Concrete Pavement Patching: Know Your Rights

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Overview

• Right Treatment (definitions and objectives)
• Right Pavement (project selection)
• Right Time
• Right Methods (construction sequence)
Patching—Definitions

• Full-depth patches (VDOT Types I and II): cast in-place repairs that extend the full depth of the PCC slab

• Partial-depth patches (VDOT Type III): removal and replacement of small, shallow areas of deteriorated PCC at spalled or distressed joints up to one-third the slab thickness
Patching—Objectives

- Full-depth patches: restore ride, restore structural capacity, prepare for an overlay
- Partial-depth patches: restore ride, enhance safety, maintain structural capacity, extend service life, restore joint integrity for sealing

Owner objective: a permanent repair that will last as long as the surrounding pavement
Right Pavement for Full-Depth

- Structural deterioration
- Joint deterioration
- Utility cut repairs
- Overlay preparation
Candidate Distresses (JCP)

- Transverse cracking (M, H)
- Longitudinal cracking (M, H)
- Corner breaks (L, M, H)
- Spalling (M, H)
- Blowups (L, M, H)
- D-cracking (M, H)
- Reactive aggregate spalling (M, H)
- Deterioration of existing repairs (M, H)
Poor Timing

- Structural inadequacy
- Material-related distresses present, such as ASR, D-cracking
- Widespread deterioration (too many joints need repair)
- Uncertainty associated with number of patches
- When it is an expensive project line item
Good Candidates
Good Candidates
Good Candidates
Bad Candidates
What are These Candidates For?
Right Timing and Extent?
Construction Sequence

1. Marking the boundaries
2. Concrete sawing
3. Concrete removal
4. Repair area preparation
5. Restoration of load transfer
6. Concrete placement
7. Curing
8. Diamond grinding (optional)
9. Joint sealing
Selecting Repair Boundaries

Repair Dimensions

- **Minimum dimensions**
  - Use full lane-width repairs
  - Length ≥ 6 ft (doweled)
  - Length 6 to 10 ft (nondoweled)
- **Long repairs (> 10 to 13 ft)**
  - Provide reinforcement or intermediate joint
- **Independent repairs in adjacent lanes**
- **If distress falls within 2 ft of joint, extend repair to joint**
Selecting Repair Boundaries

Example Repairs in JPCP

Before

After

L, M, H = Low-, Medium-, High-Severity
Concrete Sawing

- Full-depth, diamond-bladed sawing
- Overrun sawcut to minimize slab spalling
- Limit traffic loading on sawed pavement to avoid pumping
- Maintain straight edge along shoulder side
Layout of Sawcuits

Full-depth sawcut along longitudinal joint

Partial or full-depth sawcut

Pressure relief cut

75 mm

Full-depth sawcuts

Full-depth sawcut

Full-depth sawcut

125 mm
Concrete Removal
Breakup and Cleanout Method

• Advantages
  – Simple and straightforward
  – Readily available equipment

• Disadvantages
  – Greatly disturbs subbase
  – Potential to damage slab and underground utilities
  – Relatively slow
  – Safety problems with flying debris
Concrete Removal
Concrete Breakup
Concrete Removal
Cleanout with a Backhoe
Concrete Removal

Liftout Method
Repair Area Preparation
Restoration of Load Transfer

Drilling Holes for Dowels

Smooth steel dowel bars (typ. 1.25 to 1.5 in)

Dowel holes drilled mid-depth on 12-inch centers
Restoration of Load Transfer

Bar Installation Recommendations

- Blow debris and dust from holes
- Place grout or epoxy in holes
- Insert dowel into hole with slight twisting motion
- Install grout retention disks (optional)
- Apply bondbreaker to protruding dowel ends
Restoration of Load Transfer

Cleaning Holes
Restoration of Load Transfer
Injecting Anchoring Material
Restoration of Load Transfer

Dowel Bar Placement

1

2

3
Restoration of Load Transfer

Dowel Bar Placement

Grout-retention disk (optional)

Repair area

Existing slab

Anchoring material

Hole dia. = d + a

d = dowel diameter

Subbase

a = 1/8 in for epoxy

a = 1/4 in for cement grout

Subgrade Soil
Restoration of Load Transfer
Area Prepared with Dowels in Place
Longitudinal Joint
Placement of Bondbreaker Board
Concrete Placement

- Consolidation and level finish are critical.
- Vibrate along edges of repair and in vicinity of dowel bars.
- Don’t use vibrators to move concrete.
- Avoid addition of extra water.
- Texture surface to match existing pavement.
Concrete Placement
Concrete Placement

Screeding
Concrete Placement

Texturing
Curing
Application of Curing Compound

- White-pigmented curing compound
- Apply immediately after texturing
- Uniform coverage
## Opening to Traffic

<table>
<thead>
<tr>
<th>Slab Thick, in</th>
<th>Strength for Opening to Traffic, psi</th>
<th>Length &lt; 10 ft</th>
<th>Slab Replace</th>
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VDOT Policy is 2000 psi
Key Factors For Success

- Selection of proper candidate projects
- Properly sized repairs
- Good material removal practices
- Well prepared subbase
- Effective restoration of load transfer
- Selection of appropriate repair material
- Proper material placement, finishing, and curing

Short-cuts may save time in the short run, but don’t fall within your Rights
Know Your Rights… and Wrongs
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Some Other Issues

- Warranties
- Type I/II vs. Type III
- Cast-in-place vs. precast
- PCC vs. HMA
Questions?

Thank you!

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