

Chapter 4

Crack Sealing, Crack Filling, and Joint Sealing

From... Maintenance Technical
Advisory Guide (MTAG)

Managers' Overview

From... Maintenance Technical
Advisory Guide (MTAG)

Introduction

- Why fill/seal cracks and joints?
- Where to use crack sealing/filling?
- When to use crack sealing?
- How long it will last?



Why Treat Cracks?

- Prevent water from entering and weakening the base and subgrade
- Prevent debris (incompressible materials) from entering cracks/joints
- Prepare road surface for overlay or maintenance treatments
- Cost Effective – “fix the roof now so that you don’t have to fix the house later”



When to Use?

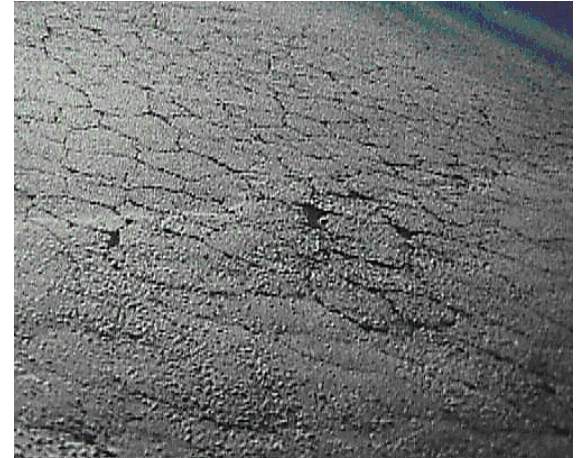
- Longitudinal Cracking
- Transverse Cracking
- Block Cracking



- Crack width should be 0.12 – 1.00 inch

When NOT to Use?

- Crack sealing/filling is not efficient on:
 - Alligator Cracking (due to poor subgrade support)
 - Fatigue Cracking (due to fatigue failure)
 - Reflective Cracking
 - Edge Cracking
 - Slippage Cracking



When to Use?

- Longitudinal Cracking
- Transverse Cracking
- Block Cracking



- Crack width should be 0.12 – 1.00 inch

Performance

- Depending on sealant and method used:
 - Asphalt emulsion placed in flushed configuration, in unrouted cracks: 2 – 4 years
 - Hot-applied rubber and fiber modified asphalt placed in flush or overbanded configuration: 6 – 8 years

Module 4-1

Design, Materials & Specifications

From... Maintenance Technical
Advisory Guide (MTAG)

Crack Sealing/ Crack Filling

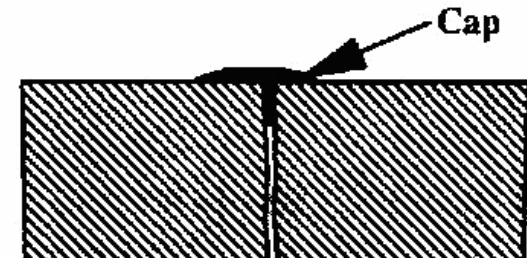
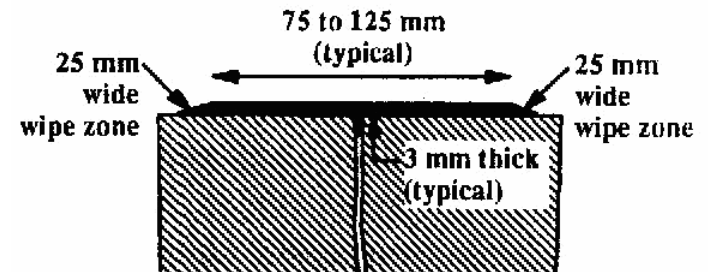
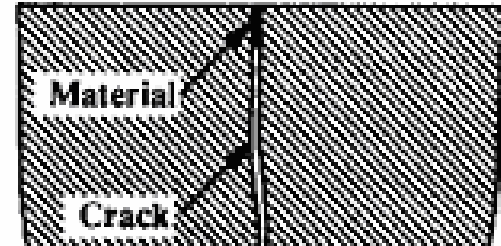
- Design
- Specification
- Materials

Criteria for Crack Sealing/ Crack Filling

Crack Characteristics	Criteria for Crack SEALING	Criteria for Crack FILLING
Width	0.12 – 1.00 inch	0.12 – 1.00 inch
Edge Deterioration	Minimal to None (<25% of crack length)	Moderate to None (<50% of crack length)
Annual Horizontal Movement	> 0.12 inch (working cracks)	< 0.12 inch (non-working cracks)
Type of Crack	Transverse Thermal Transverse Reflective Longitudinal Reflective Longitudinal Cold Joint	Longitudinal Reflective Longitudinal Cold Joints Longitudinal Edge Block, Distantly Spaced

