CHICAGO PAINT RESEARCH DEPARTMENT

INDEX OF EXPOSURES SERIES (PIGMENTED)

Exposure No.	Title	Also Refer To
13654-71	Representative Finishes at Five Exposure Locations	Projects 97 and 103
12688H-12711H	Special Agents in Mildew Resistant Treated White and Undercoater	" 77
10597-10617F,C	Special Agents in SWP Mildew Resistant Treated White and Undercoater (Addendum to Report of January 12, 1950)	" 77
12305-29F, C	Styrenated Oils in SWP Gloss White	" 97
12059-65, 12285C	Rot Tests of Wood Using Special Preservative Agents (Final Report)	" 77
15835-72 C,F	Titanium Pigment Corporation Cooperative Series (1951)	" 97
16046-16115 C,F	du Pont-Sherwin Williams Cooperative Series of 1951	" 97
15934-58 C,F	St. Joseph Lead Company Cooperative Series	" 97
15392-15403 F,C	Iso Phthalic Acid in Alkyd Formulations	" 105 and 178

0007-SWP-000115194

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0007-SWP-000115195

J. W. Chapin
January 5, 1950

Progress Report on Exposures 13654-71

Representative Finishes at Five Exposure Locations

Pg. 97
Pg. 103

FEB 15 1950

Introduction

In September, 1948, we received a letter forwarded by Mr. A. B. Holton with a note expressing some interest in exposures at Wickenburg, Arizona. Among the claims made by Mr. C. R. Caryl of Wickenburg in soliciting exposure test business were: 292 days of sunshine yearly as against 97 for Miami; brilliant sunshine for about 90% of the daylight hours; no smoke, fog or dust; and low humidity. We informed Mr. Caryl at the start that we are concerned with much more than high ultraviolet concentration in testing our finishes, such as dampness, frost, dew, extreme temperature fluctuations, etc., plus the practical matter of testing close to areas of large paint consumption.

We decided to give Wickenburg, Arizona a trial, using a wide variety of formulations and making parallel exposures at our usual locations -- Chicago, Miami and Coffeyville. The main thought was that we might find that Wickenburg exposure was particularly informative for some specific type of finish. A secondary purpose was to get a display showing a variety of finishes tested under different climatic conditions.

Paints Tested

1. On cedar bevel siding panels, for vertical exposure, including north at Chicago.

   Rex 471 SWP Gloss White, Card No. 54, both 2 coats self-primed and over Rex 450 Undercoater.

   Rex 436 SWP Fume Resistant White, both 2 coats self-primed and over Rex 450 Undercoater.

   CH 4697 One Coat House Paint White, over Rex 450 Undercoater.

   Rex 45000 Kem Bulletin White, 2 coats self-primed.

   Rex 600 Family Paint (old lithopone type), 2 coats self-primed.

   Rex 17 Lead-in-Oil, 3 coats as per label.

FEB 28 1950

0007-SWP-045823

0007-SWP-000115196

2. On steel panels, cold-rolled, 6 x 12" flat, for 45° south exposure.

Rex 16174, C2747 Kromik primer - Rex 27399, C3097 Metalastic Gray.

E61 E C2 Wash primer - E43 R C1 Intermediate - F44 A 68 Carclad Vinyl Gray, 2 coats.

F65 W1 Kem Lustral White, both as one coat and with E61 A1 primer.

F66 G27 Kem Lustral Green, both as one coat and with E61 A1 primer.

E67 R C3 Primer - F2 M3 Ruby Maroon Kem Transport Enamel.

E67 R C3 Primer - F1 A99 Ford Birch Gray Kem Transport Enamel.

Automotive Lacquer, Opex Light Gray System, P1 A1, 28539 and L1 A99 (F)

Automotive Lacquer, Opex Opalescent Maroon, P1 N1, 28542 and L2 M3.

3. On maple panels 8 x 12 x 3/8", for 45° south exposure.

Rex 04, C1159 Rexpar Varnish, phenolic, 3 spray coats.

V78 V4, C129, Kem Finishing Clear, alkyd, 3 spray coats.

Preparation and Exposure

Panels of group 1 (house paints) were prepared by the writer in the usual manner. All panels were painted with 2 coats of gray paint on the backs. In this group there are 5 locations, because at Chicago they were exposed both north and south. These are "half-and-half" panels, each panel carrying 2 systems, one on the left, the other on the right half.

0007-SWP-000115197

Special care was taken with all panels, to see that they had the same drying time between coats and the same elapsed time between painting and exposure. The entire series was exposed on the same day at all locations, June 6, 1949, and removed on December 6, for a total of exactly 6 months.

Panels of groups 2 and 3 were prepared by others in the Chicago plant, who were asked to specify what they considered the most suitable systems to use for a test program of this type and to follow their best procedure for preparing panels. The cooperating parties were:

G. G. Schurr, Paint Research (Metalastic and Vinyl)
A. B. Scott, Varnish-Resin Laboratory (Clear Finishes)
A. Brolin, Chicago Technical Service (Kem Lustral)
C. H. Williams, Lacquer Laboratory (Kem Transport)
C. D. Owens, Lacquer Laboratory (Opex Automotive)

Summary of Results

With the exception of a few general explanatory and supplementary statements, the bar graphs which follow suffice to tell the story of the results up to 6 months. We also present a summary of the weather conditions at each location.

The Wickenburg panels, in general, seemed to be outstanding in only one respect -- low dirt collection. In several cases, Coffeyville panels were equally clean. The outstandingly dirty location was Miami, where mildew was obviously a major factor. It was rather surprising to note that the high ultraviolet concentration at Wickenburg did not result in above-average loss of gloss or chalking. Both Florida and Chicago South showed appreciably greater chalk rub-off than Wickenburg on the systems most susceptible to chalking.

Mr. Williams and Mr. McIntyre felt that the Arizona location offered no advantage over Florida. They customarily judge their automotive formulations on the basis of 6 months Florida exposure (in many cases only 3 months), the most important characteristic being the recovery of gloss and color after polishing. Florida and Wickenburg showed about equal color change (darkening), but the Wickenburg panels seemed to carry a film which, although it did not cause difficulty in polishing, may have protected the finish from deterioration to a certain extent.

0007-SWP-000115198

The clear finish panels require some comment on points not adaptable to graphing. David Lesser, of Furniture Technical Service, who has been working on discoloration of woods and clear finishes, evaluated the panels by stripping a small portion over both the exposed and protected areas. In the case of Chicago, there was no protected area, thus the evaluation was more or less subjective. The Florida films could not be judged for darkening because of the mildew growth. It seems significant that the differences between the two finishes are more obvious than the differences between locations. Further, Mr. Lesser made the comment that the alkyd V78 V4 showed the same results on these outdoor exposures as would be expected from his work with films under a carbon arc light, whereas the Rex 04 phenolic showed quite the reverse. He suggested that not even the Arizona exposure was severe enough, at 6 months, to allow a conclusive evaluation.

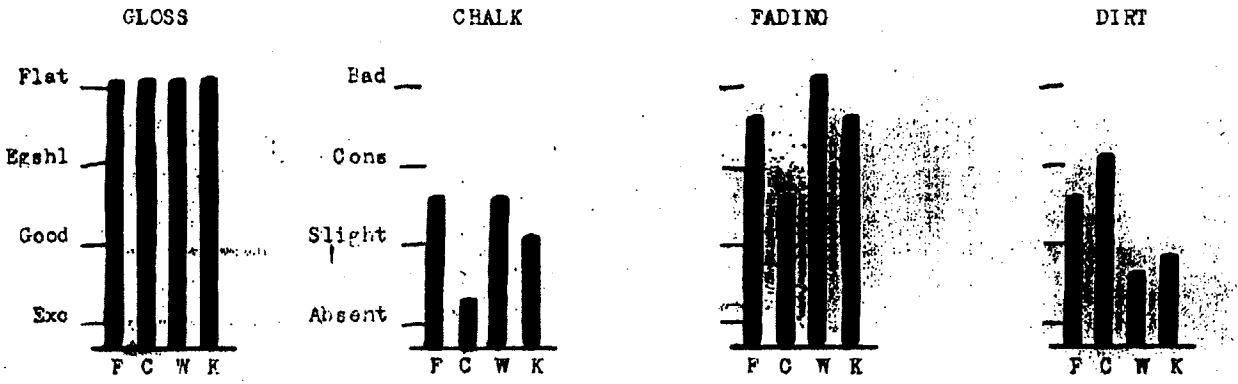
The Rex 04 sample at Wickenburg showed considerable microscopic checking, or crazing, the only film failure of the entire series, while the V78 V4 showed none.

0007-SWP-000115199

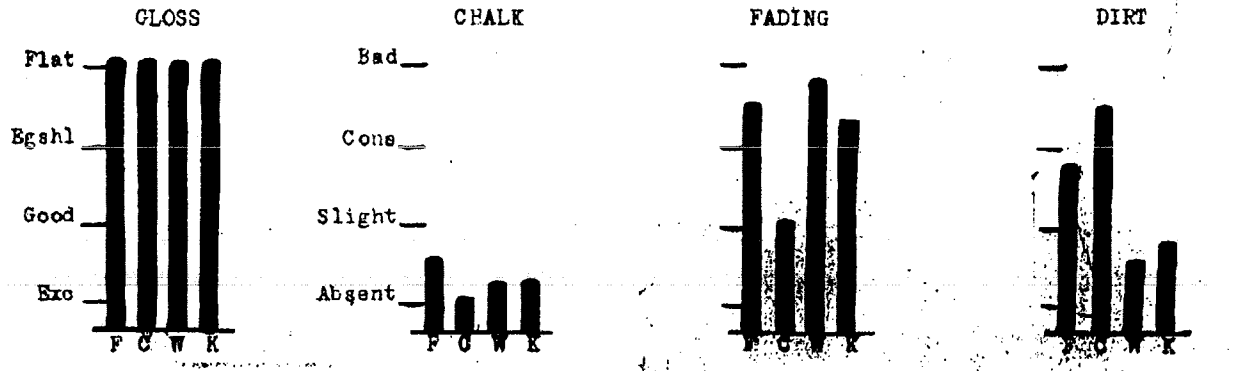
Graph #1

F -- Miami, Fla. W -- Wickenburg, Ariz. 45° South
C -- Chicago, Ill. K -- Coffeyville, Kas. 6 months

KROMIK-METALASTIC GRAY



"CAMCLAD" VINYL SYSTEM



0007-SWP-045827
0007-SWP-000115200

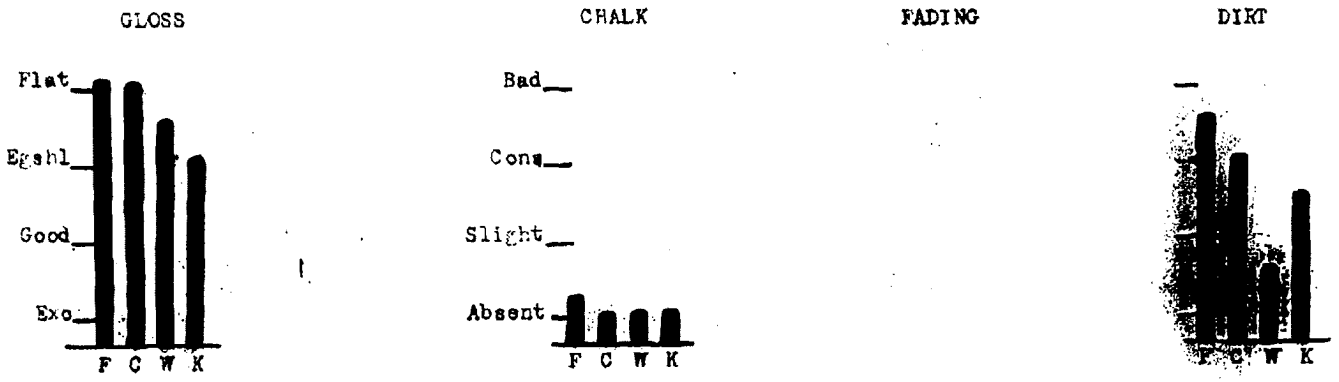
F -- Miami, Fla.
C -- Chicago, Ill.

W -- Wickenburg, Ariz.
K -- Coffeyville, Kans.

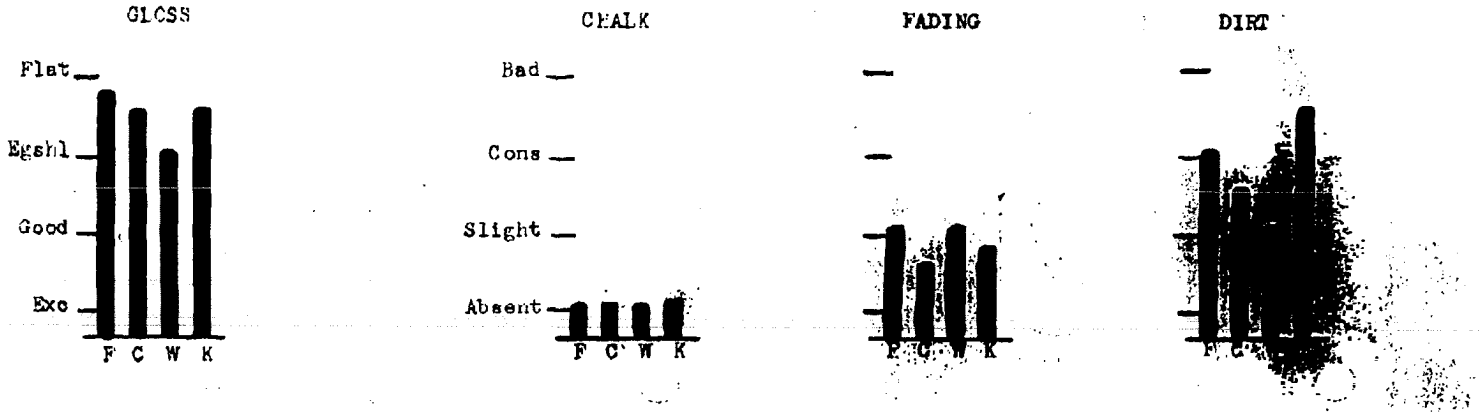
45° South
6 Months

Graph #2

KEM LUSTRAL WHITE -- 2 COATS



KEM LUSTRAL GREEN -- 2 COATS



0007-SWP-045828

0007-SWP-000115201

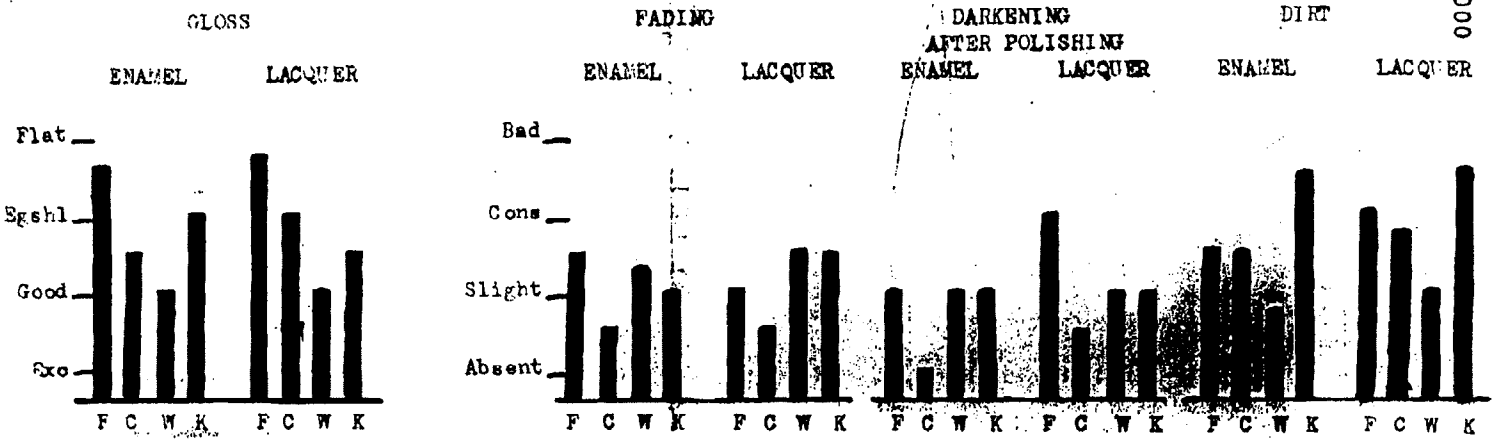
0007-SWP-045829

F -- Miami, Fla.
C -- Chicago, Ill.
W -- Wickenburg, Ariz.
K -- Coffeyville, Kas.

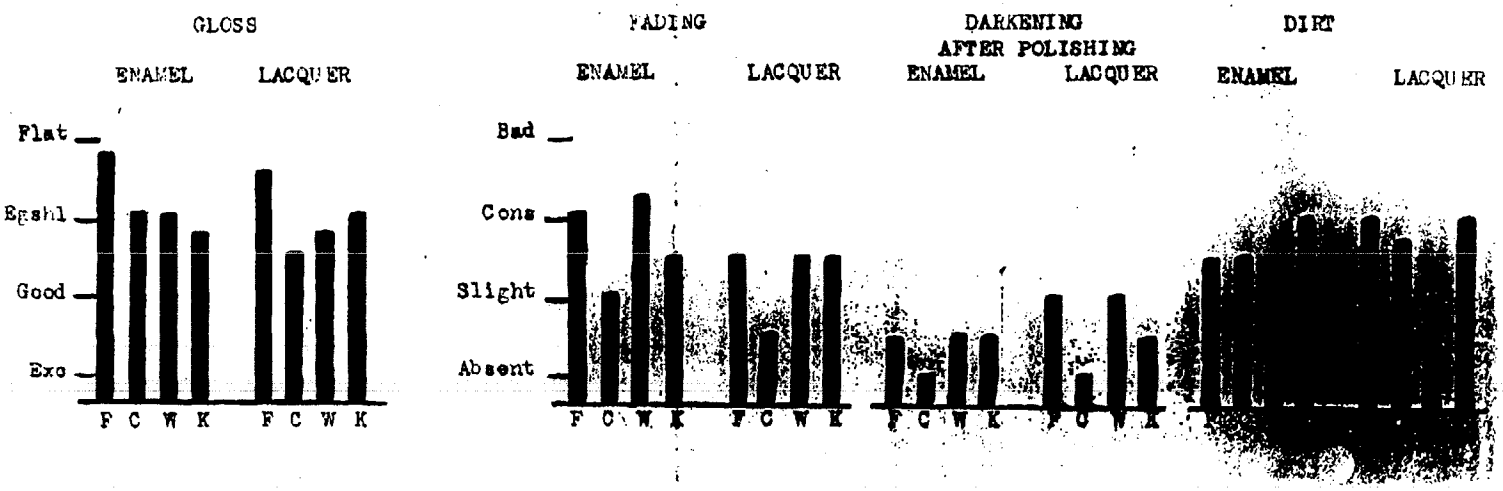
45° South
6 Months

Graph #3

AUTOMOTIVE SYSTEMS -- MAROON



AUTOMOTIVE SYSTEMS -- LIGHT GRAY

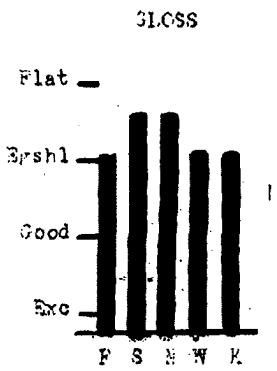


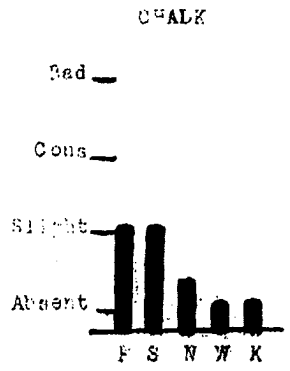
0007-SWP-00011520

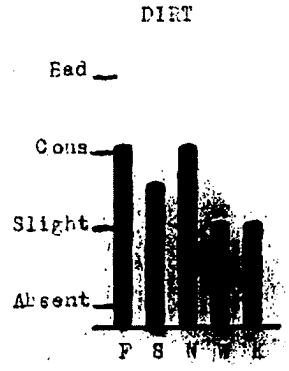
Graph #4

F -- Miami, Fla.
S -- Chicago, South
N -- Chicago, North
W -- Wickenburg, Ariz.
K -- Coffeyville, Kas.
Vertical
6 Months

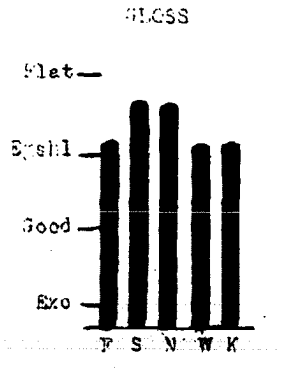
REX 471 SWP GLOSS WHITE
OVER REX 450 UNDERCOATER

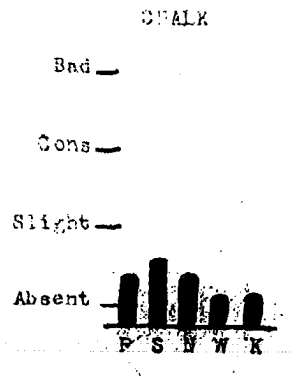


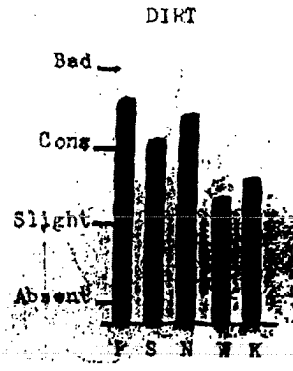




REX 436 FUME RESISTING WHITE
OVER REX 450 UNDERCOATER







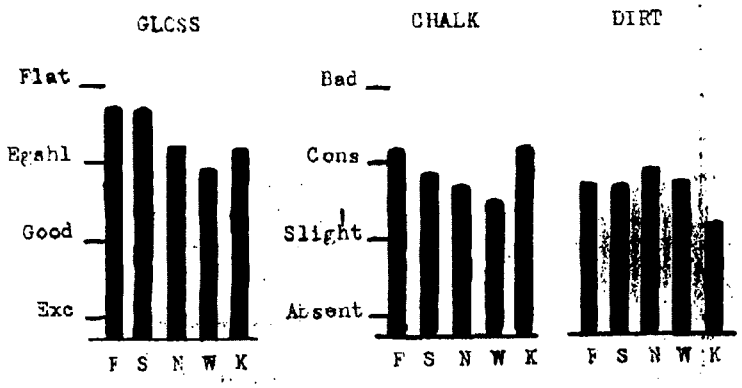
0007-SWP-045830
0007-SWP-000115203

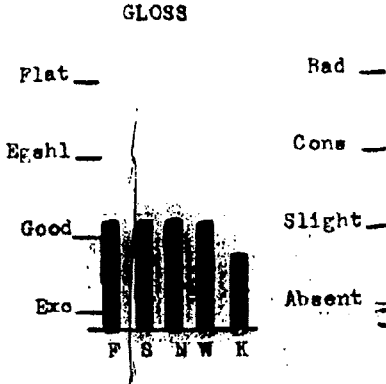
F -- Miami, Fla.
S -- Chicago, South
N -- Chicago, North
W -- Wickenburg, Ariz.
K -- Coffeyville, Kas.

