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EFFECTIVE 5/28/96

New York State Department of Transportation
ENGINEERING INSTRUCTION

EI 96-029

Title: **CRACKING AND SEATING EXISTING PORTLAND CEMENT CONCRETE PAVEMENT**

Distribution:
- ☐ Manufacturers (18)
- ☒ Main Office (30)
- ☐ Local Govt. (31)
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Approved:

P. L. Clark, Deputy Chief Engineer, Design Division — Date 5/8/96

This Engineering Instruction (EI), along with EI 96-030, supersedes EIs 90-33 and 90-09.

EFFECTIVE DATE:

The specifications transmitted by this EI are effective beginning with August 15, 1996 lettings. They will be Main Office inserts into contract documents.

TRANSMITTED SPECIFICATIONS:

1. Special Specification 18502.6596, "Cracking and Seating Existing PCC Pavement", and
2. Special Specification 18502.6596 M, "Cracking and Seating Existing PCC Pavement".

AFFECTED PAY ITEMS: Disapprove the following pay items:

1. 18203.9904, Cracking and Seating Existing Concrete Pavement, and
2. 08203.9904, Cracking and Seating Existing Concrete Pavement (Modified).

DESIGN CONSIDERATIONS:

1. The following should be considered when selecting Cracking and Seating for a project:

   - Cracking and Seating is appropriate when the majority of thermal movement within the PCC pavement occurs at transverse slab cracks, rather than at transverse joints. This is generally the case when 50 percent or more of the pavement slabs have open cracks. If less than 25 percent of the pavement slabs have open cracks, these items are generally not appropriate. For cracking between 25 and 50 percent, additional techniques, such as a combination of partial- and full-depth sawcuts, redundant sawing and sealing of the hot-mix asphalt (HMA) overlay, or post-construction crack sealing may be needed.

   - If the existing pavement has frequent and extensive transverse joint spalls requiring full lane width milling, consider rubblizing the pavement or including additional full-depth sawcuts to provide pressure relief within the pavement. In previous cracking and seating projects, blowups occurred at transverse joints that were milled full lane width because the thinner PCC pavement section (that resulted from milling) was not capable of withstanding forces that developed when slabs expanded during the cracking operation.

Removing badly cracked slabs and cleaning joints and cracks also provide pressure relief within the pavement. If the existing pavement has enough cracking to warrant Cracking and Seating and these items are performed, enough pressure relief should exist to prevent blowups without additional sawcuts.

- The presence of utilities and drainage structures may preclude the use of cracking and seating.

Consult the Regional Materials Engineer to determine the appropriateness of Cracking and Seating, as well as the need for other techniques to address pressure relief and reflection crack control.

2. Include pay items within contract documents for the following:

- Milling existing asphalt overlays. Complete this work in accordance with §490, Cold Milling.
- Installing underdrains. Consult the Regional Geotechnical Engineer for appropriate pay items and locations. Drains must have a positive outlet.
- Cleaning joints and cracks greater than 10 mm (⅜ inches) wide. Include a note on the plans effectively stating the following: "Clean joints and cracks greater than 10 mm (⅜ inches) wide in accordance with Item 18633.07, Cleaning and Filling Joints and Cracks. Leave cleaned joints and cracks unfilled during cracking and seating. Re-clean and fill joints and cracks greater than 10 mm (⅜ inches) wide in accordance with 18633.07 as close to paving as practical."
- Sawcutting concrete pavement.
- Excavating the pavement and repairing the subbase/subgrade. Consult the Regional Materials and Geotechnical Engineers to determine the need for this work.
- Repairing spalls. Use a pay item such as Item 18502.4467, Repair of Spalled Areas, Joints, and/or Cracks in PCC Pavement. Consult the Regional Materials Engineer to determine the need for this item.
- Cleaning existing pavement and/or shoulders, Item 633.0202.
- Tack coat, Item 407.0101.

3. Include details for the following operations:

- Shimming faults and ruts. Include a note effectively stating "Shim any fault greater than 13 mm (½ inch) before paving. Shim 600 mm (2 feet) longitudinally for every 6 mm (¼ inch) of fault."
- Reconstructing shoulders. Consult the Regional Geotechnical Engineer to determine course types and thicknesses.

