

SUDAS Revision Submittal Form

Status Date: As of 5/7/2021 Topic: Crack and seat
Manual: Design Manual Location: Section 5J-1, C
Specifications Section 7092 (new)

Requested Revision:

Section 5J-1 - Overlays

C. HMA Asphalt Overlays

2. **Crack and Seat with HMA Asphalt Overlay:** Cracking and seating with HMA asphalt overlay is considered a major rehabilitation. Crack and seat will typically reduce the occurrence and severity of reflection cracks in the asphalt surface overlay. The crack and seat process is best used on structurally good PCC pavements with limited panel movement. Installing a subdrain well in advance, up to a year prior, of the crack and seating operation will enhance the quality of the crack and seat operation because the more stable subgrade/subbase will assist in efficient pavement cracking. The subdrain will also provide improved subgrade support for the new pavement structure. The existing concrete is broken with a segmental type breaker to produce hairline cracks at approximately 1 1/2 to 3 to 4 foot spacing. The cracked slabs are then seated by use of a weighted roller to reestablish support between the underlying subbase or subgrade and the existing pavement. The roller is usually a rubber-tired piece of equipment with a minimum gross load of 30 tons. Some streets may not have adequate strength to support a heavy roller. The engineer may designate the use of a lighter roller.

In urban areas, a full depth saw cut along the curbline and also around manholes and utility fixtures, such as water valves, is required prior to conducting crack and seat operations. In addition, a guillotine style breaker should be used with caution where structures are near the roadway. Impacts from the large single breaker can vibrate structures and cause concerns for property and utility owners. A segmental breaker results in lower magnitude vibrations and is recommended for crack and seat projects in urban areas. Informing the public about the project and especially the project schedule will help avoid potential problems. Assuring complete transverse cracking is critical with a segmental breaker. The breaking pattern with the segmental breaker must be varied to avoid developing continuous longitudinal cracks. Crack and seat activities typically produce earth-borne vibrations that are below the level necessary to cause damage, unless the source of the vibrations is very close (< 25 feet). Therefore, these lower intensity vibrations can be considered annoying and may cause people to believe that the building is being damaged, when in reality it is not being damaged. However, there are certain conditions such as close proximity to historical buildings or buildings that house historical or antique artifacts that may require special attention to avoid damaging the structure or the artifacts in the structure. The following steps should be taken as the project design is progressing:

- a. Identify potential problem areas along the project including evaluating the potential for damage to underground utilities.
 - b. Determine what conditions exist and check for existing damage. Deteriorated sewer systems and aging water mains could be damaged by the vibrations.
 - c. If allowed by the property owners, take photos of existing conditions prior to construction commencing to establish a baseline.
 - d. If necessary, provide for monitoring and recording vibrations during the project construction.
 - e. Be ready to investigate concerns and respond to them.
3. **Modified Rubblization with Asphalt Overlay:** Modified rubblization blends the principles of crack and seat and full rubblization by cracking the roadway to approximately 12 inch to 18 inch pieces. Installation of a longitudinal subdrain prior to initiating the modified rubblization process is strongly recommended. Subdrains will enhance the success of the project because the more stable

subgrade/subbase will assist in efficient pavement breaking and provide improved subgrade support for the new pavement structure. This process can be used when softer subgrades prevent use of full rubblization. Seating is accomplished with either a 35 ton rubber tired roller or a 10 ton vibratory roller. A 2 inch to 3 inch rock interlayer of 3/4 inch roadstone may be placed on the rubblized concrete and rolled prior to placing the asphalt overlay if surface variations remain after initially rolling. The use of the interlayer provides a more stable work platform and enhances the overlay's ability to stop reflective cracking.

Like rubblization, modified rubblization is not recommended for use in urban areas due to the potential for damage to underground utilities, adjacent properties, and structures.

