Crack Sealing
Joint Sealing & other Repair Materials

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Crafco Inc.

ACPA/FAA
Concrete Airport Pavement Workshop
Atlanta, GA
October, 2013
SUSTAINABILITY BEGINS WITH PRESERVATION

Right Choice, Right Now

Maintenance of Airport Pavements
AC 150/5380-6B
Guidelines & Procedures for
• Applying the *Right* Treatment
• On the *Right* Pavement
• At the *Right* Time
Reality...pavements at all levels and funding is flat or declining $$$$$$
Right Choice – Right Now
Leadership - Attitude - Dedication

My Purpose
* Challenge you to Up-Your-Game
* Review best practices
* Share study results
* Hot & Cold applied patching materials

Pavement Condition

Years / Traffic / Environment
Today’s Choices Impact the future condition of our pavements.

- Preventive
  - Joint / Crack Seal
  - Partial Depth Spalls
  - Corner Breaks
  - Utility Spalls
    - Lighting
    - Drains
- Rehabilitation
  - Panel Replacement
  - Full & Partial
  - Under Capacity
- Reconstruction
Today’s Choices Impact the future condition of our pavements.
Why Rout Cracks?

Cracks routed and sealed achieve more than twice the service life vs. non-routed and sealed cracks.

The FHWA-RD-99-143 Crack Treatment Experiment proved:
1 - Cracks that are routed and sealed perform more than twice as long as non-routed cracks.

AC Crack Treatment Placement Configuration

- Simple Band Aid
- Standard Reservoir and Flush
- Standard Recessed Band Aid

The additional sealant volume in the routed reservoir allows the sealant to expand and contract effectively while protecting the integrity of the sealant.
21 year Field Performance
Joint Resealing Project, Fairchild AFB
PCC Pavement

Conclusions.... Field Performance

Two sealants were still performing after 21 years
• Silicone sealant
• Improved Non-JFR low modulus asphalt sealant

• Failure mode for hot-applied asphalt sealants was adhesion loss
• Failure for silicone was adhesion loss and spalling (6 x more than spalling of hot-applied).
21 year Field Performance
Joint Resealing Project, Fairchild AFB
PCC Pavement

Conclusions....Install Configuration on hot-applied

The hot-applied asphalt sealants had >50% life increase when installed flush

Flush fill had a greater effect on sealant life than did sealant properties

Hot-applied asphalt sealant life is influenced both by sealant properties and install configuration
Preserving our Pavements is Serious Business

- When we should apply treatments.
- Which distresses we should NOT treat.
- Methods & Materials.
- How long it will last?

Solutions and Decisions we implement now Impact the future condition of our pavements.
Sealing prevents Water from Entering the Subgrade:

- Prevents sub-base erosion
- Voids beneath the slab
- Faulting

Do not ignore Moisture
Sealing prevents incompressible from lodging in joints and cracks

- Joint Spalling
- Blowups
- Heaving
Joint sealing in PCC

Which SEALANT do I choose?

Silicone

Hot Pour
Item P-605 Joint Sealing Filler

MATERIALS

605-2.1 JOINT SEALERS.

Joint sealing materials shall meet the requirements of

The Engineer shall specify one or more of the following:

- FED SPEC SS-S-200E(2) - Sealants, Joint, Two-Component, Jet-Blast Resistant, Cold Applied.
- ASTM D 1854 - Jet-Fuel-Resistant Concrete Joint Sealer, Hot-Applied Elastic Type
- ASTM D 3406 - Joint Sealants, Hot-Applied, Elastomeric- Type, for Portland Cement Concrete Pavements
- ASTM D 3569 - Joint Sealants, Hot-Applied, Jet-Fuel-Resistant type, for Portland Cement Concrete Pavements
- ASTM D 3581 - Joint Sealant, Hot-Applied, Jet-Fuel-Resistant Type, for Portland Cement Concrete and Tar-Concrete Pavements
- ASTM D 6690 - Joint and Crack Sealants, Hot-Applied, for Concrete and Asphalt Pavements
Material Type
How do we decide?

- Crack **Sealing** Sealant Specifications
  - ASTM 6690 TYPE I, II, III and IV

- Crack **Filling** Sealant Specifications
  - ASTM 5078

Crack sealants and crack fillers need to remain functional over the range of anticipated pavement temperatures.
APPENDIX B. GENERIC SPECIFICATIONS

(GENERIC SPECIFICATION #01)

ITEM M-361 HOT-APPLIED JOINT AND CRACK SEALANTS FOR RIGID (PORTLAND CEMENT CONCRETE) AND FLEXIBLE (BITUMINOUS) PAVEMENTS

DESCRIPTION

361-1.1 This item consists of providing and installing a resilient and adhesive [joint][crack] sealant, hot-applied, capable of effectively sealing [joints][cracks] in rigid (PCC) or flexible (bituminous) pavements. This item includes the removal of existing, loose, or damaged sealant material where applicable, preparation of the [joints][cracks], preparation of the sealant material, and the complete installation of the sealant repair system. The selection of sealant material products will be based on climate conditions, past performance of products, and at the discretion of the engineer.