Vertical
6 Months

ONE COAT HOUSE PAINT WHITE
OVER REX 450

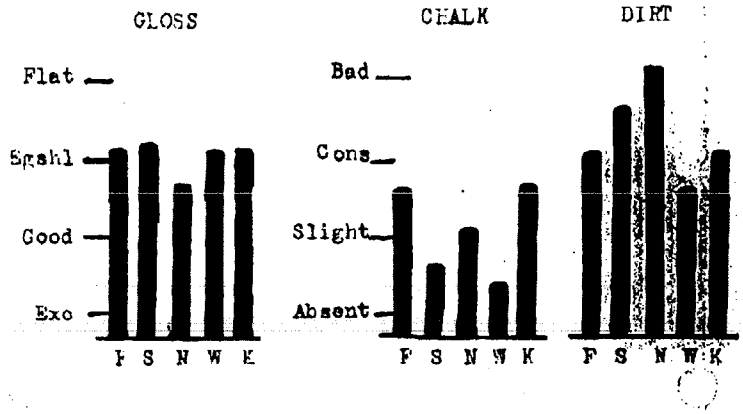
KEM BULLETIN WHI
SELF-PRIMED

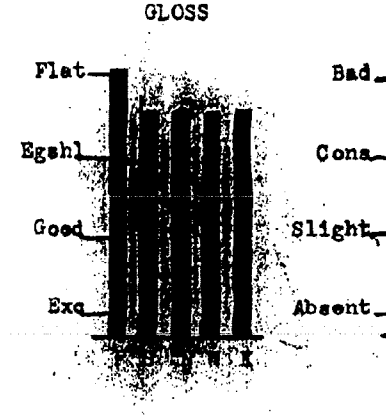




LEAD-IN-OIL, 3 COATS

REX 300 FAMILY PA



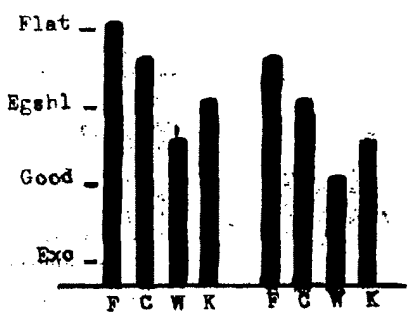


0007-SWP-000115204

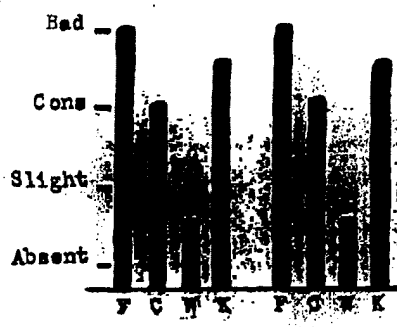
F -- Miami, Fla. W -- Wickenburg, Ariz. 45° South
C -- Chicago, Ill. K -- Coffeyville, Kas. 6 Months

CLEAR FINISHES ON MAPLE

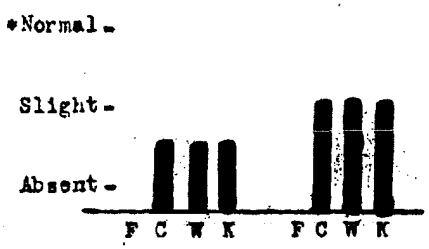
GLOSS
Rex 04 V78 V4



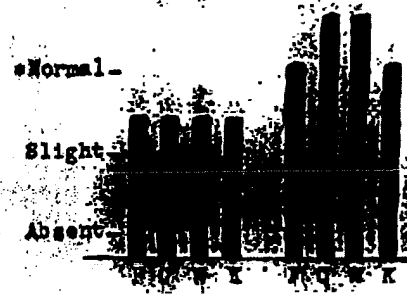
DIRT
Rex 04 V78 V4



DARKENING OF FINISH
Rex 04 V78 V4



DARKENING OF WOOD
Rex 04 V78 V4



* Darkening equal to that of unfinished wood.

0007-SWP-000115205

Weather Data

	Temp., Degrees F.				Precip., Inches		% of Possible Sunshine	
	High	Low	Ave.	Norm.	Total	Normal	1949	Normal
June, 1949								
Chicago	95	50	74.0	68	3.65	3.48	70	69
Miami	92	69	80.3	80	10.37	7.17	63	--
Wickenburg	108-57 range, no further record							
Coffeyville	96	58	78	76.2	6.6	5.68	61	--
July, 1949								
Chicago	102	78	77.8	72.7	3.59	3.43	61	74
Miami	90	71	81	81.8	5.08	5.60	71	--
Wickenburg	112	62	33*	--	1.34	1.03	82	83
Coffeyville	99	64	81.4	81.1	7.22	3.78	69	--
August, 1949								
Chicago	95	50	74.7	71.6	1.31	3.02	69	70
Miami	93	73	82	82.1	7.57	5.88	76	--
Wickenburg	112	53	41*	--	0.87	1.00	95	83
Coffeyville	100	52	77.9	80.9	1.46	3.40	78	--
September, 1949								
Chicago	85	38	60.4	64.9	1.24	3.20	65	65
Miami	95	70	82	80.9	9.07	8.65	78	--
Wickenburg	108	60	25*	--	0.89	0.89	85	88
Coffeyville	95	37	68.9	72.9	3.59	4.40	65	--
October, 1949								
Chicago	67	30	57.2	52.5	2.73	2.56	65	60
Miami	88	68	79	78.0	7.15	7.74	77	--
Wickenburg	98	39	28*	--	0.80	0.47	82	88
Coffeyville	86	27	60.5	61.1	4.5	3.52	71	--
November 1949								
Chicago	71	15	40.1	37.7	0.89	2.51	44	46
Miami	No Record							
Wickenburg	90	42	32*		0.30	0.67	87	83
Coffeyville	84	21	52.6	48.1	0	2.34	93	--

* This item (Wickenburg only) is not the average temperature, but average difference between high and low temperature.

0007-SWP-000115206

Formulas

Rex 471 OJ 37N
SWP Gloss White

Pounds	Gallons	Material
275		20 L
75		2132
150		1403
200		412
200		414W
	29 1/2	(2)
	19	(310)
	5/8	(543)
	1 3/4	(4230)
	4	(141)
	19 3/4	(348)

A. Wt. - 14.35
Visc. - 22.6" on #3

Rex 436 RB 2503 "A"
SWP Fume Resisting White

Pounds	Gallons	Material
100		1403
100		2030
290		2295
288		20
	19	(310)
	28 1/2	(2)
	1 1/2	(543)
	3	(5096)
	2	(2231)
	18 1/4	(348)
	4	(141)
	1 1/4	(2236)

T. Wt. - 13.28 A. Wt. - 13.24
Visc. - 25" on #3

Rex 300 OJ 92N
Family Paint Outside White

Pounds	Gallons	Material
1		547
250		20L
5		1128
285		4818
105		2140
100		412
50		511
	1	(12)W
	8	(310)
	29	(2)
	1/4	(4232)
	21	(2)
	2 3/8	(4230)
	1/2	(2231)
	14	(348)

T. Wt. - 13.25 A. Wt. - 13.32
Viscosity - 26.2" on #3

Rex 450 OJ 81W
SWP Undercoater

Pounds	Gallons	Material
80		1552
250		20L
240		511
120		18
142		2174
3		547
	28	(2)
	15	(310)
	4	(141)
	1 1/2	(4230)
	1 1/2	(543)
	26	(348)

A. Wt. - 13.63
Visc. 12" on #3

0007-SWP-000115207

Rex 17 Soft Paste Lead-in-Oil

	First Coat	Second Coat	Third Coat
White Lead	100# or 1-9/15 oz.	same	same
Pure Raw Linseed	4 gal. or 8 oz.	1-1/2 gal. or 3 oz.	3 gal. or 6 oz.
Pure Turpentine	1-3/4 gal. or 3-1/2 oz.	1-1/4 gal. or 2-1/2 oz.	--
Drier (183)	1 pint or 1/4 oz.	same	same
Makes up	9 gallons	6 gallons	6-1/4 gal.

CH 4697 OJ 276 L

One Coat House Paint White

Pounds	Gallons	Material
520		412
224		1403
76		2307
118		2188
160		18
	1/2	(12)W
	29	(2)
	20	(798)
	4 1/4	(4106)
	4	(48)
	2 3/4	(4250)
	3/4	(545)
	1/4	(4252)
	4	(141)
	7 1/4	(348)

A. Wt. - 16.30

0007-SWP-000115208

Mil Al Enamel Undercoater

Pounds	Gallons	Material
130		2174 or 1004
135		1989
5		1826
?		BB1211
?		BY1240
	1	(5026)
	32	(3136)
	2	(4230)
	1	(4231)
	2	(4232)
	17	(4046)
	22	(4104)
	16	(4026)

Grind 5H

F65 W1 Kem Lustral White

Pounds	Gallons	Material
300		2229
3		1826
?		BL1246
?		BM1239
	25	(4101)
	46 1/2	(4101)
	1/2	(5026)
	5	(4103)
	1 1/2	(4231)
	1	(4232)
	15	(348)

Grind 7H

F65 G27 Kem Lustral Green

Pounds	Gallons	Material
76		5005
4		2270
?		BY1240
	23	(3110)
	35	(5140)
	23	(6100)
	3	(4250)
	2	(4252)
	1	(5026)
	15	(348)

Grind 7H

Mil E C2
Super A & A Basic Zinc Chromate primer

Pounds	Gallons	Material
94		CW 2531
86		CW 2615
14		1509
	39	(2659)
	41	(1891)
	10	(4031)

Wt./Gal. 7.70
Viscosity 35" @ 75 deg. on #4 Ford Cup Reduced

0007-SWP-000115209

Carolad Intermediate Coat - E43 R C1

Pounds	Gallons	Material
200		201
25		214*
	2 1/4	(1621)
	2	(3038)
60		CW 2678**
	27	(3038)
87		CW 2678
	22	(4046)
	17	(241)
	3	(4021)
	9	(3038)
	4	(4030)
	3/4	(1621)
	1/2	(4098)

* Mill 12 hours
**Add as cold cut. Mill 8 hrs. more or till 6H.
Wt./gal. - 9.53
Viscosity 30" @ 75 deg. on #4 Ford Cup

Super A & A Enamel Gray - F44 A C8

Pounds	Gallons	Material
90		CB 7168
?		CB 7154, CB7153, CB 7159
135		CW 1817
	20	(4046)
	20	(241)
	45	(3038)
	3	(1621)
	1/2	(CW 2458)

Wt./gal. - 8.10
Viscosity 30" @ 75 deg. on #4 Ford Cup Reduced

Kromik Primer - 16174

Pounds	Gallons	Material
170		12054
210		201
126		1707
170		2272
170		20 L
2		547
	4	(2)
	26	(2326)
	28	(348)
	8	(4950)G
	3	(4230)
	1/2	(4231)
	1/2	(4232)
	10	(348)

Wt./ gal. - T. 13.82
Viscosity 20-30" on #3

Metalastic Light Gray - 27399

Pounds	Gallons	Material
14		488
3		547
210		20 L
9		1128
131		2174
157		412
	15	(2)
	1	(12)W
	8	(48)
	8	(2)
	17	(48)
	11	(4950)G
	3	(4230)
	1/2	(4231)
	1/2	(4232)
	22	(348)

Wt./Gal. - T. 11.28
Viscosity 30-40" on #3

0007-SWP-000115210

F2 M3 Kem Transport Ruby Maroon

Pounds	Gallons	Material
207		BM 1227
22		FL 201
2		BA 1200
458		V 15625
3		(7060)
10		(2235)
12		(2214)
3		(2205)
9		(2225)
3		(2238)
42		(63)

A. Wt. - 7.47

Opex L1 A99(E), Maroon

Pounds	Gallons	Material
785		BW 669
60		BB 689
5		CB (2400)
?		B 9672

Basic vehicle

453 lbs. nitrocellulose solids
410 lbs. (3107) solids
137 lbs. (1620)
1000 lbs.

Rex 04, C1159, Rexpar Varnish

Pounds	Gallons	Material
690	92	(2985)A
36	5	(1257)
10-1/2	1 1/2	(4232)
10	1 1/2	(5026)
747	100	

F Visc.

0007-SWP-000115211

F1 A99, C1019 Kem Transport, Birch Gray

Pounds	Gallons	Material
187		DW 1238
7		BB 1203
		(BL 1246, BY 12407)
498		(3149)
24		(2237)
24		(2215)
6		(2205)
10		(2225)
18		(5026)
1		(1767)
86		(348)
21		(1257)

A. Wt. 8.38

Opex 32451(A) Gray

Pounds	Gallons	Material
125		CB 2089
27		2292
16		(1620)
124		(3107)
200		(241)
119		(1670)
23		(2624)
106		(2611)
70		CB (2105)

Basic Vehicle

453 lbs. nitrocellulose solids
410 (3109) solids
137 (1620)
1000 lbs.

V78 V4, C 129 Kem Finishing Clear

Pounds	Gallons	Material
	72	(4100)
	16 3/4	(348)
	8	(2049)
	1	(5026)
	2	(4230)
	1 1/8	(4232)
	100	

Viso. C-D

JWC:LS

John W. Chapin

0007-SWP-045839

0007-SWP-000115212

J. W. Chapin
January 12, 1950

Final Report on Exposures 12688H-12711H

Special Agents in Mildew Resistant Treated White and Undercoater

Proj 77

FEB 15 1950

Purpose and Plan of Tests

The purpose of this series of tests is to supplement the series numbered 10597-10617F, C. This former series was prepared and exposed in May, 1946 at Chicago and Florida, on cedar bevel siding panels. The paints represented mildew resistant treated house paints prepared by Mr. Jagd. Examination at about one year showed unsatisfactory results, because of the fact that neither location gave appreciable mildew. However, the tests were continued on exposure to 36 months at both locations. In the meantime, having had very good results with mildew tests at Havana, Cuba, a new series of test panels were prepared for Havana. The same paints were used as in the 10597 series, and had been in storage for about 1-1/2 years. The paints were applied on 8 x 24" cedar panels, exposed vertical south at Havana, the exposure time now being 17 months.

The plan of the present report is to present a complete coverage of all tests, since this series covers a wide range of fungicides and includes several which have been recommended widely and have received commercial notice. Cuprous oxide can be used only in deep colors. A number of copper organic compounds are on test in Barn Red and other deep colors, and these also are unsuitable for whites.

This report on Havana exposures is the basic report. We are attaching a routine final report on the 10597 series, which is somewhat more detailed than necessary, due to the fact that it was actually written before the Havana panels were received and examined.

All panels are being discontinued.

Materials Tested

Because of the difficulty of typing the complete description of each paint on the tabulation of readings, this is presented below, with only the names of materials being given in the tabulation. Considerable variation will be noted in the percentages used; this is because the paints were formulated on the basis of the manufacturers' recommendations as to [illegible] except where we had had experience with the particular materials. The fungicides are used in the same amount in the Undercoater and Rex 472 SWP M.R.T. Gloss White, unless otherwise noted.

FEB 1950

0007-SWP-045840

0007-SWP-000115213

Pyridyl Mercuric Stearate -- 0.04% and 0.02% Hg on paint solids. (0.02% only in primer)

DDT - 2% on vehicle weight, also at 2% on vehicle solids only.

Dowicide 6, 2052 dry (tetrachlorphenol) -- 3% on paint weight. (regular agent)

Chlorinated Bis-phenol -- 3% on paint weight.

Dimethyl phthalate -- 1% on vehicle solids.

Milban (zinc dimethyl-dithio-carbonate) -0.5% on vehicle solids.

Nuocide 321 (10% cresyl mercuric naphthenate) -- 0.02% and 0.04% Hg on paint solids. (0.02% only in primer)

Benzene Hexachloride -- 2% on vehicle solids.

Sodium Copper Polyphosphate -- 7.7% CuO on vehicle solids. (Used with a primer carrying 2052 dry)

8-Methyl Naphthoquinone -- 2% on vehicle solids.(also tested in primer only)

Phenyl Mercuric Naphthenate -- 0.04% Hg on total solids in finish coat, 0.02% in primer. (Samples from both Berk and Edwal)

Permacide OS-10 -- 3% on paint weight.

Zinc Fluoborate -- 0.05%, 1% and 2% on vehicle solids. (Primer in each case is 1%)

Mert ZT -- 1/16 and 1/8 parts by volume of paint. (Not tested in 10597 series; paints are new, not aged, in Havana series)

Summary of Results

Only a few of these materials show good or even fairly satisfactory resistance to mildew growth at 17 months at Havana, where the tendency toward mildew formation seems to be very great. There seems to be a difference in some cases between the front and back (presumably north, and open to the weather), but in no case is one side relatively clean and the other badly mildewed. There is no failure, nor even any chalking, and some of the panels still hold a noticeable gloss. It is thought that the breakdown of gloss is due at least in part to the action of the mildew on the surface.

0007-SWP-000115214

Tetrachlorphenol, the 2052 dry regularly used, is definitely best in mildew resistance and general appearance. The only material approaching it is chlorinated bis-phenol, which shows slightly more fungus growth, especially on the back of the panel. 2052 dry definitely lowers the durability of the paints in which it is used. Sodium copper polyphosphate seems to be very effective in reducing mildew growth, but looks bad due to the greenish cast imparted in the film. Phenyl mercury naphthenate, especially Edwal's, and Permacide OS-10 show somewhat less mildew than the rest of the agents, but are hardly in a class with 2052 dry. It will be noted that several of the agents, in cases where more than one concentration is used, actually show more mildew at the higher concentration.

Because of having the three locations, and because of the fact that the Havana results give no indication of film failure which is likely to occur in other climates, we are presenting a condensed tabulation of results. (Further data may be found in the complete examination results on another page.) The Havana results should probably be considered as conclusive as far as mildew growth is concerned, but any conflicting evidence from the other locations will be presented in the tabulation. The Chicago and Florida tests have an untreated guide or control section on each panels.

Paint No. and Test Material	Havana(17 Mo.)	Florida(36 Mo.)	Chicago(36 Mo.)
FN617-621 (guide) No Agent.	Very bad mildew	Varies considerably in mildew.* Slight to moderate film failure	Varies slightly. Slight cracking*
FN618-622. Berk's phenyl Hg naphth.	Bad mildew	Good condition	Good condition
FN619-623. Same but Edwal's	Slightly better on front side	Similar, slightly dirtier	Good condition
FN620-624. Permacide OS-10	Fair, slightly better than preceding.	Good film, but serious mildew	Good condition
OJ534-531J. Zn fluoborate, 0.5%	Very bad mildew	Good film, but bad mildew	Good condition
534-532J. Ditto, but 1%	Very bad mildew	Good film, but even worse mildew	Good condition
534-533J. Ditto, but 2%	Extremely bad mildew	Good film, but even worse mildew	Good condition
246-235J. Pyridyl mercuric stearate, 0.04%	Very bad mildew	Moderate micro-failure. Very little mildew	Good condition

0007-SWP-000115215

Paint No. and Test Material	Havana(17 Mo.)	Florida(36 Mo.)	Chicago(36 Mo.)
246-236J. Ditto, but 0.02%	Very bad mildew	Slightly more failure, also more mildew	Good condition
247-237J. D.D.T. 2% on vehicle weight	Bad mildew, very bad on back	Good film, but serious mildew	Slight cracking
247-238J. D.D.T. 2% on vehicle solids	Extremely bad on front	Good film, but serious mildew	Slight cracking
248-239J. Chlorinated bis-phenol	Considerable mildew. One of the best.	Slight checking, very little mildew	Very slight cracking, clean
249-240J. Na Cu polyphosphate	Mildew not serious but bad greenish color	Bad color, bad mildew	Color not quite as bad as Florida
250-241J. Dimethyl phthalate	Very bad mildew	Slight checking, very little mildew	Good condition
249-242J. 2052 dry	Least mildew, especially clean on back	Had micro check and crack, mildew as guide	Bad check and crack
355-243J. Nuocide 321, 0.02%	Bad mildew, very bad on back	Slight cracking, slight mildew	Serious failure, also dirty
355-244J. Ditto, 0.04%	Very similar, slightly better	Slight checking, moderate mildew	Somewhat better, but poor.
253-254J. Benzene hexachloride	Extremely bad, but much better on back	Good condition	Good condition
498-491J. Methyl naphthoquinone	Extremely bad mildew	Slight micro-failure, slight mildew	Serious failure, poor color, dirty
252-245J. Milban	Very bad mildew	Considerable micro-failure, considerable mildew	Good condition
759-747L. Mert Z-T. 1/16 parts	Very bad mildew	No test	No test
760-746L. Mert Z-T. 1/8 parts	Very bad mildew	No test	No test

* When failure is mentioned below, Chicago and Florida, it is rated in relation to the individual guide (untreated).

