

# OFFICE MEMORANDUM



MICHIGAN  
STATE HIGHWAY DEPARTMENT

May 17, 1965

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To: E. A. Finney, Director  
Research Laboratory Division

From: R. H. Merrill

Subject: Evaluation of "EpoXiment" Admixture for Mortar or Concrete.  
Research Project 64 NM-117. Research Report No. R-519.

In compliance with R. L. Greenman's request of May 12, 1964, the Concrete Unit has evaluated EpoXiment for use as an admixture in portland cement patching mortar. For comparative analysis, a standard mortar mix was also used and subjected to identical conditions of curing and testing.

According to the manufacturer's literature (Edoco Technical Products Inc., Long Beach, Calif.), the EpoXiment additive (Edoco Code 2105) improves adhesion to new or old concrete for repair or resurfacing, increases tensile and flexure strengths, reduces permeability, increases acid resistance, and reduces shrinkage. The additive is a two-component epoxy resin of thick paste consistency, which is added directly to the concrete mixer along with the sand, cement, and water. The addition of 1 to 3 gal of premixed EpoXiment per sack of cement is recommended, with an equal reduction in mix water.

For our evaluation of this product we chose to test only the patching mortar to determine EpoXiment's effect on:

1. Compressive strength.
2. Tensile strength.
3. Shear bond on hardened concrete.
4. Shrinkage properties.
5. Freeze-thaw durability when bonded to hardened concrete.

## Mixing Procedure

A sand (2NS) to cement (Type I) ratio of 2.8 to 1 by weight was used for both the EpoXiment and plain mortar mixes which would be equivalent to about 5 sacks per cu yd of concrete mix. The EpoXiment components were mixed in the recommended ratio of 1 to 2 by volume of resin base to setting agent, to form a fairly viscous fluid which was then diluted with water. The amount of additive used corresponded to a value of 2 gal per sack of cement. Some difficulty was encountered in diluting the epoxy and water, with a considerable amount of time consumed in the mixing operation.

The diluted epoxy replaced the initial portion of the mix water, with more water being added to bring the batch to a medium consistency. The consistencies of both Epoximent and plain mortar mixes were kept as nearly identical as possible. It was noted at the time of mixing that the additive tended to make the mortar rather sticky and a little more difficult to place.

#### Molding and Testing Procedures

Compressive strengths were obtained at 7 and 28 days on 2-in. cubes according to procedures outlined in ASTM C109-58. Tensile strengths were obtained at 7 and 28 days on briquets according to ASTM C109-59. Shrinkage values were obtained at 7, 14, 30, 60, and 90 days following ASTM C157-60T.

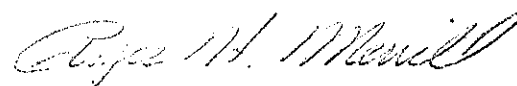
Shear bond and freeze-thaw durability specimens were made by pouring a 1-in. mortar cap on the sawed face of a 3- by 3- by 4-in. hardened concrete block. Before placing the Epoximent mortar a brush coat of the diluted additive was applied to the face of the block to form a tack coat for the mortar. All blocks were damp at the time of mortar placement. All specimens were moist cured until time of testing.

The shear bond samples were tested at 7 and 28 days by applying a load on the mortar cap parallel to the interface of concrete and mortar. The load divided by the shearing area (which in this case was 12 sq in.) gave the results found in Table 1. The freeze-thaw samples were tested at alternating temperatures of 0 to 40 F with six complete cycles a day starting after 14 days of moist curing. The cycles were freeze-in-air, thaw-in-water (ASTM C291-61T) and continued until the samples failed by loss of bond.

#### Conclusions

A comparison of test data in Table 1 indicates that the Epoximent additive to mortar is quite inferior to the standard mortar mix. Considerable decreases were measured in compressive, tensile, and shear bond strengths. Due to the considerable difficulty in mixing the Epoximent components and mixing into the portland cement mortar, plus the fact decreases in physical strengths were noted in the resulting mortar, the use of this material does not appear to warrant further testing.

OFFICE OF TESTING AND RESEARCH



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cc: A. J. Permoda  
M. G. Brown

TABLE 1  
SUMMARY OF TEST DATA  
ON EPOXIMENT ADMIXTURE IN PORTLAND CEMENT MORTAR

Property	Standard Mortar	Epoximent Mortar
Compressive Strength, psi		
7 days	7,421	3,424
28 days	8,893	4,687
Tensile Strength, psi		
7 days	526	468
28 days	596	485
Shear Strength, psi		
7 days	397	154
28 days	340	195
Freeze-Thaw, cycles to failure	520	268
Percent Volume Change *		
7 days	+0.014	+0.013
14 days	--	-0.050
30 days	-0.071	-0.086
60 days	-0.090	-0.112
90 days	-0.097	-0.121

\* All negative volume changes indicate shrinkage. All test values are average of three specimens each, moist-cured 7 days followed by laboratory air curing.