Report No. CDOH-DTP-R-84-2

PAVEMENT AND SHOULDER MAINTENANCE
WORKSHOP

Crack and Joint Sealing of Concrete Pavements
Crack Sealing of Bituminous Pavements
Seal Coating of Bituminous Pavements

FIELD TESTS AND EVALUATIONS

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Special Report
January 1984

Prepared in cooperation with the
U.S. Department of Transportation
Federal Highway Administration

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16. Abstract

Colorado participated in the Pavement and Shoulder Maintenance Workshop in 1982 and agreed to participate in the field testing and evaluation of three of the activities on which guidelines are to be developed. This report is in three parts, each of which documents the work done by maintenance sections in Colorado. The three activities are Crack and Joint Sealing of Concrete Pavements, Crack Sealing of Bituminous Pavements and Seal Coating of Bituminous Pavements. This document, therefore, outlines the general procedures and results obtained from these activities in Colorado. It is hoped that this report will be of value to maintenance and engineering forces in Colorado.

The FHWA is combining these results with results from the six other states that also participated in the workshop to produce a final set of guidelines for six maintenance activities. The FHWA maintenance guidelines report will be useful to State and Local Maintenance Supervisors throughout the country.

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TABLE OF CONTENTS

PAVEMENT AND SHOULDER MAINTENANCE

WORKSHOP

DENVER, COLORADO

Crack and Joint Sealing of Concrete Pavements

FIELD TEST AND EVALUATION

Colorado Department of Highways

4201 East Arkansas Avenue

Denver, Colorado 80222

Federal Highway Administration

REGION 8

OCTOBER 3 - 6, 1983

Background

Colorado participated in the Pavement and Shoulder Maintenance Workshop in 1982 and agreed to participate in the field testing and evaluation of Crack and Joint Sealing of Concrete Pavement. This report documents the work done by Maintenance Section 8 and the evaluation by the Research and Development Section. Items of the work which were in agreement with the Performance Guides are not reported in depth but items which deviate from the Performance Guides are discusssed in detail.

Introduction

The field tests and evaluations of crack and joint sealing in Colorado were conducted in the Denver Maintenance Section Number 8. Interstate 70 east of Denver between I-225 and Tower Road was selected for these field tests and evaluations. This four lane concrete highway is 19 years old and carries 24,600 vehicles per day. The highway is in fair condition with some random cracking and spalling at corners. The cracks and joints had not been filled for several years.

The warrants for sealing joints and cracks in Colorado are the same as those stated in the Performance Guide.

Materials Used

Colorado has used a considerable amount of rubber-asphalt in the past, especially in large urban areas, however, the older hot poured asphalts have

been used in recent years. Colorado Maintenance Superintendents are quite concerned about the safety hazards of using asphalt-rubber mixes and not satisfied with the lower production of 150 to 250 gallons per day.

For the purposes of these field trials, RC 800-R and HFE 100SC were evaluated as hot pour sealants, placed by maintenance forces. Additional materials used in conjunction with the Concrete Rehabilitation Demonstration on the same project, included two brands of silicone rubber, two rubber asphalt materials and a neoprene joint sealer. Table A lists the materials, the placement temperature of the pavement and the material, the date of placement, the cost per pound, and the installed cost per lineal foot. The preparation of joints including sawing and cleaning was done in advance and is estimated to cost about $1.00 per foot. Therefore, if $1.00 is added to each figure in the installed cost column total in-place costs would result.

TABLE A

Material	Placement Temperature Pavement/Matl		Date	Material Cost/lb.	Installed Cost/ft.
Dow Silicone #888	65°F	65°F	10/5/83	$2.81	$1.27
GE Silicone	65°	65°	10/5/83	$2.81	$1.27
Neoprene Joint Sealer	65°	65°	10/5/83	1.25/1in. ft	$3.10
Allied Joint Compound	65°	370°	10/5/83	0.40	$0.52
Crafco RS 221	65°	380°	10/5/83	0.43	$0.52
RS 211	65°	380°	10/6/83	0.42	$0.52
RS 213	65°	380°	10/7/83	0.46	$0.53
RS 231	65°	380°	10/7/83	0.73	$0.57
AR Mod	65°	380°	10/11/83	0.33	$0.50
AR Plus	65°	380°	10/11/83	0.41	$0.52
HFE 100 SC	48°	120°	10/17/83 10/21/83	0.13	$0.47
RC 800 R	45°	190°	10/21/83 11/13/83	0.11	$0.47

Performance

One to 3 years of service is expected from the conventional hot poured materials, 3 to 5 years from the rubber asphalt and more than 7 years from the silicone materials. Recent inspections (December, 1983) have revealed cohesion failures in many of the GE silicone sealed joints. Cohesion and adhesion failures were also observed in the HFE 100 SC filled joints. No explanation for these failures is submitted at this time. Good performance is expected, equal to or better than that stated in the performance guide, from the remaining materials.