0007-SWP-000115216

Composition and Data

Panel No.	Description	Paint Nos.*	Gloss	Chalk	Mildew Front	Mildew Back	Gen. App.
12688H	Pyridyl Hg stearate, 0.04%	OJ246J 235J	(Eg)	A	VB	VB	VP
89	Same, 0.02%	OJ246J 236J	"	"	"	"	"
90	D.D.T. on vehicle weight	OJ247J 237J	"	"	B	"	P
91	2% D.D.T. on vehicle weight	OJ247J 238J	F	"	VVB	(B)	VVP
92	2052 dry	OJ249J 242J	G	"	(C)	S	(G)
93	Chlorinated bis-phenol	OJ 248J 239J	(G)	"	C	C	F
94	Dimethyl phthalate	OJ250J 241J	F	"	VB	VB	VP
95	Milban	OJ252J 245J	"	"	"	B	"
96	Nuocide 321, 0.02%	OJ355J 243J	(Eg)	"	B	VB	P
97	Same, 0.04%	OJ355J 244J	"	"	B-	B	"
98	Benzene Hexo-chloride	OJ253J 254J	F	"	VVB	(B)	VVP
99	Na Cu polyphosphate	OJ249J 240J	(Eg)	"	(C)	(C)	VP*
12700	Methyl naphthoquinone (in primer only)	OJ489J	F	"	VB	VVB	VP
01	In both coats	OJ498J 491J	"	"	"	VB	"
02	Berk's phenyl Hg naphth.	FN618 622	Eg	"	(B)	B	(F)
03	Same, but Edwal's	619 623	Eg	"	C	"	F
04	Permacide OS-10	620 624	(Eg)	"	(B)	(B)	(F)
05	Zn fluoborate, 0.5%	OJ534J 531J	F	"	B	VB	P
06	ditto, 1%	OJ534J 532J	"	"	VB	"	VP
07	ditto, 2%	OJ534J 533J	"	"	VB	VVB	"
08	No agent	FN617 621	"	"	VVB	"	VVP
09	No agent	OJ758L 745L	"	"	VB	"	VP
10	Mert ZT, 1/16 parts	OJ759L 747L	(Eg)	"	"	VB	"
11	ditto, 1/8 parts	OJ760L 746L	(Eg)	"	"	"	"

* Due to green-yellow color

Note: No checking or cracking.

0007-SWP-045844

0007-SWP-000115217

Formulas

See formulas in the "Addendum report" on the 10597-10617 series. The following formulas are used in the Havana series only:

SWP Gloss White M.R.T. 745 L

Pounds	Gallons	Material
260		20 F
146		1403
470		412
182		BW 103
	23 1/2	(2)
	18 1/4	(48)
	1/4	(4231)
	3/4	(4230)
	15	(348)
	4	(141)

A. Wt./Gal. 15.97
Visc, 38.2"

SWP Undercoater M.R.T. 758 L

Pounds	Gallons	Material
160		414 W
80		1552
200		20 L
116		2269
450		BW 103
	7-1/2	(785)
	10 3/4	(2)
	10	(48)
	23 3/4	(348) - hold
	4	(141) out, add
	1 3/4	(4230) the am-
	1	(4231) ount
		neces-
		sary to
		reduce
		visc. to
		25 sec.

A. Wt./Gal. 15.22
Visc. 25.4"

SWP Gloss White M.R.T. 747 L

fl. oz.	
16	paint 745 L
1	Mert ZT

0007-SWP-000115218

SWP Undercoater - 759 L

fl. oz.

16 760 L

1 Mert ZT

SWP Undercoater - 760 L

fl. oz.

16 758 L

2 Mert ZT

SWP Gloss White - M.R.T. 746 L

fl. oz.

16 paint 745 L

2 Mert ZT

JWC:LS

John W. Chapin

0007-SWP-000115219

J. W. Chapin
January 13, 1950

Addendum to Report of January 12, 1950

Final Report on Exposures 10597-10617F, C

Special Agents in SWP Mildew Resistant Treated White and Undercoater

77

DM

Purpose

To test various special agents as fungicides in mildew resistant house paints and undercoaters formulated along the lines of Rex 63057, date 7-22-44.

Preparation and Exposure

The panels are all cedar bevel siding, exposed 36 months at Florida and 40 months at Chicago, vertical south. In general, both the top coat and the primer use the same agent in each case, but it will be necessary to refer to the formulas at the end, and to the Havana report, to get full details on the individual samples. The Florida panels are being retired; the Chicago panels remain on exposure, but it is quite possible that further results will not merit an additional report.

Summary of Results

Only a few general statements can be made, as variations are so great that it seems advisable to present results in a tabulation, which is a part of the report on Havana tests. Many inconsistencies have been noted in the results of Florida exposure, considered much more valuable than Chicago because the latter developed no mildew. Na Cu polyphosphate is the only material shown as clearly and positively good. We have concluded that all others showing bad mildew either have guides or companion samples of different concentration, or both, which also show bad mildew. On the good side, pyridyl mercuric stearate, chlorinated bis-phenol and di-methyl phthalate perhaps deserve mention for appearance, but tend to check and crack.

Unfortunately, the past history of the Florida panels tells us little. When examined by us at 18 months, mildew was so light on all panels that there were no indications of fungicidal effectiveness. The series shows good examples of the shortcomings of Florida exposure for testing mildew-resisting formulas.

(Turn to Havana report for condensed tabulation of results.)

0007-SWP-045847

0007-SWP-000115220

Composition and Data

Examination at 39-1/3 Months, Chicago

Panel No.	Description	Paint No's*	Chalk	Check	Crack	Eros'n	Relative to Guide	Dirt	Gen. App.
10597C	Pyridyl Hg stearate, 0.04%	OJ246J 235J	B	A	A	S	OK	S+	G-
98	Same, 0.02%	OJ246J 236J	"	"	"	"	"	"	"
99	2% D.D.T. on vehicle weight	OJ247J 237J	"	"	(S)	S+	Sl. Inferior	(C)	(G)
10600	2% D.D.T. on vehicle weight	OJ247J 238J	"	"	tr	S	OK	S+	G-
01	2052 dry	OJ249J 242J	B-	Sm	(C)m	"	Def. Inferior	"	"
02	Chlorinated bis-phenol	OJ248J 239J	"	(S)m	(S)m	S-	V. sl. Inferior	S	G
03	Dimethyl phthal.	OJ250J 241J	B	A	"	S	OK	"	"
04	Milban	OJ252J 245J	"	"	A	S-	Seems Good	S	"
05	Mooide 321, 0.02%	OJ355J 243J	"	tr	C part m	C	Much inferior	(C)	F
06	Same, 0.04%	OJ355J 244J	"	Sm	(C)m	(C)	Def. inferior	"	"
07	Benzene hexa-chloride	OJ253J 254J	"	A	A	S-	Seems good	S	G
08	Na Cu poly-phosphate	OJ249J 240J	"	"	"	(S)	ditto	"	"
09	Methyl [redacted]-quinone (in primer only)	OJ489J	B+	"	tr	(C)	Inferior, erodes	C	(F)
10	In both coats	OJ498J 491J	"	"	(C)	C	ditto, worse	"	"
11	Berk's phenyl Hg naphth.	FN618 622	"	"	A	S+	OK	S	G
12	Same, but Edwal's	619 623	"	"	tr	"	OK	"	"
13	Permacide OS-10	620 624	B	A	"	"	OK	"	"
14	Zn fluoborate, 0.5%	OJ534J 531J	"	"	A	S	OK	"	"
15	ditto, 1%	OJ534J 532J	"	"	"	"	OK	"	"
16	ditto, 2%	534J 533J	"	"	"	"	OK	"	"
Guide 10617	No agent	FN617 621	"	"	A toS	"	--	"	"

* First number is undercoater and the second is the finish coat.

0007-SWP-045848

0007-SWP-000115221

Examination at 36 Months, Florida

Panel No.	Paint Nos*	Chalk	Check	Crack	Surf. Flake	Guide Fail.	Mildew	Guide Mildew	Dirt*	Gen. App.	Notes
10597F	OJ246J 235J	VB	Sm	(C)m	C	V. sl.	S	(C)	S	(G)	
98	OJ246J 236J	"	Cm	"	(B)	"	C	C	(C)	F	
99	OJ247J 237J	"	tr	tr	"	"	(B)	"	(B)	(F)	
10600	OJ247J 238J	"	(S)m	tr	B	sl.	B	(B)	B	P	Very "spotty"
01	OJ249J 242J	"	Cm	Bm	S	def. less	(C)	(C)	(C)	F	
02	OJ248J 239J	B	(B)m	Sm	"	sl. less	S	"	S	(G)	
03	OJ250J 241J	"	Sm	"	"	v. sl.	"	"	S+	"	
04	OJ252J 245J	"	Cm	Cm	"	def. less	C	"	C	F-	
05	OJ355J 243J	VB	tr	B	"	Due to wood	(C)	S	(C)	F	
06	OJ355J 244J	"	(C)m	(S)m	C	V. sl.	C	"	C	"	
07	OJ253J 254J	B	tr	tr	(B)	V. sl.	"	(C)	"	"	
08	OJ249J 240J	VVB	Cm	Bm	(S)	"	B	S	VB	VP	Green cast
09	OJ489J	B	(C)m	Sm	C	"	(C)	(C)	(B)	(F)	Sl. green
10	OJ498J 491J	(B)	Sm	"	B	"	(B)	"	"	"	
11	FN618 622	VB	"	"	(B)	About same	(C)	"	C	"	
12	619 623	"	"	tr	B	Same	C	C-	(B)	(F)	
13	620 624	B	tr	"	"	V. sl.	B	(B)	B	P	
14	OJ534J 531J	"	(S)m	(S)m	(B)	"	VB	B	VB	VP	
15	OJ534J 532J	"	"	tr	B	V. sl.	B	S	B	P	
16	OJ534J 533J	"	Sm	Sm	"	Sl.	(B)	"	"	"	
Guide 10617	FN617 621	VB			C to B						

* Includes in this case mildew and all surface discoloration, etc. tending to lower gen. appearance.

0007-SWP-045849

0007-SWP-000115222

Formulas Involved

SWP Undercoater M.R.T. Reg. OJ 249J

Pounds	Gallons	Material
210		412
80		1552
200		20F
116		2173
385		BW 103
46		2052
	1/8	(12)W
	7-1/2	(785)
	12-3/4	(2)
	10	(48)
	23-3/4	(348)
	4	(141)
	1-3/4	(5230)
	1	(5231)

Output - 100 Gals.
Wt/Gal. - T. 14.48 - A. 14.49
Viscosity fresh - 27.8" @ 75 deg. F. on #3
3 days - 29.4" @ 75 deg. F. on #3

SWP Undercoater M.R.T. OJ 246 J

Same as OJ 249J except agent is 3/4 lb. Pyridyl Mercuric Stearate

SWP Undercoater M.R.T. OJ 247J

Same as OJ 249J except agent is 6-1/2 lb. D.D.T.

SWP Undercoater M.R.T. OJ 248J

Same as OJ 249J except agent is 46 lb. Chlorinated bis-phenol

SWP Undercoater M.R.T. OJ 250J

Same as OJ 249J except agent is 1/2 gal. Dimethyl Phthalate

SWP Undercoater M.R.T. OJ 252J

Same as OJ 249J except agent is 1-5/8 lb. Milban

SWP Undercoater M.R.T. OJ 253J

Same as OJ 249J except agent is 6-1/2 lb. Benzene Hexachloride

SWP Undercoater OJ 255J (M.R.T.)

Same as OJ 249J except agent is 5/16 gal. CW (2119) C.M.N.

0007-SWP-000115223

SWP Gloss White M.R.T. OJ 235J
(Basic formula for all topcoats, except OJ 489J)

Pounds	Gallons	Material
248		20 F
146		1403
500		412
1-1/2 Pyridyl Mercuric Stearate		
160		BW 103
(0.04% Hg on total paint solids)		
	1/4	(12)W
	23-1/2	(2)
	18-1/4	(48)
	1/4	(5231)
	3/4	(5230)
	22	(348)
	4	(141)

Output - 100 gals.
Wt./gal. - T. 15.35 - A. 15.35
Viscosity fresh - 30.2" @ 75 deg F. on #3
2 days - 31.0" " " "

SWP Gloss White M.R.T. OJ 236J

Same as OJ 235J except agent is
13/16 lb. Pyridyl Mercuric Stearate
(0.02% Hg)

SWP Gloss White M.R.T. OJ 237J

Same as OJ 235J except agent is
11 lb. D. D. T.
(2% on total vehicle weight)

SWP Gloss White M.R.T. OJ 238J

Same as OJ 235J except agent is
7-1/2 lb. D.D.T.
(2% on vehicle solids)

SWP Gloss White M.R.T. OJ 239J

Same as OJ 235J except agent is
48 lb. Chlorinated bis-phenol
(3% on total paint weight)

SWP Gloss White M.R.T. OJ 240 J

Same as OJ 235J except agent is
180 lb. Sodium Copper Phosphate
(7.7% CuO based on vehicle solids)

SWP Gloss White M.R.T. OJ 241J

Same as OJ 235J except agent is 9/16 gal. Dimethyl Phthalate (1% on vehicle solids)

SWP Gloss White M.R.T. OJ 242J

Same as OJ 235J except agent is the regular tetrachlorphenol, Dowicide 6 (2052 dry), at 3% by weight of total paint.

SWP Gloss White M.R.T. OJ 243J

Same as OJ 235J, except using Nuocide 321 (C.M.N.) at 0.02% Hg based on paint solids

SWP Gloss White M.R.T. OJ 244J

Same as OJ 235J except using Nuocide 321 at 0.04% Hg on paint solids.

SWP Gloss White M.R.T. OJ 245J

Same as OJ 235J except agent is 1-7/8 lb. Milban (0.5% on vehicle solids)

SWP Gloss White M.R.T. OJ 254J

Same as OJ 235J except agent is 7-1/2 lb. Benzene Hexachloride (2% on vehicle solids)

SWP Gloss White - No Agent - OJ 489J

Pounds	Gallons	Material
296		20 L or F
132		2173
480		412
92		BW 103
	26-5/8	(2)
	19	CVR 366
	1/8	(12)W
	5/8	(543)
	1-3/4	(4230)
	19-1/2	(348)
	4	(141)

Output - 100 gals.
Wt./gal. - T. 15.00 - A. 15.06
Viscosity Fresh - 26.8" @ 75 deg. F. on #3
1 day - 30"

0007-SWP-000115225

SWP Gloss White M.R.T. OJ 491J

Same as OJ 235J except agent is 1-3/8 lbs. 8 Methyl Naphthoquinone

SWP Undercoater M.R.T. OJ 498J

Same as OJ 235J except agent is 1-3/8 lb. 8 Methyl Naphthoquinone

SWP Gloss White M.R.T. - OJ 531J

Same as OJ 235J except agent is 3/8 gal. Zn Fluoborate, 41% (0.5% on vehicle solids)

SWP Gloss White M.R.T. - OJ 532J

Same as OJ 235J except agent is 3/4 gal. Zn Fluoborate, 41% (1% on vehicle solids)

SWP Gloss White M.R.T. OJ 533J

Same as OJ 235J except agent is 1-7/16 gal. Zn Fluoborate, 41% (2% on vehicle solids)

SWP Undercoater M.R.T. - OJ 534J

Same as OJ 249J except agent is 5/8 gal. Zn Fluoborate, 41%

FN-617 SWP Undercoater, M.R.T. Type Rex 451 (Untreated)

Same as OJ 249J except no agent used.

FN-618 Undercoater, M.R.T.

Same as OJ 249J, except agent is .71 lbs. Phenyl Mercury Naphthenate (Berk 36% Hg)

FN-619 Undercoater, M.R.T.

Same as OJ 249J, except agent is 1-1/4 lbs. Phenyl Mercury Naphthenate (Edwal's 19.6% Hg)

FN-620 Undercoater, M.R.T.

Same as OJ 249J, except agent is 6-3/8 gal. Permacide OS 10

FN-621, M.R.T. (Untreated) Gloss White

Same as OJ 235J, except no agent used.

FN-622 Gloss White, M.R.T.

Same as OJ 235J, except agent is 1-1/2 lbs. Phenyl Mercury Naphthenate (Berk's 36% Hg)

FN-623 Gloss White, M.R.T.

Same as OJ 235J, except agent is 2-13/16 lbs. Phenyl Mercury Naphthenate (Edwal's 19.5%)

FN-624 Gloss White, M.R.T.

Same as OJ 235J, except agent is 6-7/8 gal. Permacide OS 10.

J. W. Chapin

JWC:LS

0007-SWP-045853

0007-SWP-000115226

J. W. Chapin
April 27, 1950

Progress Report on Exposures 12305-29F, C

Styrenated Oils in SWP Gloss White

PM

Purpose

To test styrenated oils in Rex 471 SWP Gloss White of 7-29-47, using both Dow Chemical Company's styrenated oils X 356 and X 357-40 and several blends from the Resin Research Department based on linseed and soya oils. Complete details on the resins, oils and paints involved are tabulated below.

Preparation and Exposure

The panels are cedar bevel siding primed with Rex 450 Undercoater (white), also duplicated as two-coat self-primed work. The Florida panels have been exposed vertical south for 24 months, the Chicago panels north and south for 26 months. A regular Rex 471 formula using 100% linseed oils was used as the guide paint.

All panels continue on exposure.

Summary of Results

It is important to note that this series is not an especially harsh test of styrene as such, because the binder in every case contains at least 50% (79%) non-break linseed oil, which had to be used to get usable consistencies and flow.

Both the Chicago and Florida tests, in general, look good, clean and white throughout the series at about 2 years. Florida tests which show serious dirt are balanced by a similar amount on the guides. Slightly more dirty than normal for the series at Chicago are: RB 7375 glycerol-resin-soya-styrene and RB 8259 Isolene-styrene.

No tests are dirtier than the guides at Florida, and all have been consistently rated equal as to dirt in Dr. Sieplein's routine reports. In fact, he has reported all tests as nearly identical from month to month except for minor early differences in chalking. Our Chicago examinations in the past have shown only very minor differences in the usual characteristics rated.

The failure by erosion at Chicago at present is very slight, and only a few panels, mostly self-primed, show erosion approaching the visible range. Three self-primed panels at Florida show microscopic checking of possible significance: (a) RB 5582 linseed-styrene, our match for Dow's X 356, (b) RB 5583 Isolene-linseed-styrene and (c) Dow's X 357-40 castor-styrene. A sample using 60/40% linseed/ (3316) soya-chinawood still holds some gloss at Florida.

0007-SWP-000115227

Composition and Data

Characteristics of Oils and Paints

OJ No.	Binder	Composition of Test Oil	Set-to-Touch Time	Brushing	Flow	Gloss
200L	60/40% or 29/19 gal.* (2)/(48) linseed	--	5 hr. 10 min.	Good	Good	Good
201L	60/40% or 29/19 gal. (2)/(3316)	80/20 Soya/CWO	5 hr. 15 min.	"	"	Good-
202L	60/40% or 29/19 gal. (798)/RB6875	50/50 (48) linseed/styrene	4 hr. 33 min.	sl. sticky	"	Fair+
203L	60/40% or 29/19 gal. (798)/ RB 6876	12.5/37.5/50 CWO/soya/ styrene	4 hr. 40 min.	"	"	Good
204L	75/25% or 32/16 gal. (798)/ RB 6877	12.5/37.5/50 CWO/linseed/ styrene	4 hr. 56 min.	"	"	Good+
205L	50/50% or 24/24 gal. (798) RB 5582	50/50 linseed/ styrene (our match for X 356)	3 hr. 56 min.	"	Fair-	Fair+
206L	50/50% or 24/24 gal. (798)/ RB 5583	25/25/50 Isolene/linseed/ styrene	3 hr. 50 min.	"	Good	Good+
207L	55/45% or 26/21 gal. (798)/ X 357-40	Dow's 60/40 castor/styrene	--	--	--	--
209L	50/50% or 24/24 gal. (798)/ CW-2253	50/50 (44) linseed/Dow X 356 styrene	3 hr. 55 min.	sl. sticky	Poor	Fair
305L	60/40% or 29/25 gal. (798)/ RB 7662	Pentek resin/ RB 6903 soya-styrene, 80% solids	5 hr. 30 min.	"	Good	Good
306L	60/40% or 29/23 gal. (798)/ RB 7375	Glycerol resin/ RB 6903 85% solids	5 hr. 15 min.	"	"	Good-
421L	60/40% or 29/19 gal. (798)/ RB 8259	60/40% Isolene/ styrene	4 hr. 50 min.	"	Very Good	--

*Fractions of gallons omitted

0007-SWP-045855

0007-SWP-000115228

Notes on drying when painted out for exposure test --

1. Self-prime first coats OJ 200L, 201L, 202L, 203L dried normally.

2. All other self-prime first coats blistered after standard 40 hour air-drying plus two hours U.V. arc cabinet. All were repeated.

3. OJ 204L, 205L, 206L, 207L gave the same trouble on repeat, after pre-drying of the wood, and only 1 hour arc treatment. These were repeated a second time.

4. All the poor-drying samples were finally O.K. when dried 3 to 4 days without arc treatment.

It appeared that these styrene paints tended to surface-dry, trap solvent and blister when artificially dried. The schedule did not permit the testing of this phenomenon in exactly the same manner for each paint, but the evidence indicates that all the styrene-containing paints have the tendency.

Basic Formula

OJ 200L, Rex 471 SWP Gloss White, 7/29/47

Pounds	Gallons	Material
290		20 F
136		1403
480		412
70		18
	1/4	(12)W
	29-3/8	(2)
	19	(48)Drum
	5/8	(543)
	1-3/4	(4230)
	1/2	(4232)
	19	(348)
	4	(141)

A. Wt. 15.06

JWC:ls

0007-SWP-000115229

J. W. Chapin
July 13, 1950

Final Report on Exposures 12059-65, 12285C

Rot Tests of Wood Using Special Preservative Agents

P. 7

Purpose

To test several fungicidal preparations, both alone and in aluminum paints, as to their actual effectiveness in preserving wood against rotting. The copper compounds involved are naphthenates.

Preparation and Testing

The materials listed below were prepared and applied to strips of yellow pine approximately 24 x 2-3/4 x 3/8 inches. The entire length was brushed with the primer or clear preservative, then the bottom 4" was painted with regular Rex 471 SWP Gloss White. This was to check whether there was any blooding of the preservative through a white paint. Also, it allows a test of both primer only and primer plus finish coat on the same piece of wood. Seven days of drying were allowed between coats.

The panels were placed upright in the ground, only 2 to 3 inches being above the surface, and Milorganite was worked in around each to promote decay. The panels were removed recently after 2-1/2 years burial. They will be filed for at least one year.

Summary of Results

Burial Tests, on Examination at 2-1/2 Years

Panel No.	Description	OJ No.	
12059C	Rex 23015 Alum. Paint, Rog.*	--	Buried portion entirely rotted away
60	Rex 23015 plus 0.4 lbs. 2052 dry per gal.	--	Rotted seriously (entire buried portion), no strength left, but still in one piece
61	Special Alum. #30 Al. paste plus OV-3P1	289L	Entirely rotted away
62	Ditto, but Roy-No-Mold Al. paste **	290L	Good. Primer starting to flake off, incipient rotting. Rex 471 intact

(Cont.)

