

E. I. duPont de Nemours & Co.
Fabrics and Finishes Department
Chemical Division

Philadelphia Laboratory

COMPETITIVE PRODUCTS REPORT

Subject: Competitive House Primers and Two Coat
House Paint Systems

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**COMPETITIVE HOUSE PRIMERS AND TWO COAT
HOUSE PAINT SYSTEMS**

In connection with the recent activation of Release Letter #638 and its supplements recommending the general sale of 347-817 House Primer, a comparison of the DuPont product has been made with five competitive house primers. The comparison covers both the properties of the primers themselves and the application in two coat systems comprising the primers and the topcoats of the same manufacturer. The competitive primers are the following:

SR-42078 National Lead Company Dutch Boy House Paint #010
Primer Undercoater

SR-42049 Sears Roebuck Master Mix House Paint Undercoat
#10 Grayish White

SR-42077 Devco-Raynolds Company House Paint #539 White
Undercoat

SR-42048 Sherwin-Williams Prepared Paint #450 Undercoater

SR-42070 Pittsburgh Plate Glass Sunproof House Paint 1-201
White Primer

The competitive Outside White topcoats which have been used over the primers are described in the report on Investigation WT-310 by O. R. Volk dated June 27, 1947. One topcoat, SR-42058, Pittsburgh #1-54 White was received later and is described in a letter to Mr. John Marshall of October 24, 1947. The Pittsburgh White is a lead free pigmentation and is further distinguished by containing #500 Selected Soya Oil as 25% of the binder.

Summary:

The house primers fall into two classes according to the pigmentation; zinc-free non-penetrating primers and zinc-containing primers which are similar to topcoats in pigmentation. DuPont, National Lead, Sears-Roebuck and Devco are of the zinc-free type. Pittsburgh Plate Glass and Sherwin-Williams are of the topcoat type. The zinc-free primers are generally lower in hiding than their respective topcoats, but the zinc-containing primers approach the topcoats in hiding.

As compared with the competitive products, the DuPont primer may be somewhat deficient in hiding, being lower than Pittsburgh, Sherwin-Williams or National Lead. Increasing the titanium oxide from 1.0 to 1.3 lb. per gallon would place it equal to National Lead and Sherwin Williams, and slightly lower than Pittsburgh.

All the primers yield two coat systems of satisfactory appearance and hiding, although the film thickness is likely to be 4 instead of 5 mils. Durability of the two coat systems will be determined at a controlled spreading rate in Series 9666.

Details:

Table I lists the composition of the primers as calculated from the label analyses together with two estimates of their hiding power.

Primer Types: The zinc-free primers are derived from a pigmentation first suggested by the National Lead Company which was originally 50% titanium barium pigment and 50% basic carbonate white lead. The non-penetrating vehicle was originally advocated by Devco-Raynolds Company as part of a two coat house paint system which was claimed to give as good service as the conventional three coat system. DuPont, National Lead, Sears Roebuck and Devco-Raynolds are of this type. National Lead has retained almost the original pigmentation, whereas the other paints show a reduction in titanium oxide and white lead content with increase in extender. The Devco paint contains a large amount of extender and a high pigment volume, 50%, whereas the other primers are at approximately 40% pigment volume. A small amount of varnish is used by National Lead, Sears, and Devco; the DuPont primer is the only one of this class in which linseed oil is not fortified with varnish or resin. The use of varnish is sound in these primers because they do not contain zinc oxide.

The Pittsburgh Plate Glass primer is a competing type in which the pigmentation is similar to that of conventional house paint topcoat with about the same amount of zinc oxide and the same pigment volume. The Pittsburgh primer contains no basic carbonate white lead. It probably contains a higher portion of bodied oil or a somewhat more drastically treated oil than the corresponding topcoat, but is essentially similar.

The Sherwin-Williams primer is intermediate between the lead free type and the type which has a topcoat pigmentation. It is low in zinc oxide and high in the content of basic carbonate white lead. In contrast to all the other primers in this investigation, it contains a large proportion of raw linseed oil and is not made in accordance with the theory that penetration should be avoided. It is the only primer in which a substantial addition of raw linseed oil is recommended, most of the other primers being so formulated that the only change which should be made in them is the addition of a small amount of thinner if they drag too much under the brush.

