RESEARCH PROJECT 43

EVALUATION TESTS ON RECLAMITE

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DEPARTMENT OF HIGHWAYS
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BACKGROUND

In recent years there nas been an ever increasing demand to determine new and better ways to design, construct, and maintain highways. Keeping pace with this demand, the Idaho Department of Highways is continually searching for new products, better construction procedures and advanced design methods.

A continual problem faces the Maintenance Division when efforts are made to extend the expected life of a pavement. A large portion of Maintenance funds are expended each year for construction, on sealcoats, and repaving projects. Any alternate method that might reduce this outlay would tend to economize and better utilize the highway dollar.

The Maintenance Division, in conjunction with the Construction Division, made inquiries to the Golden Bear Oil Company concerning a rejuvenating agent manufactured by them under the trade name "Reclamite."

Reclamite is an emulsion of high quality petroleum oils and resins. It is designed to penetrate dry, weathered asphalt pavements, giving them new vitality and plasticity. If adequate penetration results, Reclamite tends to restore the surface asphalt to its original properties.

The inquiry to the Golden Bear Company was followed by a field inspection of various pavements in the State by representatives of the Company. On I-15 between Pocatello and Idaho Falls, which exhibited abnormal cracking, the representatives contended Reclamite would serve the following purposes:

1. "Seal the pavement in depth (1/2") against moisture penetration. This will not wear out as fog seals do."

2. "Rejuvenate the asphalt by combining chemically with the asphaltenes and raising the penetration of the asphalt. This will return the surfacing to a flexible pavement and make it more plastic. There will be no further loss of material due to pitting, raveling or stripping. There will be no further cracking if this cracking is due to surface failure."

3. "It will make the surfacing more durable because the components of RECLAMITE are more chemically stable than those in the original asphalt."

If these results could be attained, more costly maintenance alternatives might be eliminated. With this realization, the Department consented to purchase 6,000 gallons

of Reclamite on an experimental basis. Applications were to be made on as many varied locations as possible.

A central distributing site at Shoshone in District 2 was selected for storage. The Reclamite was shipped by rail tank car at a cost of 41¢ per gallon to this location.

With the exception of District 4, this location was the most centrally situated for loading and transporting. The 6,000 gallons were divided between Districts One, Two, Three, and Four. Each District was responsible to load and haul to the selected application sites within their respective areas.

MATERIAL CHARACTERISTICS

As stated previously, Reclamite is an emulsion made up of petroleum oils and resins. It is delivered in a concentrated form and is generally diluted at the rate of 2 parts concentrate to 1 part water. The material has a bright pink color when diluted and which disappears as penetration occurs.

Reclamite is applied through an asphalt distributor in the same manner as seal oil. No heating is necessary and the same general weather conditions apply.

A simple test is used to determine application rates. This test consists of using a 6-inch grease ring dike on the pavement and timing the penetration on known applied amounts. The test is simple and may be quickly performed to determine the best application rate.

EVALUATION PROCEDURE

To best judge the benefits which might be derived from using applications of Reclamite, the following procedure was used:

1. Visual observance of the application and penetration characteristics on various surfaces.

2. Visual observance and apparent change in surface characteristics after application.

3. Evaluation of test cores in selected locations to determine the amount of penetration and any change in asphalt viscosity.

RECLAMITE APPLICATION AND VISIBLE RESULTS

DISTRICT I

Three locations were selected in District 1 for application.

Application:

The first location was selected on I-15 north of Blackfoot at milepost 106. The mat in this area appeared to be very dense, but dry. Considerable cracking was evident in the wheel paths.

The northbound travel lane was shot with 0.1 gallon per square yard. Penetration was slow and the roadway was sanded approximately one hour after application as a safety precaution.

Visible Results

Approximately five months after application, the roadway was examined for visible results. A large portion of the transverse and longitudinal cracks were closed in the wheel paths.

