENT (Continued)

E. Filter Aggregate:

1. **Measurement:** Measurement will be in tons based upon scale tickets for the material delivered and incorporated into the project.

2. **Payment:** Payment will be made at the unit price per ton of filter aggregate.

3. **Includes:** Unit price includes, but is not limited to, furnishing, hauling, placing filter, and compacting aggregate.

F. Permeable Interlocking Pavers:

1. **Measurement:** Measurement will be in square yards for the area of each type of permeable interlocking pavers installed. The area of manholes, intakes, or other fixtures in the pavement will not be deducted from the measured pavement area.

2. **Payment:** Payment will be made at the unit price per square yard of each type of permeable interlocking pavers.

3. **Includes:** Unit price includes, but is not limited to, testing, placement of bedding course, installing permeable interlocking pavers, placing joint/opening fill material, refilling joint after 6 months, and pavement protection.

G. PCC Edge Restraint:

1. **Measurement:** Measurement will be in linear feet for each type and size of PCC edge restraint. The area of manholes, intakes, or other fixtures in the pavement will not be deducted from the measured pavement area.

2. **Payment:** Payment will be at the unit price per linear feet for each type and size of PCC edge restraint.

3. **Includes:** Unit price includes, but is not limited to, final trimming of subgrade or subbase, bars and reinforcement, joints and sealing, surface curing and pavement protection, safety fencing, and boxouts for fixtures.

PART 2 - PRODUCTS

2.01 ENGINEERING FABRIC

Comply with Iowa DOT Section 4196, requirements for subsurface drainage.

2.02 UNDERDRAIN

A. Provide slotted or perforated pipe(s) complying with the requirements for Type 1 Subdrain in Section 4040.

B. Provide 6 inch diameter collector pipes unless otherwise specified in the contract documents.

C. Provide 4 inch diameter lateral pipes unless otherwise specified in the contract documents.

2.03 AGGREGATE

Provide crushed stone with 90% fractured faces. Wash all stone materials to ensure less than 2% passing the No. 200 sieve.

A. Storage Aggregate: Aggregate complying with Iowa DOT Section 4122, Gradation No. 13, Class 2 durability (AASHTO M 43/ASTM D 448, Size 2).

B. Filter Aggregate: Aggregate complying with Iowa DOT Section 4115, Gradation No. 3, Class 2 durability (AASHTO M 43/ASTM D 448, Size 57).

C. Bedding/Joint/Void Filler Aggregate: Crushed stone complying with Iowa DOT Section 4125, Gradation No. 29 (AASHTO M 43/ASTM D 448, Size 8).

2.04 PERMEABLE INTERLOCKING PAVERS

A. **Interlocking Concrete Pavers:** Comply with ASTM C 936 for minimum 3 1/8 inch thick pavers.

B. **Clay Brick Pavers:** Comply with ASTM C 1272 for minimum 2 3/4 inch thick, Type F brick for PX applications.

2.05 PCC EDGE RESTRAINT

Provide PCC edge restraint complying with Section 7010. A PCC edge restraint may be standard curb and gutter section, a vertical curb section, or a narrow concrete slab.

PART 3 - EXECUTION

3.01 PRE-INSTALLATION PROTECTION

A. Complete grading, utility installation, and other earth disturbing operations prior to excavating for the permeable paver system.

B. Prior to placing permeable interlocking pavers, install sediment control practices upstream to protect the area from sediment in stormwater runoff from disturbed soil.

3.02 SUBGRADE PREPARATION FOR PERMEABLE INTERLOCKING PAVERS

A. Excavate area to the elevations and grades specified in the contract documents.

B. When underdrain is specified, excavate a minimum 12 inch wide by 8 inch deep trench at locations specified in the contract documents.

C. Where fill materials are required, compact materials to 95% of maximum Modified Proctor Density. Do not over compact.

D. Fill and lightly re-grade any areas damaged by erosion, ponding, or traffic compaction prior to placing the engineering fabric.