0007-SWP-045857

0007-SWP-000115230

Panel No.	Description	OJ No.	
12063C	Nuodex 8% Cu-Preservative	291L	Very good. Wood looks as good as new. Rex 471 intact
64	2.2% Nuodex Cu added to paint similar to 289L	303L	Entirely rotted away
65	No primer. Rex 471 only	--	Some wood left, but rotting almost complete
12285C	Pestroy Penta 5% pentachlorophenol	--	Fair. More rotting than on 290L, but wood still quite strong. Rex 471 intact.

*Only primer or preservative is listed; each panel also has a section of Rex 471.

**Rey-No-Mold paste contains copper naphthenate, same material as in "Nuodex 8% Copper," but percentage is not known.

NOTE: We have no positive explanation of the poor showing of OJ 303L, copper added to aluminum paste, which theoretically should be equivalent or at least similar to Rey-No-Mold. However, there are two logical possibilities: (a) the leafing of the aluminum may prevent the agent from being absorbed into the wood; (b) Rey-No-Mold paste may be either much higher in copper content or may be specially processed to overcome the possible difficulty in (a).

0007-SWP-045858

0007-SWP-000115231

Formulas Involved

#15 Ready Mixed Aluminum Paint
† 4/10 pounds 2052 - 23015

Pounds	Gallons	Material
40		2052
	100	Rex 23015

#15 Ready Mixed Aluminum Paint
Card No. 12 - #23015

Pounds	Gallons	Material
137		1576
	14-1/4	(3498)L
	50-1/4	(2963)L
	24-3/4	(348)
	1	(4232)
	1/2	(1767)
†		(377)

Total Wt./Gal. - 8.00
Output - 100

(Samples furnished by E.C. Haag)

Aluminum Primer using Nuodex Copper CV 39 - 303 L

Pounds	Gallons	Material
215		Nuodex Copper 8%
200		Std. #30 Paste
	75	CV 39 *

Aluminum Primer made with Std. #30 paste - OJ 289 L

Pounds	Gallons	Material
32 oz.		Std. #30 Paste
	128	CV 39

Aluminum Primer made with Rey-No-Mold OJ 290 L

Pounds	Gallons	Material
32 wt.oz.		Rey-No-Mold
	128 lq.oz.	CV 39

Nuodex Copper Preservative Coating OJ 291 L

Pounds	Gallons	Material
29		Nuodex Copper 8%
35		(2)
	1/2	(4092)
36		(348)

* CV 39 is a long oil CNO-linseed-Velsicol liquid, based on (2963)L and (48).

0007-SWP-045859

0007-SWP-000115232

Photograph After 2-1/2 Years Burial

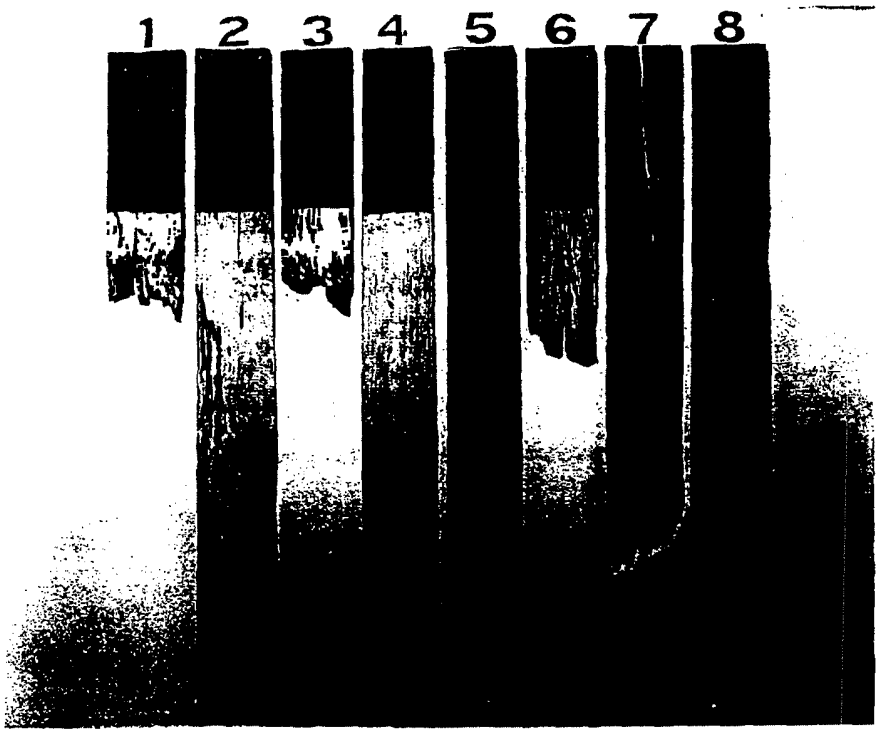


Photo No.	Panel No.	Material
1	12059C	Rex 23015 Aluminum Paint
2	60	Ditto, plus 0.4 lbs. 2052 dry per gal.
3	61	#30 Al. paste plus CV 39
4	62	Rey-No-Mold Al. paste plus CV 39
5	63	Nuodex 8% copper preservative
6	64	Same added to paint similar to #3
7	65	No treatment
8	12285	Pestroy Ponta, 5% pentachlorophenol

JWC:ls

J. W. CHAPIN

Sent to:

KRB(Attn. ECH)	JCW	RGL	HLB
ABH	OJG	ERH	WDR
EWF	DFH	WRC	
SFC	LFK	MWH	
JWC	HES		

0007-SWP-045860

0007-SWP-000115233

Paint Research Dept.
September 24, 1952

Progress Report on Exposures 15835-72 C,F

Titanium Pigment Corporation Cooperative Series (1951)

PMJ 9/1

Purpose

To compare exposure results on white and tinted house paints, planned as an extension of a previous series, with special emphasis on comparison of results at our locations with those at Sayville, New York.

Paints Tested

Group 1 -- Fume Resisting House Paints

Paint No.	TiO_2 Variation
RB 3328	Titanox A/AA 50/50 blend
RB 3329	Titanox AA
RB 3330	Titanox A/RANC 75/25 blend
RB 3331	Titanox A/RCHT 50/50 blend

Group 2 -- Lead Containing Gloss White

Paint No.	TiO_2 Variation
RB 3299	Titanox A
RB 3300	Titanox A/AA 50/50 blend
RB 3301	Titanox A/RANC 82/18 blend
RB 3302	Titanox A/RCHT 50/50 blend

Group 3 -- Lead containing tint - Colonial Yellow

Paint No.	TiO_2 - extender
RB 3303 Y	Titanox RANC - Mg silicate
RB 3304 Y	Titanox RC - Mg silicate
RB 3305 Y	Titanox RANC - Ca carbonate
RB 3306 Y	Titanox RC - Ca carbonate

Group 4 -- Lead containing tint - Gray

Paint No.	TiO_2 - extender
RB 3303 G	Titanox RANC - Mg silicate
RB 3304 G	Titanox RC - Mg silicate
RB 3305 G	Titanox RANC - Ca carbonate
RB 3306 G	Titanox RC - Ca carbonate

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0007-SWP-000115234

Group 5 - T.P. Co. White House Paints

Paint No.	
1527-1	10% TxA MO-10% TxRA-38.5% PbZn-15.7% BCWL-25.8% Asb.
1527-2	10% TxA MO-10% TxRA 10-38.5% PbZn-15.7% BCWL-25.8% Asb.
1527-3	20% Tx A168 LO-38.5% PbZn-15.7% BCWL-25.8% Asb.
1527-4	The same paint as No. 2 with all the lead being replaced by 45X on a volume basis.
1527-5	7.5% TxA MO-7.5% TxRA 10-34.6% PbZn-14.7% BCWL-35.7% Asb.
1527-6	35% TxRCHT-10% TxA MO-50% PbZn-5% Asb.
1527-7	The same paint as No. 6 with all the lead replaced by 45X on a volume basis.
1527-8	25% TxRCHT-7.5% TxA MO-35% PbZn-32.5% Asb.
1527-9	15% TxA 168 LO-10% TxRA 10-35% ZnO-20% Asb.-20% Calcium Carbonate.
1527-10	35% TxRCHT-10% TxA MO-35% ZnO-20% Asb.

Group 6 - T.P. Co. Tint Bases (Gray)

Paint No.	
1527-11	13% TxRANC-38% ZnO-13% 45X-36% Calcium carbonate
1527-12	12% TxRANC-35% ZnO-53% Calcium Carbonate
1527-13	53% TxRC-34.5% ZnO 12.5% Basic Lead Silicate 45X
1527-14	20% TxRC-25% ZnO-10% 45X-45% Calcium Carbonate
1527-15	Primer 60% TxRC-20% BCWL-20% Asb. in usual dehydrated castor oil-linseed-ester gum vehicle at a PVC of 40%
1527-16	Primer - 65% TxRC-35% Asbestine in usual vehicle

0007-SWP-000115235

Preparation and Exposure

The paints are tested on cedar bevel siding as follows:

a. The left 1/3 of each panel a control using house paint undercoater plus SWP Gloss White or the appropriate SWP tint.

b. The center 1/3 of each panel a test topcoat over undercoater. (Undercoater for SWP groups is Rex 450. For T.P. Co. groups it is their #1527-15; but see also special T.P. Co. primer at end of list).

c. The right 1/3 of each panel the same test as the center 1/3 but self-primed work.

d. First coats at 450 sq. ft. per gallon, topcoats at 550.

The panels have been exposed 12 months at Miami, Florida, vertical south, and 14 months at Chicago, north and south vertical.

Summary of Results

There is no serious film failure on any system as yet, but some systems should be mentioned as unsatisfactory because of dirt collection, mildew or yellow cast. However, since Chicago and Florida results do not verify each other in certain cases, we prefer at this stage to make only a few general statements, all of which are subject to amendment as the exposure progresses. More detailed comparisons may be made by comparing the attached readings item by item. Some general statements are:

1. Poor performance over #1527-15 primer. This is generally in the form of microscopic checking, which is much less on the self-primed sections. However, a number of self-primed tests show more dirt than the special-primed.

2. Rutile yellowing of grays where titanium calcium pigment is used with calcium carbonate extenders.

3. Rutile yellowing of titanium calcium paints more evident in lead-free than in lead-containing paints.

4. Dirt collection more noticeable with lead-free than with lead-containing paints, also with the larger amounts of rutile type pigments.

5. Control of color in tints all quite satisfactory except for Titanox RC-calcium carbonate combinations.

0007-SWP-000115236

Examination Results

Examination at 12 Months, Florida

Panel No.	Description	RB No.	Chalk	Check	Fade	Dirt	Gen. App.
Guide	Rex 450 plus Rex 471 reg.						
15835F	All 1403, left 1/3	3299	6	10		8	8
						Dirt mostly mildew	
SWP Fume Resisting							
36	Rex 436, 50/50 TxA/AA	3328	5	10		5	6
36-2	"2's" all self-primed, otherwise as 36	3328	6	10		5	6
37	All Tx AA	3329	5	10		5	6
37-2	self-primed	3329	6	10		5	6
38	75/25 TxA/RANC	3330	7	10		4	5
38-2	self-primed	3330	7	10		4	5
39	50/50 TxA/RCHT	3331	8	10		5	6
39-2	self-primed	3331	8	10		5	6
SWP Gloss White							
15840	Rex 471 as guide	3299	5	10		7	7
40-2	self-primed	3299	5	10		7	7
41	50/50 TxA/AA	3300	6	10		8	8
41-2	self-primed	3300	5	10		8	8
42	82/18 TxA/RANC	3301	4	10		8	8
42-2	self-primed	3301	4	10		8	8
43	50/50 TxA/RCHT	3302	6	10		8	8
43-2	self-primed	3302	6	10		8	8
SWP Colonial Yellow							
Guide	Reg. 450, white						
15844F	Rex 465 reg.	3303Y	9	10	5	5-6	5-6
45	Same, but center 1/3 (RANC/20 dry)	3303Y	9	10	5	4	4
45-2	self-primed	3303Y	9	9m	5	4	4
46	TxRC/20	3304Y	8	10	5	4	4
46-2	self-primed	3304Y	8	8m	5	4	4

0007-SWP-000115237

Panel No.	Description	RB No.	Chalk	Check	Fade	Dirt	Gen. App.
15847	RANC/566	3305Y	9	10	4	5	5
47-2	self-primed	3305Y	9	9m	4	5	5
48	RC/566	3306Y	8	8m	4	5	5
48-2	self-primed	3306Y	8	7m	4	5	5
Guide 15849F	SWP Westchester Gray Rex 450 white, plus 477, left 1/3	3303G	9	10	5	5-6	5-6
50	Same but center (RANC - 20 dry)	3303G	8	10	4	5	5
50-2	self-primed	3303G	8	10	5	4	4
51	RC/20	3304G	7	10	4	5	5
51-2	self-primed	3304G	7	8m	4	4	4
52	RANC/566	3305G	8	10	4	4	4
52-2	self-primed	3305G	8	9m	5	3	3
53	RC/566	3306G	8	6m	5	3	3
53-2	self-primed	3306G	8	5m	5	3	3
Guide 15854F	Guide as 15835, but T.P.'s reg. primer 1527-15 (left + center parts all this primer)	3299	6	7-9m	Guide dirt --	--	3-5
		T.P. No.					
55	T.P. white with Tx A-MC/RA	1527-1	6	10	5	3	3
55-2	self-primed	1527-1	6	10	5	4	4
56	AMC/RA-10	1527-2	7	10	5	4	4
56-2	self-primed	1527-2	6	10	5	4	4
57	Tx A168-LG	1527-3	5	10	5	3	3
57-2	self-primed	1527-3	5	10	5	4	4
58	As 15858 but 45X	1527-4	5	10	4	5	5
58-2	self-primed	1527-4	5	10	4	5	5
59	A-MC/RA-10 but lead-zinc changes	1527-5	5	5m	3	4	4
59-2	self-primed	1527-5	5	8m	3	4	4

Panel No.	Description	RB No.	Chalk	Check	Fade	Guide Dirt	Dirt	Gen. App.
15860	RCHT/A-MO	1527-6	5	5 part m*		4	5	5
60-2	self-primed	1527-6	5	8m		4	5	5
61	As 60, but 45X	1527-7	5	5m		3	5	5
61-2	self-primed	1527-7	5	10		3	4	4
62	As 60, but more extender	1527-8	5	6m		3	4	4
62-2	self-primed	1527-8	5	9m		3	4	4
63	A188-LO and R_A-10	1527-9	10	10		4	2	2
63-2	self-primed	1527-9	10	10		4	2	2
64	RCHT/A-MO	1527-10	10	7m**		5	3	3
64-2	self-primed	1527-10	10	7m**		5	3	3
T.P. Co. Tints, Gray Guide 15865F	As 49, but T.P. Co. Primer	RB 3503G	8	10	5			4-5
66	T.P. Special RANC/45X/Ca CO_3	TP 1527-11	9	9m	7	5	4	5
66-2	self-primed	1527-11	9	10	7	5	3	4
67	RANC/ZnO/Ca CO_3	1527-12	10	9m	7	5	3	4
67-2	self-primed	1527-12	10	10	7	5	3	4
68	RC/ZnO/45X	1527-13	9	5m	6	5	5	5
68-2	self-primed	1527-13	9	10	6	5	4	4
69	RC/ZnO/45X/Ca CO_3	1527-14	10	4m	7	5	3	4
69-2	self-primed	1527-14	10	6m	7	5	2	3

*Seems to be slight microscopic cracking on 15860F.

**Tiny checks, "wrinkle" type.

Ratings on gloss (actually only a slight sheen at this stage) are omitted for lack of space.

0007-SWP-000115239

Panel No.	Description	RB No.	Chalk	Check	Fade	Guide Dirt	Dirt	Gen. App.
T.P. White with Special Primer								
Guide 15870F	as before, but T.P. Special Primer which is 65/35 RC/Asbestine	RB 3299 TP	5	10				6
71	As 15863, but spec. pr.	1527-9	9	10		6	4	4
71-2	self-primed	1527-9	9	10		6	3	3
72	As 15864, but spec. pr.	1527-10	9	8m —		6	4	4
72-2	self-primed	1527-10	9	10		6	3	3

0007-SWP-000115240

Examination at 14 Months, Chicago

Panel No.	RB No.	SOUTH Chalk	SOUTH Fade	SOUTH Dirt	SOUTH Gen. App.	NORTH Chalk	NORTH Fade	NORTH Dirt	NORTH Gen. App.
Guide 15835C	3299	5		8	8	5		7	7
36	3328	5		8	8	6		7	7
36-2	3328	5		8	8	6		8	8
37	3329	5		8	8	6		7	7
37-2	3329	5		8	8	6		7	7
38	3330	6		8	8	7		7	7
38-2	3330	6		8	8	7		8	8
39	3331	6		6	6	7		4	4
39-2	3331	6		6	6	7		5	5
40	3299	5		8	8	6		7	7
40-2	3299	5		8	8	7		7	7
41	3300	6		7	7	6		6	6
41-2	3300	6		7	7	6		7	7
42	3301	6		7	7	6		6	6
42-2	3301	5		8	8	5		7	7
43	3302	5		7	7	6		6	6
43-2	3302	4		7	7	5		6	6
44	3303Y	6	4	6	5	6	5	4	4
45	3303Y	6	5	6	6	6	6	4	4
45-2	3303Y	6	4	6	5	5	5	4	4
46	3304Y	6	6	6	6	6	7	3	4
46-2	3304Y	6	5	6	6	5	6	3	4
47	3305Y	6	6	6	6	6	7	3	4
47-2	3305Y	6	5	7	6	6	6	3	4

0007-SWP-045868

0007-SWP-000115241

Panel No.	RB No.	SOUTH Chalk	Fade	Dirt	Gen. App.	NORTH Chalk	Fade	Dirt	Gen. App.
15848	3306Y	7	3	5	4	7	4	2	3
48-2	3306Y	6	3	5	4	6	4	2	3
49	3303G	6	5	7	6	6	5	5	5
50	3303G	6	6	7	6	6	5	5	5
50-2	3303G	5	5	7	6	6	5	5	5
51	3304G	6	6	6	6	6	6	4	4
51-2	3304G	5	5	7	6	6	6	4	4
52	3305G	7	6	6	6	7	6	3	4
52-2	3305G	6	5	7	6	7	6	3	4
53	3306G	7	4	4	4	7	6	2	3
53-2	3306G	6	4	5	4	7	6	2	3
54	3299	5		8	8	5		7	7
55	1527-1	6		7	7	6		6	6
55-2	1527-1	5		7	7	6		6	6
56	1527-2	6		7	7	6		5	5
56-2	1527-2	5		7	7	6		5	5
57	1527-3	5		8	8	6		7	7
57-2	1527-3	5		8	8	5		8	8
58	1527-4	5		7	7	6		6	6
58-2	1527-4	5		7	7	6		6	6
59	1527-5	6		7	7	7		6	6
59-2	1527-5	6		8	8	7		7	7
60	1527-6	4		6	6	5		4	4
60-2	1527-6	4		7	7	5		4	4
61	1527-7	5		6	6	6		4	4
61-2	1527-7	5		7	7	6		4	4

0007-SWP-045869

0007-SWP-000115242

Panel No.	RB No.	SOUTH Chalk	Fade	Dirt	Gen. App.	NORTH Chalk	Fade	Dirt	Gen. App.
15862	1527-8	7		7	7	7		6	6
62-2	1527-8	7		8	8	7		8	6
63	1527-9	6		6	6	6		4	4
63-2	1527-9	6		7	7	6		5	5
64	1527-10	5		6	6	6		4	4
64-2	1527-10	5		7	7	6		5	5
65	RB 3303G TP	5	5	7	6	6	5	5	5
66	1527-11	7	6	5	5	7	7	4	4
66-2	1527-11	7	5	6	5	7	6	4	5
67	1527-12	7	6	5	5	8	8	3	4
67-2	1527-12	7	5	6	5	8	7	4	4
68	1527-13	6	5	6	5	7	5	3	2
68-2	1527-13	6	4	7	5	6	4	4	3
69	1527-14	9	7	4	4	9	8	2	3
69-2	1527-14	9	6	5	5	9	7	3	4
70	RB 3299	5		8	8	6		7	7
71	1527-9	5		6	6	6		5	5
71-2	1527-9	5		7	7	6		6	6
72	1527-10	4		6	6	5		5	5
72-2	1527-10	4		7	7	5		5	5

No checking or cracking on any Chicago panels. Ratings on erosion, which are all "10" on tints and vary from 7 to 9 on whites, are being omitted for lack of space. It is conceded that these ratings may be of value, but erosion is not a factor in general appearance at this time.