Hiding: The hiding of the primers has been estimated in two ways: (1) From values for the single pigments originally determined by R. L. Hallett of the National Lead Company reproduced in "Physical and Chemical Examination of Paints", by H. A. Gardner, 10th Edition, 1946, p. 36. (2) By determination of the contrast ratio over black and white glazed paper at various spreading rates. The determination by means of the contrast ratio has an experimental error about 20 sq. ft. per gallon. The two methods agree fairly well in most cases.

Hiding is the only property in which 347-817 House Primer is somewhat lacking in comparison with the competitive products. The two zinc oxide containing primers, Pittsburgh and Sherwin-Williams, have hiding in the range of topcoats and are considerably higher in hiding than the other primers. Of the zinc oxide-free primers, the National Lead has higher hiding than the others with the DuPont product second. Technically the hiding level of the DuPont primer is probably satisfactory, since good build and complete hiding can be obtained in a two coat system. However, an increase in the titanium oxide from 1.0 lb. per gallon to 1.2 or 1.3 lb. would place it in a better competitive position and would not be undesirable technically. There is a high margin of profit on this product when it is sold at the same price per gallon as house paint topcoats, so that a small increase in cost could be tolerated.

Application Properties: As a practical test of the primers in two coat systems, brush outs were made on unpainted red cedar clapboard. The systems are listed in Table II. The amount of primer and topcoat was applied at the discretion of the painter in order to give a satisfactory film in two coats. The amount of paint applied in each coat was determined by weighing. The spreading rate could be determined from the weight, and the dry film thickness could be calculated from the spreading rate and the known solids content of the paint by volume. The film thickness calculated in this way does not make any allowance for absorption of some of the oil in the prime coat. This might be considerable in the case of priming coats which contain a large amount of raw oil, such as the pre-war #40 Outside White self primed in system 1 and the Sherwin-Williams primer in system #8.

The Devco primer in system #7 and the Sherwin-Williams primer in system #8 were reduced according to label directions. The Pittsburgh primer in system #9 and the DuPont Primers in systems #2, 3 and 4 were thinned slightly to ease brushing after trial had shown that the unthinned material was too difficult to brush. The primer consistencies shown in the table are those determined for the reduced material.

The viscosity of 347-817 as packaged is too high for easy brushing. It was necessary to reduce the batch of this material with one pint of mineral spirits per gallon in order to obtain good brushing. While other batches may not require quite so much reduction, it is probable that the product could be packaged at a somewhat lower consistency and resulting slightly lower solids content and cost. This reduction in cost might be sufficient to compensate for an increase in hiding.

The experimental alkyd house primer P-67-P-44562 has been included in the comparison of house primers. This product is practical in working properties although it results in a slightly thinner film than 347-817 House Primer because of lower solids content.

Two-Coat Films: When the primers are used with current topcoats in two coat systems, film thickness ranging from 4 to 5 mils is obtained. Film thicknesses over five mils can be obtained with high oil, high solids topcoats such as the pre-war #40 White. The only current product which is comparable in solids content and film thickness to the pre-war #40 White is the Devco topcoat. The other topcoats are definitely lower in solids and give slightly thinner films.

Although there are differences in the gloss and hiding of the primers when applied as one coat, all the two coat systems give a film of satisfactory build and appearance on flat surfaces. At the sharp edge of the clapboard some of the paints containing oil conservation vehicles leave a thin film which presents a point of weakness. The best build on sharp edges is given by the pre-war #40 with the new #40 White, 301-864, second. The National Lead White has less build on the sharp edge than would be expected from its high oil content because the brush tends to cut through. On the other hand, the Pittsburgh Plate Glass White topcoat covers fairly well on the sharp edge although it is a paint of low solids content and little false body because the paint tends to sag down to the edge. This particular paint was applied at the maximum possible film thickness: if it were applied any heavier sagging might result.

