Chapter 4
Joint Resealing and Crack Sealing

From… Maintenance Technical Advisory Guide (MTAG)
Learning Objectives

1. List the benefits of joint resealing and crack sealing
2. List the desirable sealant properties and characteristics
3. Describe recommended installation procedures
4. List important quality control activities
5. Describe potential construction and performance problems
6. Identify troubleshooting solutions
Introduction

Placement of an approved sealant material in an existing joint or crack to reduce moisture infiltration and prevent intrusion of incompressibles
PCC Pavement Deterioration
Influence of Moisture Infiltration

Cracks/Joints
+ Moisture Infiltration
↓ Subgrade Softening

Loss of Fines (Pumping)
Corner Breaks
Transverse Joint Faulting

Chapter 4 – Joint Resealing and Crack Sealing
PCC Pavement Deterioration
Influence of Moisture Infiltration

Cracks + Moisture Infiltration → Breakdown of Existing Cracks

Chapter 4 – Joint Resealing and Crack Sealing
PCC Pavement Deterioration
Influence of Incompressibles

Cracks/Joints + Incompressible Material

Joint Spalling
Blow-Ups
PCC Joint Resealing
Current Practice

- Debate: to seal or not to seal
- Some believe the benefits do not offset the costs
- Most states seal transverse joints
- Recommendation: continue to reseal joints if they were originally sealed!
Guidelines for Resealing Joints

- Sealant no longer functional
- Pavement not severely deteriorated
- Performed with other CPR activities
- Moderate installation temperatures
- Proper material selection and joint preparation is essential
Guidelines for Sealing Cracks

- Seal working transverse cracks
- Can seal cracks ≤ 13 mm (0.5 in) wide
- Use special crack-sawing blades
- Same general joint resealing procedures apply to crack sealing
Module 4-1

Design, Materials & Specifications

From… Maintenance Technical Advisory Guide (MTAG)
Material Selection

- Sealant
  - Thermoplastic materials
  - Chemically cured materials
- Backer rod
Sealant Material
Thermoplastic Materials

- Rubberized asphalt
- Low modulus rubberized asphalt
- PVC coal tar
Sealant Material
Chemically Cured Materials

- Polysulfide
- Polyurethane
- Silicone (non-sag)
- Silicone (self-leveling)
## Sealant Material

### Desirable Sealant Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Durability</td>
<td>Resistance to traffic, moisture, sunshine, and climatic variation</td>
</tr>
<tr>
<td>Extensibility</td>
<td>Deformation without rupturing</td>
</tr>
<tr>
<td>Resilience</td>
<td>Recovery from deformation and resist stone intrusion</td>
</tr>
<tr>
<td>Adhesiveness</td>
<td>Adherence to joint/crack walls</td>
</tr>
<tr>
<td>Cohesiveness</td>
<td>Resistance to internal stresses (rupturing from elongation)</td>
</tr>
</tbody>
</table>

Chapter 4 – Joint Resealing and Crack Sealing
Sealant Material Performance

- Varies greatly with material type
- Quality of installation procedures
- Design factors affecting performance:
  - Joint movement
  - Sealant properties
  - Shape factor
Material Selection Factors

- Climate conditions
- Traffic level and percent trucks
- Crack extent and severity
- Contractor experience
- Safety concerns
- Material availability and cost
Joint Reservoir Design
Common Configurations

Chapter 4 – Joint Resealing and Crack Sealing
Joint Reservoir Design

3.2 to 6.4 mm (0.125 to 0.25 in) recess

Sealant Thickness (T)

Width (W)

Backer Rod

Sealant
## Joint Reservoir Design

### Recommended Shape Factors

<table>
<thead>
<tr>
<th>Sealant Material Type</th>
<th>Typical Shape Factor (W:D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rubberized Asphalt</td>
<td>1:1</td>
</tr>
<tr>
<td>Silicone</td>
<td>2:1</td>
</tr>
<tr>
<td>PVC Coal Tar</td>
<td>1:2</td>
</tr>
<tr>
<td>Polysulfide and Polyurethane</td>
<td>1:1</td>
</tr>
</tbody>
</table>
## Sealant and Related Specs

<table>
<thead>
<tr>
<th>Sealant Type</th>
<th>Specifications</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicone Joint Sealant*</td>
<td>Caltrans SSP 41-200, SSP 41-210</td>
<td>Low modulus</td>
</tr>
<tr>
<td>Asphalt Rubber Joint Sealant*</td>
<td>Caltrans SSP 41-200, SSP 41-210</td>
<td>A mixture of paving asphalt and ground runner</td>
</tr>
<tr>
<td>Backer Rods*</td>
<td>ASTM D 5249</td>
<td>An expanded, closed-cell polyethylene form compatible with the joint sealant</td>
</tr>
</tbody>
</table>

[http://www.dot.ca.gov/hq/esc/oe/specifications/SSPs/2006-SSPs/]
# Typical Item Codes