Include HMA quantities for these operations in their respective items.

CONSTRUCTION CONSIDERATIONS:

1. Underdrains must be installed and functioning at least 2 weeks before cracking begins. To effectively crack the pavement, the subbase must be as well-drained as possible. Ensure drains are functional by providing a positive outlet.

2. Sawcutting over culverts and utilities at regular 3 m (10 foot) intervals is not necessary if there are open cracks in the pavement above. In areas above culverts and utilities that can not be cracked and seated, space sawcuts such that either a sawcut or open crack occurs at 3 m (10 foot) intervals.

3. The joint and crack cleaning sequence has been changed to the following:

- Clean inadequately sealed joints and cracks,
- Crack and seat the pavement,
- Re-clean (blow out) joints and cracks, and
- Fill joints and cracks.

Re-cleaning and filling should be as close to paving as practical.

The cracking operation tends to expand slabs. When cracked slabs expand into uncleaned joints and cracks, it becomes very difficult to remove debris and sealant material. Furthermore, clean joints and cracks provide better pressure relief for the cracked slabs to expand, allowing the induced cracks (from the cracking operation) to more effectively redistribute thermal stresses and strains. Re-cleaning is necessary to remove debris that accumulates during cracking, seating, or other operation. Adequately sealed joints and cracks may be left alone. An adequately sealed joint contains only sealant material and no incompressibles such as pebbles, sand, or debris.

Consult the Regional Materials Engineer to determine whether joints are adequately sealed and what type of fill material should be used. Some regions prefer to use only shim course as filler. In this case, 13 mm (½ inch) or wider joints and cracks should be cleaned and filled. Joints and cracks 10 - 13 mm (⅜ - ½ inches) wide should be cleaned and left unfilled.

4. The test section should be approximately 300 m (1000 feet) long. The Engineer instructs the Contractor to crack a portion of the test section, say 75 m (250 feet), using the Contractor-recommended drop height and strike spacing. Generally, higher drop heights result in a more effective cracking operation, but also produce more surface spalling. In this portion of the test section, instruct the Contractor to raise the drop height such that occasional spalls are produced where induced cracks intersect. These spalls will typically be less than 50 mm (2 inches) deep and less than 0.05 m^2 (0.5 square foot) in area. The drop height that produces occasional spalls is generally the drop height used throughout the project.

When an acceptable drop height is determined, the Contractor should continue cracking the next 75 m (250 foot) portion of the test section. When that portion is complete, instruct the Contractor to stop cracking and wet a small length (20 m, 60 feet) of the cracked lane. The Engineer should verify that the cracking operation has produced a network of cracks that is full lane width. As the pavement surface dries, the crack network will become readily visible. If the network does not reach the pavement edges, instruct the Contractor to decrease the strike spacing or make multiple parallel passes. Continue cracking and wetting until a full-width pattern is obtained. If multiple parallel passes at the same drop height increases the amount of spalling, a reduced drop height would need to be determined.

When a full-width pattern has been obtained, instruct the Contractor to core one of the induced cracks to verify cracking is full-depth. Take cores in the lane being cracked and as far away from the strike as possible. As the core dries, the crack will become readily visible. If the crack is not full-depth, instruct the Contractor to decrease the strike spacing or make multiple passes as described above.

This specification allows the Engineer to re-establish test sections if adequate crack patterns are not being consistently obtained. We recommend continuous inspection of the cracking operation to ensure the Contractor is using as great a drop height as possible. The Engineer may require increased drop

heights without re-establishing a test section. However, if the Engineer decides to lower the drop height below the original level to reduce spalling, a test section should be re-established to verify that the reduced drop height produces an acceptable pattern. Consult the Regional Materials Engineer regarding acceptable crack patterns.

5. Spall repairs must be made to the seated pavement to provide a stable paving platform. Spalls may result from the cracking operation, or they may have existed before cracking. Loose material must be removed and the resulting depressions filled with HMA and compacted before paving. The intent of a spall repair item is to create depressions with sound concrete faces and edges capable of holding an asphalt patch. It is desirable to blast clean and tack coat spall faces before placing HMA.