3.03 ENGINEERING FABRIC

A. Install engineering fabric over completed subgrade, including trench for underdrain when specified.

B. Overlap adjacent strips of fabric a minimum of 12 inches.

C. Extend fabric up the sides of the subbase trench to the bottom of the proposed pavement.

3.04 UNDERDRAIN

A. Underdrain Collector Pipes:

1. Place 2 inches of filter aggregate in the bottom of the underdrain trench over engineering fabric.

2. Begin underdrain collector installation at the outlet and continue upgrade.

3. Lay underdrain collector pipe to the proper line and grade. Place pipe with perforations down.

4. Place filter aggregate over installed pipe in layers no more than 6 inches thick. Thoroughly tamp each layer with mechanical tampers.

5. Provide cleanouts where specified in the contract documents. Comply with Figure 4040.232.

6. Connect underdrain collector to outlet. Comply with Figure 4040.233. Install rodent guard on all underdrain pipe 6 inches or smaller.

7. Install underdrain cleanout pipes and observation wells as specified in the contract documents.

3.04 UNDERDRAIN (Continued)

B. Underdrain Lateral Pipes:

1. Place 2 inches of filter aggregate over the bottom of the prepared subgrade at lateral pipe locations specified in the contract documents.

2. Lay underdrain lateral over filter aggregate to the proper line and grade. Place pipe with perforations down.

3. Connect underdrain laterals to underdrain collector with wye or tee fitting.

4. Install plug or cap on upstream end of lateral pipe.

5. Place additional filter aggregate along each side of the lateral pipe to the springline of the pipe.

3.05 STORAGE AGGREGATE

A. Place storage aggregate in 6 inch maximum lifts to the thickness specified in the contract documents. If underdrain system is specified, take care not to damage or displace pipe during placement of storage aggregate.

B. Compact each lift with a vibratory drum roller until no visible movement can be seen in the aggregate layer. Do not crush aggregate. Do not operate compaction equipment directly over underdrain, until a minimum of 12 inches of storage aggregate is placed over the underdrain.

C. Install storage aggregate to the elevation specified in the contract documents.

3.06 FILTER AGGREGATE

A. Place filter aggregate directly over storage aggregate.

B. Install aggregate in a single lift with a thickness of 4 inches.

C. Lightly compact filter aggregate with one or two passes from a vibratory plate compactor or vibratory roller. If a vibratory roller is utilized, perform the final pass without vibration. Do not crush aggregate.

3.07 BEDDING AGGREGATE

A. Place bedding aggregate directly over filter aggregate.

B. Install aggregate in a single lift with a thickness of 2 inches.

C. Use laser guided spreader or place screed rails on the completed filter aggregate layer. Use screed width no less than the full width of each cross-section component of the roadway and no less than 16 feet for parking areas. Surface variations must be within 3/8 inch when tested with a 10 foot straightedge prior to compaction.

D. Lightly compact bedding aggregate with one or two passes from a vibratory plate compactor or vibratory roller. Recheck tolerance following compaction and make necessary corrections. Ensure surface is even, smooth with no roller ridges, and at the proper elevation to accommodate the pavers.

E. Restrict pedestrians and equipment from screeded bedding prior to placement of pavers.

3.08 INSTALLING PCC EDGE RESTRAINT

Place PCC edge restraint according to Section 7010.

3.09 INSTALLING INTERLOCKING PERMEABLE PAVER SYSTEM

Place and install pavers according to the pattern specified, the paver manufacturer's published installation specifications, and the following:

A. Where pavers are placed against a curb and gutter or other pavement, installation of an edge course or soldier course is required if the pavement edge is not straight. Trim pavers as required to compensate for deviations in the adjacent pavement edge. Do not cut pavers to less than 1/3 their original size.

B. Install PCC edge restraint.

C. Place chalk lines on the bedding course to maintain straight joint lines.

D. After pavers have been installed on the bedding course, and all cut pavers have been inserted to provide a full and complete surface, inspect pavers for damaged units and irregular joint lines. Remove and replace pavers as required.

E. After inspection and replacement of damaged pavers, fill joint openings with bedding stone. Sweep the surface clean.

F. Compact pavement surface with two passes of a vibratory plate compactor capable of at least 5,000 pounds centrifugal compaction force. Do not operate plate compactor within 6 feet of an unrestrained pavement edge.

G. Re-inspect pavers, and remove and replace all damaged units. Refill joint openings completely. Sweep pavers clean. Complete compaction with two passes of the plate compactor.

