

Reviewed By:

Robert F. Cauley
 Robert F. Cauley
 Materials and Research
 Engineer



Prepared by:

C. Graham
 C. Graham
 Research Technician

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RESEARCH UPDATE

U96-2

EVALUATION OF CONCRETE SEALERS

REFERENCE:

WP 83-R-8, P87-31, P87-32, P87-37

BACKGROUND:

Due to the winter climate in Vermont, use of road salt as a deterrent to icing has become a part of the implementation of the State's "bare roads policy". Perhaps the single biggest factor in the deterioration of concrete roadway structures is the detrimental effect of these salts. One method of preventing such damage is the application of concrete sealers to exposed concrete surfaces to reduce the intrusion of chloride ion.

Historically, Vermont has elected to use linseed oil as its primary sealer, based on a relatively inexpensive material cost as compared with other products. This report compares the performance of two other systems with linseed oil.

MATERIAL:

The following products were obtained for the test:

- Standard linseed oil/mineral spirits mixture, supplied by various distributors
- Hydrozo 600 Sealer supplied by Garvin Construction Products of Charlestown, MA
- Chemtrete supplied by Whitney Building Supply of Braintree, MA

PERFORMANCE:

In order to evaluate several products and determine the long term performance of each, portions of a median barrier on I-89 in Bolton were treated with a number of systems in 1983. Concrete samples were taken at various depths and tested using titration analysis to determine chloride ion concentration (See Figure 1). The results indicated that the two coat Chemtrete outperformed the other sealers. As a point of reference, it is normal to reapply the linseed oil every two years. In the case of this study only one additional application of linseed oil was made between 1985 and 1993.

Sample Depth	LINSEED OIL			CHEMTRETE 1 COAT		CHEMTRETE 2 COAT		HYDROZO 600	
	1985	1987	1993	1987	1993	1987	1993	1987	1993
0" to 1/2"	385	350	1165	455	620	215	230	530	960
1/2" to 1"	110	220	750	290	520	205	210	240	910
1" to 1 1/2"	70	75	285	80	190	60	130	60	334

Figure 1- EVALUATION OF VARIOUS SEALERS (NEAREST 5 PPM OF CHLORIDE ION)

COST:

The costs for the various systems as of January 1996, were \$25.00/gal for linseed oil/mineral spirits, and \$24.50/gal for Chemtrete. The Chemtrete sealer did provide a significant reduction in chloride content, while its price per gallon was comparable with linseed oil. It should be noted that the linseed oil sealer is normally reapplied every two years. Normal costs for sealing a 360 square foot concrete deck over a 10 year period would be as follows:

Cost					
Product	Application Rate	Price/sq ft	Total Price	Reapplication	10 year Price
Linseed Oil	1st Coat@275 sq ft/gal	\$0.09	\$32.40	5 reapplications@\$18.00 each	\$140.40
	2nd Coat@540 sq ft/gal	\$0.05	\$18.00		
Chemtrete	1st Coat@180 sq ft/gal	\$0.14	\$50.40	N/A	\$100.80
	2nd Coat@180 sq ft/gal	\$0.14	\$50.40		

When the distributor for Hydrozo 600 sealer was contacted in December 1995 it was learned that the material was no longer available, and had been replaced by Hydrozo Enviroseal 20. Since this material has not been evaluated by the VAOT, it should not be considered an alternative to linseed oil.

OBSERVATIONS:

On March 29, 1996 these barriers were visually inspected. Some were found to be crumbling. After inspecting the barriers closely on April 22, 1996, it was observed that the areas which were treated with Chemtrete showed less distress than those treated with linseed oil, Hydrozo 600, and those left untreated.

Distressed Barriers as of April 22, 1996			
Treatment	Total Barriers treated	Distressed Barriers	%
Untreated	17	5	29
Linseed Oil	12	5	41
Hydrozo 600	10	3	30
Chemtrete (Both 1 and 2 coats)	10	2	20
Other	20	7	35
Total	69	22	32

A crack 150 mm above the surface of the road had developed in all five distressed barriers in the Hydrozo and Chemtrete sections. This was the only evidence of any concrete failure in these areas. As a comparison, the barriers in the untreated, linseed oil and other sections were crumbling and decaying at both the bases and corners of the structures.

CONCLUSIONS:

Visual inspection and test results indicate that the Chemtrete system performed better than linseed oil. It is felt that this system would be the most cost effective to the Agency for further concrete sealing operations.