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WATER PERMEABILITY OF A "MARBLESEAL" COATING

by

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Report to

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NBS

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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Abstract

The resistance to wind-driven rain of a cementitious coating of "Marbleseal," applied to a highly permeable cinder-concrete masonry test wall, was measured. The Marbleseal coating was applied by the sponsors using a small spray gun. The coating was found to be permeable on each of two tests. As may be expected, a decrease in permeability was indicated on the second test. It is probable that a more water-resistant coating would have been obtained with the Marbleseal if it had been scrubbed into the surface of the wall.

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1. INTRODUCTION

Tests of the water permeability of a coating of Marbleseal applied to a cinder-concrete masonry test wall were requested by the Office of the Chief of Engineers, Department of the Army, Washington, D. C. The request was made in a letter dated August 25, 1953, and signed by Mr. Max Barth, Acting Chief, Engineering Division, Military Construction, reference ENGMC.

2. Marbleseal

The Marbleseal was a white cementitious powder passing a No. 100 sieve and manufactured by Marbleseal, Inc., Middlesboro, Kentucky. The results of an examination of

the Marbleseal, made for conformity with the requirements of Federal Specification TT-P-21, are listed and described below.

a) The Marbleseal contains no titanium dioxide or zinc sulphide pigments, one of which is required.

b) The percentage of carbonates, calculated as CO_2 is 23 more than the maximum specified (3 percent).

c) The amount of portland cement in the powder was 43 percent by weight, less than the minimum specified (65 percent).

As indicated above, the Marbleseal does not conform with the requirements of Federal Specification TT-P-21, amendment 2, Type 1, Class A.

3. MASONRY WALL SPECIMENS

A cinder-aggregate concrete masonry wall specimen about 50-in. high, 40-in. long and 8-in. thick was furnished by the National Bureau of Standards. The wall was numbered D-12 and its construction was the same as that of the concrete masonry test walls described in Report BMS 95. The wall was highly permeable.

4. APPLICATION OF THE COATING

A sample of the dry Marbleseal powder was furnished and delivered to the National Bureau of Standards by the makers. Application of the coating was in charge of Mr. Franklin B. Slusher, Field Engineer, Marbleseal, Inc., who also prepared and applied the paint. Others of the sponsors who were present at the Bureau when the paint was applied were Mr. H. P. McNeer, President of Marbleseal, Inc., and Mr. Harold W.Kemper, Lexington, Kentucky.

Five pounds of Marbleseal was mixed with a small quantity of water until the water repellency of the paint was broken. Additional water was then added to produce a creamy consistency. The paint was applied to the dampened face of

wall L-12 with a small DeVilbiss (G.O.) spray gun having a capacity of about 1 quart. Several fillings of the gun were required to apply the paint. Water, in small amounts, was added to the paint before each filling of the gun. The total amount of water used, by weight of dry powder, was 62 percent. The wall was not completely covered after all of the paint was applied and a second batch containing 2 lb of Marbleseal was prepared. The percentage of water in the second batch of paint was 66. Considerable care was taken during application of the paint from both batches and the gun was again used over areas which had already been painted. Although the small size of the gun may have made it desirable to do some "touching up" the application was too carefully made to be fully representative of field practice. Ordinarily a Binks or a DeVilbiss MBC gun with a tank and agitator with 45- to 60-lb/in.^{2} air pressure would be used for pneumatic application in the field. The total amount of dry powder in the paint applied to the wall was about 6.3 lb. This was equivalent to about 43 lb of dry powder to place one coat on 100 sq ft of wall area. It was stated that the field applications averaged about 25 lb of powder per 100 sq ft of wall. However, the amount of paint applied to a wall is affected by and is somewhat dependent upon the roughness of the wall surface.

5. CURING OF THE COATING

The Marbleseal coating on wall L-12 was applied on September 14, 1953, and was wetted down twice on September 15 and once on September 16. The coating was again wetted on September 23 and 25. The water permeability of the coating was tested on September 30, and a second test was made on October 14. The wall was placed out-of-doors on October 23.