H. Refill all paver joint openings with bedding aggregate 6 months after installation.

3.10 QUALITY CONTROL

A. Ensure horizontal alignment of the PCC edge restraint is within 1/2 inch of design alignment.

B. Ensure final surface is within 3/8 inch when tested with a 10 foot straightedge.

C. Ensure no greater than 1/8 inch difference in height between adjacent pavers.

D. Maintain surface elevation within 1/4 inch above adjacent drainage inlets, gutters, and other appurtenances.

3.11 PROTECTION OF PAVEMENT

A. Protect pavement from heavy construction traffic, including trucks, skid steers, loaders, and all tracked vehicles.

B. Provide barriers and protection as necessary.

3.11 PROTECTION OF PAVEMENT (Continued)

C. Do not place soil, mulch, sand, aggregate, or stockpile other materials on the pavement surface that may contaminate the pavement and plug the porous surface.

D. Remove by vacuuming any base and bedding materials contaminated with sediment and replace with clean materials at no cost to the contracting authority.

END OF SECTION

Refer to the contract documents for dimensions, grades, and additional requirements for permeable interlocking pavers and associated improvements.

1. Permeable interlocking pavers as specified in the contract documents.
2. 2 inch minimum permeable pavement bedding aggregate to accomodate imperfections in the permeable pavement filter aggregate layer.
3. Permeable pavement storage aggregate thickness as specified in the contract documents.
4. When underdrain collectors and/or laterals are specified, install to the line and grade specified in the contract documents. Place permeable pavement filter aggregate to springline of pipe.
5. Place 4 inches of filter aggregate under curb and gutter section. Extend to 12 inches beyond the back of curb. Extend engineering fabric under aggregate.
6. Install paver edge restraint system along unrestrained edges.