   Spalls less than 25 mm (1 inch) deep may be paved over with no pre-patching. Spalls 25 - 50 mm (1 - 2 inches) deep should be pre-patched prior to paving. Deeper spalls should be repaired using Item 18502.4467, Repair of Spalled Areas, Joints, and/or Cracks in PCC Pavement. It is not always necessary to remove loose material with a milling machine. Material may be removed by hand, hand tools, or chipping hammers.

   Repairing spalls less than 50 mm (2 inches) deep will be paid for as part of the Cracking and Seating specification. Deeper spalls should be paid for under Item 18502.4467. Consult the Regional Materials Engineer regarding spall repair requirements, including the use of Item 18502.4467.

6. This specification revision includes provisions to remove areas of poor support, repair the subbase and/or subgrade, and replace PCC with full-depth HMA after seating. If not removed and repaired, areas of poor support will deteriorate at a faster rate than well-supported areas. Removal areas typically consist of slabs broken into independently acting pieces that rock under traffic, blowups that have been patched partial-depth or have deteriorated patches, or areas that excessively and permanently deform during seating. Consult the Regional Geotechnical Engineer to determine excavation depth and subbase\subgrade replacement items. Ensure that HMA is compacted by mechanical tampers in areas inaccessible to rollers.

7. The maximum longitudinal spacing between strikes is now 600 mm (2 feet).

CONTACT:

Questions concerning these specifications should be directed to Bill Cuerdon of the Materials Bureau's Field Engineering I office at (518) 457-5956.

ITEM 18502.6596 - CRACKING AND SEATING EXISTING PCC PAVEMENT

DESCRIPTION: The Contractor shall crack and seat an existing portland cement concrete (PCC) pavement, including PCC shoulders, within the limits shown on the plans (or within revised limits established by the Engineer in writing) before placing a Hot-Mix Asphalt (HMA) overlay.

EQUIPMENT REQUIREMENTS:

Cracking Equipment: A self-propelled, self-contained unit equipped with:

- A 12,000 pound guillotine-type drop weight having a striking surface 65 inches wide by 4 inches thick. Weight and dimensions are minimums.
- An adjustable drop height.
- A readily visible and accurate measure or rule that allows the inspector to observe the drop height.
- A skirt or shield at the pavement level that surrounds the strike area and protects traffic from flying debris.

Alternate equipment may be submitted to the Director, Materials Bureau, for approval consideration. Such a submission is not cause for a time extension as provided in §108-04.

Seating equipment: A roller conforming to the requirements of §203-3.13B with a minimum gross weight of 50 tons.

CONSTRUCTION DETAILS: All Construction Details shall be performed by the Contractor unless stated otherwise.

Preparation: Before cracking, perform the following as indicated on contract plans or as ordered by the Engineer:

- Remove existing HMA overlays or overlay patches (including those on shoulders) having areas greater than 12 square yards.
- Install functional underdrains a minimum of 2 weeks before cracking begins.
- Identify locations of existing drainage facilities beneath the pavement. Do not crack within 10 feet of culverts and storm drains having less than 10 feet of cover. If such a culvert traverses the pavement, and the slab above it contains no existing open cracks, make a full-depth; full-width transverse sawcut; ⅜ inches wide maximum; in the PCC slab above the culvert centerline. If the culvert is skewed relative to the pavement centerline, make multiple transverse cuts such that either a sawcut or open crack occurs at 10 foot increments where cracking is not allowed. There are no restrictions regarding cracking adjacent to pavement underdrains.
- Consult utility companies and municipalities to determine cracking limits near their facilities and abide by their recommendation. If the utility company or municipality offers no recommendation, do not crack within 20 feet of the utility. If the utility traverses the pavement, and the slab above it contains no existing open cracks, make a full-depth; full-width transverse sawcut; ⅜ inches wide maximum; in the PCC slab above the utility centerline. If the utility is skewed relative to the pavement centerline, make multiple transverse cuts such that either a sawcut or open crack occurs at 10 foot increments where cracking is not allowed.

