



Research

Reflectivity of Crack Sealant

Report NM02MSC-02

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New Mexico Department of Transportation
Research Bureau
7500B Pan American Freeway NE
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By Brian Degani, Project Investigator

OBJECTIVE

Crack sealing is used in road maintenance but presents a problem when crack seal material is visually “pops-out” on the roadway, making it difficult to see lane stripes. This problem will increase as New Mexico increases its use of crack sealants. This survey has investigated whether there are any additives to the caulking material that will make it stand out less visually under certain conditions and what the impact of the additives are to the efficiency of the crack seal. The study was conducted in two different areas: modification of crack sealants and improvement of pavement markings.

DATA COLLECTION

- Experts in the field were consulted at the 2002 TRB conference.
- A literature search was conducted on this problem.
- Local materials experts were consulted.
- A survey was sent to other DOT’s to determine whether the problem is one that has been researched by their departments.
- Crack sealing manufacturers have been contacted about the problem.
- The NMSHTD materials lab has been queried as to the possibilities of conducting reflectivity tests. The University of New Mexico’s Engineering Department has a retro-reflect-o-meter used to measure the reflectivity of striping from an angle.
- A literature search of the best practices for painting lane stripes and different lane striping materials (i.e. pavement marking tapes) has been performed.

CONSULTATION OF EXPERTS

Experts in the fields of materials and maintenance were consulted at the 2002 Transportation Research Board (TRB) meetings. These experts stated that they have not studied the reflectivity of crack sealing.

LITERATURE SEARCH

A literature search was conducted (See References). The problem of crack sealing reflectivity was only mentioned tangentially as a safety problem and many indicated they have not heard of the problem. No solutions were suggested for this issue nor had research been conducted on the reflectivity of crack sealants. The Utah DOT said for example, they “have a policy of minimum patch width and their crews are trained to fill only the crack and not to leave a band-aid on the pavement surface.”

LOCAL MATERIALS EXPERTS CONSULTED

Dr. Gordon McKeen, Pavement Engineer with the Alliance for Transportation Research Institute (ATRI) was consulted. He stated that he knew of the problem from Pete Rahn, but he was not clear on the problem. His questions were, “How bad is it really?” and “Is this a result of normal crack sealing or is it due to poorly applied crack sealing?” McKeen said that he was told that putting sand on the top of the crack sealings would solve the problem.

SURVEY of the NATIONAL RAC

A question was sent to the national RAC members to discover whether crack sealing reflectivity was perceived as a problem in other states and whether other states have done research on this. Eighteen states replied to the survey. Representatives from four states (22%) said that they did

not use crack sealing; another two (11%) stated that although they use crack sealing, they use it immediately prior to resurfacing the pavement so the visual impact of the crack sealing is nullified. The majority of those surveyed (72%) state that they do not have the problem with visual impact of crack sealing.

Suggestions from the National RAC:

- David Kilpatrick of Connecticut stated that their solution is to maintain the lane stripes through a routine line painting program.
- Bill Rinard of Indiana stated that they use an ASTM D-6690 mixture with 18% recycled tire materials; this mixture gives a high quality, lasting crack seal with little degradation to the lane markings.
- Kevin J. Haas of Oregon states that in Oregon, crack sealing is used immediately prior to chip sealing the highway. He has also heard of using sand as a top coat to reduce glare.

CRACK SEAL MANUFACTURERS QUERIED

Four different manufactures of crack sealant, Envirotech Services Inc., Maintenance Inc., Neyra and Ultraseal, have been contacted. Three of these, Envirotech Services Inc., Maintenance Inc., and Neyra showed no interest in the project; however, Ultraseal (Carl Mohammad) indicated interest in working with NMSHTD on this issue.

NMSHTD MATERIALS LAB CONSULTATION

Jim Stokes of the Materials Lab was consulted. He talked about the different types of testing that could be performed. Reflectivity tests and weatherometer tests would have to be conducted at “outside labs.” He could do some testing on the elasticity of crack sealants. Other test material

comparisons of reflectivity and durability would look at the following: regular crack seal material; crack seal material with sand on top; crack seal material with sand mixed-in; crack seal material with recycled material mixed-in; and crack seal material with dust, carbon black or other crack seal additives. Mr. Stokes said he will review the ASTM D-6690 (Standard Specification for Joint and Crack Sealants) to determine if any chemical testing should be done. Mr. Stokes suggested contacting Dennis Ortiz of the NMSHTD Maintenance Bureau because he thought there may have been contracts done in the past that used recycled tires in the application of our crack sealants.

