

RESEARCH REVIEW: Crack Seal Best Practices

by Andrew Wrucke, NDLTAP Technical Expert

“Preventative maintenance is the key to wisely utilizing public dollars and building and maintaining an effective transportation system. This is particularly important for regions such as the Upper Great Plains and northern Rocky Mountains where “road miles” and “land area” far exceed population, weather and environment present a never ending series of cycles and challenges, and subgrades and base layers are many times composed of or contaminated by water and frost susceptible, fine grained soils. The first step in pavement preservation is crack sealing/crack filling as water is a constant, sometimes “unseen”, but always ever present enemy of road performance. Effective and timely materials, methods and placement are the first step in this critical pavement preservation technique.”

– Ken Swedeen, Dakota Asphalt Pavement Association (DAPA) Executive Director



Crack sealing in the field

Crack sealing/filling is a cost effective pavement maintenance tool that can be effectively completed by county workers or contractors. Knowing how to most effectively employ this technique is important, as failure of this product is costly, especially in low budget situations. This review includes some researched best practices from NDDOT, FHWA, and other sources. Crack sealing and crack filling are similar processes which prevent water infiltration into the pavement layers. Crack sealing is commonly referred to as a “route and seal” which can include routing out the cracks and is best for cracks that are considered “working.” Crack filling is commonly just filling of existing cracks with sealant.



Routed crack being sealed

The ideal crack seal/fill creates a watertight seal over longitudinal and transverse cracks in the roadway. This prevents infiltration of water into the asphalt layer, base and subgrade, extending the life of the pavement. Cracks must be clean, dry and at least 1/8” wide to be candidates to be filled or sealed. Block and fatigue cracks are not good candidates to be sealed, as they are symptoms of pavement failure. Cracks wider than 1.5” will need to be evaluated for filling, as these are also symptoms of pavement failure. Thinner cracks may be routed to allow for a better seal placement. If a crack is routed, it should be routed to a minimum of 3/4” width to allow for a reservoir of sealant.

There are two main types of sealing materials: hot pour and cold pour. All hot pour sealant should conform to ASTM D 6690 specifications, and should be Type II or greater for the Upper Great Plains and Mountain regions. Hot pour sealants are recommended for general use and can be used for all sizes of cracks. Ensure the material is heated to the manufacturer’s recommended temperature for proper placement. Cold pour sealants are generally recommended for thinner cracks (3/16” or less) and in ambient temperatures over 50°F or higher. Some projects may require multiple types of crack seal.

Crack sealing is most effective when done after the initial paving or overlay of a roadway. A NCHRP report found that the optimal time for crack sealing in Michigan is 5 years after paving. NDSU research suggests that cracks should be filled soon after they have fully developed to prevent further separation and suggest a 4-8 year timeline. Crack seals/fills can last 6-8 years, and are commonly employed before chip seals. NDSU has also suggested that the optimal season to place crack seal is the spring, as ambient temperatures are moderate or cool but thermal cracks are still maximized from the winter.

Safety is of the utmost importance when having county staff complete crack sealing. Proper personal protective equipment (PPE) and work zone safety rules must be followed to keep workers and the traveling public safe from the high temperature materials. SDS Sheets should also be obtained and reviewed before work begins. For further discussion on crack seal safety, please refer to the March 2017 NDLTAP Safety Talk.

Following these guidelines and seeking outside opinions during design and scheduling of crack seal projects will improve the performance and cost effectiveness of these treatments. As with all pavement maintenance projects, this is not a cure all for every roadway, but a useful tool within your toolbox to help maintain the existing roadway network.

Suggested treatments based on crack characteristics (NDSU)

Crack characteristics	Crack treatment activity	
	Crack sealing	Crack filling
Width, inch (mm)	0.19 to 0.74 (5 to 19)	0.19 to 0.98 (5 to 25)
Edge deterioration (i.e., spalls, secondary cracks)	Minimal to none (\leq 25% of crack length)	Moderate to none (\leq 50% of crack length)
Annual horizontal movement, inch (mm)	\geq 0.11 (3)	< 0.11 (3)
Types of cracks	Transverse thermal cracks	Longitudinal reflective cracks
	Transverse reflective cracks	Longitudinal cold-joints cracks
	Longitudinal cold- joints crack	Distantly spaced blocked cracks
	Longitudinal reflective cracks	Longitudinal edge cracks

RESOURCES

Asphalt Maintenance – Crack Sealing to Surface Treatments. Presentation March 31, 2017. Tom Wood. [Asphalt Pavement Thermal Crack Maintenance Best Management Practices: Survey and Literature Review](#). NDDOT Project Number NDSU 2013-01, M. Abedelrahman et al. [Crack Filling/Sealing & Pothole Patching](#), NDLTAP Safety Talk, March 2017. Chris Padilla. [FHWA North Dakota Asphalt Crack Sealing Report](#). FHWA North Dakota Division Process Review Program. September 2005. Kevin J. Michel. [NCHRP Report 523: Optimal Timing of Pavement Maintenance Treatment Applications](#). Transportation Research Board.