The mat was darker in appearance where the Reclamite was applied. The darker color is especially evident in the wheel paths where the best penetration occurred due to the cracking.

The tightening of the mat appears to be a result of traffic action on softened asphalt in the wheel paths. The results of this application were very beneficial in sealing the mat.

Application:

The second application was made on I-15 just north of the McCammon Interchange. The general condition of the mat was good, but it appeared to be very dry.

Little cracking was evident on this section but the surface had a rough-pitted texture. A 0.1 gallon per square yard application was made on the northbound passing lane. This site was also sanded approximately one hour after application.

Visible Results

The mat appears to have a traffic seal on it with a rich dark coloration. The rough-pitted texture is not evident in the passing lane as compared to the travel lane. A comparison of the two lanes also indicates considerable polished aggregate in the untreated lane. This aggregate is not evident in the passing lane.

Application:

The third application was made on U.S. 191 between Pocatello and Tyhee. This section had been overlaid with a popcorn seal. The mat was very open and showed signs of reveling

with considerable cracking. The penetration of a 0.1 gallon application was rapid and complete.

Visible Results

Very little effect was observed after the application on this section. This may be largely due to the open condition of the mat. A heavier application may have been in order on this section, especially after observing the rapid penetration.

DISTRICT 2

Two locations were selected in District 2 for application.

Application:

The first application was made on S.H. 25 near milepost 195. This section consisted of a Cl. D plantmix laid in 1962. Considerable cracking was evident in the mat. The surface appeared to be very dry and brittle.

A 0.1 gallon application was made in both lanes.

Visible Results

Examination of the mat was made approximately five months after application. A portion of the transverse cracks appeared to be closed. The mat's appearance is darker in color and this is especially evident in the wheel paths. The dry condition is still apparent on the outside edges and centerline.

Application:

The second application was made on I-80 just south of Jerome. This project was still under construction and had not been subjected to traffic.

An application of 0.1 gallon was made on the eastbound lane in the vicinity of Sta. 170+00. The penetration was very rapid and complete.

Visible Results

Examination of this mat was made several times during the last five months. The only visible effect was a darker coloration. After observing the effect of Reclamite on other projects, indications would lead one to suspect this may have a very dense traffic seal on it as a result of the Reclamite.

DISTRICT 3

Two applications were made in District 3.

Application:

Both applications in District 3 were made on existing seal coats. This observer was not present during the application, but was informed that very poor penetration resulted in both cases.

The first application was made on S.H. 51 south of Mountain Home. The second application was made on U.S. 30 between Boise and Meridian.

Visible Results

Other than some discoloration of the seal chips, very little effect was noted in these applications.

A limited third application was made on the driveways around the Boise Headquarters Office. The mat appeared to be very dry but showed very little cracking. Only fair penetration resulted leaving the mat darker in appearance.

DISTRICT 4

Application:

S.H. 3 in the vicinity of Kendrick was selected as a test site in District 4. The roadway consisted of a roadmix with many large skin patches. A considerable amount of alligator cracking was evident over the entire section. This road is subject to very heavy logging truck traffic. An application of 0.1 gallon was made over the entire roadway. The absorption was varied depending upon the surface condition. The best absorption occurred in the highly cracked areas and in the skin patches.

The entire area was sanded after application.

Visible Results

Very little visible effect was observed on this application site. Some skin patches appear to have a good traffic seal as a result of the application.

TEST RESULTS

Two test sections were designated for evaluation of any change in existing asphalt properties as a result of the Reclamite application.

Abson Recovery was taken on cores removed from the treated and untreated sections to determine the following properties:

Penetration at 77° F.
Viscosity at 275° F.
Viscosity at 140° F.
Solubility in N-heptane
Solubility in CCL_4
Ductility at 77° F., 5 cm/min.
(Regular and Micro)

A total of 36 cores were removed from three sites at each section prior to application. Two sites were in the application area and one site for control samples was outside the application area. Twelve cores were taken from each site.