Procedures Used

All materials were placed in October when the weather was clear and dry. Pavement temperatures ranged from the 30s at night to a high of 70°F on the warmest day.

All preparation of cracks and joints was done in accordance with the performance guides. This included sawing, routing, cleaning and installation of backer rod to provide the proper shape factor.

Hot poured materials were placed with hand pour buckets to the top of the joint ± 1/8 inch. Silicone sealants were placed with pressurized wands to within 1/4" of the surface. Rubber asphalt materials were installed by a heated pressurized wand and squeegeed to level with the surface. The neoprene joint material was compressed and forced into place with a weighted rolling tool after the application of a lubricating glue.

Crew Size

Routing, sawing, and cleaning had been done in advance, therefore, the filling crew included two men to blow loose debris from the joints and cracks with compressed air, and four men to install the materials. This filling operation required six men, some of whom set and maintained traffic control as well as fill cracks.

Productivity

In all cases the crack and joint preparation had been completed prior to application and is not included in these estimates. Productivity is also very dependant on the size of the cracks and joints to be filled i.e.: 1/4" vs, 3/4". The hot poured asphalt materials HFE 100SC and RD-800R were placed at a rate of about 300 to 500 gallons per day. All other materials were placed in small test sections which required less than one days run. The following are estimates derived from rates per hour and from previous experience.

Rubber asphalt materials = 100 to 300 gallons per day. Silicone materials = 60 to 150 gallons per day. Neoprene joint material = 1200 to 1800 lineal feet per day.

Safety

Traffic control was maintained according to MUTCD at all times while work was conducted. Company representatives and employees installed the rubber asphalt and silicone materials and all of these people observed the safety precautions for their operations. These safety precautions agree with those stated in the performance guide. The CDOH maintenance forces observed appropriate safety precautions however these asphalt materials applied between 100 and 200^{0}F aren't nearly as dangerous as the rubber asphalts.

Remarks

It has been well established that joint resealing, performed at the proper time, greatly increases the life of a concrete pavement. Pavement deterioration rapidly accelerates with open and ignored pavement joints and cracks. More time and money should be allocated to this and other maintenance activities which are known to prevent extreme deterioration and costly repair or reconstruction. Long term evaluations of these materials will be done under the CPR project. All these materials were applied at the same location and time on the CPR Demonstration project, therefore, the test performance evaluation will be optimized.

Cutting & cleaning old joints to establish proper joint shape factor. Joints are cut with diamond saw blades to prevent spalling.

Compressed air is used to remove sand and debris just before application of filler materials.

Backer rod is installed to provide the proper shape factor.

Hot poured asphaltic materials are placed with hand pour buckets.

Silicone materials are injected into the joints with a pressurized wand.

Hot rubber – asphalts are placed with a heated pressurized wand and squeegeed to level with the surface.

PAVEMENT AND SHOULDER MAINTENANCE

WORKSHOP

DENVER, COLORADO

Crack Sealing of Bituminous Pavements

FIELD TEST AND EVALUATION

Colorado Department of Highways

4201 East Arkansas Avenue

Denver, Colorado 80222

Federal Highway Administration

REGION 8

OCTOBER 3 - 6, 1983

Background

Colorado Maintenance Section 4 agreed to field test crack sealing of bituminous pavements as a result of the 1982 Pavement and Shoulder Maintenance Workshop. The Research and Development Section accepted a contract agreement with the FHWA Region 8 to evaluate and report on the crack filling activity. This report documents the work and the evaluation of this activity. Items of the work which were in agreement with the Performance Guides are not reported in depth; however, items which were not performed according to the Performance Guides are discusssed in detail.