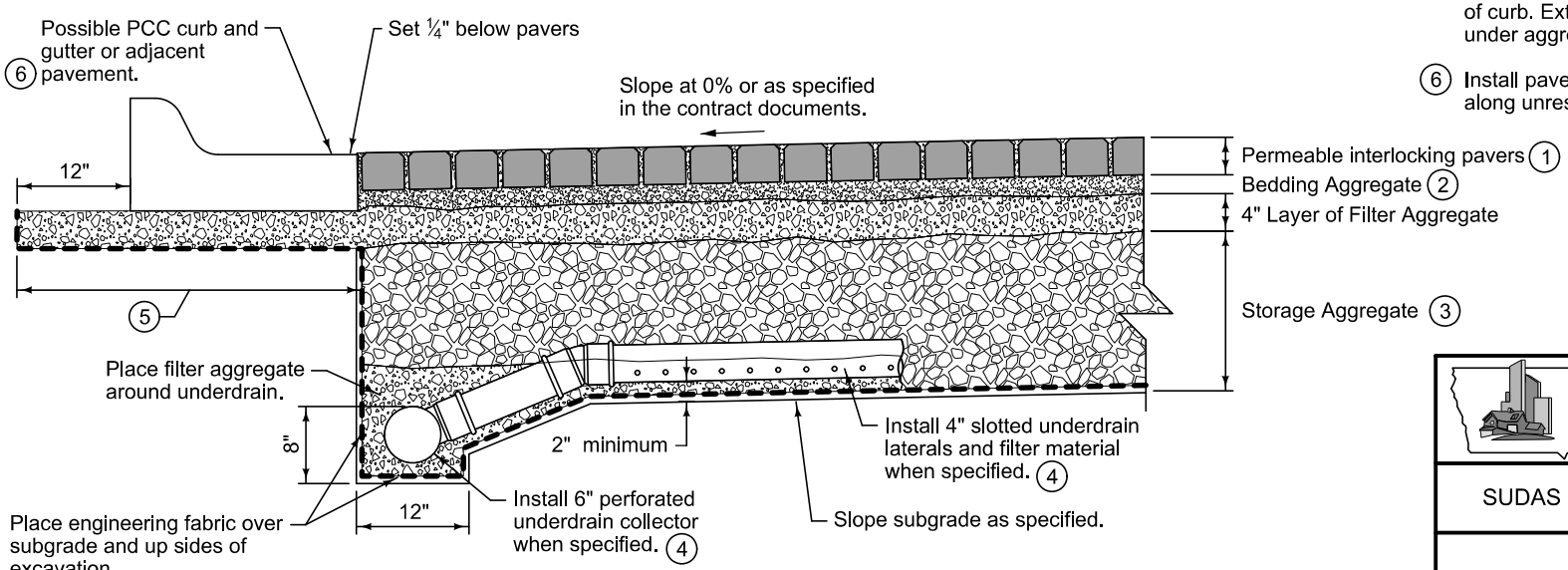

FIGURE 7080.101 | SHEET 1 OF 1

SUDAS

REVISION	
New	10-20-15

7080.101

SHEET 1 of 1

SUDAS Standard Specifications

PERMEABLE INTERLOCKING PAVERS

Refer to the contract documents for dimensions, grades, and additional requirements for permeable interlocking pavers and associated improvements.

1. Permeable interlocking pavers as specified in the contract documents.
2. 2 inch minimum permeable pavement bedding aggregate to accomodate imperfections in the permeable pavement filter aggregate layer.
3. Permeable pavement storage aggregate thickness as specified in the contract documents.
4. Set PCC edge restraint 1/4 inch below pavers.

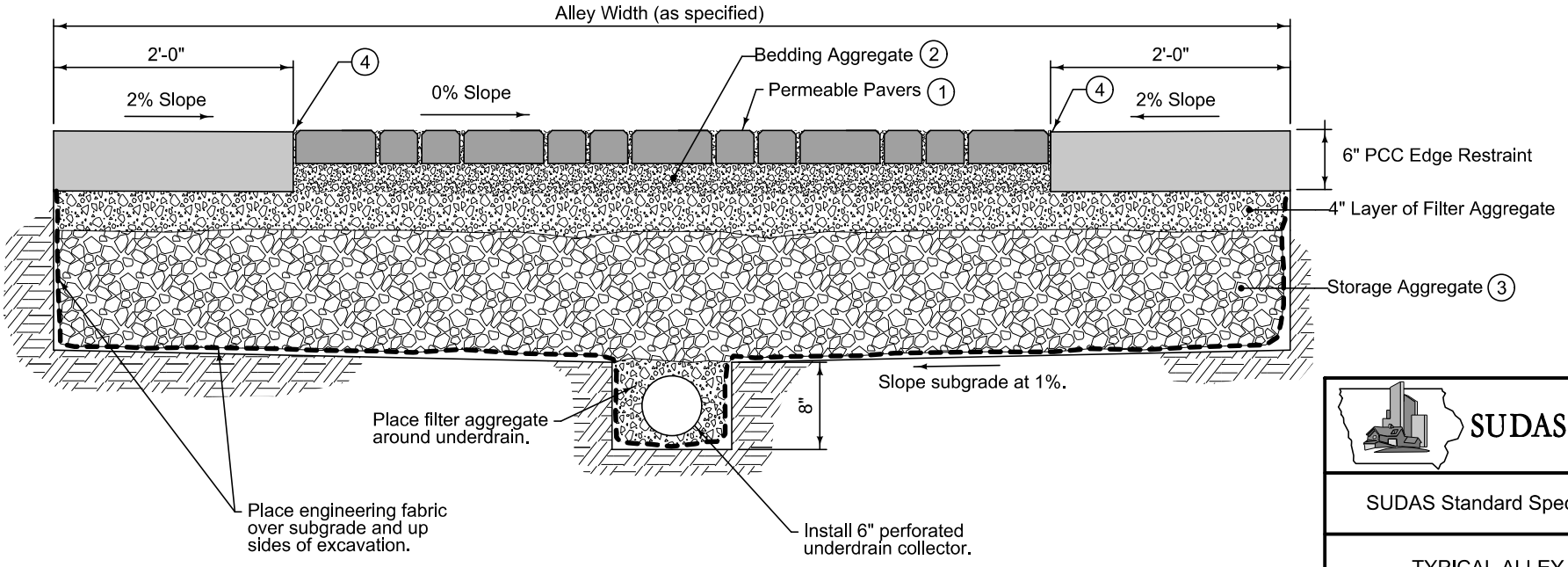

FIGURE 7080.102

SHEET 1 OF 1

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SUDAS Standard Specifications

TYPICAL ALLEY WITH PERMEABLE PAVERS