0007-SWP-000115243

Formulas Involved

SWP Undercoater - Rex 450 - RB 3322

Pounds	Gallons	Material
100		2077
250		20
240		511
120		18
142		2174
3		547
	3/4	(5094)
	28	(2)
	14-1/2	(310)
	4	(141)
	1-1/2	(901)
	1-1/2	(543)
	25	(348)

Wt./Gal. - T 13.73 - A 13.80
Viscosity 19" @ 75 deg. on #3

Tint Base - RB 3306

Pounds	Gallons	Material
440		412
325	2140	Titanox RC
230		566
	1/2	(5094)
	32-1/2	(2)
	19	(310)
	1-1/4	(901)
	3/4	(543)
	4	(141)
	11	(5027)

Wt./Gal. - A 15.16
Viscosity 33" @ 75 deg. on #3

Tint Base - RB 3305

Pounds	Gallons	Material
440		412
137	1004	Titanox RA NC
375		566
	1/2	(5094)
	32-1/2	(2)
	19	(310)
	1-1/4	(901)
	3/4	(543)
	4	(141)
	1/4	(5027)

Wt./Gal. - T 14.65 - A 14.61
Viscosity 23" @ 75 deg. on #3

Tint Base - RB 3304

Pounds	Gallons	Material
440		412
325	2140	Titanox RC
200		20
	1/2	(5094)
	32-1/2	(2)
	19	(310)
	1-1/4	(901)
	3/4	(543)
	4	(141)
	13	(348)

Wt./Gal. - T 15.00 - A 15.02
Viscosity 37" @ 75 deg. on #3

Tint Base - RB 3303

Pounds	Gallons	Material
440		412
137	1004 -	Titanox RA NC
326		20
	1/2	(5094)
	32-1/2	(2)
	19	(310)
	1-1/4	(901)
	3/4	(543)
	4	(141)
	17	(5027)

Wt./Gal. - T 14.38 - A 14.31
Viscosity 22" @ 75 deg. on #3

SWP Gloss White - RB 3302

Pounds	Gallons	Material
250		20
175	2132 -	Titanox RC HT
100	1403 -	Titanox A
200		412
200		1424
	32-1/2	(2)
	19	(310)
	1-3/4	(901)
	5/8	(543)
	4	(141)
	15-3/4	(348)

Wt./Gal. - T 14.46 - A 14.50
Viscosity 26" @ 75 deg. on #3

SWP Gloss White - RB 3301

Pounds	Gallons	Material
30	1004 -	Titanox RA NC
140	1403 -	Titanox A
200		412
200		1424
325		20
	32-1/2	(2)
	19	(310)
	1-3/4	(901)
	5/8	(543)
	4	(141)
	16-3/4	(348)

Wt./Gal. - T 14.25 - A 14.23
Viscosity 21" @ 75 deg. on #3

SWP Gloss White - RB 3300

Pounds	Gallons	Material
85	1403 -	Titanox A
85	2030 -	Titanox AA
200		412
200		1424
325		20
	32-1/2	(2)
	19	(310)
	1-3/4	(901)
	5/8	(543)
	4	(141)
	16-3/4	(348)

Wt./Gal. - T 14.25 - A 14.30
Viscosity 25" @ 75 deg. on #3

SWP Gloss White - RB 3299

Pounds	Gallons	Material
170		1403 - Titanox A
200		412
200		1424
325		20
	32-1/2	(2)
	19	(310)
	1-3/4	(901)
	5/8	(543)
	4	(141)
	16-3/4	(348)

Wt./Gal. - T 14.25 - A 14.31
Viscosity 25" @ 75 deg. on #3

Fume Resisting White - RB 3328

Pounds	Gallons	Material
100		1403 - Titanox A
100		2030 - Titanox AA
290		2059
288		20
	32-1/2	(2)
	19	(310)
	3	(5096)
	1-1/2	(543)
	2	(2231)
	1-1/4	(2236)
	4	(141)
	14-1/4	(348)
	4	(348)

Wt./Gal. - T 13.29 - A 13.33
Viscosity 42" @ 75 deg. on #3

Fume Resisting White - RB 3330

Pounds	Gallons	Material
126		1403 - Titanox A
42		1004 - Titanox RA NC
290		2059
314		20
	32-1/2	(2)
	19	(310)
	3	(5096)
	1-1/2	(543)
	2	(2231)
	1-1/4	(2236)
	4	(141)
	14-1/4	(348)

Wt./Gal. - T 13.22 - A 13.23
Viscosity 41" @ 75 deg. on #3

0007-SWP-000115246

Fume Resisting White - RB 3329

Pounds	Gallons	Material
290		2059
288		20
200		2030 - Titanox AA
	32-1/2	(2)
	19	(310)
	3	(5096)
	1-1/2	(543)
	2	(2231)
	1-1/4	(2236)
	4	(141)
	14-1/4	(348)
	3	(348)

Wt./Gal. - T 13.29 - A 13.31
Viscosity 41" @ 75 deg. on #3

Fume Resisting White - RB 3331

Pounds	Gallons	Material
290		2059
112		20
75		1989
246	2132	- Titanox RC HT
74	1403	- Titanox A
	32-1/2	(2)
	19	(310)
	3	(5096)
	1-1/2	(543)
	2	(2231)
	1-1/4	(2236)
	4	(141)
	14-1/4	(348)

Wt./Gal. - T 13.48 - A 13.45
Viscosity 32" @ 75 deg. on #3

JWC:ls

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0007-SWP-000115247

Paint Res Dept

Inspection Trip
Exposures - Titanium Pigment Corporation
National Lead Company
du Pont Pigment Division
June 26 - 27, 1952

General Statement

On June 26 Mr. E. W. Fasig and the writer inspected the panel exposures of the Titanium Pigment Corporation and the National Lead Company at Sayville, Long Island, New York, and on June 27 the panel tests and some house tests of the du Pont Pigment Division at Newport and Wilmington, Delaware. Due to the terrific heat and high humidity our inspections necessarily were very restricted and only limited notes were made.

Most of the general statements made in our 1951 inspection report still hold and need not be repeated here. Supplementary remarks would include:

1. TPC reported that some antimony oxide would increase the chalk resistance of their so-called "non-chalking" rutile TiO_2 Titanox RANC. We did not see these panels.

2. du Pont stated that alkaline environment favored "rutile yellowing" and thus calcium carbonate must be used in whites with care. They said even anatase Ti-Pure FF can be made to yellow. TPC said Titanox RCHT can show yellowing but less than Titanox RA 10 MO.

3. du Pont is promoting their low zinc oxide - calcium carbonate paints for both whites and tints even more actively than in previous years.

4. Basic Silicate White Lead 45 X seems to be satisfactory as a reactive lead pigment.

5. Lead-zinc free stain-resistant paints continue to receive a lot of attention.

Titanium Pigment Corporation - Sayville, New York

White House Paints

(a) S-W Cooperative Series - Exposed June, 1951

This series consists of a group of paints selected by TPC and S-W for cooperative exposure to follow the very informative cooperative series concluded in 1950. The new series were exposed in June, 1951 at Sayville by TPC and in Chicago and Miami by S-W.

Since this series is handled by special reports no details need be given here. All the white paints are in good condition at all locations after one year, except that at Sayville the lead containing whites with 82/18 Titanox A/Titanox RANC and 50/50 Titanox A/Titanox RCHT are slightly grey on the north, with some mildew. The S-W buff and grey tint controls show somewhat more fading than is desirable.

0007-SWP-045875

0007-SWP-000115248

(b) White House Paints C 086 - 097. Exposed February, 1952.

This series covers comparisons of the 50% rutile titanium calcium pigment Titanox RCHT and the new 50% pigment Titanox C 50. Obviously, the exposures had not progressed far enough in Sayville to make it worth while to discuss details. However, it is worth noting that the Florida set has started to chalk and so far C 50 is chalking less than RCHT.

(c) 1950 Commercial White House Paints. Exposed June, 1950.

This series includes a number of nationally distributed house paints as well as standard type paints such as lead-in-oil, 60/30/10 BCWL/zinc oxide/extender, 50/50 titanium magnesium/leaded zinc, and 15.8/15.7/55.5/17 Titanox A/Titanox AA/leaded zinc/extender. The lead-in-oil has cleaned up fairly well on the south but the north panel is grey. The 60/30/10 paint is fairly clean on the south but is showing spotty clean-up on the north. The other two pattern formulas perform like the commercial multi-pigment paints.

Among the commercial paints S-W 471 Gloss White shows a tendency to crack along the edge of the bevel siding. It was chalking at the same rate as Lowe Brothers' High Standard 328 White on the south but was a trifle whiter and chalking a trifle faster than the 328 White on the north. Devoe's 547 White had an obviously grey cast on the south and was definitely grey on the north. Patterson-Sargent #218 was also definitely grey in cast. It is known that they use Titanox RA, which is too chalk resistant for a white. No special notes were made on National Lead, du Pont, Ward, Sears, or Benjamin Moore.

(d) 1948 Commercial White House Paints. Exposed June, 1948.

A series somewhat similar to (c), now 4 years old. As noted in previous reports, SWP is showing a fine checking pattern on the south but is O.K. on the north. Lead-in-oil (3 coats as in case of all but the one coat house paints) is almost down to bare wood on the south, with little paint left even on the north. Pittsburgh's 1-54 White looks very nice on the south, while National Lead's 10 and 110 Whites look good both south and north. Again, Devoe's 547 White looks grey on the north and their One Coat House Paint (over TPC's zincless primer) is checking on the south and looks grey and is mildewed on the north.

In another series put out in June, 1950, one coat over primer, the Devoe pigmentation of 8.5% TiO_2/67.5% titanium calcium/24% zinc oxide looks grey on the north. A related composition of 8.5% TiO_2/61.5% titanium magnesium/30.2% zinc oxide looks better.

0007-SWP-000115249

(e) 1949 White House Paints. Exposed January, 1949.

The first group in this test carries 20% titanium oxide, 35% leaded zinc, 15% BCWL and 30% magnesium silicate. The second group is similar but the 15% BCWL is eliminated and the leaded zinc increased to 50%. When the TiO_2 is all anatase Titanox A the paints stay white but tend toward fine checking and cracking on the south. If the 20% of TiO_2 is divided equally between A and RANC the durability is improved but chalking is retarded too much and the paint becomes grey and mildews. In general, the removal of BCWL and increased leaded zinc decreases dirt collection.

(f) 1948 White House Paints. Exposed June, 1948.

The original pigmentation of 50% Titanox RCHT/50% leaded zinc collected too much dirt, but clean-up was improved by the use of 5% Titanox A. When the pigmentation was revised to 50% Titanox RCHT/40% leaded zinc/10% magnesium silicate the paint became prone to mildew. And again this tendency was reduced by the use of 5% Titanox A. (In the writer's opinion this still is not enough Titanox A, as proven by our Chicago north exposures.) The general appearance of the paints at 35% PVC with a 25% Z_2 bodied oil vehicle is better than at 29% PVC with 6% Z_2 bodied oil. When the leaded zinc is replaced by lead-free zinc oxide in a fume resisting pigmentation the higher PVC paints are less critical as to behavior when the zinc oxide is reduced and extender increased.

In another 1948 series the Titanox A was increased and RCHT decreased, after which the zinc oxide was reduced successively by lowering the leaded zinc or zinc oxide, and extender was increased, as follows:

(1) 55% Titanox RCHT/10% Titanox A/45% leaded zinc/10% Mg silicate

(2) 55% Titanox RCHT/10% Titanox A/40% leaded zinc/15% Mg silicate

(3) 55% Titanox RCHT/10% Titanox A/30% zinc oxide/25% Mg silicate

(4) 55% Titanox RCHT/10% Titanox A/25% zinc oxide/30% Mg silicate

These paints were all at 35% PVC with 4-1/4 pounds of oil per gallon, with 25% Z_2 bodied linseed. All the paints looked better than the series described in the previous paragraph, due to the higher anatase TiO_2 content. Dirt collection and mildew increased on the north, going from (1) to (4).

(g) Lead Silicate House Paints. Exposed June, 1948.

These paints were described in the 1951 report on page 10. The 15% Titanox A/38.5% leaded zinc/15.7% BCWL/30.8% Mg silicate paint was compared with a similar paint in which all the lead (sulfate and carbonate) was replaced with an equal volume of 45 X basic silicate white lead. The paints were made up at both 29 and 35% PVC. All of the paints are still performing well, with less cracking when basic silicate is used.

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0007-SWP-000115250

Another group involves a pigmentation based on 35% Titanox RCHT/ 5% Titanox A/50% leaded zinc/10% Mg silicate, in which the same variations were made as above, with the same results.

(h) High Hiding House Paints. Exposed June, 1949.

These are high opacity white house paints applied one coat over a 30% Titanox RCHT/40% BCWL/30% Mg silicate primer. The TPC paint is based on 25% RCHT/50% Titanox AMO/15% Mg silicate (they now recommend Titanox A 168 for better color and less erosion). Comparisons are made with Devoe's One Coat House Paint, Glidden's Endurance Imperial White and an unidentified one coat house paint with a pigmentation of 24.5% TiO_2/34% titanium magnesium/ 41.5% zinc oxide. The Devoe paint shows its usual grey cast and susceptibility to checking. The Glidden one coat paint looks O.K. but shows some crazing.

(i) Lead and Zinc-free Paints.

These paints were described on pages 11 and 12 of the 1951 report. The pigmentation consists of 3 pounds of TiO_2 per gallon, half Titanox RA 10 and half A 168, at 60% TiO_2/40% Mg silicate at 35% PVC. At 1-1/2 years and 2 years the paints look good self-primed on new wood, being especially clean on the north and whiter than conventional white house paints, but with some evidence of small slit cracks on the south. In the paints with 75% alkyd, 25% Chlorowax binder, Chlorowax 40 shows less chalk than Chlorowax 70. In general, Chlorowax seems to develop chalk easily but does not advance to erosion. TiO_2 plus extender in linseed oil chalks quickly and advances to bad erosion - this is retarded if part of the oil is replaced with Chlorowax. These non-reactive pigment paints must be protected with fungicides, and offer a great problem when used to repaint conventional zinc containing house paints.

(j) Lead Free White House Paints. Exposed June, 1950.

These paints are based on a pigmentation of 20% Titanox A 168/ 55% zinc oxide/22.5% Mg silicate/22.5% calcium carbonate. The binders and PVC's were varied as follows:

Oil			PVC
94%	Refined Linseed	- 6% Z_2 Linseed	29%
75%	"	- 25% "	33
50%	"	- 50% " - 20% Mg Oil	36
75%	"	- 25% Z_2 Driscy	33
45%	"	- 50% Refined Soya - 25% Z_2 Linseed	33
45%	"	- 50% Driscy - 25% Z_2 Linseed	33
45%	"	- 50% " - 25% Z_2 Driscy	33
75%	Driscy	- 25% Z_2 Driscy	33

At the present time (two years' exposure) all these paints are in good condition and quite similar, even on the north.

0007-SWP-000115251

(k) Tint Base House Paints. Exposed June, 1949

These are 29% PVC tint bases with pigment 12% Titanox RANC/50% zinc oxide/58% extender in the first group and 12% Titanox RANC/50% leaded zinc/38% extender. The extenders were successively magnesium silicate, calcium carbonate, domestic terra alba and barytes. The leaded zinc paints show slightly more chalk face than the lead-free group. With zinc oxide magnesium silicate shows slightly more fading and mildews, barytes shows fair tint retention and terra alba is outstanding in tint retention. Practically all such color differences disappear when leaded zinc is used. The same general conclusions hold at 35% PVC.

National Lead Company - Sayville, New York

Only a brief review was made of the National Lead and S-W cooperative series of exposures evaluating 45 X Basic Silicate White Lead in house paints. These have been described in previous reports and cover three methods of substituting basic silicate and 12/88 leaded zinc for 35/65 leaded zinc in whites, and buff and grey tints:

A. Zinc oxide replacement by equal poundage, lead by equal volume.

B. Maintain 35/65 lead/zinc ratio, replace on total volume.

C. As B but replace on equal weight, adjust volume with extender.

As further variations, the zinc oxide level was reduced from the regular 52% to 25 and 20%, and in one special variation Azo ZZZ-33 was substituted for leaded zinc.

A special report with photographs is available for loan to those interested. In general all the paints are performing well after 4 years of exposure, and there are very few radical differences.

Basic lead silico-chromate M 50

A sample of this pigment has been submitted to us on a semi-confidential basis for evaluation as a rust-inhibitive pigment. It is a chromated 45 X silicate pigment, made according to our understanding from 45 X, chromic oxide and potassium chromate. The pigment is yellow, with very low opacity or tinting strength.

A series of metal primers put out in 1939 showed a chromated red lead to be superior to red lead in an alkyd metal primer. A basic chromated red lead was even better. Panels put out in 1949 showed chromated lead silicate to be still better, especially when not topcoated.

We will proceed with our own evaluation. Incidentally, National Lead does not recommend 45 X for metal primers. It is fair for salt water immersion.

0007-SWP-045879

0007-SWP-000115252

On June 27 we inspected the panel exposures and a few house tests conducted by the du Pont Pigment Division at Newport and Wilmington, Delaware. As stated previously, the extreme heat made any detailed inspection impossible. Some valuable information was obtained regarding their special mildew fence, their farm lay-out and the design and cost of erecting their new building, which will be useful in planning our new Chicago exposure farm.

(a) White House Paints

It will be recalled from the 1951 report that we were interested in certain comparisons of various titanium pigments in so-called "high lead," "low lead," and "no lead" formulations. Details of the formulations were given in the 1951 report. It should be kept in mind that the "high lead" formula actually carried 38% of lead pigment, and the so-called "low lead" formula (Ti-Sil) 17-1/2% lead.

Some of the earlier observations still hold. Ti-Cal at the same TiO_2 content is still cleaner than the paint with straight Y-CR. Dirt collection is aggravated as the lead content is reduced or eliminated. The high oil paints show generally poorer appearance and greater differences than the low oil paints (5.75 pounds of oil per gallon).

(b) High TiO_2 House Paints

This group included several series of exposures of varying age. Fundamentally they consisted of paints in which the TiO_2 content was increased progressively from 1.8 to 2.25 pounds of TiO_2 per gallon, and straight Ti-Pure FF compared with 50/50 blends of FF with Y-CR, R-110 and Ti-Cal R-25. There also were blends of 80/20 FF and R-610.

The general conclusions which may be drawn from these series is that straight FF shows the best self-cleansing, and that dirt collection on slower chalking TiO_2 types is reduced when intermixed with FF. Self-cleansing is improved as the TiO_2 content is increased. 80/20 FF/R-610 is approximately equal to a 50/50 blend of FF/Y-CR in resistance to chalking and washing. R-610 is recommended for intermix with FF to control chalking where washing has caused customer complaint. No evidence is available as to dangers of yellowing. (We have our own exposures covering chalking and washing.)

(c) Two Coat Systems - Durability

A top coat with the typical Ti-Sil pigmentation of 15% Ti-Pure FF/ 50% leaded zinc/35% Mg silicate was exposed as two and three coat work self-primed and over four commercial primers. Special primers included 12-1/2/45/ 42.5 and 22.5/45.5/54.2 Ti-Pure R-610 leaded zinc/Mg silicate pigmentations and Federal Specification primer TT-P-25 where R-610 was used as the TiO_2 content.

0007-SWP-000115253

The conclusions after 4 and 5 years' exposure were about as expected. Three coats, of course, were better than two coats and self-priming not as good as using properly formulated special primers. A high hiding (2 pounds per gallon) R-610 primer looks very good with a full film when topcoated, but naturally its hiding power might tempt the painter to spread it too far. The S-W 450 Undercoater is performing well. du Pont concludes that leaded zinc in the primer aids in retarding erosion and mildew but makes the system vulnerable to blistering.

(d) Low Zinc Oxide - Calcium Carbonate Paints

du Pont is placing a lot of emphasis on this phase of their formulation and exposure work. They feel that in the presence of alkalinity introduced when calcium carbonate is used as the extender the zinc oxide content can be reduced sharply below conventional levels. Typical pigmentations under observation may be grouped as follows:

Pigmentation		White Lbs. per Gal. TiO_2	ZnO	Oil	PVC %
15/50/35	Ti-Pure FF/leaded zinc/Mg silicate	1.27	2.76	4.25	31.6
12.4/41.3/46.3	" / " /$CaCO_3$	1.27	2.76	3.76	41.2
20.1/11/68.9	" / " / "	1.82	0.65	3.66	43.1
17.5/41.2/41.3	" / " / "	1.80	2.76	3.79	40.5
25.1/10.7/64.2	" / " / "	2.35	0.65	3.62	43.7
16.9/33.4/49.7	"/Acicular ZnO/ "	1.40	2.76	4.05	35.5
20.7/5.7/73.6	" / " / "	1.83	0.50	3.65	43.4
21.6/51/47.4	" / " / "	1.92	2.76	3.95	37.8
25.8/5.5/68.7	" / " / "	2.35	0.50	3.62	43.9

The TiO_2 content was adjusted to hold hiding constant as the zinc oxide or leaded zinc was reduced, and all substitutions were at equal binder requirements. Series 11027 were exposed south and north vertical on August 30, 1950 and Series 11054 on August 29, 1951.

0007-SWP-000115254

Pigmentation		White Lbs. ZnO/Gal.	PVC %
15/50/35	Ti-Pure FF/leaded zinc/Mg silicate	2.76	31.6
18.8/12.7/68.5	" / " / "	0.56	31.7
11.5/38.5/50	" / " / $CaCO_3$	2.76	44.8
13.1/8.8/78.1	" / " / "	0.56	47.4

These paints were exposed in Series 8627 south and north vertical on March 11, 1949. Hiding power was not controlled, formulas are at equal free binder.

Pigmentation		Gray or Buff Lbs. ZnO/Gal.	PVC %
12.5/45/42.5	Ti-Pure R-610/leaded zinc/Mg silicate	2.54	53.3
15.7/12.5/71.8	" / " / "	0.56	32.2
11.2/26.4/62.4	" /Acicular ZnO/ $CaCO_3$	2.54	42.9
11.4/5.9/82.7	" / " / "	0.56	47.4

du Pont believes that calcium carbonate extenders may permit a marked reduction in the zinc oxide or leaded zinc content of white or tinted house paints. We recommend caution in adopting such pigmentations but some trials would be in order. One of the big problems would be to locate adequate supplies of satisfactory calcium carbonate and to be sure of uniform quality. du Pont has had the most experience with York Whiting from R. E. Carroll, Inc. Evidently they prefer dry ground whiting over wet ground and avoid precipitated types. Georgia Marble's No. 10 White and Thompson-Weinman's No. 1 White are satisfactory so far but test experience is more limited.

In general, the low zinc oxide or leaded zinc-calcium carbonate paints are performing well both in whites and tints. Whereas the low zinc oxide-magnesium silicate paints show very bad mildew in both whites and tints and poor tint retention, similar paints made with calcium carbonate show good performance and good control of tint and mildew. Actually in gray tints performance is good all the way from 2.6 to 0 pounds of zinc oxide per gallon, while in the buffs there is some increase in mildew below 1-1/2 pounds per gallon. Still lower ZnO contents may be entirely practical provided an auxiliary fungicide such as phenyl mercury oleate is added.

Broeker has suggested the following formulation for a second grade white and possibly even as an all purpose white, since the TiO_2 is 2/3 Ti-Pure FF and 1/3 R-610. A similar all R-610 may prove to be a first class tint base. We are checking.

0007-SWP-000115255

	Pounds/100 Gal.	Gallons
Ti-Pure FF	100	3.08
Ti-Pure R-610	50	1.45
Acicular ZnO ZZZ-33	150	3.20
York Whiting	650	28.78
Soya lecithin	5	0.58
Alkali Refined linseed	268	34.78
X bodied linseed	89	11.20
24% Pb naphthenate	8.9	0.93
6% Mn naphthenate	1.2	0.15
Mineral spirits	103	15.87
	1425.1	100

This formula should be watched very carefully for rutile yellowing as the calcium carbonate may accentuate this tendency.