This procedure was again repeated after the Reclamite was applied.

The first two 3/8" layers of each core were sliced for the Abson Recovery.

On S.H. 25, the second set of cores was taken approximately two months after application. A second control sample was taken at the same time in the untreated section. The reported values of penetration and viscosity varied to such an extent no conclusive evidence of change could be noted.

On I-15 near Blackfoot, a lapse of approximately three and one-half months occurred between application and the second core removal. The treated section indicated there was an increase in the penetration values at both core sites. There was also a reduction in the viscosity levels at these locations which would indicate a softening of the surface asphalt.

CONCLUSIONS

The practice of seal coating most of the plantmix and roadmix surfaces reduced the number of sites Reclamite could be applied. A wider distribution of test sites would have been desirable. On all sections which Reclamite was applied, the grease ring test indicated Reclamite would be absorbed. Many times the wheel paths had a traffic seal on them which would not allow absorption.

Clear indications of the absorption qualities of Reclamite were observed during the application on I-80 south of Jerome. This mat had not been exposed to traffic and was still in its original condition after paving. Certain benefits might be realized by using Reclamite as a construction seal on new mats. The ability of the agent to soften the surface asphalt would accelerate a tight traffic seal. Moisture percolating through the mat from the surface would thus be reduced.

Reclamite might also be considered in lieu of a seal coat. If the non-skid characteristics of the cover coat material is secondary compared to the sealing of the surface, an application of Reclamite would accomplish the same purpose. Considerable saving would result in this application.

The Reclamite cost per square yard at the application rate of 0.1 gallon would be 2.7¢ per sq. yard.

The cost of applying MC-RC3000 and cover coat at normal rates would be 6.5¢ per square yard.

These costs are based on 41¢ per gallon for undiluted Reclamite and $35.00 and $3.00 per ton for seal oil and chips respectively.

After reviewing all the test sites, the visual results appear to be more apparent than the test results. An example would be the test section on I-15 near Blackfoot. Visual observations show most of the cracking in the wheel paths to be closed due to a softening of the surface asphalt. The test results show a very slight increase in softening properties which resulted in this marked change of surface conditions.

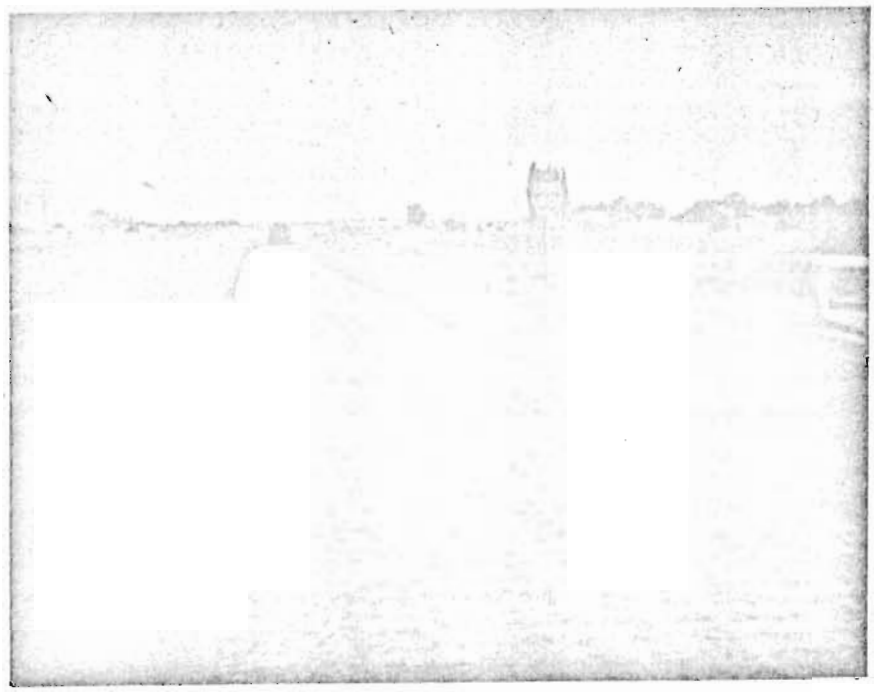
RECOMMENDATIONS

The following recommendations are offered for consideration with future applications of asphalt rejuvenating agents:

1. Consider using an asphalt rejuvenating agent as a construction seal to accelerate waterproofing on new mats.

2. Consider using an asphalt rejuvenating agent on reconditioning jobs where the old mat is pulverized and relaid as base. An application on the pulverized surfacing would reclaim much of the asphalt binder which may otherwise be lost.

3. Because of the penetration characteristics, an asphalt rejuvenating agent would work well as a fog seal. The application rate would be greater than the normal fog coat and may deter seal coating several seasons.

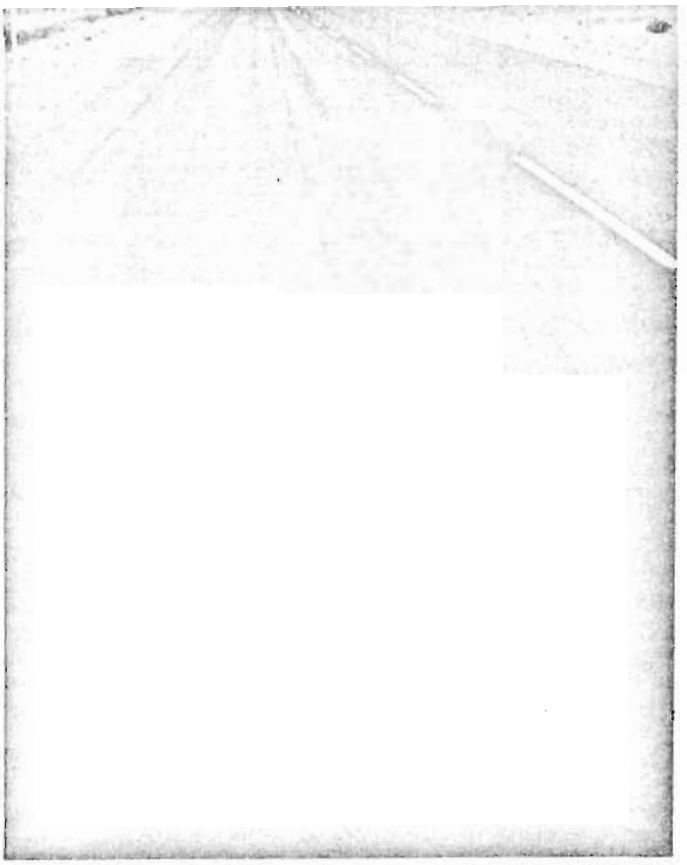


Approximately 2 minutes after application. 0.1 gallon/yd.^{2}

Approximately 10 minutes after application.

