Illinois Department of Transportation
2300 South Dirksen Parkway / Springfield, Illinois / 62764

Subject:
Rubblizing PCC Pavement and Placing a Bituminous Concrete Overlay

CONSTRUCTION MEMORANDUM NO. 01-40

Effective: **June 1, 2001**

Expires: **Indefinite**

Rubblizing is a rehabilitation process in which the existing portland cement concrete (PCC) pavement is fractured (in-place) into small pieces, and the concrete/steel bond is broken. The pavement is compacted to create a uniform base. The purpose of this memorandum is to advise the Resident on the equipment, construction sequence, and other considerations involved in rubblizing a PCC pavement and placing a bituminous concrete overlay.

Equipment

Three types of PCC pavement breakers can be used to rubblize the pavement: a multi-head breaker, and two versions of a resonant breaker. The multi-head breaker uses a series of drop hammers to impact the pavement in a specific pattern. Pavement breaking occurs at the back of the machine. Full-lane coverage can be achieved in a single pass.

The resonant breakers produce a high-frequency, low amplitude striking force to a shoe that breaks the pavement but does not damage the underlying layers. The 27 metric ton (30+ ton) resonant breaker requires up to 20 passes per 3.6 m (12 ft) lane to cover the pavement area. The resonant breaker in Rubblization Method II utilizes a high flotation tire, with a tire pressure under 4l5 MPa (60 psi) for use with softer subgrades.

Choice of rubblizing equipment is project dependent. The project special provisions will indicate the Rubblization Method (I, II, III or IV- per the Special Provision for Rubblizing PCC Pavement) that is applicable.

Construction Sequence

The general sequence of construction should be as follows:

- Install underdrains or French drains, as required.
- Remove any existing bituminous concrete overlay to the staged width.
- Remove and replace any existing unsound bituminous repair materials.
- Rubblize the pavement.
- Compact the broken pavement.
- Pave the binder lifts of the bituminous concrete overlay.

- Allow traffic on sections which have adequate thickness, as shown on the plans (if needed).

- Pave the surface of the bituminous concrete overlay.

Other Construction Considerations

Bituminous material from temporary patching, in the pavement section may be left in place. If there are any full-depth bituminous concrete patches in the section, soundness of the patch material should be determined. Visually indeterminate patches may be investigated, with a limited coring program. If a bituminous concrete patch is considered unsound, the material should be removed. When traffic is maintained during the patching operation, the replacement material should be a Class C or D patch. If concrete is the replacement material it shall be rubblized.

If the unsound patch is greater than 1 sq m (10 sq ft), bituminous concrete binder mixture shall be used. When the road is closed to traffic and the unsound patch is less than or equal to 1 sq m (10 sq ft), the replacement material may be aggregate. Aggregate replacement material shall be a Class D Quality (or better) crushed stone, crushed slag, crushed concrete, or crushed gravel meeting a CA 6 or CA 10 gradation; according to Section 1004 of the Standard Specifications.

Partial-depth bituminous concrete patches may be left in place during rubblization. If partial-depth patches prevent proper breaking of the PCC pavement, a skid steer loader (with a jack hammer attachment or similar device) may be used to complete breaking in these areas.

Any large concrete pieces that result from inadequate breaking can be broken as described above or can be removed along with any unsuitable and unstable material encountered during the breaking process. Removed material shall be disposed of according to Article 202.03 of the Standard Specifications. Areas of approximately 1 sq m (10 sq ft) or less may be repaired by use of aggregate replacement material. Larger unstable areas require removal and replacement as directed by the Engineer. The Department's "Subgrade Stability Manual" will be referenced for subgrade repair, to provide a stable subgrade. Following subgrade repairs, bituminous concrete binder mixture shall be placed to the depth of the original PCC pavement, and compacted to the satisfaction of the Engineer.

The rubblizing process will increase the pavement width 25 to 75 mm (1 to 3 in.) per 2-lane width, and encroach slightly into the underdrain trench. This has not caused performance problems with sand trench and pipe type underdrains to date. When using the Resonant Breaker, the breaking shall begin at the centerline and proceed to the outside edge of the pavement. Also, when using the Resonant Breaker, the driving of heavy wheel loads directly over the underdrain trench should be avoided as much as possible. This may require limiting the breaking operation to only one direction, until the breaker wheels are no longer aligned with the trench. Wheel loads directly over the underdrain trench are of less concern if the existing shoulder is in sound condition. Regardless of the method chosen, the contractor is responsible for protection of the pipe underdrains along the project.

Rubblized pavement should be covered with the overlay as quickly as is practical. Light rains have little effect. Underdrains will minimize the adverse effects of rainfall.

No traffic (including unnecessary construction traffic) should be allowed on the fractured pavement surface once the breaking operation begins. Traffic will dislodge the rubblized base, negatively affect grade control, and loosen the interlock between pieces. This will reduce the support of the layer. Traffic on the rubblized base may result in subgrade intrusion, requiring complete removal and replacement of the rubblized base.

All bituminous concrete binder lifts should be paved before traffic is allowed onto the section. Sections opened with reduced thickness have the potential of becoming overstressed very rapidly, which results in reduced pavement life.

If a Contractor proposes the use of a Material Transfer Device (MTD), the Contractor is required to submit equipment specifications with axle loading configurations to the Engineer three weeks prior to paving. The Engineer will contact the Bureau of Materials and Physical Research to perform an analysis and provide any equipment restrictions based on device loadings and proposed paving sequence.

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