- 34. Rubblizing with HMA Asphalt Overlay:** Rubblizing of an existing concrete pavement and placement of an HMA asphalt overlay is an optional major rehabilitation method. This process includes breaking up the concrete pavement into small pieces and rolling it into place to produce a sound base, which prevents reflective cracking in the asphalt surface. Rubblizing a concrete pavement successfully is predicated on having a stable subgrade so the concrete material does not intermix with the subgrade. Installation of a longitudinal subdrain prior to initiating the rubblization process is recommended and will enhance the success of the project because the drier, more stable subgrade/subbase will assist in efficient pavement cracking. Rubblization has limited uses in areas of soft subgrades, which are often encountered in Iowa. If soft subgrades are encountered during a project, complete failure of the rubblization can result. In urban areas, care must be taken not to damage utilities with minimal cover, as well as the associate utility structures. Rubblization is generally not advised for urban roads. The final surface is HMA an asphalt overlay.

It may be necessary to work with the rubblizing contractor to establish a 100 to 200 foot test section as a means of determining the effectiveness of the rubblization. The goal is to break the existing PCC pavement into pieces with a nominal maximum size of 4 6 inches. In certain circumstances, the designer may allow larger pieces but they should not exceed 12 inches in size and should only be allowed for a limited area. It may be appropriate to require the contractor to excavate a test pit (4 feet by 4 feet) to assure that the PCC has been fractured throughout its entire thickness and that the bond between any steel and the concrete has been broken.

The displacement of the rubblized pieces into the subgrade should be minimized. A steel drum vibratory roller having a minimum gross weight of 10 tons is required to compact the rubblized pavement.

In areas of soft subgrade, it may be necessary to remove the pavement and patch with 2 inch limestone chokestone. Geogrid may be used under the patch rock to add additional support.

A 2 inch to 3 inch rock interlayer of 3/4 inch roadstone may be placed on the rubblized concrete and rolled prior to placing the HMA asphalt overlay if surface variations remain after rolling. The use of the interlayer provides a more stable work platform and enhances the overlay's ability to stop reflective cracking.

See attached for the new Specifications Section

Reason for Revision: Expanded design information and developed new specifications section addressing crack and seat projects in urban areas.

Comments: None.

District: 1 2 3 4 5 6
Initial Comments: None.
Final Comments: None.
Action: Deferred Not Approved Approved

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Initial Comments: None.
Final Comments: None.
Action: Deferred Not Approved Approved

District: 1 2 3 4 5 6
Initial Comments: Comments on the figures - top of the details at the bottom is mislabeled; runout shows a length of 6 feet - typically have longer runouts - 7020.903 - shows runouts based on speed; both bottom details are edge notches; 25 feet preferred. Design - do we include guidance on when to use the interlayer? Concern about vibratory monitoring - is that a contractor responsibility or an agency responsibility? Look at terminology usage of spade vs guillotine breaker. *Note - this has been revised.*
Final Comments: Figure says "HMA" rather than "asphalt". *Note - fixed.*
Action: Deferred Not Approved Approved

District: 1 2 3 4 5 6
Initial Comments: Evaluate utilities before crack and seat (water main breakage).
Final Comments: None.
Action: Deferred Not Approved Approved

District: 1 2 3 4 5 6
Initial Comments: Need to coordinate who's doing the placement of parking signs - contractor or agency. In 3.02, the traffic control plan needs to be in place. Davenport has a very specific traffic control plan for these things. Is there a need for some partial depth patching pre-cracking?
Final Comments: None.
Action: Deferred Not Approved Approved

District: 1 2 3 4 5 6
Initial Comments: None.
Final Comments: Recommendation for depth of utilities or proximity to poles? *Note - no known research covers this topic.*
Action: Deferred Not Approved Approved

District: 1 2 3 4 5 6 **2/24/2021 Webinar**
Comments: Suggested taking photos prior to work to a baseline to know if there's any damage due to this process. *Note - added in C, 2, c above.*

Final District Action Summary: All 6 districts approved; see comments above.

Board of Directors Action: Approved.