Introduction

Crack filling of bituminous pavements was performed in Pueblo Maintenance Section 4. Five test sections of one mile each were established on S.H. 287 south of Lamar. Table A shows the materials, site locations, placement temperatures, and times.

The average daily traffic on this thirty-five year old highway was 2,350. The surface was overlayed with a two-inch hot plant bituminous surfacing about ten years ago. The major cracking on this highway is transverse thermal cracks spaced at 40 to 60 foot intervals. Three additional test sites were evaluated with a high float emulsion used. These were on S.H. 96 near Westcliff and two projects on I 25 near Pueblo. The sites placement temperatures and time of placement are also included on Table A.

TABLE A
Crack Sealing Test Sections
South of Lamar

Site Location	Material	Placement Temperature	Time of Year
MP 58-59	AC-10	265	April
MP 60-61	RC-800	200	April
MP 62-63	RC-800 & MC-250	200	April
MP 64-65	RC-250	200	April
MP 66-67	CRS-2 & Reclamite	150	April
	I-25 in Pueblo County		
MP 90-91 Southbound	HFE 100 SC	130	Feb-Mar
MP 96-97 Southbound	HFE 100 SC	120	May-June
	S.H. 96 Near Westcliffe		
MP 6-7	HFE 100 SC	140	Feb

Type of Cracks and Warrants for Sealing

The Performance Guides were generally followed with the following exceptions. Cracks less than 1/4" are often filled or covered as a bandaid treatment. This is only a small percent of the work and is done concurrently with the larger cracks being filled. Cracks larger than 3/4" are occasionally filled with hot poured liquid rather than a bituminous mix.

Materials Used

Colorado has used a considerable amount of rubber-asphalt in the past, especially in large urban areas, however we have returned to older hot poured asphalts have been used in recent years. Colorado Maintenance Superintendents are quite concerned about the safety hazards of using asphalt-rubber mixes and not satisfied with the lower production of 150 to 250 gallons per day.

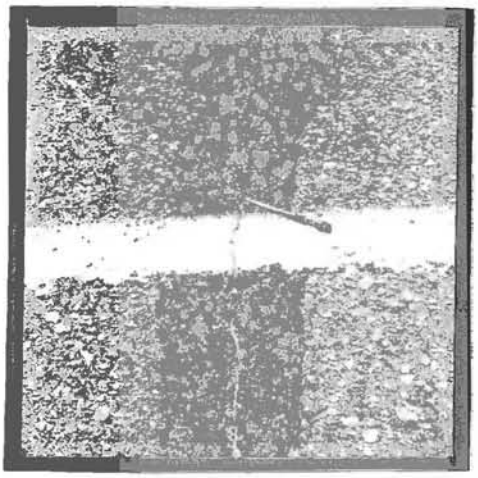
For the purposes of these field trials AC-10, RC 800, RC 800 + MC 250, RC 250, CRS 2 + Reclamite and HFE 100SC were evaluated as hot pour sealants.

Performance

All of the above materials except the HFE-100SC were placed in 1982 and had failed by cohesion in more than 70% of the lineal feet by the end of nine months. This failure is by definition any reopening which would allow entry of water or debris.

Colorado feels strongly that there is considerable benefit of crack filling even if hair line recracking occurs. The 2" $\pm$ lap of asphaltic material on the surface either side of the crack (bandaid effect) prevents the adjacent pavement from spalling and raveling.

All materials are expected to be of some benefit for at least five years.



This crack was filled and recracked one year later. The new crack is small and the edges are protected.

These cracks were filled in June 1983 with HFE 100 SC.

The material HFE 100SC (polymerized high-float anionic emulsion (band name STYRELF) was placed on three projects in February, May and June of 1983. After three to seven months there have been no failures and the material is very resilient and flexible, yet there has not been any tracking under high speed and high volume traffic. Several years of observation will be required to determine the effectiveness of HFE100SC, however good long term performance is anticipated.

Procedures Used

All of the materials except HFE100SC were placed in the late spring using standard maintenance tar pots and manual pouring buckets. The weather was clear and dry with ambient temperatures ranging between 40 and 60° F.

Pavement temperatures ranged from 45 to 80° F. Colorado does not rout cracks. Cracks are blown out with compressed air when necessary, and are filled to overflow slightly to form a bandaid surface. All other procedures outlined in the performance guide such as safety, traffic, temperatures and crew sizes are generally followed in Colorado.