(e) Mildew inhibitors

du Pont is very high on phenyl mercury oleate as a mildew inhibitor. They believe that it is much more effective than Ad-It or our (2233) cresyl mercury naphthenate and since it costs less a notable saving can be made. We are now testing a 10% solution of the oleate which we obtained from the du Pont Organic Chemicals Department. Other fungicides showing promise in their tests are phenyl mercury salicylate and cuprous oxide.

The inhibitors were tested in amounts of 1/2, 2 and 5% by weight based on the total paint, using a 10/10/10/70 Ti-Pure FF/Ti-Pure R-610/leaded zinc/Mg silicate low oil paint. The control is showing bad mildew after 1-1/2 years' exposure. Shirlan is fair but off-color, Copper-8 is fair at 2 and 5% but color is poor, Cumilate #40 is ineffective, phenyl mercury salicylate is effective even at 1/2% (used in concentrated solution). Even 5% of Ad-It is not as effective as 1/2% of phenyl mercury oleate.

There were some sets of panels which were not examined due to the heat. However, it was thought that the conclusions drawn by du Pont might be of interest. It should be emphasized that we had no opportunity to confirm these conclusions.

(f) Special Oils

Ardol and Drisoy show excellent performance as house paint vehicles in exposures approaching six years. There are limited indications that calcium carbonate may be a preferred extender for soybean paints.

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(g) Stain resistant paints

One group of stain resistant paints were formulated with 52/48, 40/60 and 55/65 Ti-Pure FF/Mg silicate, at a PVC of 30% in various vehicles, and exposed in October, 1950 and March, 1951. The exposures were made with and without phenyl mercury oleate at 0.2% by weight of the total paint as a mildew inhibitor. du Pont's conclusions are that considering the relatively short exposure time Aroplaz 1271 offers most promise for lead-zinc free paints of high total solids (approximately 72.5% by volume) with good brushing properties. Considering application characteristics, mildew inhibition, color and stain resistance, they recommend Asbestine 5 X as the most promising extender.

(h) Blister Resistance

Considerable detail on du Pont's blister resistance tests and their blister test house is available in the report supplied us at the time of our visit. We did not inspect the test house on this call. Observations made last year appear on pages 7 and 8 of the 1951 report.

du Pont's present observations are as follows:

1. Paint compositions vary widely in blister resistance with special lead-zinc pigment free alkyd stain resistant type paints showing exceptionally good performance as tested on new wood.

2. Zinc oxide, used in this work as leaded zinc oxide, is detrimental to the adhesion characteristics of certain films as tested under adverse moisture conditions. In this connection, however, a further evaluation of the vehicle effect is needed.

3. Alkyd stain resistant type house paints can be made which will show more permeability than regular house paint when used self-primed on new wood.

4. Zinc oxide, used in this work as leaded zinc oxide, or white lead in a primer serves to decrease the permeability of certain alkyd type top coats.

5. The application of an alkyd stain resistant type paint over a primer or first coat which carries leaded zinc oxide results in a marked decrease in permeability which may lead to severe peeling.

6. High permeability results are in the direction of superior blister resistance.

7. It remains to be demonstrated that alkyd stain resistant type paints can be made which will retain permeability and show no greater tendency toward peeling than regular house paints when used for repaint purposes under adverse moisture conditions. Further, the actual field performance of such stain and blister resistant paints is yet to be established.

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Blister Ratings:

No.	Paint	Avg. % Effective Blister Resistance
A	Regular House Paint - self-primed	52
B	Paint A over Fed. Spec. TT-P-25 (Rev.) Zincless Type Primer P-1	72
C	Paint A over a "Ti-Pure" R-610/35% ZnO/Mg Sil. type primer at 33% P.V., P-2	65
D	Same as C with primer at 40% P.V., P-3	71
E	Alkyd Stain Resistant Paint I - self-primed	99
F	" " " " II - "	100

Adhesion:

No.					
E	Alkyd Stain - Resistant Paint I				
E/P-1	" - "	Over Primer P-1 - Zincless			
E/P-2	" - "	" P-2 - with 55% ZnO			
F	" - " II				

Nos.	E	E/P-1	E/P-2	F
Avg. % effective blister resistance	99	86	62	100
Wet adhesion - "Scotch" tape	100	96	47	100
- Spatula	8	4.1	2.6	8

Notes:

Spatula rating - resistance to separation of film from wood.

8 - Good 6 - Fair 4 - Poor 2 - Very Poor

Dry panels all showed good adhesion.

Average wet adhesion rating based on 20 readings for the "Scotch" tape and 10 readings with the spatula.

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Permeability:

No.	Paint
A	Regular house paint
E	Alkyd Stain Resistant Paint I
F	" " " " II

No.	Avg. Specific Permeability A	E	F
Self-primed	.86	.87	1.07
Over TT-P-25A, P-4 Zincless	.89	.62	.76
" " Replacing lead with 35% ZnO, P-5	.75	.58	.66

Note: Average of 3 readings.

Method of test - Federation Standard 9-47
Official Digest No. 271, 479
(August, 1947).

Compositions:

Alkyd Stain Resistant Paint I

52/48 - "Ti-Pure" TF/Mg Silicate in Glyptal 2475 at 50% P.V.

Alkyd Stain Resistant Paint II

54.8/65.2 - "Ti-Pure"/Mg Silicate in Aroplax 1271 at 50% P.V.

(i) Asbestos Shingle Paints

du Pont found that a Pliolite S-5 paint formulated with 20% Ti-Pure R-610 or R-110, 60% barytes, 10% Mg silicate, 10% mica in Pliolite S-5 plasticized with Chlorowax was the only composition tested which showed good performance on glazed asbestos shingles. The Pliolite paint and the Stain Resistant Aroplax 1271 paint are considered desirable for cement veneer [illegible] surfaces relatively high in alkalinity. Standard house paints showed good performance on gray or regular asbestos shingles (we do not know whether these were first weathered). Exposures of latex and vinyl emulsion type paints are in progress.

0007-SWP-000115259

We only had time to examine two du Pont test houses, with the following special comments worth noting:

(j) Demme house. This is an upper bracket house and garage in a rural setting. Prior to 1951 the owner complained of washing of du Pont #40 White over the field stone lower walls within a year. The test paint was applied in April, 1951 and consisted of a straight Ti-Pure R-610 white, with 1.7 pounds R-610, 4.42 pounds of leaded zinc and 2.9 pounds Nytal 300 per gallon. Earlier this year the surface was showing some mildew. While the mildew has now disappeared it would have been safer to have added a fungicide.

The house presents a very good appearance. However, it can scarcely be assumed that a straight R-610 TiO_2 paint would solve our washing problems, as the very clean, rural location makes dirt collection no problem at all.

(k) du Pont house. This house has been used for tests for several years and appears in previous reports. The most recent test was applied in November, 1950. The primers are based on Ti-Pure R-610 and include a zinc-containing topcoat tint base type of formula (45% leaded zinc) and a revision of TT-P-25, which is zincless. The so-called "test paint" is conventional, with half FF and half Y-CR TiO_2. The specials include two conventional lead-free (fume-resisting) pigmentations with FF TiO_2, with Azo ZZZ-33 zinc oxide in one instance and New Jersey's XX-503 in the other. Another special has a pigmentation of 11.2% FF/11.2% Y-CR/52.7% leaded zinc/24.9% Nytal 300, in which the Nytal was simply stirred in and 0.5% Rheotol was added. There is also a low zinc-calcium carbonate paint such as was described under du Pont (d). The pigmentation consists of 12.4% FF/12.4% Y-CR/10.7% leaded zinc/64.5% calcium carbonate at 45.4% PVC. This calculates out to two-thirds of a pound of zinc oxide per gallon.

All of the paints are in generally good condition. The low zinc oxide - calcium carbonate paint seems cleaner than the Nytal paint, and the regular leaded zinc paint a trifle cleaner than the XX-503 paint.

- o -

As usual, every one did their utmost to make our trip informative and as pleasant as it was possible, considering the weather.

M. VAN LOO

Director of Paint Research

MVL:AR

0007-SWP-045887

0007-SWP-000115260

Paint Research Dept.
September 29, 1952

Progress Report on Exposures 16046-16115 C,F

du Pont-Sherwin Williams Cooperative Series of 1951

Purpose

To compare outdoor exposure results at our locations with those at Wilmington, Delaware, as exposed by the du Pont Pigment Division. Paints testing various Ti-Pure and Ti-Cal pigments in SWP White, Colonial Yellow and Westchester Gray were made by us. Somewhat similar formulations were made by du Pont, their accent being mainly on variations in amounts of lead and zinc pigments and the use of their bodied linseed oil versus ours. These paints were interchanged and both sets painted out and exposed by each.

Paints Tested

Sherwin-Williams paints tested are as follows:

Group 1. Fume Resisting House Paints

Paint No.	TiO_2 Variation
RB 3307R	Ti-Pure FF/YCR 50/50 blend
3308R	Ti-Pure YCR
3309	Ti-Pure FF/R-610 75/25 blend
3310	Ti-Pure FF/Ti-Cal R-27 50/50 blend

Group 2. Lead Containing Gloss White

Paint No.	TiO_2 Variation
RB 3401	Ti-Pure FF
3312R	Ti-Pure FF/YCR 50/50 blend
3313	Ti-Pure FF/R-610 82/18 blend
3314	Ti-Pure FF/Ti-Cal R-27 50/50 blend

Group 3. Lead Containing Tint - Colonial Yellow

Paint No.	TiO_2 - extender
RB 3400Y	Ti-Pure R-610 - Mg silicate
RB 3402Y	Ti-Cal R-60 - Mg silicate
RB 3317Y	Ti-Pure R-610 - Ca carbonate
RB 3403Y	Ti-Cal R-60 - Ca carbonate

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Group 4. Lead Containing Tint - Gray

Paint No.	TiO_2 - extender
RB 3400G	Ti-Pure R-610 - Mg silicate
RB 3402G	Ti-Cal R-60 - Mg silicate
RB 3317G	Ti-Pure R-610 - Ca carbonate
RB 3403G	Ti-Cal R-60 - Ca carbonate

The du Pont paints may be described as follows:

Formula		Description	Lb/Gal.
TTP-25a		Primer - R-610/BCWL/BSWL/Mg sil.	
	1	Ti-Pure FF/35% ZnO/Mg sil.	1.27/4.24/2.97
	1A	ditto, but using S-W (310)	
	2	Ti-Pure FF/55% ZnO/Ca CO_3	1.50/2.55/5.99
	3	Ti-Pure FF/YCR/35% ZnO/Mg sil.	.90/.90/4.24/2.58
	3A	Ditto, but using S-W (310)	
	4	Ti-Pure FF/YCR/Acic. ZnO/Mg sil.	.96/.96/2.76/2.99
	4A	Ditto, but using S-W (310)	
	5	Stain resistant Ti-Pure FF/Mg sil.	2/3.7
		Colonial Yellow	
	206	Ti-Pure R-610/Acic. ZnO/Ca CO_3	1.2/2.54/5.51
	206A	Ditto, but using S-W (310)	
	207	Ti-Pure R-610/Acic. ZnO/Ca CO_3	1.42/1.00/7.36
		Gray Tint	
	106	Ti-Pure R-610/Acic. ZnO/Ca CO_3	1.2/2.54/5.51
	106A	Ditto, using S-W (310)	
	107	Ti-Pure R-610/Acic. ZnO/Ca CO_3	1.42/1.00/7.36

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Preparation and Exposure

The paints are tested on cedar bevel siding as follows:

1. The left 1/3 of each panel a control using Rex 450 SWP Undercoater (with one exception) plus SWP Gloss White or the appropriate tint.

2. The center 1/3 of each panel Rex 450 plus a test paint.

3. The right 1/3 of each panel the test paint self-primed.

4. All prime coats spread at 450 sq. ft. per gallon; all topcoats at 550.

5. Our tests have been exposed at Florida, vertical south, for 12 months and at Chicago, north and south, for 13 months.

Summary of Results

Most paints are performing well and there is no indication of film failure except microscopic checking on some tints at Florida. This is a phenomenon which has been occurring on our Florida panels for several years; it seems to vary with the formulations, and careful examination of the readings below is suggested. We would hesitate to draw any conclusions so early but tints with Ti-Cal and calcium carbonate seem to check most at present. Also, our regular tints are showing relatively bad chalk masking at Florida and dirt collection on Chicago north exposure. The du Pont tints seem considerably better in color but definitely subject to mildew at Florida.

The most important thing to report at this time is that an error apparently was made in our painting. Due to the presence of bad mildew on the guides only of several Florida panels (16081-9F, beginning of the du Pont paints), a special check was made and it was found that we could not positively identify the paints actually used on these panels. One system was supposed to carry the TTP-25a zincless primer and might have accounted for the differences in mildew. Since we are not sure of correct original application, we are planning to repeat this part of the series, the du Pont white paints (see R. R. Bruhn's letter to Dr. W. G. Vannoy, October 1, 1952).

0007-SWP-000115263

Examination Results

Examination at 12 Months, Florida

Panel No.	Description	RB No.	Chalk	Check	Crack	Fade	Guide Dirt	Dirt	Gen. App.
Guide	Rex 450-471, all FF,								
16046	Left 1/3	3401	9	10	10		--	--	5-6
47	450-pr. Rex 436 50/50 FF/YCR	3307R	8	10	10		6	6	6
48	Same, self-primed	3307R	8	10 yellow cast.	10	Guide def. Dirt largely mildew.	6	6	7
49	Rex 436, all YCR	3308R	7	10	10		7	6	7
50	self-primed	3308R	7	10	10		7	7	8
51	25/75 R-610/FF	3309	6	10	10		6	7	7
52	self-primed	3309	6	10	10		6	8	8
53	50/50 FF/R-27	3310	6	10	10		6	7	7
54	self-primed	3310	6	10	10		6	7	7
55	Rex 471, all FF (as guide)	3401	9	10	10		5	6	6
56	self-primed	3401	9	10	10		5	6	6
57	50/50 FF/YCR	3312R	6	10	10		7	8	8
58	self-primed	3312R	6	10	10		7	8	8
59	82/18 FF/R-610	3313R	6	10	10		6	8	8
60	self-primed	3313	6	10	10		6	8	8
61	50/50 FF/R-27	3314	6	10	10		5	8	8
62	self-primed	3314	6	10	10		5	8	8
Colonial Yellow Guide	Rex 465 over 450								
16063	R-610 + Mg sil.	3400Y	7	10	10	2	--	--	2
64	Same, center	3400Y	7	10	10	2	8	8	2
65	self-primed	3400Y	7	10	10	2	8	8	2
66	R-60 + Mg Sil.	3402Y	9	6m	10	5	7	4	4 mildew
67	self-primed	3402Y	9	5m	10	5	7	3	3
68	R-610 + $CaCO_3$	3317Y	10	10	10	7	8	6	6

0007-SWP-045891

0007-SWP-000115264

Panel No.	Description	RB No.	Chalk	Check	Crack	Fade	Guide Dirt	Dirt	Gen. App.
16069	self-primed	3317Y	10	10	10	6	8	7	5
70	R-60 + $CaCO_3$	3403Y	8	7m	10	5	8	6	5
71	self-primed	3403Y	8	7m	10	4	8	7	4
Chelsea Gray									
16072F	Rex 474 over 450 R-610, Mg sil.	3400G	7	10	10	2	--	--	2
73	Same, center	3400G	7	10	10	2	8	8	2
74	Self-primed	3400G	7	10	10	2	8	8	2
75	R-60 + Mg sil.	3402G	8	9m	10	5	8	7	5
76	R-60 + Mg sil.	3402G	8	7m	10	4	8	7	4
77	R-610 + $CaCO_3$	3317G	9	10	10	6	7	7	6
78	R-610 + $CaCO_3$	3317G	9	10	10	5	7	7	5
79	R-60 + $CaCO_3$	3403G	8	5m	10	5	7	6	5
80	" "	3403G	8	4m	10	4	7	6	4
du Pont Samples									
16081	Guide same as 16046	3401	9	10	10				4-6
81FA	Same, but TTP-25a primer	3401	not listed						4-6
82	FF/35% ZnO/Mg over spec.	#1	6	10	10		4	6	6
83	Same, self-pr.	#1	6	10	10		4	7	7
84	ditto, but over 450	1	7	10	10		4	6	6
85	Self-primed	1	7	10	10		4	7	7
86	As #1 but S-W (310)	1A	6	10	10		4	6	6
87	Self-primed	1A	6	10	10		4	7	7
88	As #1, but $CaCO_3$	2	7	10	10		4	5	5
89	self-primed	2	7	10	10		4	6	6
90	FF/YCR/ZnO Mg sil.	3	6	10	10		5	6	6

0007-SWP-045892

0007-SWP-000115265

Panel No.	Description	RB No.	Chalk	Check	Crack	Fade	Guide Dirt	Dirt	Gen. App.
16091	Self-primed	3	6	10	10		5	6	6
92	As #3, but S-W (310)	3A	7	10	10		6	6	6
93	Self-primed	3A	7	10	10		6	6	6
94	FF/YCR/Acic. ZnO/Mg sil.	4	7	10	10		6	7	7
95	Self-primed	4	7	10	10		6	7	7
96	As #4, but S-W (310)	4A	7	10	10		5	7	7
97	Self-primed	4A	7	10	10		5	6	6
98	Stain Resist. FF/Mg sil.	5	6	10	10		5	5	5
99	Self-primed	5	7	10	10		5	3	3
16100	As 16098, but TTP primer	5	6	10	10		6	4	4
01	Self-primed	5	6	10	10		6	3	3
Colonial Yellow									
Guide 16102	Rex 465, as 16063	3400Y	7	10	10	2	--	--	2
03	du Pont's with R-610 over 450	206	10	10	10	8	7	3	4
04	Self-primed	206	10	10	10	8	7	3	4
05	As 206 but S-W (310)	206A	10	10	10	8	7	4	4
06	Self-primed	206A	10	10	10	8	7	4	4
07	As 206, but def. lower ZnO	207	10	10	10	7	7	2	4
08	Self-primed	207	10	10	10	7	7	2	4
Chelsea Gray									
Guide 16109	As 16102, but Gray	3400G	7	10	10	2	--	--	2
10	As 16103, but gray	106	10	10	10	8	5	3	3
11	As 16104, but gray	106	10	10	10	8	5	3	3
12	As 16105, but gray	106A	9	10	10	7	8	5	4

0007-SWP-045893

0007-SWP-000115266

Panel No.	Description	RB No.	Chalk	Check	Crack	Fade	Guide Dirt	Dirt	Gen. App.
16113	As 16106, but Gray	106A	9	10	10	7	8	4	3
14	As 16107, but Gray	107	10	10	10	8	8	3	3
15	As 16108, but Gray	107	10	10	10	8	8	3	3

0007-SWP-045894

0007-SWP-000115267

Examination at 13 Months, Chicago

Panel No.	RB No.	SOUTH Gloss	Chalk	Fade	Dirt	Gen. App.	NORTH Gloss	Chalk	Fade	Dirt	Gen. App.
Guide											
16046	3401	0	6		6	6	0	6		4	4
47	3307R	0	8		8	8	0	8		6	6
48	3307R	0	8		8	8	0	8		6	6
49	3308R	0	7		8	8	0	7		7	7
50	3308R	0	7		8	8	0	7		7	7
51	3309	0	7		8	8	0	7		7	7
52	3309	0	7		8	8	0	7		7	7
53	3310	0	8		8	8	0	8		6	6
54	3310	0	8		8	8	0	8		6	6
55	3401	0	6		6	6	0	7		4	4
56	3401	0	6		6	6	0	6		4	4
57	3312R	0	6		8	8	0	7		7	7
58	3312R	0	6		8	8	0	6		7	7
59	3313	0	6		7	7	0	7		6	6
60	3313	0	6		7	7	0	6		6	6
61	3314	0	6		8	8	0	7		6	6
62	3314	0	6		8	8	0	6		6	6
Colonial Yellow											
16063	3400Y	0	6	4	6	5	0	7	5	4	3
64	3400Y	0	6	4	6	5	0	7	5	4	3
65	3400Y	0	6	4	6	5	0	7	5	4	3
66	3402Y	2	7	6	5	6	3	8	6	5	4
67	3402Y	2	7	6	5	6	3	8	6	5	4
68	3317Y	2	7	6	5	6	3	9	8	4	4
69	3317Y	2	7	6	5	6	3	9	8	4	4

0007-SWP-045895

0007-SWP-000115268

Panel No.	RB No.	SOUTH Gloss	Chalk	Fade	Dirt	Gen. App.	NORTH Gloss	Chalk	Fade	Dirt	Gen. App.
16070	3403Y	2	7	6	5	6	3	8	6	4	4
71	3403Y	2	7	6	5	6	3	8	6	4	4
72	3400G	0	8	4	6	6	0	7	6	6	6
73	3400G	0	8	4	6	6	0	7	6	6	6
74	3400G	0	8	4	6	6	0	7	6	6	6
75	3402G	2	7	6	5	6	2	8	7	5	5
76	3402G	2	7	6	5	6	2	8	7	5	5
77	3317G	2	7	7	5	6	3	9	8	4	5
78	3317G	2	7	7	5	6	3	9	8	4	5
79	3403G	2	7	7	5	5	2	8	7	4	3
80	3403G	2	7	7	5	5	2	8	7	4	3
du Pont Samples Guide											
16081	3401	0	5		6	6	0	6		4	4
81A	3401	0	5		6	6	0	6		4	4
82	#1	0	5		8	8	0	6		7	7
83	#1	0	5		8	8	0	6		7	7
84	#1	0	6		7	7	0	7		6	6
85	#1	0	6		8	8	0	7		7	7
86	1A	0	6		8	8	0	7		7	7
87	1A	0	6		8	8	0	6		7	7
88	2	1	8		7	7	2	8		6	6
89	2	0	8		7	7	0	8		6	6
90	3	0	7		8	8	0	7		7	7
91	3	0	7		8	8	0	7		7	7
92	3A	0	6		8	8	0	7		7	7
93	3A	0	6		8	8	0	6		7	7

0007-SWP-045896

0007-SWP-000115269

Panel No.	RB No.	SOUTH Gloss	Chalk	Fade	Dirt	Gen. App.	NORTH Gloss	Chalk	Fade	Dirt	Gen. App.
16094	4	0	6		8	8	0	7		7	7
95	4	0	6		8	8	0	6		7	7
96	4A	0	6		8	8	0	7		7	7
97	4A	0	6		8	8	0	6		6	6
98	5	0	8		8	8	0	8		7	7
99	5	0	8		8	8	0	8		7	7
16100	5	0	8		8	8	0	8		7	7
01	5	0	8		8	8	0	8		7	7
Guide 16102	3400Y	1	7	4	6	5	2	7	5	4	3
03	206	2	8	7	5	6	2	9	8	4	5
04	206	2	8	7	5	6	2	9	8	4	5
05	206A	2	9	7	5	6	3	9	8	4	5
06	206A	2	9	7	5	6	3	8	8	4	5
07	207	2	9	6	5	6	2	9	7	4	5
08	207	2	9	6	5	6	2	9	7	4	5
Guide 16109	3400G	0	7	4	6	5	1	7	6	6	6
10	106	2	8	7	5	6	3	9	8	4	5
11	106	2	8	6	5	6	3	9	8	4	5
12	106A	1	7	7	5	6	2	8	8	4	5
13	106A	1	7	6	5	6	2	8	8	3	4
14	107	2	8	7	5	6	3	9	8	4	5
15	107	2	8	6	5	6	3	9	8	4	5

There is no checking, cracking or erosion.