MATERIALS

361-2.1 The repair material will be a hot-applied sealant conforming to the requirements of ASTM D 6690, as listed in Table 1, for the classification type specified below. The engineer will evaluate performance based on local conditions.

a. Type I – A joint and crack sealant capable of maintaining an effective seal in moderate climates. The material is tested for low temperature performance at -18°C (-64.4°F) using 50% extension.

b. Type II – A joint and crack sealant capable of maintaining an effective seal in most climates. The material is tested for low temperature performance at -29°C (-84.2°F) using 50% extension.

c. Type III – A joint and crack sealant capable of maintaining an effective seal in most climates. The material is tested for low temperature performance at -29°C (-84.2°F) using 50% extension. Special tests are included.

d. Type IV – A joint and crack sealant capable of maintaining an effective seal in climates experiencing very cold temperatures. The material is tested for low temperature performance at -29°C (-84.2°F) using 200% extension.

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The Engineer will select the materials to be used for the sealant and delete the paragraphs from 361-2.1a to 361-2.1d that do not apply.

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Selecting Sealant

Temperature

HIGHS

- 52°C
- 58°C
- 64°C
- 70°C
Selecting Sealant

Temperature

Lows

-10°C
-16°C
-22°C
-28°C
-34°C
-40°C
-46°C
### Type I
- A joint and crack sealant capable of maintaining an effective seal in moderate climates. The material is tested for low temperature performance at –18°C using 50% extension (formerly Specification D 1190).

### Type II
- A joint and crack sealant capable of maintaining an effective seal in most climates. Material is tested for low temperature performance at –29°C using 50% extension (formerly Specification D 3405).

### Type III
- A joint and crack sealant capable of maintaining an effective seal in most climates. Material is tested for low temperature performance at –29°C using 50% extension. Special tests are included (formerly Federal Spec SS-S-1401C).

### Type IV
- A joint and crack sealant capable of maintaining an effective seal in climates experiencing very cold temperatures. Material is tested for low temperature performance at –29°C using 200% extension.

### Usage Guidelines
RoadSaver 222 pavement temperature performance limits are 64-28 for crack sealing and 64-34 for crack filling. Usage recommendations are shown in Crafoon pavement temperature grade charts shown at the right. Refer to Crafoon Product Selection Procedures to determine sealant or filler use and pavement temperature grades.

### Specification Conformance
RoadSaver 222 meets all requirements of Federal Specification SS-S-1401C, ASTM D6690 (AASHTO M324), Type II (formerly D3405, AASHTO M301) and Type III. It exceeds requirements of ASTM D6690 Type 1 (formerly D1190, AASHTO M 173) and Federal Specification SS-S-164.

<table>
<thead>
<tr>
<th>Test</th>
<th>Type I Limit</th>
<th>Type II Limit</th>
<th>Type III Limit</th>
<th>Type IV Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cone Penetration</td>
<td>90 max.</td>
<td>90 max.</td>
<td>90 max.</td>
<td>90-150</td>
</tr>
<tr>
<td>Softening Point, °C</td>
<td>80 (176) min</td>
<td>80 (176) min</td>
<td>80 (176) min</td>
<td>80 (176) min</td>
</tr>
<tr>
<td>Bond, non-immersed</td>
<td>Two out of three 25.4 mm specimens pass 5 cycles at 50% ext. at -18°C</td>
<td>Three 12.7 mm specimens pass 3 cycles at 50% ext. at -29°C</td>
<td>Three 12.7 mm specimens pass 3 cycles at 50% ext. at -29°C</td>
<td>--</td>
</tr>
<tr>
<td>Bond, water immersed</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Resilience, %</td>
<td>--</td>
<td>60 min.</td>
<td>60 min.</td>
<td>60 min.</td>
</tr>
<tr>
<td>Oven Aged Resilience, %</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Asphalt Compatibility</td>
<td>Pass</td>
<td>Pass</td>
<td>Pass</td>
<td>Pass</td>
</tr>
</tbody>
</table>

### Performance Verified Product
- CERTIFIED
- FIELD AND AGENCY TESTED
*For details go to Crafo.com
BACKER ROD

- 25% Larger than Joint
- Cold Rod/Hot Rod
- Closed Cell Backer Rod

Cold Rod

Hot Rod
REMEMBER!!!!!!!
CLEAN AND DRY!
Who’s Checking?
How long will it last?

Crack Sealing

Rubberized (polymer-modified) asphalt sealants

5-9 years performance in *routed* working cracks

Rubberized (polymer-modified) asphalt sealants

2.5-5 years performance in *un-routed* working cracks

(FHWA-RD-99-147)
Cracks Happen...
In a lot of ways

REQUIRE DIFFERENT STRATEGIES
AC No: 150/5380-6B .....Chapter 3 – Pavement Distress
Too Wide for Sealant
Hot Mastic Repair Material

Hot applied polymeric binder and aggregate blends

Pourable, self adhesive, voidless, flexible, load resistant

Properties result in improved performance and unique uses
Flowable and Voidless

Black

Gray
Cherry Point Marine Air Station

Stone filled Mastic Repair Materials
Slab Replacement – Big $

Much less expensive Choice - Mastic Repair
Knoxville AP
Knoxville AP
Baltimore - Washington

Isolation Joint
Mesa – Gateway AP
Today’s Choices Impact the future condition of our pavements.

<table>
<thead>
<tr>
<th>Pavement Condition</th>
<th>Useful Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>punket</td>
<td>value</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Preventive</td>
<td>Reconstruction</td>
</tr>
</tbody>
</table>

- **Pavement Condition**
  - Preventive
  - Rehabilitation
  - Reconstruction

- **Useful Life**
Neglect leads to accelerated damage and HAZARDS

Questions?

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