6. APPEARANCE OF THE COATING

The coating of Marbleseal was carefully examined on November 3, 11 days after placing the wall out-of-doors. The coating was hard, clean, white, and without dusting. It contained some pinholes and some small round indentations, both of which are characteristic of pneumatically applied cementitious coatings. The Marbleseal coating was also crazed and most of the crazing appeared on the surface after the wall was placed out-of-doors on October 23.

7. PERMEABILITY TESTS AND TEST DATA

The water permeability tests simulated an exposure to a wind-driven rain. The test apparatus, test procedure and the arbitrary system of rating permeability are described in Reports BMS 82 and 95. The permeability tests are also referred to in a NBS report to the Office of Chief of Engineers, dated January 25, 1951, titled "Tests of Proprietary and Other Surface Waterproofing for Masonry Walls."

The resistance of the Marbleseal to the penetration of wind-driven rain was measured by observing and comparing the water permeability of the test wall B-12, before and after the wall was coated with the Marbleseal. Two permeability tests were made on the coated wall. The data are listed in Table 1.

3. DISCUSSION OF TEST RESULTS

The coating of Marbleseal on the face of wall B-12 greatly reduced the leakage of water through the walls. The small amount of water that penetrated the coating may have entered through pin holes in the coating. It is possible that a brush application of the Marbleseal, applied with a scrubbing action with a stiff brush would have produced a tighter and more water resistant coating, without pin holes. Previous tests of concrete masonry walls coated with portland cement water paints show that pneumatically applied coatings of paint contain minute pin holes and such coatings are more permeable than are coatings applied with a stiff bristle brush, see "Tests of the Resistance to Rain Penetration of Walls Built of Masonry Units" by A. A. Copeland and O. C. Carlson, Proc. Am. Conc. Inst. 36, 169 (1940).

The water penetrating the coating of Marbleseal collected at the bottom of the inside of the wall and appeared on the back at points just above the flashing. Since the water appeared in less than 3 hr and since the maximum rate of leakage was equal or greater than 0.05 liters per hr in both tests, the resistance of the Marbleseal coating to the penetration of wind-driven rain was rated as "Poor," see Table 1. However, since the coating barely missed being rated as "Fair" on the second test, the rating of "Poor" may possibly be considered to be unduly severe.

In general, the tests of the Marbleseal coating indicates the vulnerability to rain penetration of pin holes in spray-applied coatings. These tests do not show whether or not the Marbleseal coating is more or less durable to weathering exposure than are coatings of other cementitious paints.

Table 1. Permeability of Marbleseal coating on cinder-concrete masonry wall, P-12

Date of test, 1953	Condition of wall	Time to failure as indicated by: Damp on back	Water visible on back [b]	Leak from flashing [c]	Rate of leakage: Maximum	Rate of leakage: At one day	Area damp in one day	Rating [a]
		hr	hr	hr	liters/hr	liters/hr	%	
9-10	Before treatment	0.01	0.01	0.07	43.0	43.0	65	Very Poor
9-30	After treatment with Marbleseal	0.05	2.3	2.3	0.18	0.18	15	Poor
10-14	Retest after treatment	0.05	2.6	3.0	0.09	[d]	15	Poor to Fair

[a] The arbitrary ratings are: Fair: Water visible on back of wall in more than 3 and less than 24 hr. Rate of leakage less than 1 liter per hr at the end of one day.
Poor: Water visible on back in 3 hr or less, rate of leakage less than 5 liters per hr.
Very Poor: Rate of leakage equal to or greater than 5 liters/hr.

[b] Water appeared at the base of the wall (at the flashing).

[c] A leak is a flow of water from one or both flashings, the total rate of flow being equal to or greater than 0.05 liters/hr.

[d] Slightly less than 0.05 liters/hr.