Formulas Involved

SWP Undercoater - RB 3322

Pounds	Gallons	Material
100		2077
250		20
240		511
120		18
142		2174
3		547
	3/4	(5094)
	28	(2)
	14-1/2	(310)
	4	(141)
	1-1/2	(901)
	1-1/2	(543)
	25	(348)

Wt./Gal. - T 13.73 - A 13.76
Viscosity 14" @ 75 deg. on #3

SWP Fume Resisting White - RB 3307R

Pounds	Gallons	Material
100		1403 Ti-Pure FF Lot 5748
100		Ti-Pure YCR Lot 92245
290		2059
288		20
	32-1/2	(2)
	19	(310)
	3	(5096)
	1-1/2	(543)
	2	(2231)
	1-1/4	(2236)
	4	(141)
	14-1/4	(348)

Wt./Gal. - T 13.29 - A 13.33
Viscosity 25" @ 75 deg. on #3

Fume Resisting White - RB 3308R

Pounds	Gallons	Material
200		Ti-Pure YCR lot 92245
290		2059
288		20
	32-1/2	(2)
	19	(310)
	3	(5096)
	1-1/2	(543)
	2	(2231)
	1-1/4	(2236)
	4	(141)
	14-1/4	(348)

Wt./Gal. - T 13.29 - A 13.33
Viscosity 33" @ 75 deg. on #3

SWP Fume Resisting White - RB 3309

Pounds	Gallons	Material
126		1403 Ti-Pure FF
42		2174 Ti-Pure R-610
314		20
290		2059
	32-1/2	(2)
	19	(310)
	3	(5096)
	1-1/2	(543)
	2	(2231)
	1-1/4	(2236)
	4	(141)
	14-1/4	(348)

Wt./Gal. - T 13.22 - A 13.27
Viscosity 29" @ 75 deg. on #3

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Fume Resisting White - RB 3310

Pounds	Gallons	Material
74		1403 Ti-Pure FF
246		2132 Ti-Cal R-27
75		1989
112		20
290		2059
	32-1/2	(2)
	19	(310)
	3	(5096)
	1-1/2	(543)
	2	(2231)
	1-1/4	(2236)
	4	(141)
	14-1/4	(348)

Wt./Gal. - T 13.48 - A 13.44
Viscosity 28" @ 75 deg. on #3

SWP Gloss White - RB 3401

Pounds	Gallons	Material
170		1403 - Ti-Pure FF
200		412
200		1424
325		20
	32-1/2	(2)
	19	(310)
	1-3/4	(901)
	5/8	(543)
	4	(141)
	16-3/4	(348)

Wt./Gal. - T 14.25 - A 14.22
Viscosity 30" @ 75 deg. on #3

SWP Gloss White - RB 3312R

Pounds	Gallons	Material
85		1403 Ti-Pure FF lot 5748
85		2030 Ti-Pure YCR lot 92245
200		412
200		1424
325		20
	32-1/2	(2)
	19	(310)
	1-3/4	(901)
	5/8	(543)
	4	(141)
	16-3/4	(348)

Wt./Gal. - T 14.25 - A 14.29
Viscosity 25" @ 75 deg. on #3

SWP Gloss White - RB 3313

Pounds	Gallons	Material
30		2174 Ti-Pure R-610
140		1403 Ti-Pure FF
200		412
200		1424
325		20
	32-1/2	(2)
	19	(310)
	1-3/4	(901)
	5/8	(543)
	4	(141)
	16-3/4	(348)

Wt./Gal. - T 14.25 - A 14.24
Viscosity 29" @ 75 deg. on #3

SWP Gloss White - RB 3314

Pounds	Gallons	Material
250		20
175		2132 - Ti-Cal R-27
100		1403 - Ti-Pure FF
200		412
200		1424
	32-1/2	(2)
	19	(310)
	1-3/4	(901)
	5/8	(543)
	4	(141)
	15-3/4	(348)

Wt./Gal. - T 14.46 - A 14.53
Viscosity 28" @ 75 deg. on #3

SWP Tint Base - RB 3400

Pounds	Gallons	Material
440		412
137		2174
325		20
	1/2	(5094)
	32-1/2	(2)
	19	(310)
	1-1/4	(901)
	3/4	(543)
	4	(141)
	17	(5027)

Wt./Gal. - T 14.38 - A 14.37
Viscosity 19" @ 75 deg. on #3

Tint Base - RB 3402

Pounds	Gallons	Material
440		412
325		Ti-Cal R-60 - new sample from Pig. Division
200		20
	1/2	(5094)
	32-1/2	(2)
	19	(310)
	1-1/4	(901)
	3/4	(543)
	4	(141)
	13	(5027)

Wt./Gal. - T 15.00 - A 15.06
Viscosity 30" @ 75 deg. on #3

0007-SWP-000115273

Tint Base - RB 3317

Pounds	Gallons	Material
440		412
137		2174
375		566
	1/2	(5094)
	32-1/2	(2)
	19	(310)
	1-1/4	(901)
	3/4	(543)
	4	(141)
	14	(5027)

Wt./Gal. - T 14.65 - A 14.66
Viscosity 17" @ 75 deg. on #3

Tint Base - RB 3403

Pounds	Gallons	Material
440		412
325		Ti-Cal R-60*
230		566
	1/2	(5094)
	32-1/2	(2)
	19	(310)
	1-1/4	(901)
	3/4	(543)
	4	(141)
	11	(5027)

Wt./Gal. - T 15.10 - A 15.08
Viscosity 30" @ 75 deg. on #3
*New approved sample - lot 2469

S-11053, Paint #1

Pounds	Gallons	Material
127	3.92	Ti-Pure RF
424	8.65	Cofumed 35% Leaded ZnO
297	12.50	Magnesium Silicate
518	40.90	Alkali Refined Linseed Oil
107	13.38	"X" Bodied Linseed Oil
12.2	1.25	24% Lead Naphthenate
1.6	0.20	6% Mn Naphthenate
126	19.20	Mineral Spirits
1412.8	100.00	
4.2	0.48	Soya Lecithin
2.2	0.27	Spencer Kellogg Special M-25 L.O.

Wt./Gal. - 14.13
Consistency - 83 K.U.
PVC - 31.6%

0007-SWP-000115274

S-11053 - Paint #1A

Pounds	Gallons	Material
127	3.92	Ti-Pure FF
424	8.65	Cofumed 35% Leaded ZnO
297	12.50	Magnesium Silicate
344	44.24	Alkali Refined Linseed Oil
81	10.04	S-W Bodied Linseed Oil
12.2	1.25	24% Lead Naphthenate
1.6	0.20	6% Mn Naphthenate
126	19.20	Mineral Spirits
1412.8	100.00	
4.2	0.48	Soya Lecithin
1.4	0.17	Spencer Kellogg Special M-25 L.O.

Wt./Gal. - 14.13
Consistency - 83 K.U.
PVC - 31.6%

S-11053, Paint #2

Pounds	Gallons	Material
150	4.64	Ti-Pure FF
255	5.20	Cofumed 35% Leaded ZnO
599	26.66	Natural Ground Whiting
269	34.66	Alkali Refined Linseed Oil
91	11.34	"X" Bodied Linseed Oil
10.5	1.06	24% Lead Naphthenate
1.4	0.17	6% Mn Naphthenate
107	16.27	Mineral Spirits
1482.7	100.00	
6.0	0.57	Soya Lecithin
1.8	0.22	Spencer Kellogg Special M-25 L.O.

Wt./Gal. - 14.83
Consistency - 82 K.U.
PVC - 44.2%

0007-SWP-000115275

S-11053 - Paint #3

Pounds	Gallons	Material
90	2.78	Ti-Pure RF
90	2.78	Ti-Pure YCR
424	8.65	Cofumed 35% Leaded ZnO
258	10.86	Magnesium Silicate
318	40.90	Alkali Refined Linseed Oil
107	13.38	"X" Bodied Linseed Oil
12.2	1.25	24% Lead Naphthenate
1.6	0.20	6% Mn Naphthenate
126	19.20	Mineral Spirits
1426.8	100.00	
4.3	0.49	Soya Lecithin
1.8	0.22	Spencer Kellogg Special M-25 L.O.

Wt./Gal. - 14.27
Consistency - 83 K.U.
PVC - 31.6%

S-11053 - Paint #3A

Pounds	Gallons	Material
90	2.78	Ti-Pure RF
90	2.78	Ti-Pure YCR
424	8.65	Cofumed 35% Leaded ZnO
258	10.86	Magnesium Silicate
344	44.24	Alkali Refined Linseed Oil
81	10.04	SW Bodied Linseed Oil
12.2	1.25	24% Lead Naphthenate
1.6	0.20	6% Mn Naphthenate
126	19.20	Mineral Spirits
1426.8	100.00	
4.3	0.49	Soya Lecithin
1.4	0.17	Spencer Kellogg Special M-25 L.O.

Wt./Gal. - 14.27
Consistency - 83 K.U.
PVC - 31.6%

0007-SWP-000115276

S-11053 - Paint #4

Pounds	Gallons	Material
96	2.97	Ti-Pure RF
96	2.97	Ti-Pure YCR
276	5.91	Acicular ZnO
215	9.05	Magnesium Silicate
335	43.22	Alkali Refined Linseed Oil
113	14.13	"X" Bodied Linseed Oil
12.7	1.31	24% Lead Naphthenate
1.7	0.24	6% Mn Naphthenate
133	20.20	Mineral Spirits
1278.4	100.00	
3.4	0.39	Soya Lecithin
2.1	0.26	Spencer Kellogg Special M-25 L.O.

Wt./Gal. - 12.78
Consistency - 83 K.U.
PVC - 26.8%

S-11053 - Paint #4A

Pounds	Gallons	Material
96	2.97	Ti-Pure RF
96	2.97	Ti-Pure YCR
276	5.91	Acicular ZnO
215	9.05	Magnesium Silicate
363	46.70	Alkali Refined Linseed Oil
85	10.64	S-W Bodied Linseed Oil
12.7	1.32	24% Lead Naphthenate
1.7	0.24	6% Mn Naphthenate
133	20.20	Mineral Spirits
1278.4	100.00	
3.4	0.39	Soya Lecithin
2.7	0.33	Spencer Kellogg Special M-25 L.O.

Wt./Gal. - 12.78
Consistency - 83 K.U.
PVC - 26.8%

0007-SWP-000115277

S-11053 - Paint #5

Pounds	Gallons	Material
200	6.18	Ti-Pure FF
370	15.60	Magnesium Silicate
424	50.78	Aroplaz 1271
10.6	1.09	24% Lead Naphthenate
2.1	0.26	6% Cobalt Naphthenate
148	22.57	Mineral Spirits
24	3.52	10% Solution Phenyl Mercury Oleate
1178.7	100.00	

Wt./Gal. - 11.79
Consistency - 84 K.U.
PVC - 30%

S-11053 - White Base Paint for #106 and #206

Pounds	Gallons	Material
120	3.43	Ti-Pure R-610
254	5.44	Acioular ZnO
551	24.52	Natural Ground Whiting
283	36.47	Raw Linseed Oil
94	11.75	"X" Bodied Linseed Oil
10.8	1.11	24% Lead Naphthenate
1.4	0.17	6% Mn Naphthenate
112	17.11	Mineral Spirits
1426.2	100.00	
4.6	0.53	Soya Lecithin
3.5	0.43	Spencer Kellogg Special M-25 L.O.

Wt./Gal. - 14.26
Consistency - 83 K.U.
PVC 80%

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S-11053 - White Base Paint for #106A and #206A

Pounds	Gallons	Material
120	3.43	Ti-Pure R-610
254	5.44	Acicular ZnO
551	24.52	Natural Ground Whiting
305	39.30	Raw Linseed Oil
72	8.92	S-W Bodied Linseed Oil
10.8	1.11	24% Lead Naphthenate
1.4	0.17	6% Mn Naphthenate
112	17.11	Mineral Spirits
1436.2	100.00	
4.6	0.53	Soya Lecithin
3.9	0.48	Spencer Kellogg Special M-25 L.O.

Wt./Gal. - 14.26
Consistency - 82 K.U.
PVC - 40.8%

S-11053 - White Base for #107 and #207

Pounds	Gallons	Material
142	4.06	Ti-Pure R-610
100	2.14	Acicular ZnO
736	32.75	Natural Ground Whiting
259	33.33	Raw Linseed Oil
87	10.90	"X" Bodied Linseed Oil
9.9	1.02	24% Lead Naphthenate
1.3	0.16	6% Mn Naphthenate
103	15.64	Mineral Spirits
1438.2	100.00	
4.9	0.56	Soya Lecithin
1.9	0.24	Spencer Kellogg Special M-25 L.O.

Wt./Gal. - 14.38
Consistency - 83 K.U.
PVC - 46.8%

0007-SWP-000115279

TT-P-25a Type Primer

Pounds	Gallons	Material
122	3.49	Ti-Pure R-610
230	4.07	BCWL
230	4.33	BSWL
338	14.21	Magnesium Silicate
170	21.90	Raw Linseed Oil
206	25.60	Z-2 Bodied Linseed Oil
9.9	1.02	24% Lead Naphthenate
1.3	0.16	6% Mn Naphthenate
165	25.22	Mineral Spirits
1472.2	100.00	
3	0.40	RL-80 Bodying Agent

Wt./Gal. - 14.72
Consistency - 87 K.U.
PVC - 35.46%

Amount of Tinting agents added to the white bases for the Grays and Buffs

	Paint No.	Amount added to 100 gallon of white base Pounds of Sienna Paste	Pounds of Black Paste
Grays	106	9.1	4.7
	106A	10	5
	107	8.5	4
Yellows	206	69.6	Less than 1
	206A	78.3	"
	207	73.9	"

Tinting Pastes Used

du Pont Sienna

Pigment	64%	Raw Italian Sienna	60	100%
Vehicle	36%	Silicates	40	
		Linseed Oil		100%

du Pont Lampblack

Pigment	26%
Vehicle	74%

Pigment 100% Carbon

Vehicle 100% Linseed Oil

JWC:ls

0007-SWP-000115280

Paint Research Dept.
September 30, 1952

.97

PM

Progress Report on Exposures 15934-58 C,F

St. Joseph Lead Company Cooperative Series

Purpose

To compare a number of white house paints using various zinc oxides in both lead-free and lead-containing formulations. The series includes Rex 471 SWP Gloss White as a lead-containing type and both Rex 436 SWP Fume Resistant and St. Joseph's submitted samples as lead-free types. The zinc oxides involved are:

American Zinc's Azo ZZZ-33 and ZZZ-55
New Jersey's Horsehead XX-592, -503 and -50
St. Joseph's Green Label #17, 40 and 42

Preparation and Exposure

The two companies exchanged the paints described above and painted out a complete series for exposure. Our series is on cedar bevel siding, primed with Rex 450 Undercoater and also as self-primed (both on one panel). The tests have been exposed 12 months at Florida, vertical south, and the same at Chicago, south only. We have had no report on the progress of the St. Joseph series at Josephtown, Pennsylvania.

Summary of Results

Chicago panels at present show no differences except very minor ones in chalking and past ratings show nothing worthy of comment, as the panels have been quite uniformly satisfactory in all respect.

Florida tests, however, do show some differences in mildew formation (along with normal dirt collection) and in microscopic checking. On the whole, the St. Joseph paints show somewhat more mildew than either S-W group. As may be seen from the readings below, certain zinc oxides could be picked as showing least or most mildew in any one group, but the tendency is not confirmed in the other groups.

The checking noted is a very tiny micro pattern. St. Joseph #42 and Azo ZZZ-55 show the most of this checking in our lead-free formula, but #42 seems satisfactory in the St. Joseph group of paints. We would hesitate to say that the checking at present, other than on the 2 samples mentioned, is serious enough to warrant definite conclusions.

0007-SWP-000115281

Examination Results

Examination at 12 Months, Florida

Panel No.	Description	RB No.	Chalk	Check	Guide Dirt	Dirt*	Gen. App.
Guide 15934F	Reg. Rex 450-471	3208	7	10	--	--	6-7
Rex 436	Fume Resistant O.W.					Guide a sl. yellow cast	
35A	With ZZZ-33. Over Rex 450	3200	7	10	7	7	7
B	Self-primed	3200	7	10	7	7	7
36A	With XX-503	3201	7	10	7	7	7
B	self-primed	3201	7	10	7	7	7
37A	With XX-50	3202	6	10	7	7	7
B	Self-primed	3202	6	10	7	8	8
38A	With XX-592	3203	6	10	7	6	6
B	Self-primed	3203	6	10	7	5	5
39A	St. Joe #17	3204	7	10	7	7	7
B	Self-primed	3204	7	10	7	6	6
40A	St. Joe #40	3205	7	10	7	6	6
B	Self-primed	3205	6	10	7	6	6
41A	St. Joe #42	3206	6	10	6	5	5
B	Self-primed	3206	6	10	6	5	5
42A	ZZZ-55	3207	6	10	6	5	5
B	Self-primed	3207	6	10	6	5	5
Rex 471	SWP Gloss White						
15943A	As guide, using co-fumed	3208	7	10	6	6	6
B	Self-primed	3208	7	10	6	6	6
44A	Mechanical mix, with ZZZ-33	3209	6	10	7	6	6
B	Self-primed	3209	6	10	7	6	6

*Dirt, especially if lower than 7, is mostly mildew.

0007-SWP-045909

0007-SWP-000115282

Panel No.	Description	RB No.	Chalk	Check	Guide Dirt	Dirt	Gen. App.
15945A	With XX-503	3210	7	8m	5	5	5
B	Self-primed	"	"	6m	5	5	5
46A	With XX-50	3211	6	6m	5	6	6
B	Self-primed	"	6	5m	5	6	6
47A	With XX-592	3212	6	9m	6	6	6
B	Self-primed	"	6	8m	6	6	6
48A	St. Joe #17	3213	6	9m	6	6	6
B	Self-primed	"	6	6m	6	6	6
49A	St. Joe #40	3214	6	6m	5	4	4
B	self-primed	3214	6	6m	5	4	4
50A	St. Joe #42	3215	6	3m	5	5	5
B	Self-primed	3215	6	2m	5	5	5
51A	ZZZ-55	3216	6	3m	6	5	5
B	self-primed	3216	6	2m	6	5	5
St. Joseph Paints (lead-free)							
15952A	Using ZZZ-33		7	9m	5	4	4
B	Self-primed		7	9m	5	4	4
53A	XX-503		7	10	5	4	4
B	Self-primed		7	10	5	4	4
54A	XX-50		5	10	4	3	3
B	Self-primed		5	10	4	3	3
55A	XX-592		7	10	6	4	4
B	Self-primed		7	10	6	4	4

0007-SWP-045910

0007-SWP-000115283

Panel No.	Description	RB No.	Chalk	Check	Guide Dirt	Dirt	Gen. App.
15956A	St. Joe #17		6	9m	6	4	4
B	Self-primed		6	8m	6	4	4
57A	St. Joe #40		7	very tiny 8m	6	4	4
B	Self-primed		6	8m	6	4	4
58A	St. Joe #42		7	9m	6	3	3
B	Self-primed		6	9m	6	3	3

No cracking on any panels, no appreciable erosion.