Supervisors expect 300 to 500 gallons per day production.

The only cost variable is the cost of materials since crew size and other factors are the same for the crack fillers used in Colorado. The following is a list of these materials and their cost:
AC-10 = $161.80/T, RC-800 = $219.35/T, RC 800DN = $291,80/T, CRS-2 = $162.80/T and HFE 100 SC = $280.00/T.

The HFE 100SC was placed on one high altitude cold climate job in February of 1983, another project in April and May and on a third urban interstate project in June. This material also required only a standard tar pot or distributor and hand pouring buckets since it pours well between 100°F and 140°F. The high float emulsion can be placed in damp cracks with no detrimental effect. A thin crust or skin forms over the top in as few minutes which does not track or pick up on tires. Traffic can be opened within one to three hours depending on the temperature and humidity. Production ranged from 300 to 450 gallons per day. The material can be stored for several days down to 70°F, then heated and remixed with minimal agitation. Conclusions are not being drawn yet, as we have not seen long term results however it may become a valuable tool in our future crack pouring program.

A draft copy of Colorado's specifications for polymerized high float emulsion is attached.

REVISION OF SECTION 702
EMULSIFIED ASPHALTIC MATERIAL (RUBBERIZED)

The following shall be added to Section 702 of the Standard Specifications for this project:

HIGHFLOAT EMULSIFIED ASPHALT HFMS (RUBBERIZED)

HFMS (Rubberized) shall be an emulsified blend of asphalt, rubber, water and emulsifiers. The asphalt cement shall be thoroughly blended with a miminum of three (3.0) percent rubber prior to emulsification. The emulsion, standing undisturbed for a minimum of twenty-four (24) hours shall show no separation indicated by white milky colored substance on the surface. The emulsion shall be pumpable and suitable for application through a pressure distributor. The emulsified blend shall conform to the following requirements:

Property	HFMS-2R	HFMS-2hR	AASHTO TEST NO.
Test on Emulsions:			
Stretch Test	Pass	Pass	CPL-2211
Viscosity, Saybolt Furol at 122 F,s	50 min	50 min	T-59
Storage stability test, 24 hrs, %	1 max	1 max	T-59
Sieve test, %	0.10 max	0.10 max	T-59
Residue by distillation	65 min	65 min	T-59
Oil distillate by volume, %	3 max	3 max	T-59
Test on Residue from Distillation Test:			
Penetration, 77 F 100g, 5s	100-200	60-100	T-59
Float test, 140 F, s	1200 min	1200 min	T-50

COLORADO PROCEDURE L-2211
STRETCHABILITY OF HIGHFLOAT EMULSIFIED ASPHALT HFMS (RUBBERIZED)

SCOPE

1.1 This procedure describes the method of test for determining the stretchability of rubberized highfloat emulsified asphaltic materials.

APPARATUS

2.1 Container - metal, approximately 100 mm (4 in.) in diameter and 10 mm (3/8 in.) in depth.

NOTE 1 - One quart friction can lid, or similar container has been found to be satisfactory.

2.2 Oven capable of maintaining a temperature of 38° ± 3 C. (100° ± 5 F.)

PREPARATION OF TEST SPECIMEN

3.1 The sample, as received, shall be throughly mixed. It shall not be heated above ambient room temperature. The sample shall be homogenous, showing no separation.

3.2 The aggregate shall be clean, sharp edged material between approximately 19 mm and 12.5 mm (3/4 in. and 1/2 in.).

TEST PROCEDURE

4.1 Pour the emulsion onto the metal container to a depth of .0625 to .125 mm (1/16 in. to 1/8 in.). Immediately embed 4 to 6 aggregate specimens into the emulsion.

4.2 Place the prepared specimen into an oven maintained at 38° ± 3° C (100° ± 5° F.) for 24 ± 2 hrs. After oven curing, remove the test specimen and allow to cool to room temperature.

4.3 Determine the stretchability of the specimen by lifting each stone from the metal container at a steady uniform rate of pull with the fingers.

REPORT

5.1 The asphaltic material between the metal container and aggregate shall stretch a minimum of 76 mm (3 in.) without breaking. The average of the number of embeded aggregate pieces shall be used for reporting.