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>120090</td>
<td>Construction area signs</td>
</tr>
<tr>
<td>120100</td>
<td>Traffic control system</td>
</tr>
<tr>
<td>128650</td>
<td>Portable changeable message sign</td>
</tr>
<tr>
<td>413111</td>
<td>Repair spalled joints</td>
</tr>
<tr>
<td>413114</td>
<td>Replace joint seal (existing concrete pavements)</td>
</tr>
<tr>
<td>413115</td>
<td>Seal joint (existing concrete pavements)</td>
</tr>
<tr>
<td>414091</td>
<td>Seal longitudinal joint</td>
</tr>
<tr>
<td>414101</td>
<td>Seal transverse joint</td>
</tr>
<tr>
<td>414111</td>
<td>Rout and seal random cracks</td>
</tr>
</tbody>
</table>

[http://i80.dot.ca.gov/hq/esc/oe/awards/#item_code](http://i80.dot.ca.gov/hq/esc/oe/awards/#item_code)
Module 4-2

Construction and Inspection

From… Maintenance Technical Advisory Guide (MTAG)
Construction: Joint Resealing
Construction: Joint Resealing
Procedure

1. Sealant removal
2. Joint refacing
3. Joint cleaning
4. Backer rod installation
5. New sealant installation
Construction: Joint Resealing
Sealant Removal with Joint Plow
Construction: Joint Resealing
Joint Refacing
Construction: Joint Resealing
Refacing Blades
Construction: Joint Resealing
Sandblasting
Construction: Joint Resealing
Waterblasting
Construction: Joint Resealing
Compressed Air
Construction: Joint Resealing

Backer Rod
Construction: Joint Resealing
Backer Rod Installation
Construction: Joint Resealing
Installed Backer Rod
Construction: Joint Resealing
Thermoplastic Sealant Installation
Construction: Joint Resealing
Silicone Sealant Installation
Construction: Joint Resealing
Longitudinal PCC/PCC Joints

- Tied non-working joint
- Hot-poured thermoplastic materials
- Reservoir not always formed
Construction: Joint Resealing
Longitudinal PCC/PCC Joints
Construction: Joint Resealing
Longitudinal PCC/HMA Joints

- 25-mm (1-in) width (min.) and depth
- No backer rod required
- Hot-pour and silicone sealants
Construction: Joint Resealing
Longitudinal PCC/HMA Joints
Construction: Joint Resealing
Longitudinal Sawcutting
Construction: Joint Resealing
Sawed Longitudinal Joint Reservoir
Construction: Joint Resealing
Installation of Sealant
Construction: Joint Resealing
Sealed PCC/HMA Longitudinal Joint
Construction: Crack Sealing
Construction: Crack Sealing

Procedure

1. Crack sawing
2. Cleaning
3. Backer rod Installation
4. Sealant installation
Construction: Crack Sealing

Crack Sawing
Construction: Crack Sealing
Completed Crack Seal
Quality Control

- Sealant preparation
- Surface preparation
- Placement conditions
- Method of application
- Curing
- Opening to traffic
Project Checklist

- Preliminary Responsibilities
  - Project review
  - Document review

- Materials Checks
  - Sealant
  - Primer
  - Backer rod
  - General
Project Checklist

- **Equipment Inspections**
  - Hot-applied sealant melters
  - Cold-applied sealant pumps
  - Joint cleaning equipment
  - Other equipment

- **Others**
  - Weather requirements
  - Traffic control
Project Checklist

● Project Inspection Responsibilities
  • Joint preparation
  • Backer material installation
  • Hot-applied sealant installation
  • Cold-applied sealant installation
  • Opening the pavement to traffic

● Cleanup Responsibilities

Chapter 4 – Joint Resealing and Crack Sealing
Presentation Outline

- Introduction
- Material selection and reservoir design
- Construction
- Quality control
- Troubleshooting

Chapter 4 – Joint Resealing and Crack Sealing
Troubleshooting

- Construction quality and performance problems
- Approach:

  Identify Problem ➔ Determine Cause ➔ Identify Solution
Troubleshooting
What is wrong here?

Too Much Applied Sealant
Troubleshooting
What is wrong here?

Dirt on Refaced Surfaces
Troubleshooting
Possible Construction Problems

Problem:

*Bubbles in hot applied sealant material*

Potential causes?
Troubleshooting
Possible Construction Problems

● Problem: *Irregularities in surface of tooled sealant*

● Potential causes?
Troubleshooting
Possible Construction Problems

● Problem:
  Tracking of material

● Potential causes?
Troubleshooting
Possible Construction Problems

- Problem: *Punctured or stretched backer rod*
- Potential impact on performance?
Troubleshooting
Possible Construction Problems

● Problem:

*Burrs along sawed edge*

● Potential impact on performance?
Troubleshooting Guide – Causes and Solutions

- Dust, dirt, or contamination on refaced joint or crack surfaces.
- Bubbles in hot-applied sealant material.
- Punctured or stretched backer rod.
- Raveling, spalling, or other irregularities of the joint walls prior to sealant application.
- Difficulty in installing sealant material.
- Tracking of material (i.e., the transfer of sealant material onto unwanted areas of the surface area via shoes, tires, and so on).
- Bumps or irregularities in surface of tooled sealant application.
Presentation Outline

☑ Introduction
☑ Material selection and reservoir design
☑ Construction
☑ Quality control
☐ Troubleshooting

Chapter 4 – Joint Resealing and Crack Sealing
Review: Learning Objectives

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Thank You

Questions?