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SALES DEVELOPMENT LABORATORY MEMORANDUM REPORT NO. SM-58-12

PREPARED BY: J. E. OYLER

RATING OF APPLICATION AND APPEARANCE PROPERTIES
OF EXTERIOR HOUSE PAINTS BY PROFESSIONAL PAINTERS

INTRODUCTION:

The MacGregor Lead Co. of Chicago has been marketing a paint called "Scotch Laddie" House Paint which is very high in white lead and which has received wide acceptance among professional painters for its application properties and initial appearance. Up to this time it was not known whether this acceptance has had a psychological basis due to the high gallon weight and high white lead content (70% on Total Pigment) or whether Scotch Laddie actually has superior initial properties compared to other house paints such as #40 Outside White. Because of this uncertainty the following tests were conducted in an effort to determine how and why this paint differs from other paint.

OBJECTIVE:

The objective of this experiment was to have professional painters evaluate nine exterior house paints for relative application and initial appearance properties. The following paints were included but were not identified for the painters during or after the tests, except by numbers as shown:

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<u>Name</u>	<u>No.</u>	<u>Group</u>
70% White Lead Experimental	1	1
20% " " "	2	
#40 O.W. 301-918 (506941 - 50/50 506884	3	
Sherwin-Williams #471	4	2
National Lead #110	5	
Scotch Laddle (70% White Lead)	6	
#42 O. W. 301-948 #494230-B	9	3
Prof. House Paint 301-959 #484835	10	
#43 Alkyd H. P. 603-922 #625715	11	

(Included Paint #3)

The 70% White Lead Experimental Paint, 301-D-44153, is a very close compositional analog of the Scotch Laddle paint based on the latter's label analysis. The 20% White Lead Experimental, modified 301-966, had been formulated to give high gloss, good flow, and to use the maximum amount of white lead at the raw material cost of 301-919 #41 One Coat O.W.

DESIGN OF EXPERIMENT AND PROCEDURE:

No more than four paints were tested against each other at one time in order to make it easier for the painters to determine the relative positions of each paint. For application properties, paints 1, 2 and 3 were tested as a group, not necessarily in that order, and the painter was asked to select what he considered the best paint. At the same time he was asked to rate various properties such as Ease of Application, Ease of Lapping, Ease of Spreading, Speed of Application and Body as excellent, good, fair or poor so that we could have a guide as to the magnitude of the differences which may have been noted. In addition the painters were asked whether each paint was acceptable or not in each of these properties.

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Similarly paints 4, 5 and 6 were tested and rated. The best paints from each of these two groups were then compared, not from memory but as a new test, to select the preferred paint among numbers 1 thru 6.

Numbers 9, 10 and 11 were then compared as a group. Added to this group as a tie-in paint from the first six paints was Paint #3. This paint was selected because, based on results from the first two groups, it was expected to have application properties more nearly like those expected in these last three paints.

Five painters were included in this experiment and one du Pont employee was assigned to work with each painter to record all comments and data. The painter/assistant teams were spaced sufficiently far apart so that comments from other teams would not be overheard.

The panels employed were prepared by mounting four 6' x 10" cedar clapboards on a suitable frame and then priming with one brush coat of 347-907 #39 House Paint Primer. The prime coat had dried indoors for nine days before use.

The nine paints were applied in single brush coats with a ten minute lap time included. All painting was done out-of-doors and all painters used the same brush and pot of paint for each product. All brushes were identical, new 3 1/2" pure bristle Harrison brushes. Weather conditions during application were very favorable-warm with a generally over-cast sky and gentle breeze. Painting began around 10:30 A.M. and continued until 3:30 P.M. on July 24. A heavy rain storm started about 5:00 P.M. but none of the paint tests was seriously damaged.

All panels were rated for initial appearance the following morning. The same groupings of paints were used in rating appearance. Individual properties rated were Gloss Uniformity, Flashing, Flow and Color. Comments were also made on dry.

LIMITATIONS OF THE TESTS:

The results and the conclusions may not be as completely reliable as possible because of the following limitations:

1. Design of Experiment: Had the sequence of applying the paints been altered, and different groups of 3 paints compared, it is possible that different results may have been obtained. However, considering the unanimity of opinions obtained, we believe the design used represents as good a combination as possible for a single application.

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2. Single batches of material were applied over only one substrate.