REVISION OF SECTION 702
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Property	HFMS-2R	HFMS-2hR	AASHTO TEST NO.
Test on Emulsions:			
Stretch Test	Pass	Pass	*
Viscosity, Saybolt Furol at 122 F, s	50 min	50 min	T-59
Storage stability test, 24 hrs, %	1 max	1 max	T-59
Sieve test, %	0.10 max	0.10 max	T-59
Residue by distillation	65 min	65 min	T-59
Oil distillate by volume, %	3 max	3 max	T-59
Test on Residue from Distillation Test:			
Penetration, 77 F 100g, 5s	100-200	60-100	T-59
Float test, 140 F, s	1200 min	1200 min	T-50

* Stretch Test

Pour onto a 1 quart friction can lid, or a similar container, enough of the emulsion to cover the surface to a depth of 1/16 to 1/8 inche. Immediately, while the emulsion is still brown embed with thumb pressure several 3/8 to 5/8 inch stone or chips into the binder. The stone should be clean and sharp edged.

Put the lid containing the binder and chips into a 100 F oven and allow to cure for a period of 8 hours or overnight. After the curing period remove the lid and let cool to room temperature. Upon lifting a stone from its binder, the asphaltic material must stretch out for a distance of at least three inches without breaking.

PAVEMENT AND SHOULDER MAINTENANCE

WORKSHOP

Denver, Colorado

SEAL COATING OF BITUMINOUS PAVEMENTS

FIELD TEST AND EVALUATION

Colorado Department of Highways
4201 East Arkansas Avenue
Denver, Colorado 80222

FEDERAL HIGHWAY ADMINISTRATION

REGION 8

OCTOBER 3 - 6, 1983

Background

Colorado participated in the Pavement and Shoulder Maintenance Workshop in 1982 and agreed to participate in the field testing and evaluation of Seal Coating of Bituminous Pavements. This report documents the work done by Maintenance Section 1 and the evaluation by the Research and Development Section. Items of the work which were in agreement with the Performance Guides are not reported in depth but items which deviate from the Performance Guides are discussed in detail.

Introduction

The field tests and evaluations of seal coats in Colorado were conducted in the Greeley Maintenance Section Number 1. Reclamite was used as a rejuvenating agent on S.H. 157 in Boulder. This recently completed highway carries 12,000 to 15,000 vehicles per day. Table A shows the site and the temperature conditions of placement.

Five other seal coats were placed S.H. 170 near Boulder in August. The weather was hot and dry with temperatures ranging into the 90s. The materials used and the temperature conditions are also shown in Table A.

In addition a high float emulation was used in Pueblo Maintenance Section 4 for sand and chip seal coats. These were placed from July through early September and at altitudes between 4,200 and 8,500 feet. All of these seal coats were placed on low volume two lane highways. Two of these are included in Table A.

TABLE A
Seal Coating Test Sections

Section Location	Type of Seal	Material	Temperature		
			Asphalt	Pavement	Air
1 SH 170	Chip	RC-800	200	90-125	95
2 SH 170	Squeegee	MC-250	200	90-125	95
3 SH 170	Fog	CSS-1h	160	90-125	95
4 SH 170	Chip	CRS-2	150	90-125	95
5 SH 170	Sand	CRS-2	150	90-125	95
SH 157	Rejuvinating	Reclamite	125	50	45
SH 96	Sand	HFE80SC	125	140	110
SH 105	Sand	HFE80SC	135	90-100	85

Type of Seal Coat and Warrants for Each

Colorado's procedures are not significantly different than the performance guide except that chip seals are occasionally applied to highways that have more than 2000 ADT. Maintenance sections do not place slurry seals as the equipment is not available.

A rejuvenating agent was used on a two month old hot bituminous pavement which was starting to show signs of raveling. Reclamite was used to check a raveling problem on this new highway in Boulder. The project was paved in the fall under cool weather conditions. Reclamite was placed on a mild winter day and alleviated the potential problem.

For the purposes of these field tests and evaluations, Colorado placed small sections of each of four other types of seal coats. Test sections of chip seal, sand seal, fog seal and squeegee seal were placed on S.H. 170 west of S.H. 93 to Eldorado Springs. This older 22 foot wide highway carries 2200 ADT and had a dry oxidized surface which was extensively cracked but was structurally sound. The surface was a quiltwork

of patches, thin bladed overlays and small sections of sand seal coats. Thermal transverse cracks were spaced from 10 to 50 feet apart and were often interconnected by alligator cracking.

