



INDOT Pavement Preservation

- Crack Sealing/Filling

INDOT Accomplishments

Crack Filling

FY 11 Costs

District	Total LM	FY 2008	FY 2009	FY 2010	FY 2011	Costs	Cost/LM
Crawfordsville	4779.06	785.88	896.35	1060.1	850.35	\$ 518,413.07	\$609.65
Fort Wayne	4625.68	845.45	882.93	1234.2	1294.25	\$ 990,896.11	\$765.61
Greenfield	4358.33	451.96	762.5	792.2	614.98	\$ 646,375.51	\$1,051.05
LaPorte	4830.46	970.06	845.34	726.1	551.5	\$ 628,384.46	\$1,139.41
Seymour	4734.14	902.3	786.1	777.4	1058.71	\$ 601,471.59	\$568.12
Vincennes	4366.11	328.1	558.82	659.48	412.82	\$ 329,009.90	\$796.98
Totals	27693.78	4283.75	4732.04	5249.48	4782.61	\$3,714,550.64	\$776.68

Crack Sealing

FY 11 Costs

District	Total LM	FY 2008	FY 2009	FY 2010	FY 2011	Costs	Cost/LM
Crawfordsville	4779.06	14.9	18.6	15.5	27.8	\$ 22,517.22	\$809.97
Fort Wayne	4625.68	0	0	0	0	\$ -	\$0.00
Greenfield	4358.33	115.4	223.2	301	191.35	\$ 148,827.59	\$777.78
LaPorte	4830.46	311.97	276.24	237.4	374.15	\$ 296,371.68	\$792.12
Seymour	4734.14	100.55	136.2	50.4	114.2	\$ 91,220.65	\$798.78
Vincennes	4366.11	6	6	57.6	35.6	\$ 42,654.64	\$1,198.16
Totals	27693.78	548.82	660.24	661.9	743.1	\$601,591.78	\$809.57



Project selection

- Pavement selection is a critical element in determining the success or failure of a crack sealing program.
- The best candidates for crack sealing are newer pavements that are beginning to form cracks.



Selection

- Always begin a crack sealing program by sealing the best or newest roads first. A good rule of thumb is to monitor roadways that have been resurfaced, and consider crack sealing within three to five years following the resurfacing.
- If the road has alligator cracking, high density, multiple cracking, poor sub-base drainage, or structural damage, then crack sealing will not solve the problem.



Effective?



Good Crack Seal?





Figure 1: Fatigue Cracking



Figure 2: Longitudinal Cracking



(Direction of Travel →)
Figure 3: Transverse Cracking



Figure 4: Block Cracking



Figure 5: Reflection Cracking



Figure 6: Edge Cracking



Figure 7: Slippage Cracking

Crack Fill vs. Crack Seal

- **Emulsion (AE-90 or AE-90S)**
 - More daily production (can cover more road)
 - Less durable (won't last as long), typically 1-2 years
 - Useful on roads where there are majority of non-working cracks
- **Hot Pour (Crumb Rubber)**
 - Less daily production (takes longer to apply)
 - More durable, typical life 3-5 years
 - Useful for transverse (working) cracks
 - Routing cracks makes for most effective seal



Crack Sealing and Filling

- 1) “Working” cracks- **crack sealing**- “The placement of specialized treatment materials above or into working cracks using unique configurations to prevent the intrusion of water and incompressibles into the crack”
(FHWA-RD-99-147)
- 2) “Non-working” cracks- **crack filling**- “The placement of ordinary treatment materials into non-working cracks to substantially reduce infiltration of water and to reinforce the adjacent pavement.” (FHWA-RD-99-147)



“Working” vs. “Non-Working” Cracks

- “Working” (high movement)- ≥ 0.1 inches of movement
- “Non-working” (low or no movement)- < 0.1 inches of movement



Crack Sealing (209)

- Crumb Rubber (Asphalt Rubber Cement)
- Width of crack (0.2 – 1.0) inches
- Edge deterioration < 25%: Minimal to None
- Annual horizontal movement > 0.1 inches
- Working cracks:
 1. Transverse thermal
 2. Transverse reflective
 3. Longitudinal reflective
 4. Longitudinal cold-joint



Benefits

- Roads and bridges that are crack sealed last longer than those that are not.
- The benefits are realized in three to five years when it becomes obvious that the pavement has not deteriorated as quickly.
- Sealing prior to surface treatments and bituminous paving overlays enhances the treatment and further extends the pavement life.



Sealing Prep

- Preparation is key to successful use of crack sealants.
- Studies show that there is almost a 40 percent greater chance of sealant success if cracks are routed prior to sealing. (Connecticut Transportation Institute Technology Transfer Center)
- Cutting a reservoir also ensures that the proper amount of sealant penetrates the crack.