3. Air temperature, thus paint and substrate temperature, increased during the period of application about 10 degrees. Therefore the paints applied last, group 3, were applied at a relatively lower effective viscosity than groups 1 and 2 applied before noon. Ratings for the tie-in paint, 301-918, were generally slightly higher in the afternoon than in the morning.

4. There was a limited number of painters; however, these five men represented a total of 187 years of painting experience.

RESULTS AND CONCLUSIONS:

Application Properties:

Four of the five painters selected the 70% white Lead Experimental paint as the best paint in Group 1. Marginally inferior due primarily to slight drag-at-lap was #2, the 20% white Lead paint. The fifth painter selected the 20% lead paint as the best paint in this group.

All five painters selected #6, Scotch Laddie, the best paint in Group 2. In this group the spread in ratings was considerably greater than among the paints in Group 1. The batch of National Lead paint was particularly poor (possibly the worst batch of Dutch Boy we have had in years).

In selecting the better paint between the best of groups 1 and 2, three painters selected the 70% Lead Experimental and two selected Scotch Laddie. No painter expressed a marked preference for one paint over the other.

Three painters selected #9, 301-948 #42 O. W. best in Group 3. Two painters selected 301-918, the tie-in paint, best. Of the other two paints 301-959, Professional Line was relatively gummy with some drag and piling up at the lap. 603-922 #43 O.W. had a definite drag at lap.

The only paints that were given unacceptable ratings were:

National Lead - for ease of brushing by 3 men

603-922 - for drag-at-lap by 2 men

SWP - for ease of brushing by 1 man

301-959 - for drag-at-lap by 2 men

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The nine paints were ranked for ease of application by the writer according to the ratings and various comments of all the painters as they are listed in the following table: Then the paints were ranked by assigning numerical values for the various ratings and obtaining over-all average ratings. This ranking is shown in the right hand column: Details of these ratings are listed in the appended tables:

<u>Writer's Ranking</u>	<u>Numerical Ranking</u>
1. Scotch Laddie	1
2. 70% Lead Paint	2
3. 20% Lead Paint	3
4. 301-918 #40 O.W.	5
5. 301-948 #42 O.W.	4
6. Sherwin-Williams	7
7. 301-959	8
8. 603-922	6
9. National Lead	9

The discrepancy with 603-922 can be accounted for by the fact that "unacceptable" ratings were mentally weighted heavily whereas they were not included in the numerical averages.

There appears to be no doubt now that the Scotch Laddie paint does have application properties that are superior to the general run of present day house paints. Its physical properties are unique only in that it has a very high yield value of about 460 dynes/cm². Its Plastic Viscosity is normal as is its sterner viscosity of 102KU considering the high lead content.

Our 70% lead paint analog of Scotch Laddie, rated practically even with Scotch Laddie, does not have the extremely high yield value but was higher than any of the other paints. Apparently there is a property, as yet undefined by physical measurements, that is supplied by use of large amounts of lead as basic carbonate of white lead. The other two competitive paints both contain lead but in other forms - SWP as 18% leaded zinc oxide and N. L. as a blend of BCWL and Basic Silicate of White Lead.

The 20% White Lead paint had initial application properties nearly equal to the high lead paints but was detectably less free of a drag-at-lap which was more nearly like #40 O.W., both of which are acceptable.

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Appearance Properties

All of the paints containing lead pigments were rated highest and essentially equal for appearance-the 20% Lead paint being rated highest. The one physical property which correlates with this result is gloss measurement. The same five paints have the highest gloss and of these the 20% lead paint is highest.

All of the lead-free paints, including the #43 Alkyd H.P. were rated low for gloss uniformity or streaking and flashing-at-laps. The Professional paint 301-959 received the lowest ratings in this group.

Within each group, the 70% Lead paint was rated best by 3 painters and the 20% lead paint best by 2 painters in Group 1; In group 2, three picked National Lead, one picked Sherwin-Williams and two picked Scotch Laddie. In Group 3, three picked #43, O.W., two picked #40 O.W. and two picked #42 O.W., but this group as a whole was inferior to other best paints.

General Conclusions

Our first grade lead-free paints have acceptable initial application properties but have just enough drag and piling-up at laps to aid in causing flashing.

The gloss level of our lead-free paints is still not high enough to give good gloss uniformity and resistance to flashing. It was demonstrated with the 20% lead paint and Sherwin-Williams that some drag at lap can be tolerated and yet give good resistance to flashing if the gloss level is high enough.