Materials Used

Five test sections were established ranging from 1100 feet to 1600 feet or about 0.2 to 0.3 miles. From east to west the test sections, materials used, and the quantities of each were:

1. A chip seal using 0.25 gallon per square yard of RC-800 and covered with 27 pounds per square yard of clean washed 3/8" chips.
2. A squeegee seal using MC-250 at the rate of 0.10 gallon per square yard blotted with 17 pounds per square yard of clean plaster sand resembling blow sand.
3. A fog seal with CSS-1h at 0.10 gallon per square yard blotted with 22 pounds per square yard of clean plaster sand.
4. Another chip seal using 0.28 gallon per square yard of CRS-2 covered with 27 pounds per square yard of clean washed 3/8" chips.
5. A sand seal with CRS-2 and 20% reclamite at 0.25 gallon per square yard and 27 pounds per square yard of clean washed cement sand resembling river sand.

In addition to the above a polymerized high float emulsion has been used for chip seals and sand seals in southeastern Colorado.

Performance

The rejuvenating agent, Reclamite, did check the raveling which had started on the new hot bituminous pavement in Boulder. The life of this pavement should easily reach or exceed the design life with little additional maintenance to the surface.

The chip, sand, fog and squeegee seals applied on SH 170 should prolong the service life of this pavement for at least 5, 4, 2 and 2 years respectively. Very little surface maintenance should be required within these time limits, and these seal coats are considered to be a very cost-effective activity.

Procedures Used

Cracks were not filled prior to the sealing operations as it was not practical to fill the thousands of small and alligator cracks. Only a few of the largest cracks were larger than 1/4" with the maximum at 1/2". Potholes were patched in advance of the sealing.

The actual procedures were quite similar for all five of the test plots since the same equipment and men were used throughout. Signing and traffic control were set up and equipment adjusted for each test. The pavement was swept and kept clean in the work area. A one-thousand gallon distributor was used for all of the asphalt materials. In each instance, the asphalt was applied at the proper temperature and at a predetermined rate. A chip spreader tended by two or three men and loaded by several trucks applied the chips, sand, or blotter sand as required. A rubber tired roller made at least two passes followed by a steel wheel roller. The one exception to this procedure was the squeegee seal where a maintainer equipped with a rubber blade was used to work the MC-250 into the cracks. The blade made four passes rolling the asphalt back and forth across each 11-foot lane until most of it was forced into the cracks. This processing was followed by the spread of fine sand and rollers as in the other operations.

There were fifteen men on the crew which included truck drivers. Production was small and not considered to be representative since these

operations were new to most of the men. The short test sections also limited production.

An observation is that the emulsions cured much faster and the chips or sand embedded firmly, while the RC and MC materials were very tender and some bleeding started after the second day.

Six chip and sand seal jobs using polymerized high float emulsion were placed in southeastern Colorado this summer. The operation is very similar to any other chip seal with a few exceptions. The emulsified asphalt is applied at 120 to 150° F and the chips or sand is applied from two to fifty minutes later. A long time delay for spreading chips was encountered when a break down in equipment occurred and there was no detrimental effect. There has been no bleeding or tracking of this material even when applied at 95 to 110° F ambient temperatures and pavement temperatures in the 150° F range.

Additional Information

As a result of a series of seal coat failures in 1982 in Colorado, a task force was formed to look into the problems and make recommendations to improve the probability of success.

The task force determined that major causes of failures included cool rainy weather and poor traffic control. A check off list and recommendations was produced to correct these and other problems. A copy of this list and recommendations is attached.

A second attachment is Colorado's Draft specifications for polymerized high float emulsion.

The third attachment is an outline from a presentation by our Section 4 Maintenance Superintendent on the use of the high float emulsion.

A typical view of S.H. 170 before the application of seal coats. Note: cracking and thin sand seal.