Notebook Reference:

	74 - 79
#3381 pages	82 - 87
	98 - 101
	134 - 135
	138 - 141
	142 - 143

Cross Reference:

Exposure series #9666

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TABLE I

COMPOSITION AND PROPERTIES OF HOUSE PRIMERS

<u>Product</u>	<u>347-817 DuPont</u>	<u>SR-42078 National Lead</u>	<u>SR-42049 Sears</u>	<u>SR-42077 Devco</u>	<u>SR-42048 Sherwin-Williams</u>
Titanium oxide	.99	1.43	.91	.98	1.21
Zinc Oxide	-	-	-	-	.93
Basic Sulfate White Lead	-	-	-	-	.19
" Carbonate "	3.66	4.75	3.13	3.34	4.21
Magnesium Silicate	3.56	3.33	2.06	2.20	2.83
Barium Sulfate	-	-	-	2.28	-
Calcium Sulfate	-	-	2.13	-	-
Limpid linseed oil	.67	-	-	-	2.53
Processed Linseed oil	2.11	1.83	3.38	2.23	.83
Tung Oil	-	-	-	.33	-
Resin	-	-	.19	.19	-
Varnish Solids	-	.99	-	-	-
Drier & Thinner	2.81	2.56	1.91	1.99	2.14
Gallon Weight-Calculated	13.80	14.89	13.71	13.54	14.87
" " - Determined	-	15.20	14.0	13.10	14.75
Pigment Volume - %	39.8	43.1	38.6	50.6	36.6
Solids Volume - %	61.1	62.7	71.2	70.0	67.8
Stormer	85	83	72	90	89
Hiding-sq.ft.per gal-theoretical	197	236*	178	163*	268
Hiding-sq.ft.per gal-determined	200	215	205	154	227
Reduction Recommended					
Raw linseed oil	-	-	-	0 to 1/16	1/4
Turpentine	-	-	-	1/16 to 1/8	-

*Calculated for anatase titanium oxide

TABLE II - TWO COAT SYSTEM ON NEW RED CEDAR

System	Manu- facture	Product	Re- duction	Storner	Sq.ft./gal (Original material)	Film Thickness Mils	Primer Properties		
							Brushing	Gloss	Hid- ing
1	DuPont	Primer:301-756 prewar(P-301-P-77879)	1/4 raw oil	86	750	1.88	Good, thin	Low, Fair	
		Topcoat: " " " "	---	100	374	<u>3.73</u> 5.51		sl. flash- ing	
2	"	Primer:347-817(P-301-R-4361)House Primer	1/8 mineral spirits	68	527	1.77	Good	Flat	Fair
		Topcoat:301-756 prewar(P-301-P-77879)	---	100	364	<u>3.82</u> 5.59			
3	"	Primer:P-67-P-44562 alkyd house primer	1/16-H200 Thinner	65	461	1.67	Fair	Flat	Fair
		Topcoat:301-756 prewar(P-301-P-77879)	---	100	402	<u>3.46</u> 5.13			
4	"	Primer:347-817(P-301-R-4361)House Primer	1/8 mineral spirits	68	471	1.98	V. Good	Flat	Fair
		Topcoat:301-864(P-301-R-4359)#40 White	---	82	531	<u>2.48</u> 4.56			
5	National Lead	Primer:SR-42078 #010 Primer-Undercoater	---	83	490	1.92	Good, like enamel	V. sl. Fair sheen	
		Topcoat: SR-42071 #110 Bright White	---	86	512	<u>2.47</u> 4.39			
6	Sears Roebuck	Primer:SR-42010 #10 House Paint Under- coat	---	80	553	1.81	Fair	Egg- shell flashing	Fair
		Topcoat:SR-41914 #143 White	---	92	455	<u>2.46</u> 4.27			
7	Devco	Primer:SR-42077 #539 White Undercoater	1/16 turpertine	-	508	2.07	Fair, like enamel	Flat, Poor ropy	
		Topcoat:SR-41916 #547 White	---	89	451	<u>3.02</u> 5.09			
8	Sherwin Williams	Primer:SR-42048 #450 Undercoater	1/4 raw oil	80	740	1.91	Fair	V. low, Fair	
		Topcoat: SR:41917 #471 Gloss White	---	75	439	<u>2.64</u> 4.55		sl. flash- ing	
9	Pittsburgh PlateGlass	Primer:SR-42070 #1-201 White Primer	1/8 mineral spirits	-	625	2.00	V. Good	Low	Good
		Topcoat:SR-42058 #1-54 White	---	77	537	<u>2.06</u> 4.06			