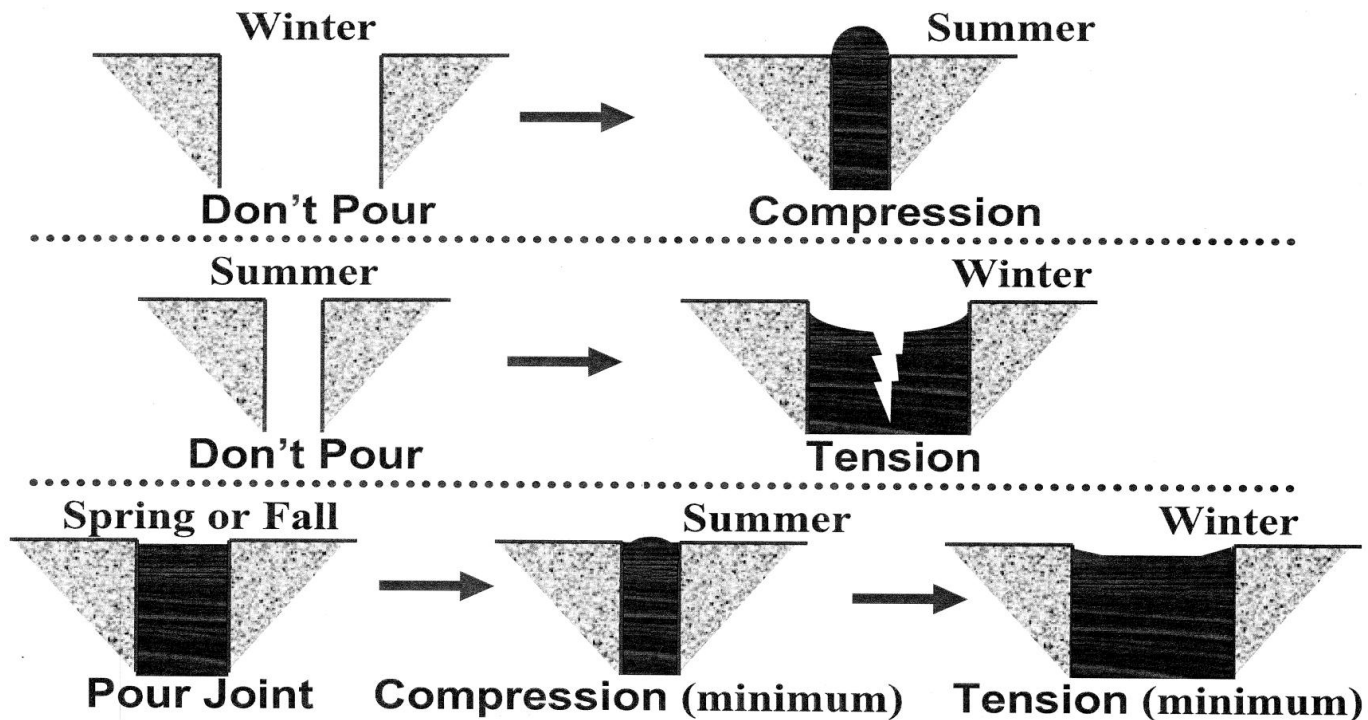


Timing?

- Spring and fall have the best weather for asphalt pavement crack sealing.
- Temperature between 45 and 65 degrees
- Cracks are normally at the middle of their working ranges.



Winter & Summer NOT the Right Time for Joint and Crack Sealing



Common Failures

Cohesive Failure



Adhesive Failure



- **Adhesion loss:** The sealant does not adhere to the sides or bottom of the crack.
- **Cohesion loss:** The sealant fails in tension by tearing.



Crack Filling (207)

- Emulsion (AE-90, AE-90S, AE -150)
- Asphalt Cement (PG64-22)
- Width of crack (0.2 – 1.0) inches
- Edge deterioration < 50%: Moderate to None
- Annual horizontal movement < 0.1 inches
- Non-Working cracks:
 1. Longitudinal edge
 2. Longitudinal reflective
 3. Longitudinal cold-joint
 4. Distantly spaced block



Considerations

- Since non-working cracks do not change in width significantly with temperature, applications of crack filling treatments can proceed at any time of the year.
- Cracks greater than 1 in. in width should be considered for repair.



Best Practice: "V" Squeegee

Good practice of applying the crack fill material with a squeegee to create an over band over the crack.



Troubleshooting

Table 4: Trouble Shooting Crack Sealing and Filling Projects

CAUSE	PROBLEM						
	ALL SEALS			EMULSION SEALS ONLY			
	Tacky Picks Up	Re-Cracks Quickly	Bumpy Surface	Separation From Crack Sides	Emulsion Sealer Not Breaking	Emulsion Sealer Breaks Too Fast	Emulsion Sealer Washes Off
Crack Wet					●		●
Sealant Not Cured	●			●		●	
Crack Dirty	●	●		●		●	
Insufficient Sanding	●			●		●	
Poor Finish, Wrong Tools	●	●	●	●		●	
Sealant Too Cold		●	●				
Sealant Too Hot	●			●			
Application Too High	●		●	●			
Application Too Low		●	●				
Sealant Degraded Due to Overheating	●	●	●	●	●	●	●
Rain During Application					●		●
Cold Weather		●			●		
Hot Weather	●		●	●		●	



Common Problems/Solutions

Table 5: Common Problems and Related Solutions

Problem	Solution
TRACKING	<ul style="list-style-type: none">▪ Reduce the amount of sealant or filler being applied.▪ For hot applied materials, allow to cool or use sand or other blotter.▪ Allow sufficient time for emulsions to cure or use a sufficient amount of sand for a blotter coat.▪ Ensure the sealer/filler is appropriate for the climate in which it is being placed.
PICK OUT OF SEALER	<ul style="list-style-type: none">▪ Ensure cracks are clean and dry.▪ Increase temperature of application.▪ Use the correct sealant for the climate.▪ Allow longer cure time before trafficking.
BUMPS	<ul style="list-style-type: none">▪ Check squeegee and ensure it is leaving the correct flush finish.▪ Have squeegee follow more closely to the application.▪ Decrease the viscosity of the sealer.▪ Change the rubber on the squeegee.



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Good Crack Seal?

Good example of a crack seal job. The seal material is not painted on the roadway and is contained to the crack area.

















Any Questions ?????