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File: 1810

Marshall Laboratory
June 30, 1954

MEMORANDUM REPORT NO. M-711

PREPARED BY: - R. A. ROBICHAUD

LABORATORY EVALUATION OF SHERWIN-WILLIAMS WATER REDUCIBLE BLACK ENAMEL

Introduction:

Sherwin-Williams offered this product at Hardwick Stove Company, Cleveland, Tennessee, as a replacement for a black Japan baking enamel. Customer is apparently satisfied with the working properties but is hesitant about using a material that is so radical in nature. Because of its novelty, Atlanta Sales asked the laboratory to examine a coated panel. Atlanta was also able to supply us with a sample of wet material for complete evaluation.

This report, the first formal one, will include results of tests reported in other correspondence in addition to the writer's evaluation of the enamel.

Conclusions:

The S-W water reducible black was extremely water sensitive, exhibiting poor humidity cabinet, salt spray and water soak resistance. Appearance of the dry film is gritty. However, its selling price, reported to be under $2.50 per gallon, and the fact that it can be reduced with water, introducing solvent savings and probable insurance cost reduction, make it attractive. In addition, this formulation is undoubtedly in the experimental stage and improvements can be expected in the future.

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Experimental Work:

A. Composition

Solids	31.1% (pkg.)
	18.3% (spray viscosity)
Reduction	67% (3 pts. enamel/2 pts. water)
Nitrogen content	1.24%
Viscosity	57" (20 cup)
Wt./Gal.	8.49#
Flash Point	None

O. D. Shreve, in his letter to Russell Morgan dated 4/5/54, reported that this enamel was composed of an alkyd, melamine, UF and rosin vehicle. His observations (supported by the writer's examination) indicate that the enamel is truly water soluble and not an emulsion type. There is some evidence, however, that the reducing thinner (water) probably emulsifies.

Appearance and Application:

The enamel has an exceedingly gritty appearance. While a felt strainer removed most of this, the more common mesh types had very little effect. The panel sent in by Atlanta had the same poor appearance.

Due to the low solids we were unable to obtain more than 0.3 mils film thickness by spray application without sagging. Therefore, multiple coats (2 or 3) are required to get 1.0 mils film thickness. This is further hindered by the slow flash time (3/4 to 1 hour) and the necessity of baking between each coat. Failure to allow sufficient flash time or to bake causes severe blistering.

We encountered no difficulty in ignoring the recommended 20 minutes waiting period after reduction before use. A pour, dip and spray were made immediately after reduction with no noticeable ill effects.

Testing Results:

Air-drying was completely unsatisfactory. The film was tacky for 1-2 weeks and was water soluble and soft after two months.

Baking produced a satisfactory film. For comparison, 707-6230 was run with the S-W enamel as a control. 707-6230 was

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baked in all cases 30' at 300°F. The following charts summarize results (all films are 1.0± 0.1 mils):

	Bake	Pencil Hardness
S-W Black	15' at 250°F.	HB
	45' at 250°F.	F
	5' at 350°F.	HB

Recommended baking schedule is reported to be 5' at 350°F.

	S-W BLACK		707-6230	
	Steel	Bonderite 100	Steel	Bonderite 100
Gloss	79	88	88	95
Flex.	V. Good	V. Good	V. Good	Fair
Salt Spray	V. Poor	Poor	Good	V. Good
Humidity Cabinet	V. Poor	Poor	V. Good	V. Good
Adhesion	Good	Good	Good	Good

Accelerated weathering test on S-W black revealed fine checking, chalking and dulling at 400 hours. The control had very slight chalking and dulling. Water soak produced blisters within a few hours on baked panels. After immersed portion was dried out, film lost adhesion and became brittle. The control had excellent water soak resistance. Heat resistance (1 week at 180°F.) was very good, slightly superior to 707-6230.

A somewhat interesting sidelight was the lack of rusting under the S-W black films subject to the various water tests. In spite of severe blistering and loss of adhesion, very little rusting appeared beneath the film on the bare steel panels.

General:

Information on test methods and other details are in Notebook #5665, starting on Page 140.

Exposure Series #13739 has been prepared on this material.

SALES DEVELOPMENT

R. A. Robichaud

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RAR/EAW
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