RECOMMENDATIONS:

Proceed with our original plans to sell the 20% lead paint which is competitive in cost, acceptable for application properties and gives an overall improvement in initial appearance. The 70% lead paint, which would give a further small boost in application properties, has a raw material cost about \$1.05 higher than the 20% lead paint and probably could not be sold competitively even with Scotch Laddie.

Spend the necessary money, perhaps 20-25 cents per gallon, on #40 and 42 O.W.'s to increase their solids and gloss to a level where their lapping properties and gloss level give the desired improvement in initial appearance.

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Because the cost of 301-959 cannot be increased, improve its lapping properties and gloss uniformity by recommending thinning with linseed oil rather than thinner.

NOTEBOOK REFERENCE:

See Notebook 6664 for details of these tests.

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TABLE I

PAINTERS RATINGS AND PERTINENT PHYSICAL PROPERTIES

	APPLICATION PROPERTIES						ASTM YIELD STRENGTH VISC. VALVE VISC.			SAC FINE- GAL. GLOSS				APPEARANCE					
	A	B	C	D	E	AVE	Barrel	Thru	K.U.	MM	MILS	%GAL	60°	A	B	C	D	E	AVE
SCATCH LARRIE	12	12	15	14	11	12.8	3.9	464	102	8	2.5	17.3	81	10.5	10.5	9.0	8.0	10.0	9.6
70% BCWL Exp.	12	14	15	6	12	11.8	2.8	240	87	11	1.5	17.8	76	9.5	10.5	11.0	6.0	10.5	9.3
20% BCWL Exp.	11	13	13	8	7	10.4	3.9	225	93	10	2.5	14.3	88	11	10	12	8.5	8.0	9.9
301-918 #40 O.W.	10.5	12	9.5	9.5	6.5	9.8	3.6	179	87	8	2.5	13.8	64	8.5	7.5	9.5	4.0	8.0	7.3
301-948 #42 O.W.	8	14	10	10	9	10.2	6.3	228	98	11	2.75	13.9	54	8	10	9	6	7	8.0
SHERWIN-WILLIAMS	8	11	6	8	7	8.0	4.9	166	89	11	1.75	14.0	70	9	11	10	10	8	9.6
301-959 #106.3	8	12	6	4	8	7.6	4.8	169	84	9	2.0	12.6	57	8	4	7	4	6	5.8
301-922 #43 O.W.	10	11	4	12	9	9.2	3.1	117	71	10	2.25	11.3	49	8	6	9	8	7	7.6
NATIONAL-LEAD	5	4	6	0	7	4.4	7.0	129	90	10	1.75	14.5	71	12	11	11	5	9	9.6

KEY: LETTERED COLUMNS CORRESPOND TO PAINTERS LISTED IN TABLE II

APPLICATION PROPERTIES - SUM OF RATINGS OF FIVE PROPERTIES, RATED } EXCELLENT
 APPEARANCE PROPERTIES - SUM OF RATINGS OF FOUR PROPERTIES, RATED } GOOD
 FAIR
 POOR

BLE II

INDIVIDUAL PROPERTIES

<u>Spreading</u>	<u>Gloss Uniformity</u>	<u>Flashing</u>	<u>Flow</u>	<u>Color</u>
2.4	2.7	2.6	2.3	2.1
2.3	2.9	2.6	2.1	1.4
2.0	2.7	2.5	2.3	2.2
2.0	1.6	1.7	2.0	1.9
2.0	1.6	2.0	2.2	2.3
1.4	2.8	2.2	2.4	2.2
1.6	1.0	0.6	2.0	2.2
2.4	1.2	1.6	2.6	1.6
0.4	2.6	2.6	2.0	2.6

TABLE III

Painters names and address and letters to correspond with ratings on Table's I and II, and names of Duponters that worked with each painter.

<u>Painters Name and Letter</u>	<u>Duponters</u>
Clarence Mebs D 1934 43th St. Pennsauken, N. J.	W. R. Smith Marshall Laboratory
George H. Smith C 3308 Madison St. Wilmington, Del.	W. J. McConeghey Marshall Laboratory
John E. Ravillious E 34 Cgle Avenue Wilmington, Del.	F. T. Johnson Wilmington F&F
Louis Giovannini A Box 673 Devon, Pa.	C. W. Shay Wilmington F&F
A. C. Krause B	J. E. Cyler Marshall Laboratory

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