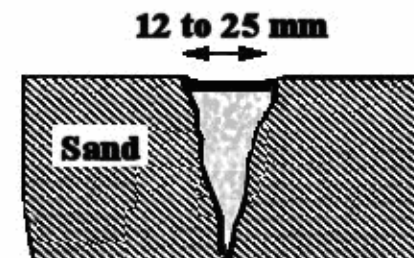
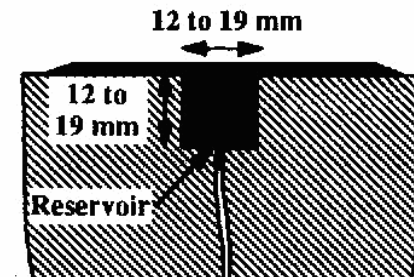
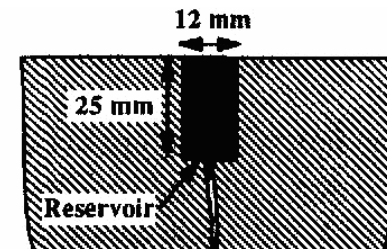
Design / Placement Methods

- Flush Fill
- Overband – Simple Band-Aid (100 mm max)
- Overband - Capped



Placement Methods (Cont'd)

- Reservoir
- Reservoir with Band-Aid
- Sand Fill with Recessed Finish



Specification

- Caltrans
 - 2006 Standard Specifications
Section 94
http://www.dot.ca.gov/hq/esc/oe/specs_html/2006_specs.html
 - Standard Special Provisions 37-400

Crack Sealant

- Desired properties:
 - Maintain adherence to the walls of the crack
 - Elongate to the maximum opening of the crack and recover to the original dimensions without rupture
 - Expand and contract over the range of service temperatures without rupture or delamination from the crack walls
 - Resist abrasion and damage from traffic

Crack Sealant (Cont'd)

- Elastomeric preferred for working cracks
 - low modulus of elasticity, will stretch easily and to high elongations (~10 times original dimensions) without fracture
- Sealant applied at elevated temperatures (thermoplastic)
- In California most sealants are rubber-modified asphalt

Crack Filler

- Desired Properties:
 - Remain attached to the walls of the crack
 - Exhibit some elasticity
 - Resist abrasion and damage from traffic

Crack Sealer/Filler Specs

Material	CT/AASHTO	Application
Asphalt Emulsion	Section 94/ M140, M208	Filling
Asphalt Cements	Section 94/ M20, M226	Filling
Fiber Modified Asphalt	No Specification	Filling
Polymer Modified Emulsion (PME)	Section 94/ M140, M208	Filling/Minor Sealing
Asphalt Rubber (AR)	SSP 37-400	Sealing
Specialty AR Low Modulus	SSP 37-400	Sealing
Silicone	SSP 41-200, 51-740	Sealing

Module 4-2

Construction and Inspection

From... Maintenance Technical
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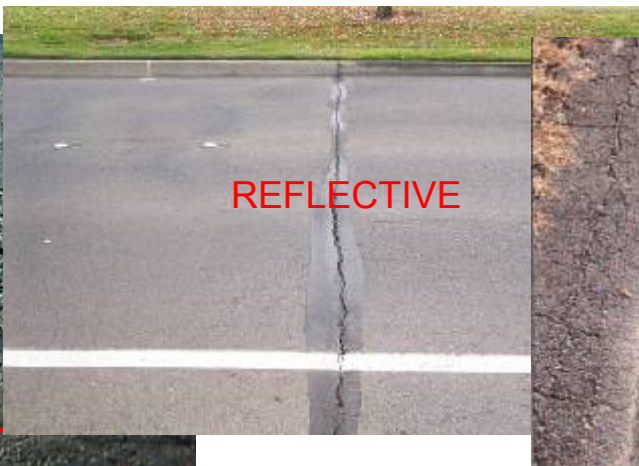
Crack / Joint Sealing Process

- Project Selection
- Construction
- Quality Control
- Troubleshooting
- Field Considerations

Project Selection

- Use as maintenance treatment or to prepare a cracked pavement for surface sealing
- Criteria:
 - Structurally sound pavement structure
 - Crack width is between 0.1 – 1.0 inch
- Should not use on pavements with: alligator, fatigue, reflective, edge and slippage cracking
- Recommended for: longitudinal, transverse, block cracking

Cracking in Flexible Pavements



“Working Cracks”

- The width of a crack may change because of temperature and moisture changes; the crack may “open” or “close”
- The sides of a crack may undergo vertical movements under traffic loading
- Criteria for “working” cracks: total horizontal movement of a crack over a period of 1 year
- According to Caltrans, a crack that undergoes $> \frac{1}{4}$ inch horizontal movement is a “working” crack

Seal or Fill?