CONCLUSIONS and RECOMMENDATIONS

Several researchers from private companies to State Department's of Transportation (DOTs) were consulted suggested putting sand over the crack seal. This seems to be a quick and easy solution. Using sand has raised questions of it being a temporary solution that only lasts for awhile. If the sand wears off within a month or two, then the problem of the reflectivity of the crack seal returns and the solution is not an effective one. Thus, weatherometric testing would be necessary to determine its durability.

Indiana Department of Transportation (INDOT) has been crack sealing for many years. When sealing the center longitudinal cracks with AE 90 or AE 150, the lane markings were degraded. Indiana suggested another promising solution: an ASTM D-6690 mixture with 18 percent recycled tires. According to Bill Rinard, Operations Field Engineer, INDOT is now using either AE 90S, a polymer modified emulsion or a high specification material that meets ASTM D-6690 with a minimum of 18 percent recycled rubber by weight of asphaltic components. The AE90S is used on older surfaces and performs better with less tracking than the AE 90/150 materials. On Indiana's high quality surfaces (2 to 5 years old), INDOT is routing and sealing with the ASTM D-6690 material.

The routing and use of these material results in high quality crack seal with very little degradation of the lane markings. An investigation of this mixture was recommended to the Materials Lab and review of past maintenance contracts noted above.

The other avenue of research into alternative lane stripping materials and procedures shows that when considering costs between painting and thermoplastic striping, the latter is more economical if the cost of crashes is factored in. Thermoplastic wears at least twice as long as paint, but is more expensive. However, the thermoplastic tape has high levels of retro reflectivity that reduce crashes (see “*Cost and Longevity-Based Scheduling of Paint and ThermoPlastic Striping*” published July 2001). With this factored into the cost equations, thermoplastic tape would appear to be cost effective. In light of the Traffic Safety Summit (May 2002), I suggest that Thermoplastic Tape be tested for use in high crash areas and/or safety corridors (a paper submitted for presentation at the 81st Annual Meeting for the Transportation Research Board January 13-17, 2002, titled “Cost-And Longevity-Based Scheduling of Paint And Thermoplastic Striping” discusses the analysis, methods, procedures, tests, conclusions and recommendation).

REFERENCES

[ATM \(Advance Traffic Markings\)](#), A Division of Patch Rubber Company, P.O. Box H, Roanoke Rapids, N.C. 27870, (252) 536-2574, Fax (252) 536-4940, Email: www.trafficmarking.com, produces the ATM 120 No-Foil Removable Temporary Grade,

[Edison Coatings, Inc.](#), 3 Northwest Drive, Plainville, CT 06062 USA Phone: (860) 747-2220 or (800) 697-8055 FAX: (860) 747-2280 or (800) 697-8044

[Environmental Services, Inc.](#), P.O. Box 338, Kersey, CO 80644. Distributed by Desert Mountain Corporation, P.O. Box 1633, Kirtland, NM 87417, 1-800-375-9264, (505) 598-5730, Fax (505) 598-0436.

[Maintenance Inc.](#), 1-800-892-6701. Maintenance Inc said they have not heard of the problem and didn't have any additives to reduce the reflectivity.

[Neyra](#), 1-800-543-7077 or 513-733-1000, Fax 513-733-3989, Neyra Industries, Inc. 10700 Evendale Dr., Cincinnati, OH 45241, Email: info@neyra.com, Neyra indicated they have not heard of the problem and their crack sealants are used on parking lots.

[Owens Corning \(TruGuard\)](#), 1-800-Get-Pink, INTEGREGX Testing Systems, 877-438-6287 (Toll-free), 740-321-4287 (Fax), Email: integrextesting@owenscorning.com, INTEGREGX Testing Systems, 2790 Columbus Rd. Rte. 16, Granville, OH 43023

[Ultraseal](#), 1-888-383-8721, Ultraseal said they use dust as they are crack sealing because it cuts down the reflectivity and reduces cracking. Carl Mohammad, Technical Support Representative, 905-629-2209, said they have also used "carbon black" in minimizing the reflectivity of the crack seal and was willing to work with NMSHTD on this issue.



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