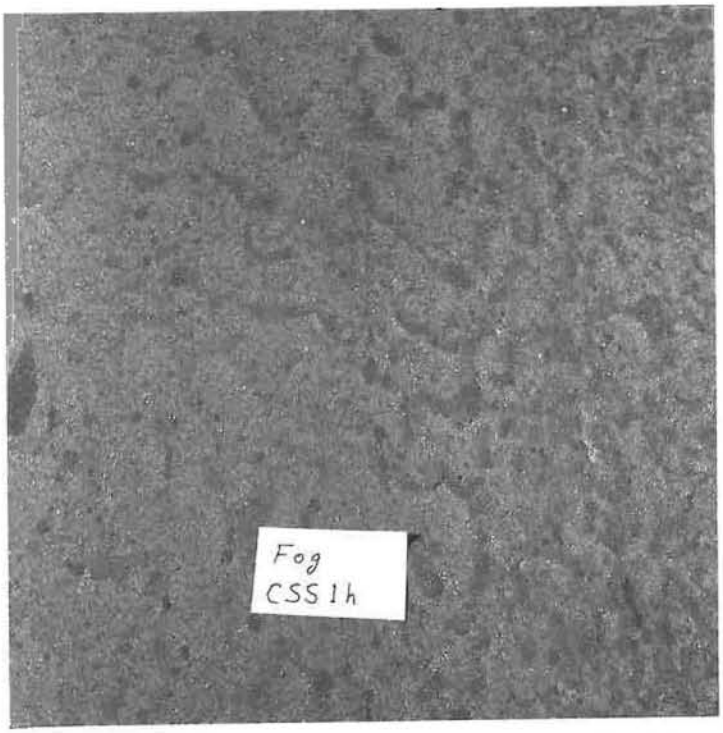
The equipment, men and procedures 1. distributor of asphalt cement, 2. chip spreader and truck, 3. rubber tire and steel wheel rollers. Not seen are traffic control, more trucks, loader, broom and foreman.

Section #1

Chip seal with RC-800 bleeding in wheel paths.

Squeegee seal using MC-250. Note the richer asphalt where cracks were filled.

This seal was tender for several days. Vehicles turning from driveways cut tire tracks into the seal.



Fog seal with SS-1h. 0.10 gal. per sq. yd. was slightly heavy; however, there has been no tracking or bleeding.

Chip seal with CRS-2

This section cured within a short time and turned out to be the best chip seal of the field tests.

Sand Seal W/CRS-2

This sand seal worked well. Note the filled crack just above the card.

A distributor spreading polymrized high float emulsion at 0.23 gal. per sq. yd.

Sand spreader within 200' of the distributor. 18-20 lb per sq. yd. Note the cracked untreated pavement in the foreground.

The sand seal in place for 24 hours.

A substantial amount of sand has been embedded into the asphalt mixture.

MEMORANDUM

DEPARTMENT OF HIGHWAYS
4201 East Arkansas Ave.
Denver, Colorado 80222

DATE: February 9, 1983

TO: District Engineers and Maintenance Superintendents

FROM: Wayne J. Capron

SUBJECT: Check-Off List for Improved Seal Coating

In September 1982 a Task Force was put together to come up with a check-off list for all seal coating. This Task Force was made up of Stu Tapp, Robert Moston, Glenn Fritts, Walt Harris, David Fraser and myself. The Committee gathered information as follows:

1. Information from other sources such as district guidelines, other states, research from Tech Transfer and Asphalt Institute.

2. We identified problem areas and tried to determine cause.

3. We researched failures and compared those failures to the total square yards placed by both construction and maintenance.

4. Looked into materials such as asphalt, emulsions, and chips.

5. Should we be seal coating by maintenance or contract and, if by maintenance, is the necessary equipment available?

6. What cost of seal coating can be expected per mile?

7. Reviewed specifications and special provisions.

As a result of these investigations and several meetings, the Task Force Committee has come up with the following check-off list and final recommendations to be utilized statewide.