CRACK AND SEAT EXISTING PCC PAVEMENT**PART 1 - GENERAL****1.01 SECTION INCLUDES**

Crack and seat of existing PCC pavement prior to overlay.

1.02 DESCRIPTION OF WORK

Full-depth saw cut along curbs and in the area of fixtures; cracking of existing PCC pavement; seating of the cracked pavement. Associated work could include subdrain installation; removal and replacement of curb and gutter; removal of existing asphalt overlay or large partial depth patches; vibration monitoring; installing crack control fabric between the leveling course and surface lifts over all full-depth saw cuts; milling of notches along the curb and at the ends of the project.

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

Notify all nearby affected parties 24 hours in advance that vibration generating activities will begin when the pavement cracking operation is ongoing. Report any specific concerns raised by adjacent parties to the Engineer.

1.08 MEASUREMENT AND PAYMENT**A. Crack and Seat of PCC Pavement:**

1. **Measurement:** Measurement will be in square yards for the area cracked and seated.
2. **Payment:** Payment will be at the unit price per square yard of roadway cracked and seated.
3. **Includes:** Unit price includes, but is not limited to, notifying adjacent properties, providing traffic control and no parking signs; vibration monitoring if specified; cracking and seating of the designated PCC pavement to the specified pattern; watering to verify crack pattern; protecting existing fixtures; cleaning of slab prior to overlay; and final project site cleanup.

1.08 MEASUREMENT AND PAYMENT (Continued)**B. Remove and Replace Curb and Gutter:**

1. **Measurement:** Measurement will be in linear feet along the face of the curb for each type and size of curb and gutter replaced.
2. **Payment:** Payment will be at the unit price per linear foot of curb and gutter removed and replaced.
3. **Includes:** Unit price include, but is not limited to full depth sawing; removing and disposing removed materials; furnishing and compacting subgrade material to bring to the proper elevation; all form work required; concrete; placing new curb and gutter; and final cleanup and backfill placement behind the new curb.

C. Full Depth Saw Cut:

1. **Measurement:** Measurement will be in linear feet for the length of full depth saw cut.
2. **Payment:** Payment will be made at the unit price per linear foot of full depth saw cut.
3. **Includes:** Unit price includes, but is not limited to, providing a concrete saw or other cutting device that will result in a full depth vertical edge and severing all tie or reinforcing steel.

D. Milling: Comply with Section 7040.**E. Subdrains:** Comply with Section 4040.**F. Fixture Adjustment:** Comply with Section 6010 for adjustment of manholes (major and minor) and intakes (minor) and Section 5020 for adjustment of water valves.**G. Intake Adjustment, Major:**

1. **Measurement:** Each existing intake adjusted to grade by removal of the boxout including any grate assembly and re-setting the grate or adjusting the open throat elevation of the intake will be counted.
2. **Payment:** Payment will be made at the unit price for each major intake adjustment.
3. **Includes:** Unit price includes, but is not limited to, sawing all three sides of the boxout; removing and replacing the boxout; removing and re-setting the grate assembly or if specified, furnishing and installing a new grate assembly; removing existing open throat intake top; adjusting intake walls; re-setting existing intake top or if specified, furnishing and installing new intake top; and furnishing, placing, and compacting backfill.

H. Joint Control Fabric:

1. **Measurement:** Measurement will be in linear feet of 12 inch wide joint control fabric placed.
2. **Payment:** Payment will be made at the unit price per linear foot of joint control fabric placed.
3. **Includes:** Unit price includes, but is not limited to, cleaning and preparing the surface, furnishing, placing, and adhering joint control fabric prior to placing surface lift.

1.08 MEASUREMENT AND PAYMENT (Continued)**I. Partial Depth Patch Removal:**

1. **Measurement:** Measurement will be in square feet of partial depth patch removed.
2. **Payment:** Payment will be at the unit price per square feet of partial depth patches removed.
3. **Includes:** Unit price includes but is not limited to provide equipment and removing all designated partial depth patches down to the base PCC, cleaning of the former patch area; and disposal of the patch material.