ITEM 18502.6596 - CRACKING AND SEATING EXISTING PCC PAVEMENT

- Clean cracks and joints greater than ⅜ inches wide in accordance the special specification, Cleaning and Filling Joints and Cracks. Leave these cracks and joints unfilled during cracking and seating.

Test Sections: Select an initial drop height and strike spacing. The maximum strike spacing is 2 feet. The drop height shall be as great as possible while producing minimal spalling at the strike. The Engineer will then designate a test section within the cracking and seating payment limits. Crack the test section normal to the centerline using the initial settings. Wet the pavement surface and retrieve pavement cores when and where directed by the Engineer to ensure induced cracks are full-width and full-depth.

If an acceptable crack pattern results as determined by the Engineer, begin production cracking with the initial drop height and spacing. An acceptable crack pattern consists of a network of full-depth, full-width cracking with minimal surface spalling to the Engineer's satisfaction. If induced cracks are not full-width or full-depth, multiple passes or closer strike spacings will be required as determined by the Engineer. The Engineer may at any time require additional test section(s) be established if the original combination of drop height, strike spacing, and number of passes proves inadequate elsewhere in the project.

Production Cracking: Crack the pavement in the direction of travel unless otherwise approved by the Engineer. Do not strike the pavement within 18 inches of transverse joints to avoid undue joint spalling.

Seating: After cracking, seat the entire cracked pavement with a minimum of 2 roller passes. A "pass" is defined as 1 movement of the roller, travelling parallel to the pavement centerline, over any point of the pavement in either direction. Multiple, parallel roller passes are required to cover the entire cracked pavement width. Complete seating before preparation to paving and within 1 week of cracking.

Preparation to Paving: After seating and before placing the first HMA course, perform the following as indicated on the contract plans or as ordered by the Engineer:

- Remove pavement areas having poor or uneven support, make subbase and/or subgrade repairs, and replace excavated PCC with full-depth HMA. The Engineer will determine, with input from the Regional Geotechnical Engineer, the required excavation depth and replacement materials. Replace excavated PCC with Asphalt Concrete, Type 1 or Type 2 Base Course. Compact HMA in accordance with §401-3.12, Compaction, using a minimum of two lifts of approximately equal thickness. Compact subbase and\or subgrade courses in accordance with §203-3.12, Compaction.

- Remove loose pieces of PCC or asphalt from the pavement surface and repair spalled areas. If removing loose pieces results in a depression less than 1 inch deep to sound concrete, that depression may be swept clean and left unpatched prior to paving. This type of spalling may have been present before cracking or a result of cracking. Sweep clean similar spalls deeper than 1 inch, patch with truing and leveling HMA, and compact. Repair full-depth spalling in accordance with the special specification, Repair of Spalled Areas, Joints, and/or Cracks in PCC Pavement.

- Re-clean and fill cracks and joints ⅜ inch or greater in width. Clean these cracks and joints with a compressed air stream having a minimum gauge pressure of 80 psig (measured at the source) with the cleaning jet held 1 inch above the pavement surface. Fill with Asphalt Filler meeting the requirements of §702, Bituminous Materials, designation 702-0700; or §403, Hot Mix Asphalt Concrete Pavement, as determined by the Engineer.

- Shim faults and ruts.

ITEM 18502.6596 - CRACKING AND SEATING EXISTING PCC PAVEMENT

- Reconstruct shoulders.
- Clean the pavement in accordance with §633-3.01, Cleaning Existing Pavement and/or Shoulders.
- Apply tack coat in accordance with §407, Tack Coat.

Traffic may be maintained on the cracked and seated pavement provided loose material has been removed and spall repairs have been made as described above, or remaining spalls pose no danger to passing vehicles as determined by the Engineer.

Paving: Seat the entire pavement width before placing the first HMA course. Cracking is not allowed in lanes adjacent to paved lanes.

Place the first HMA course within 2 weeks after the completion of the seating operation. Seasonal limitations in §401-3.01, Weather and Seasonal Limitations, apply. Place a minimum HMA thickness of 3½ inches over all cracked and seated areas before paving ceases for the winter.