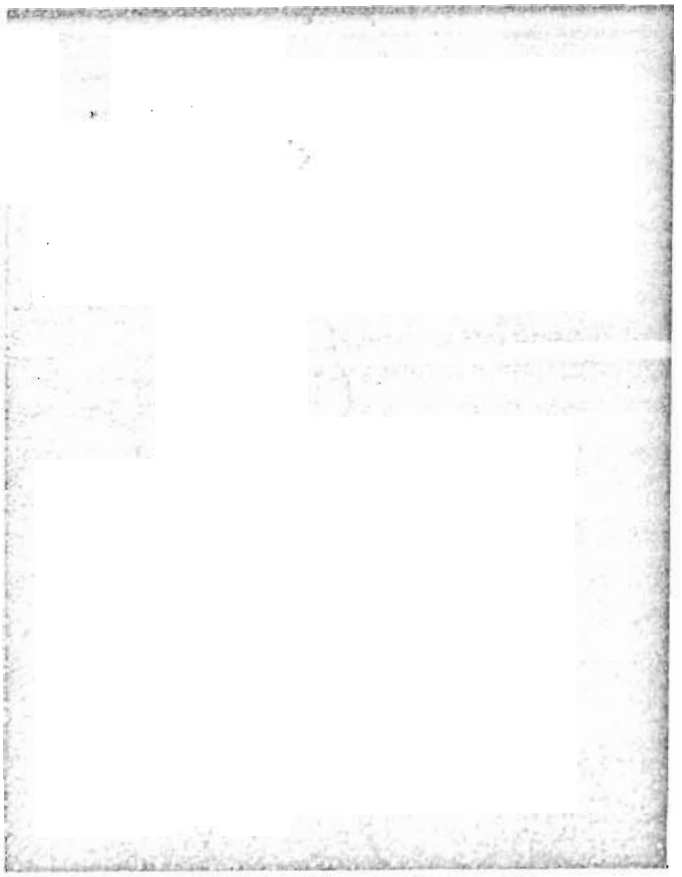
I-80N - Sta. 170±

Application site on new Interstate south of Jerome. This section had not been opened to traffic at the time of application. Very rapid penetration occurred on this section.



A dark coloration appeared on this section after application.

I-15 north of Blackfoot at M.P. 106.



A transverse crack which has been closed due to the application. Most of the wheel path cracking was also closed on this section.

Condition of Surface	Untreated		Untreated		Untreated		Treated		Untreated		Treated	
Location	WBL - 60' East-MP 106,2-8'Rt.		WBL - 60' East-MP 106-10'Rt.		EBL - 100' West-MP 106-9'Rt.		EBL - 100' W. MP 106,9-12'Rt.		EBL - 60' East-MP 106-9'Rt.		EBL - 60' E. MP 106,9-12'Rt.	
Route and Sample Date	I-15 6/23/66		I-15 10/4/66		I-15 6/23/66		I-15 10/4/66		I-15 6/23/66		I-15 10/4/66	
Position of Slice from top 3/4" of Core	Top 3/8"	Bottom 3/8"	Top 3/8"	Bottom 3/8"	Top 3/8"	Bottom 3/8"	Top 3/8"	Bottom 3/8"	Top 3/8"	Bottom 3/8"	Top 3/8"	Bottom 3/8"
	Lab Sample 211424		Lab Sample 215290		Lab Sample 211422		Lab Sample 215288		Lab Sample 211423		Lab Sample 215289	
Penetration at 77°F.	69	61	59	72	43	52	46	56	45	46	52	45
Viscosity at 275°F.	236.5 cs	247.2 cs	258.6 cs	225.6 cs	323.55 cs	290.25 cs	331.95 cs	265.15 cs	304.2 cs	310.65 cs	279.0 cs	282.6 cs
Viscosity at 140°F. Poise	769.6	816.4	882.604	566.223	1397.524	1068.001	1271.587	810.501	1369.154	1411.538	1160.406	1171.7695
Solubility:												
n-heptane	85.965%	97.31%	81.9%	87.285%	95.61%	84.02%	95.69%	82.90%	82.29%	84.94%	93.25%	90.1%
CCL_4	99.54%	99.98%	100.0%	99.91%	99.86%	99.67%	99.72%	100%	99.92%	100%	99.94%	99.44%
Ductility at 77°F. 5cm/min:												
Regular	125cm	107cm	101.3cm	114.75cm	92.75cm	140+cm	92.4cm	119.8cm	62.95cm	96.2cm	21.1cm	17.9cm
Micro	20.5cm	24.0cm	25.3cm	35.8cm	19.0cm	31.0cm	15.0cm	21.8cm	14.9cm	14.5cm	128.5cm	100.9cm
	Site 1 Outside Application Area				Site 2 Within Application Area				Site 3 Within Application Area			