J. Rock Interlayer:

1. **Measurement:** Measurement will be in tons of rock interlayer.
2. **Payment:** Payment will be at the unit price per ton of rock interlayer.
3. **Includes:** Includes but is not limited to furnishing and placing the rock interlayer to the thickness specified.

PART 2 - PRODUCTS**2.01 MATERIALS**

- A. Joint Control Fabric:** Supply a polypropylene, needle punched, non-woven fabric coated with asphalt adhesive on one side and asphalt tack coat on the other meeting the following average roll values.

Property	Test Method	Unit	Minimum Value
Strip Tensile Strength	ASTM D882 ¹	lbs/inch	45
Puncture Resistance	ASTM E154	lbs	175
Pliability	ASTM D146 ²	----	No cracks

¹ Use 12 in/min test speed and a 1 inch initial distance between grips

² Use 180° bend on 1/4 inch mandrel at -25°F

- B. Rock Interlayer:** Meet the requirements of Iowa DOT Section 4120 for Class A crushed stone.

PART 3 - EXECUTION**3.01 EQUIPMENT****A. Equipment:**

1. **Cracking Equipment:** Provide a segmental type breaker capable of controlled forward and transverse movement and of fracturing the pavement to the full depth of the slab while maintaining the fractured face interlock of the aggregate. Do not use equipment that punches holes in the pavement or results in excessive spalling.
2. **Seating Equipment:** Use a pneumatic rubber tire roller with a minimum weight of 30 tons.

3.02 PREPARATION

Prior to initiating the crack and seat process, undertake the following tasks:

- A. Identify and protect all affected utilities.
- B. Set up all traffic control including parking restrictions.
- C. Install subdrains if specified in the contract documents.
- D. Remove all asphalt overlays.
- E. Notify adjacent property owners.

3.03 FULL DEPTH SAW CUTS

Prior to initiating the crack and seat operation:

- A. Complete full depth saw cuts along the curb line as shown the contract documents.
- B. Complete full depth saw cuts at the edges of all manhole and intake boxouts. If manhole boxouts are not present, saw a 5 feet by 5 feet diamond shape around the manhole casting.
- C. At water valves and other fixtures, complete a full depth saw cut in a square shape a minimum of 6 inches from the edge of the fixture.

3.04 PARTIAL DEPTH PATCHES

Remove partial depth patches that are not solid or sound and larger than 4 square feet according to Section 7040.

3.05 INTAKE ADJUSTMENT, MAJOR

- A. **Grate Type:** Saw and remove existing boxout and intake grate assembly. If minor adjustments using adjustment rings is not possible, rebuild intake walls according to Section 6010 to the proper elevation and set new grate assembly. Existing intake grate assembly may be used when specified in the contract documents. Replace boxout to meet new elevations.
- B. **Open Throat Type:** Saw and remove existing boxout and intake top. Adjust intake walls according to Section 6010 to meet new elevations and install new intake top. Existing top may be reused when specified in the contract documents. Replace boxout to meet new elevations.

3.06 TEST SECTION

At the start of cracking operations, the Engineer will designate a 100 foot test section. Utilize varying energy and crack spacing until a satisfactory spacing is established. Furnish and apply water to the test section to allow visual verification of the cracking pattern. Apply water to the cracked sections at least once per day or when pavement depth changes to verify crack pattern is being maintained. If conditions change, the Engineer may order the development of a new test section.

3.07 CRACKING

- A. Crack the existing pavement to produce full depth transverse hairline cracks with a spacing of 18 to 36 inches.
- B. Do not induce cracking within 2 feet of an existing transverse joint or crack.
- C. Prevent the formation of continuous longitudinal cracks.
- D. Do not destabilize the subgrade.
- E. Do not damage utility fixtures.

3.08 SEATING

- A. Seat the cracked pavement with a minimum of two passes of the 30 ton pneumatic roller. If two passes are not sufficient, continue rolling until the Engineer determines seating is adequate.
- B. Complete seating of all areas cracked each work day.