METHOD OF MEASUREMENT:

The Engineer will compute the number of square yards from the payment lines shown on the plans or from revised payment limits established in writing before performing the work.

BASIS OF PAYMENT:

In the unit price bid per square yard, include the costs of furnishing all labor, materials, and equipment necessary to crack and seat the existing PCC pavement and remove loose surface material.

The following will be paid for under their respective items: Maintenance and protection of traffic, HMA removal, underdrain, sawcutting PCC pavement, full-depth pavement removal, subbase and\or subgrade repairs, cleaning and filling joints and cracks, repairing spalls, shim, constructing shoulders, cleaning the pavement prior to HMA placement, tack coat, and HMA courses.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
18502.6596	Cracking and Seating Existing PCC Pavement	Square Yard

ITEM 18502.6596 M - CRACKING AND SEATING EXISTING PCC PAVEMENT

DESCRIPTION: The Contractor shall crack and seat an existing portland cement concrete (PCC) pavement, including PCC shoulders, within the limits shown on the plans (or within revised limits established by the Engineer in writing) before placing a Hot-Mix Asphalt (HMA) overlay.

EQUIPMENT REQUIREMENTS:

Cracking Equipment: A self-propelled, self-contained unit equipped with:

- A 5.4 Mg (Metric Ton) guillotine-type drop weight having a striking surface 1.65 m wide by 100 mm thick. Weight and dimensions are minimums.
- An adjustable drop height.
- A readily visible and accurate measure or rule that allows the inspector to observe the drop height.
- A skirt or shield at the pavement level that surrounds the strike area and protects traffic from flying debris.

Alternate equipment may be submitted to the Director, Materials Bureau, for approval consideration. Such a submission is not cause for a time extension as provided in §108-04.

Seating equipment: A roller conforming to the requirements of §203-3.13B with a minimum mass of 45 Mg (Metric Ton).

CONSTRUCTION DETAILS: All Construction Details shall be performed by the Contractor unless stated otherwise.

Preparation: Before cracking, perform the following as indicated on contract plans or as ordered by the Engineer:

- Remove existing HMA overlays or overlay patches (including those on shoulders) having areas greater than 10 m^2.
- Install functional underdrains a minimum of 2 weeks before cracking begins.
- Identify locations of existing drainage facilities beneath the pavement. Do not crack within 3 m of culverts and storm drains having less than 3 m of cover. If such a culvert traverses the pavement, and the slab above it contains no existing open cracks, make a full-depth; full-width transverse sawcut; 10 mm wide maximum; in the PCC slab above the culvert centerline. If the culvert is skewed relative to the pavement centerline, make multiple transverse cuts such that either a sawcut or open crack occurs at 3 m increments where cracking is not allowed. There are no restrictions regarding cracking adjacent to pavement underdrains.
- Consult utility companies and municipalities to determine cracking limits near their facilities and abide by their recommendation. If the utility company or municipality offers no recommendation, do not crack within 6 m of the utility. If the utility traverses the pavement, and the slab above it contains no existing open cracks, make a full-depth; full-width transverse sawcut; 10 mm wide maximum; in the PCC slab above the utility centerline. If the utility is skewed relative to the pavement centerline, make multiple transverse cuts such that either a sawcut or open crack occurs at 3 m increments where cracking is not allowed.

ITEM 18502.6596 M - CRACKING AND SEATING EXISTING PCC PAVEMENT

- Clean cracks and joints greater than 10 mm wide in accordance the special specification, Cleaning and Filling Joints and Cracks. Leave these cracks and joints unfilled during cracking and seating.

Test Sections: Select an initial drop height and strike spacing. The maximum strike spacing is 600 mm. The drop height shall be as great as possible while producing minimal spalling at the strike. The Engineer will then designate a test section within the cracking and seating payment limits. Crack the test section normal to the centerline using the initial settings. Wet the pavement surface and retrieve pavement cores when and where directed by the Engineer to ensure induced cracks are full-width and full-depth.