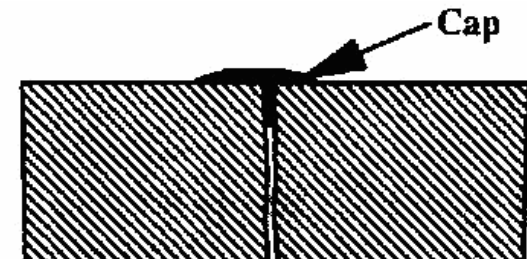
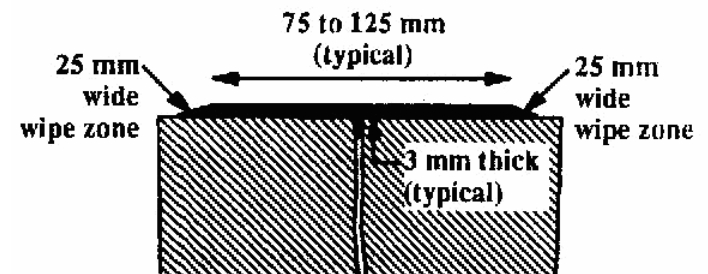
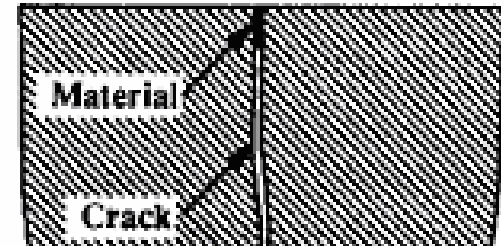
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Planning

- Apply during relatively cool weather, when “working” cracks are at midpoint to widest – spring, fall or winter
- “Non-working” cracks can be sealed any time

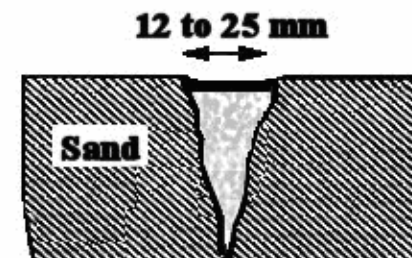
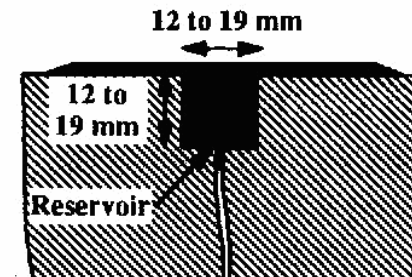
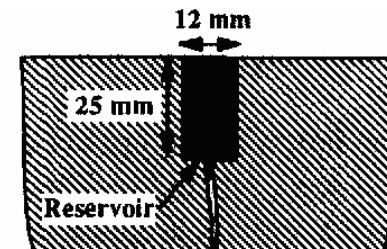
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Placement Method Selection

- Consider:
 - Type and extent of the sealing or filling operation
 - Traffic conditions
 - Crack characteristics
 - Material requirements
 - Desired performance (expectations)
 - Aesthetics
 - Cost

Safety and Traffic Control

- Traffic control should be in force during the application of the treatment, long enough to allow for adequate curing of the product and prevent tracking
- Sanding is typically used to prevent tracking of cold-applied systems

Construction Activities

- Routing and Sawing
- Crack Cleaning and Drying
- Application of Sealer or Filler
- Finishing
- Trafficking and Subsequent Treatments



Routing or Sawing

- Not appropriate on pavements with extensive cracking
- Especially important in climates where crack movement is very high
- Allows for more filler to be used and better control of the crack channel shape
- Use vertical spindle routers, rotary impact routers and random crack saws
- Generally not used in California

Cleaning and Drying

- Purpose: eliminate debris/contamination
- Methods:
 - Air blasting
 - Hot air blasting
 - Sand blasting
 - Wire brushing



Application

- Hot Pressure Fed



- Pour Pot



Finishing



FLAT PLATE



BROOMING BLOTTER COAT



Finishing (Cont'd)

- Over-banding in California was found to contribute to poor ride, increased noise and poor surface appearance – not recommended unless flush with pavement surface
- Sanding may be used to minimize the potential for “pull-outs”

Quality Control

- Typical Failures:
 - Adhesion loss
 - Cohesion loss (fail in tension)
 - Potholes
 - Spalling
 - Pull-on
- Typical Causes:
 - Poor choice of sealing and filling methods
 - Poor workmanship

Examples



EXCESSIVE SEALANT

POOR WORKMANSHIP



Troubleshooting

- **See Tables 4.4 and 4.5 in MTAG, Volume I, 2nd Edition**
- **Problems addressed:**
 - Crack wet
 - Sealant not cured
 - Crack dirty
 - Insufficient sanding
 - Poor finish, wrong tools
 - Application too high
 - Application too low
 - Sealant degraded due to overheating
 - Rain during application
 - Cold weather
 - Hot weather
 - Tracking
 - Pick-out of sealer
 - Bumps

Field Considerations

- See Tables at the end of Chapter 4, MTAG, Volume I, 2nd Edition
- Project Responsibilities
 - Project Review
 - Document Review
 - Determining Application Type
 - Materials Checks
- Pre-Seal Inspection Responsibilities
 - Surface Preparation
 - Weather Requirements
 - Traffic Control

Field Considerations (Cont'd)

- Equipment Inspection
 - Sawing/Routing Unit
 - Sealing Unit
- Application Considerations
 - Application
 - Clean up

Thank You

Questions?