MATERIALS

		YES	NO
A.	**Aggregates**		
1.	Is aggregate size too large (-½ inch recommended)?	____	____
2.	Is aggregate clean (may need to wash)?	____	____
3.	Does aggregate meet specifications?	____	____
4.	Is aggregate stock piled along project where needed?	____	____
5.	Is aggregate stored so that it will not become contaminated before use?	____	____
6.	Is proper equipment available for loading and transporting aggregate to chip spreader?	____	____
B.	**Asphalt**		
1.	Is correct asphalt being used? (At the present time there is only one supplier of RC 800 rubberized materials. There are several suppliers of emulsion-type asphalts including rubberized emulsions.)	____	____
2.	Do you have an evaporation curve for RC's available?	____	____
3.	Do you have proper storage and heating facilities for the material?	____	____
4.	Do you have the correct tables for computing gallons per square yard?	____	____

CONSTRUCTION TECHNIQUES

A.	**Pavement to be treated**		
1.	Is pavement clean and dry?	____	____
2.	Is temperature at 70 degrees and rising?	____	____
3.	Has surface been swept before applying asphalt?	____	____
4.	Is there any threat of storm during the days run?	____	____

B. Materials	YES	NO
1. Are there plenty of chips available before distributor applies asphalt?	____	____
2. Is asphalt at the right temperature for application?	____	____
3. Is spreader in position with chip truck attached before starting distributor?	____	____
4. Is joint papered?	____	____
5. Has application rate been computed and distributor adjusted accordingly.	____	____
6. Has sufficient area ahead of distributor been cleared of traffic?	____	____
7. Is proper control of traffic in place?	____	____
C. Application of Materials		
1. Are all nozzles working properly on distributor and set at proper angle?	____	____
2. Is application rate correct?	____	____
3. Is spreading of chips immediately behind distributor? (Distributor should not be over 200 feet ahead of chip spreader.)	____	____
4. Are adequate chips available to keep up with the distributor?	____	____
5. Is tanker truck located in proper location for easy and safe refill of distributor?	____	____
6. Is proper application of asphalt being applied?	____	____
7. Has a test strip been established?	____	____
8. Are adequate rollers available to keep up with the rolling (~~either~~ Both steel wheel or rubber tire rollers)?	____	____
9. Are rollers equipped with water so that they do not pick up the chips?	____	____
10. Are rollers keeping up close enough behind the spreader?	____	____
11. Are loose chips swept from the surface prior to opening to traffic?	____	____

D. Traffic Control

It was felt by the Task Force Committee that most of our failures have been the combination of rain showers and lack of traffic control. Therefore, we are recommending the following items for traffic control.

1. Can traffic be diverted while seal coating is taking place? ____ ____
2. If not all traffic, can trucks be diverted to other routes? ____ ____
3. If traffic can not be diverted are pilot cars available? (This should be mandatory.) ____ ____
4. Are there enough drivers to use pilot cars all night, if necessary? ____ ____
5. If there a CDOH sand truck on the job with blotter sand? (This is another mandatory requirement.) ____ ____
6. Are drivers available to be with the sand truck 24 hours a day or until adequate cure has occurred? ____ ____
7. Have excess chips been swept before opening to full speed traffic? ____ ____

As previously stated, the Committee felt that two changes in our operation would improve our chances for 100% success on seal coat projects. We will be asking the Specification Committee to change the specifications to reading 70 degrees minimum and dry pavement. The other item is adequate traffic control. The Committee also felt that we would have better luck with maintenance forces doing the actual seal coating while buying materials from commercial sources because there was better control over shuting down for weather. All districts are adequately equipped to place seal coats. It would appear that we should be doing more and more seal coating with the emulsion asphalts since to our knowledge there is only one supplier of the RC-800R series with the asphalt people telling us that it is being phased out.

WJC/fc
xc: E. N. Haase
H. Atchison/Donnelly
S. Tapp
R. Moston
G. Fritts
W. Harris
D. Fraser

9. Use of Stryelf:
Ron Richards gave an outstanding report. Briefly, some features are:

a. More time to apply chips when used for a sealcoat. Up to 40-50 minutes if necessary. Routinely, you would hold chip spreader back 500 - 700 ft.

b. No bleeding - no blotting.

c. Pavement temp up to 127 degrees is not problem.

d. Can sweep the same day.

e. Lose 10 pounds of chips per mile.

f. Good flow into cracks.

g. Good bond to old pavement in 12 - 18 hours.

h. From Department distributor, Stryelf ridges easy - seems to work better from rented distributor.

i. Number #2 distributor nozzle best.

j. Chips better than sand.

k. Cost $80.00 per ton.

l. .25 gallon per sq. yd. best with sand.

m. .35 - .40 gallon per sq. yd. best with chips.

n. NOTE: Clean screen on distributor suction hose often.

o. NOTE: Sealcoat check-off list is a good tool.