If an acceptable crack pattern results as determined by the Engineer, begin production cracking with the initial drop height and spacing. An acceptable crack pattern consists of a network of full-depth, full-width cracking with minimal surface spalling to the Engineer's satisfaction. If induced cracks are not full-width or full-depth, multiple passes or closer strike spacings will be required as determined by the Engineer. The Engineer may at any time require additional test section(s) be established if the original combination of drop height, strike spacing, and number of passes proves inadequate elsewhere in the project.

Production Cracking: Crack the pavement in the direction of travel unless otherwise approved by the Engineer. Do not strike the pavement within 450 mm of transverse joints to avoid undue joint spalling.

Seating: After cracking, seat the entire cracked pavement with a minimum of 2 roller passes. A "pass" is defined as 1 movement of the roller, travelling parallel to the pavement centerline, over any point of the pavement in either direction. Multiple, parallel roller passes are required to cover the entire cracked pavement width. Complete seating before preparation to paving and within 1 week of cracking.

Preparation to Paving: After seating and before placing the first HMA course, perform the following as indicated on the contract plans or as ordered by the Engineer:

- Remove pavement areas having poor or uneven support, make subbase and/or subgrade repairs, and replace excavated PCC with full-depth HMA. The Engineer will determine, with input from the Regional Geotechnical Engineer, the required excavation depth and replacement materials. Replace excavated PCC with Asphalt Concrete, Type 1 or Type 2 Base Course. Compact HMA in accordance with §401-3.12, Compaction, using a minimum of two lifts of approximately equal thickness. Compact subbase and\or subgrade courses in accordance with §203-3.12, Compaction.

- Remove loose pieces of PCC or asphalt from the pavement surface and repair spalled areas. If removing loose pieces results in a depression less than 25 mm deep to sound concrete, that depression may be swept clean and left unpatched prior to paving. This type of spalling may have been present before cracking or a result of cracking. Sweep clean similar spalls deeper than 25 mm, patch with truing and leveling HMA, and compact. Repair full-depth spalling in accordance with the special specification, Repair of Spalled Areas, Joints, and/or Cracks in PCC Pavement.

- Re-clean and fill cracks and joints 10 mm or greater in width. Clean these cracks and joints with a compressed air stream having a minimum gauge pressure of 550 kPa (measured at the source) with the cleaning jet held 25 mm above the pavement surface. Fill with Asphalt Filler meeting the requirements of §702, Bituminous Materials, designation 702-0700; or §403, Hot Mix Asphalt Concrete Pavement, as determined by the Engineer.

ITEM 18502.6596 M - CRACKING AND SEATING EXISTING PCC PAVEMENT

- Shim faults and ruts.
- Reconstruct shoulders.
- Clean the pavement in accordance with §633-3.01, Cleaning Existing Pavement and/or Shoulders.
- Apply tack coat in accordance with §407, Tack Coat.

Traffic may be maintained on the cracked and seated pavement provided loose material has been removed and spall repairs have been made as described above, or remaining spalls pose no danger to passing vehicles as determined by the Engineer.

Paving: Seat the entire pavement width before placing the first HMA course. Cracking is not allowed in lanes adjacent to paved lanes.

Place the first HMA course within 2 weeks after the completion of the seating operation. Seasonal limitations in §401-3.01, Weather and Seasonal Limitations, apply. Place a minimum HMA thickness of 90 mm over all cracked and seated areas before paving ceases for the winter.

METHOD OF MEASUREMENT:

The Engineer will compute the number of square meters from the payment lines shown on the plans or from revised payment limits established in writing before performing the work.

BASIS OF PAYMENT:

In the unit price bid per square meter, include the costs of furnishing all labor, materials, and equipment necessary to crack and seat the existing PCC pavement and remove loose surface material.

The following will be paid for under their respective items: Maintenance and protection of traffic, HMA removal, underdrain, sawcutting PCC pavement, full-depth pavement removal, subbase and\or subgrade repairs, cleaning and filling joints and cracks, repairing spalls, shim, constructing shoulders, cleaning the pavement prior to HMA placement, tack coat, and HMA courses.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
18502.6596 M	Cracking and Seating Existing PCC Pavement	Square Meter