3.09 MILLING

If specified complete notch and runout milling in accordance with Figure 7021.101.

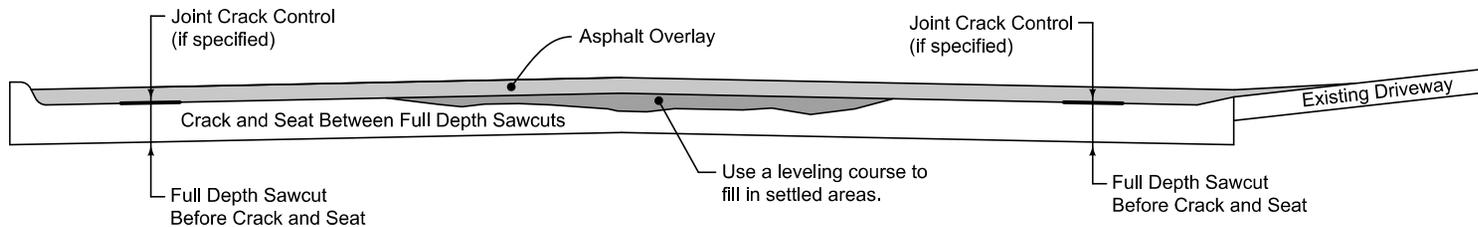
3.10 REMOVAL OF MATERIAL

Following the crack and seat process remove dirt, debris, and loose materials prior to opening the roadway to local traffic and again prior to placing the leveling course and surface lift.

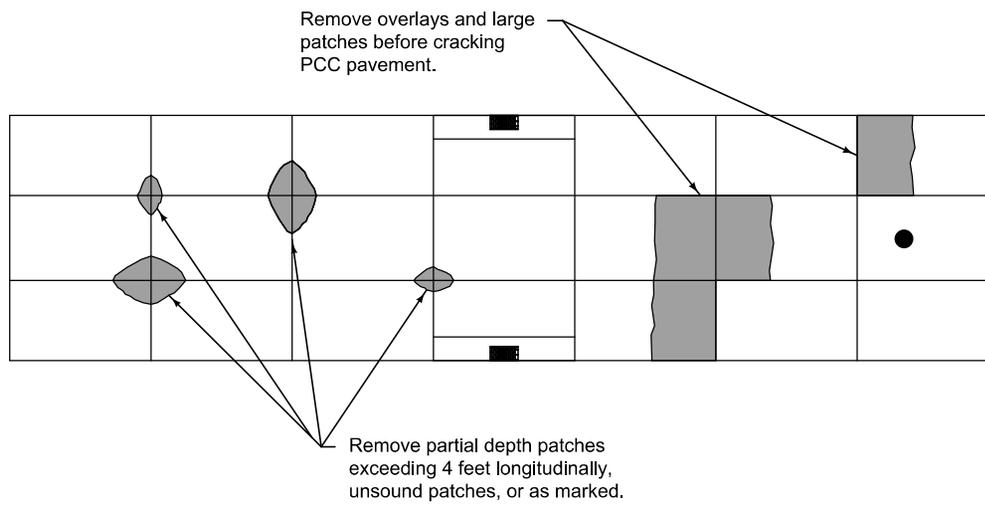
3.11 JOINT CONTROL FABRIC

Install joint control fabric over full depth saw cuts prior to final overlay lift according to the manufacturer's recommendations.

END OF SECTION



OVERLAY DETAIL



REMOVAL OF EXISTING ASPHALT

	<table border="1"> <tr> <th colspan="2">REVISION</th> </tr> <tr> <td>New</td> <td>2022 Edition</td> </tr> </table>	REVISION		New	2022 Edition
	REVISION				
	New	2022 Edition			
<p>SUDAS</p> <p>7092.101</p> <p>SHEET 1 of 1</p>					
<p>SUDAS Standard Specifications</p>					
<p>OVERLAY WITH CRACK AND SEAT</p>					