Session 5: Partial-Depth Repairs
Learning Outcomes

1. List benefits and appropriateness of partial-depth repairs
2. List the advantages and disadvantages of different available repair materials
3. Describe recommended construction procedures
4. Identify typical construction problems and appropriate remedies
Introduction

• Definition

Removal and replacement of small, shallow areas of deteriorated PCC at spalled or distressed joints.

• Distress limited to upper 1/3 of slab

• Existing load transfer devices are functional
Partial-Depth Repair

Fig. 5.1 on p. 5.7
Benefits

- Restores structural integrity
- Improves ride quality
- Extends the service life
- Restores a well-defined uniform joint sealant reservoir
Good Candidate Projects

- Spalls caused by:
  - Incompressibles in joints
  - Localized areas of weak material
  - Joint inserts
- Surface deterioration caused by:
  - Reinforcing steel too close to surface
  - Poor curing or finishing practices
- Recommended evaluation procedures:
  - Distress surveys
  - Sounding
Poor Candidate Projects

- Spalls due to dowel bar misalignment
- Spalls at working cracks due to shrinkage, fatigue, or foundation movement
- Spalls due to D-cracking or reactive aggregate
Good candidate?
Good candidate?
Good candidate?
Good candidate?
Good candidate?
## Material Selection

### Repair Material Types

<table>
<thead>
<tr>
<th>Cementitious</th>
<th>Polymeric</th>
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<tbody>
<tr>
<td>PCC-based</td>
<td>Epoxy</td>
</tr>
<tr>
<td>Gypsum-based</td>
<td>Methyl methacrylate</td>
</tr>
<tr>
<td>Magnesium phosphate</td>
<td>Polyester-styrene</td>
</tr>
<tr>
<td>High alumina</td>
<td>Polyurethane</td>
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<tr>
<td></td>
<td>Other polymeric materials</td>
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Material Selection Factors

- Allowable lane closure time
- Ambient temperature
- Cost
- Size of repair
- Estimated performance
Construction Steps

1. Repair dimension selection
2. Concrete removal
3. Repair area preparation
4. Joint preparation
5. Bonding agent application
6. Patch material placement
7. Curing
8. Diamond grinding (optional)
9. Joint sealing
Repair Dimension Selection

Sounding
Repair Dimension Selection

Marking
Repair Dimension Selection

Recommendations

Min. Patch Length 12 in
Min. Patch Width 4 in
Concrete Removal

Saw-and-Remove
Concrete Removal

Jackhammering
Concrete Removal

Cold Milling

Transverse Milling (small head, moves along joint)

Longitudinal Milling (wide head, pick up & move over)

Fig. 5.2 on p. 5.8
Concrete Removal

Cold Milling

Milling Along the Joint

Milling Across the Joint
Repair Area Preparation
Sandblasting
Repair Area Preparation

Air Blowing

• Air blow to remove dust and debris
  • Minimum 90 psi
  • Free of oil and moisture
• Direct away from patches
Joint Preparation

Plan View

Profile View

- joint
- 75 mm
- 75 mm
- 25 mm

bond breaker
patch
pavement

1 in = 25.4mm

Fig. 5.3 on p. 5.10
Bonding Agent Application

Cement Grout

Epoxy
Patch Material Placement

- Batch small quantities
- Temperature recommendations
- Some epoxy materials placed in lifts
- Overfill patch area by ~3 mm (1/8 in)
- Consolidate material with small spud vibrator
- Screed and hand trowel, working from the center of the patch to the edges
Patch Material Placement
Sealing Edges and Runouts
Curing

- Prevent moisture loss
- White-pigmented curing compound commonly used
- Opening to traffic
  - Mix / temperature dependent
  - Common values: 2,000 to 3,000 psi
Diamond Grinding (optional)
Joint Sealing
Key Factors For Success

- Proper selection of candidate projects
- Proper material selection
- Identification of repair boundaries
- Use of joint/crack reformers
- Achieving good bond
  - Patch area clean and dry
  - Sandblasting sidewalls
  - Application of bonding agent
- Proper placement and curing
Troubleshooting

• Problem

  Deterioration found to extend beyond the original repair boundaries

• Solutions?
Troubleshooting
What is wrong here?
Troubleshooting
What is wrong here?
Troubleshooting
Construction Quality Problems

• Problem
  \textit{Patch material flows into joint}

• Potential causes? Solutions?
Troubleshooting
Construction Quality Problems

• Problem

Premature patch failure from cracking or debonding of patch material

• Potential causes? Solutions?
Review: Learning Outcomes

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