0007-SWP-000115284

Examination at 12 Months, Chicago

Panel No.	RB No.	Gloss	Chalk	Eros'n	Dirt	Gen. App.
Guide 15934	3208	0	6	9	7	7
35A	3200	0	9	9	8	8
B	3200	0	8	9	8	8
36A	3201	0	9	9	8	8
B	3201	0	9	9	8	8
37A	3202	0	8	9	8	8
B	3202	0	8	9	8	8
38A	3203	0	7	9	8	8
B	3203	0	7	9	8	8
39A	3204	0	8	9	8	8
B	3204	0	8	9	8	8
40A	3205	0	7	9	8	8
B	3205	0	7	9	8	8
41A	3206	0	8	9	8	8
B	3206	0	8	9	8	8
42A	3207	0	8	9	8	8
B	3207	0	8	9	8	8
43A	3208	0	7	9	8	8
B	3208	0	6	9	8	8
44A	3209	0	8	9	8	8
B	3209	0	8	9	8	8
45A	3210	0	7	9	8	8
B	3210	0	7	9	8	8
46A	3211	0	7	9	8	8
B	3211	0	7	9	8	8

0007-SWP-045912

0007-SWP-000115285

Panel No.	RB No.	Gloss	Chalk	Eros'n	Dirt	Gen. App.
15947A	3212	0	7	9	8	8
B	3212	0	7	9	8	8
48A	3213	0	8	9	8	8
B	3213	0	8	9	8	8
49A	3214	0	7	9	8	8
B	3214	0	7	9	8	8
50A	3215	0	8	9	8	8
B	3215	0	7	9	8	8
51A	3216	0	7	9	8	8
B	3216	0	7	9	8	8
52A	--	0	8	9	8	8
B	--	0	8	9	8	8
53A	--	0	8	9	8	8
B	--	0	7	9	8	8
54A	--	0	8	9	8	8
B	--	0	7	9	8	8
55A	--	0	7	9	8	8
B	--	0	7	9	8	8
56A	--	0	8	9	8	8
B	--	0	7	9	8	8
57A	--	0	8	9	8	8
B	--	0	7	9	8	8
58A	--	0	8	9	8	8
B	--	0	7	9	8	8

Formulas Involved

SWP Fume Resisting White - RB 3200

Pounds	Gallons	Material
100		1403
100		2030
290		Azo 33
288		20
	28-1/2	(2)
	19	(310)
	3	(5096)
	1-1/2	(543)
	2	(2231)
	1-1/4	(2286)
	4	(141)
	18-1/4	(348)

Wt./Gal. - T 13.29 - A 13.38
Viscosity 46" @ 75 deg. on #3

SWP Fume Resisting White - RB 3201

Pounds	Gallons	Material
Same as RB 3200 except using		
New Jersey XX 503		

Wt./Gal. - T 13.29 - A 13.26
Viscosity 35" @ 75 deg. on #3

SWP Fume Resisting White - RB 3202

Pounds	Gallons	Material
Same as RB 3200 except using		
New Jersey XX-50		

Wt./Gal. - T 13.29 - A 13.33
Viscosity 42" @ 75 deg. on #3

SWP Fume Resisting White - RB 3203

Pounds	Gallons	Material
Same as RB 3200 except using		
New Jersey XX-592		

Wt./Gal. - T 13.29 - A 13.31
Viscosity 32" @ 75 deg. on #3

SWP Fume Resisting White - RB 3204

Pounds	Gallons	Material
Same as RB 3200 except using		
St. Joe #17		

Wt./Gal. - T 13.29 - A 13.33
Viscosity 35" @ 75 deg. on #3

SWP Fume Resisting White - RB 3205

Pounds	Gallons	Material
Same as RB 3200 except using		
St. Joe #40		

Wt./Gal. - T 13.29 - A 13.30
Viscosity 55" @ 75 deg. on #3

SWP Fume Resisting White - RB 3206

Pounds	Gallons	Material
Same as RB 3200 except using		
St. Joe #42		

Wt./Gal. - A 13.36
Viscosity 55 + 1/8 cup

SWP Fume Resisting White - RB 3207

Pounds	Gallons	Material
Same as RB 3200 except using		
Azo 55		

Wt./Gal. - T 13.29 - A 13.30
Viscosity 50" @ 75 deg. on #3

SWP Gloss White - RB 3208

Pounds	Gallons	Material
275		20
75		2132
150		1403
200		412
200		1424
	32-1/2	(2)
	19	(310)
	1-3/4	(901)
	5/8	(543)
	4	(141)
	16-3/4	(348)

Wt./Gal. - A 14.23
Viscosity 25" @ 75 deg. on #3

SWP Gloss White - RB 3209

Pounds	Gallons	Material
275		20
75		2132
150		1403
306		Azo 33
94		18

Vehicle same as RB 3208

Wt./Gal. - T 14.29 - A 14.30
Viscosity 44" @ 75 deg. on #3

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SWP Gloss White - RB 3210

Pounds	Gallons	Material
275		20
75		2132
150		1403
306		New Jersey XX-503
94		18

Vehicle same as RB 3208

Wt./Gal. - T 14.29 - A 14.3
Viscosity 31" @ 75 deg. on #3

SWP Gloss White - RB 3211

Pounds	Gallons	Material
275		20
75		2132
150		1403
306		New Jersey XX-50
94		18

Vehicle same as RB 3208

Wt./Gal. - T 14.29 - A 14.20
Viscosity 29.2" @ 75 deg. on #3

SWP Gloss White - RB 3212

Pounds	Gallons	Material
275		20
75		2132
306		New Jersey XX-592
94		18
150		1403

Vehicle same as RB 3208

Wt./Gal. - T 14.29 - A 14.29
Viscosity 36.6" @ 75 deg. on #3

SWP Gloss White - RB 3213

Pounds	Gallons	Material
275		20
75		2132
306		St. Joe #17
94		18
150		1403

Vehicle same as RB 3208

Wt./Gal. - T 14.29 - A 14.31
Viscosity 34" @ 75 deg. on #3

SWP Gloss White - RB 3214

Pounds	Gallons	Material
275		20
75		2132
306		St. Joe #40
94		18
150		1403

Vehicle same as RB 3208.

Wt./Gal. - T 14.29 - A 14.28
Viscosity 54" @ 75 deg. on #3

0007-SWP-000115289

SWP Gloss White - RB 3215

Pounds	Gallons	Material
275		20
75		2132
306		St. Joe #42
94		18
150		1403

Vehicle same as RB 3208

Wt./Gal. - A 14.27
Viscosity 52" @ 75 deg. on #3

SWP Gloss White - RB 3216

Pounds	Gallons	Material
275		20
75		2132
306		Azo ZZZ-55
94		18
150		1403

Vehicle same as RB 3208

Wt./Gal. - A 14.33
Viscosity 51" @ 75 deg. on #3

SWP Undercoater - RB 3271

Pounds	Gallons	Material
100		2077
250		20
240		511
120		18
142		2174
3		547
	3/4	(5094)
	28	(2)
	14-1/2	(310)
	4	(141)
	1-1/2	(901)
	1-1/2	(543)
	25	(348)

Wt./Gal. - T 13.73 - A 13.60
Viscosity 14.8" @ 75 deg. on #3

We have no formulas or description of the paints submitted by St. Joseph, other than a statement of the zinc oxide used in each, which is typed with the Florida readings (above).

JWC:ls

0007-SWP-000115290

Paint Research Dept.
J. W. Chapin
November 26, 1952

PMJ 178 105

Progress Report on Exposures 15392-15403 F,C

Iso Phthalic Acid in Alkyd Formulations

Previous Report -- November 9, 1951

Purpose

To test an iso phthalic acid alkyd varnish in two formulations, SWP Ardmore Green and Kem Bulletin Blue-Green. This is a test of varnishes, not colors, and the latter should not be emphasized. The Cronite Chemical Company has done considerable work on iso phthalic acid, and Dr. J. A. Arvin felt that their material held considerable promise.

Paints Tested

RB 3110 -- Rex 416 SWP Ardmore Green, regular. 20 gal. of (4106) alkyd
RB 3113 -- Same, but RC 7355 for (4106)
RB 3112 -- Kem Bulletin Blue-Green, regular. 52 gal. (4106), 14 gal. (4100)
RB 3111 -- Same, but RC 7355 replacing (4106)

RC 7355 is a (4106) made with iso-phthalic acid from Cronite Chemical Company in place of the glyceryl phthalate. The characteristics of this varnish as such were essentially the same as those of (4106).

Following are two paints added to this series by Mr. Jagd, since the #52238R iso-phthalic acid-soybean alkyd oil from Cronite with which he was working was so closely related to the RC 7355:

OJ 498 P -- Rex 416, regular, same as RB 3110
OJ 499 P -- Same, but using 17-1/2 gal. #52238-R in place of (4106)

Preparation and Exposure

The six paints were exposed in two ways:

(a) On galvanized 8 x 24" panels, primed with E2 A C2 Kem G & G Primer, exposed 45°. (Use of E2 A C2 was an error, Galvite was intended).

(b) On 8 x 24" Douglas fir, primed with Rex 450 Undercoater, exposed vertical.

0007-SWP-045918

0007-SWP-000115291

Due to delays in shipping Florida panels (twice) and the very recent Chicago readings, the exposure times are now 21 months at Chicago, 12 months at Florida. The wood panels at Florida were retired at 6 months; the Florida steel panels will now be retired.

Summary of Results

The previous report stated that (a) the resins involved seemed equivalent, all satisfactory; (b) fading in the Kem Bulletin, though not particularly bad, was serious because it indicated a "walking-out" of 12106 Hansa Yellow; and (c) very bad white chalk-mask fading characterized the Rex 416 SWP Ardmore Green tests.

At the present stage, the Florida (steel) panels show no film failure nor any variations in gloss or chalking which would indicate poor or superior performance of the special resin. The Chicago panels also show it to be equivalent to the regular alkyd.

Again the Kem Bulletin Blue-Green shows very serious fading, obviously a loss of yellow as the color is now a straight blue instead of blue-green. However, this full alkyd formula, as might be expected, is rated somewhat better in appearance than the Rex 416, because of (1) much better retention of gloss and sheen, (2) less dirt, (3) absence of white chalk-mask (not strictly true at Chicago) and (4) better resistance to erosion.

It should be re-emphasized that the main purpose of the test was to evaluate the iso-phthalic acid alkyd. The final conclusion to date, therefore, should be that the performance of this material is satisfactory. The Chicago panels will continue on test.

0007-SWP-000115292

Examination Results

Examination at 12 Months, Florida

Panel No.	Description	RB No.	Gloss	Chalk	Check	Crack	Rust	Fade	Dirt	Gen. App.
8 x 24"	Galvite G & G Primer									
15392F	Kem. Bull. Reg. (4106) at 52 gal.	3112	4	8	10	10	10	2*	6	4
93	RC 7355 iso-phthalic acid alkyd for (4106)	3111	4	8	10	10	10	1*	6	3
94	SWP Ardmore Green reg. 20 gal. (4106)	3110	1	8	10	10	10	2	4	2
95	Using RC 7355	3113 OJ	1	8	10	10	10	2	4	2
96	Reg. Ardmore, as 15394	498P	0	7	10	10	10	1	3	1
97	17½ gal. Oronite alkyd	499P	0	7	10	10	10	1	3	1

*Changed from blue-green to straight blue.

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Examination at 21 Months, Chicago

Panel No.	Description	No.	Gloss	Chalk	Check	Crack	Ero's'n	Fade	Dirt	Gen. App.
Galvanized Iron		RB								
15392	Same as Florida	3112	4	7	10	10	9	4	5	5
93		3111	4	7	10	10	9	3	5	5
94		3110	2	7	10	10	6	5	5	4
95		3113 OJ	2	7	10	10	6	5	5	4
96		498P	2	7	10	10	6	5	5	4
97		499P	2	7	10	10	5	5	5	4
Douglas Fir										
15398	As 15392, but on wood	3112	4	7	10	10	9	4	5	5
99	As 15393, sp.	3111	4	7	10	10*	9	4	6	5
15400	As 15394, SWP	3110	2	7	10	10*	5	3	5	3
01	AS 15395, spec.	3113	2	7	10	10	5	4	5	3
02	As 15396, SWP	498P	2	7	10	10	5	4	5	3
03	As 15397, sp.	499P	2	7	10	10*	6	4	5	3

*Serious pitch exudation on these 3, much less on others. Does not seem to be a function of the vehicle.

0007-SWP-000115294

Formulas Involved

Kem Bulletin Blue-Green - RB 3112

Pounds	Gallons	Material
15		12105
22		CP 1037
96		2174
50		2188
6		1128
	30	(4106)
	4	(4230)
	5	(348)
	22	(4106)
	14	(4100)
	1	(4231)
	1/2	(4232)
	1/2	(2236)
	1	(6096)
	17	(348)

Wt./Gal. - A 8.99
Viscosity 28" @ 75 deg. on #3

Kem Bulletin Blue-Green - RB 3111

Pounds	Gallons	Material
Same as RB 3112, except using 52 gallons of RC 7355		

Wt./Gal. - T 8.92 - A 8.93
Viscosity 34" @ 75 deg. on #3

SWP Ardmore Green - RB 3110

Pounds	Gallons	Material
175		2188
14		11184
21		11185
100		412
15		CP 594
8		1128
	12	(348)
	1/2	(6094)
	1/2	(2233)
	8	(2)
	25	(310)
	20	(4106)
	3	(4230)
	1	(543)
	1/2	(4232)
	1/2	(6026)
	17	(348)

Wt./Gal. - A 10.05
Viscosity 20" @ 75 deg. on #3

SWP Ardmore Green - RB 3113

Pounds	Gallons	Material
Same as RB 3110 except using 20 gallons of RC 7355		

Wt./Gal. - A 10.06
Viscosity 21" @ 75 deg. on #3

0007-SWP-000115295

SWP Ardmore Green - OJ 498 P

Pounds	Gallons	Material
		This formula exactly same as RB 3110

Wt./Gal. - A 9.75
Viscosity 21" @ 75 deg. on #3

SWP Ardmore Green - OJ 499 P

Pounds	Gallons	Material
		Same as OJ 498 P except
		17-1/2 gal. 52238 alkyd
		and 19-1/2 gal. (548)

Wt./Gal. - A 9.80
Viscosity 18" @ 75 deg. on #3

JWC:ls

John W. Chapin

0007-SWP-000115296

Inspection Trip
Exposures - Titanium Pigment Corporation
National Lead Company
du Pont Pigment Division
June 27, June 30, July 1, 1955

General Statement

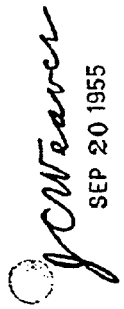
On June 27 Mr. Fasig and the writer inspected some house tests of emulsion paints in Ocean City, New Jersey, as guests of the du Pont Pigments Department. On June 30 we inspected several house tests, largely of emulsion paints, in Wilmington, Delaware, and some panel tests, all under the supervision of the du Pont Pigments Department. On July 1, we inspected panel tests of Titanium Pigment Corporation at Sayville, New York, as well as a few panel tests prepared by the National Lead Company at the same location.

This report can cover only the highlights and very general observations made during such a large number of inspections. Because of current interest in emulsion paints, the majority of the time was spent inspecting such finishes, which left less than the usual time to examine exposures of solution type exterior paints.

Certain general observations will be of interest. Our inspections left us with a very conservative opinion of exterior emulsion paints. There still is an obvious lack of a sufficient variety of exposures of sufficient duration to prove up any exterior emulsion paint. There were a relatively large number of failures observed, indicating that considerable care must be exercised in the selection of the latex or emulsion, in the selection of the formulation, in the surfaces painted and in application if a reasonable proportion of successful jobs are to result.

It will be noted that du Pont Elvacet 81-900, one of the most widely used polyvinyl acetate emulsions, has shown some serious failures. The same is true of some other polyvinyl acetates. In limited tests, National Starch's 12 K 51 has looked equal to Rohm and Haas' acrylic emulsion AC-33. AC-33 in general has shown good possibilities. Therefore, our selection of 12 K 51 and AC-33 for exploratory house tests and limited marketing appears justified.

We cannot refrain from remarking that producers of solution type house paint binders rarely base claims of ultimate performance on exposures of less than one year and usually much longer. In the case of emulsion paints there is no minimum at which exposures are shown. More testing and more time is required to get a real perspective. Other paint manufacturers who have gone into the market prematurely with exaggerated claims for exterior emulsion paints may have done the paint industry a considerable disservice.



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0007-SWP-000115297

du Pont is facing for the first time a problem which we also may encounter. Prior to house tests on emulsion paints they have never had to pay out any money to owners of test houses due to faulty performance of their test paints. Some of their Elvacet 81-900 houses are failing so badly that something will have to be done about them. If sandblasting is required it will be very expensive as there are no commercial sandblasters in the vicinity who would handle house jobs. In the case of emulsion paints on bevel siding they do not know how they can remove the paint in any practical, inexpensive manner.

As a final general comment, it seems to the writer that we should try out the du Pont "mildew" type of test fence, which does not permit the wash from one panel to fall over the next panel below. This would be a major expense if we later decided to convert all our fences, so we should try it out first.

As usual, we were shown avery courtesy and received complete cooperation from du Pont, Titanium Pigment Corporation and National Lead Company.

du Pont Pigments Department - Ocean City Exposures

As stated earlier, the afternoon of June 27 was spent inspecting house tests of exterior emulsion paints in Ocean City, New Jersey. We were accompanied by Jack Broeker, Dr. Vannoy and Mr. McCrea of the du Pont Pigments Department. Highlights of the individual house tests follow:

McCrea house

First floor cement block, second floor vertical wood panelling. Previous paint Wesco's X-tite on cement block, USI 1271 alkyd paint front and rear on wood, and sides conventional oil paint on wood. Repainted July, 1954. AC-33 acrylic paint on cement block front, AC-33 and Elvacet 81-900 PVAc paints on blocks, wood and galvanized gutters west side. The emulsion paints were pigmented 90/10 Ti-Pure R 610/FF. One coat work was used. The AC-33 paint is in definitely better condition than 81-900. The 81-900 paint has mildewed, shows erosion and intercoat peeling. PMO fungicide added to the 81-900 paint caused some discoloration. All the paints showed some peeling from galvanize, less with AC-33 than 81-900.

On the south side (street side) the USI alkyd paint with straight FF TiO_2 with no reactive pigment is in good condition on the wood surfaces after two years. It shows no washing over black shingles. An acrylic paint was applied last July on the cement block only and still is satisfactory. The north (sea side) was just repainted, using AC-33 paint on the cement block and the 1271 alkyd paint on the wood except that an oil paint was used as the ceiling paint under the sun deck.

0007-SWP-000115298

The first floor cement block utility room was painted with a light green AC-33 paint three years ago and is still in good condition, although drenched with salt spray at times. Living quarters on the first floor test a white acrylic paint and a Green Gold 81-900 paint.

This house should be kept under observation to determine the progress of paint performance.

McCrea test fence - Ocean City

Mr. McCrea has a small test fence on filled land at Ocean City. The oil paint panels have been on exposure over two years, the emulsion paints more than one year (13 months). An alkyd zincless paint mildews on the south side, but the mildew is controlled when phenyl mercury oleate is added. A 90/10 610/FF 81-900 paint self-primed and over conventional primer, also 75/25 610/FF plus mica in this location look quite good. AC-33 with all FF TiO_2 has eroded off yellow pine entirely. All 610 TiO_2 in AC-33 at 20 and 30% PVC looks O.K. so far with no choice of PVC to date. On old repaint panels the AC-33 paint is cracking and has mildewed while the 81-900 paint is O.K. (both 13 months). On the north, a 50/50 610/Y-CR pigmented acrylic looks white compared with 70/30 and 80/20 combinations of the same titanium oxides. du Pont's "All-Purpose" 610/low $ZnO/CaCO_3$ oil paint is gray and an 81-900 paint looks slightly gray.

Clement house

This is a Spanish style brushed stucco house, painted two years ago with an all FF TiO_2 AC-33 paint on the front of the house and with an 80/20 610/FF AC-33 paint on the rear half. In 1954 the portion painted with the straight FF TiO_2 acrylic paint was chalking very freely, so it was repainted. This time it was repainted with a straight 610 TiO_2 AC-33 paint tinted with Green Gold. The portion of the house previously painted with the free chalking FF paint used up twice as much paint as the rear half painted with the 80/20 610/FF combination and brushing was much harder. The current paint is fading over the old FF portion, practically no fading over the romainder. It may be that the FF chalk was worked into the new paint and has accelerated chalking and fading.

There is a rear wooden open stairway where the steps and risers are notched out of 2 x 12" timbers. Naturally the notches cut across the grain so there is considerable end grain exposed and moisture can move through. The stairs were previously painted with an oil paint. 81-900 PVAc paint on one side of the stairway has peeled almost completely from the notched areas. An AC-33 paint on the other side shows no significant failure. On the other hand, on the underside of an open sunning deck, an AC-33 paint is peeling from the timbers which were previously painted with some kind of an oil paint. This points up one of the problems in using exterior emulsion paints - some are satisfactory on some surfaces, but they do not seem to have the tolerance or versatility of oil paints. More formulation and exposure work is required.

0007-SWP-000115299

Loder house

Of limited interest pending longer exposure. Weathered cement asbestos shingles also painted with an AC-33 610 TiO_2 paint tinted with Green Gold, as on the Clement house. Painted one year ago, apparently still in good condition. On a rear addition there are a variety of paints compared. No special differences now - should be checked later.

Grone house

This house is in a location relatively open to salt water exposure and has given trouble on the bay side whatever paint was used. It is of cement block construction. Bondex and oil paints came off quickly. Two years ago this house was painted with one coat of a gray AC-33 paint. The side facing the bay again peeled, so this spring this side was scraped and repainted with the same paint. It is already showing lifting along some repaired settling cracks.

In general AC-33 paints looked better than the Elvacet 81-900 paints in Ocean City. The 81-900 paints seem to lack adhesion to other surfaces and between coats of 81-900. AC-33 looks better in this respect, but the Grone house suggests that AC-33 is not perfect.

Wilmington Exposures - du Pont Pigments Department

As stated earlier, most of the time in Wilmington was spent looking at emulsion house paint tests. Since even this time was limited we purposely looked at problem houses, and we must take Dr. Vannoy's word that on other houses Elvacet 81-900 looks quite good. However, these latter exposures are still of relatively short duration.

Cole house

A stucco house painted in May, 1954 over a chalked oil paint. The test area on the east face measured "wet" when painted. In general this house is shaded but the test area (south east) gets the morning sun. White oil paint was used on most of the house. The test area compares Pliolite S-5 paint versus PVAc 81-900 paint using 90/10 610/FF TiO_2 pigmentations. The Pliolite paint is showing a yellow-brown cast and copper staining. The 81-900 paint does not stain from the copper screens.

Where there are building cracks the PVAc paint shows more tendency to lift or pull away from the cracks. Actually old breaks have not opened up through the Pliolite paint. Somewhat the same shows on tests on the rear of the house (north east). Regular oil paints carrying titanium as 50/50 FF/610 and X-CR/610 are in good condition but the PVAc paint is pulling away from the building cracks.

0007-SWP-000115300

Sawyer house

This house is brick for the first story, wide bevel siding on the second floor. This is a two coat repaint as of June 1953 over old oil paint using Elvacet 81-900 pigmented with 75/25 610/FF for titanium. This is too much free chalking anatase. On the front of the house (north) directly under the eaves the PVAc paint lost adhesion to the dirty, protected oil paint and had to be retouched. On the wood surfaces the 81-900 paint is showing more checking, cracking and flaking than would be expected of an oil paint. It is peeling some from the brick and there is some rusting on the downspout.

On the rear of the house it is evident that there have always been some moisture problems. The PVAc paint in some places has peeled away from the old oil paint. In some cases it seems that the emulsion paint lets the moisture through to the old oil paint and it continues to fail. Where the old oil paint has blistered or peeled off and has been retouched, blisters have not reappeared.

On the east side the PVAc paint is cracking on the wood siding and peeling from the brick.

Steinbring house

This house has always been a problem house due to moisture, aggravated by an attached greenhouse. A fair amount of blistered old oil paint was burned off and some Midget Louvers were installed before repainting with a 80/20 610/FF Elvacet 81-900 paint, two coats, in October, 1954. The PVAc paint is not peeling from the burned areas but there is much peeling and evidence of lack of intercoat adhesion elsewhere. There is intercoat peeling on the garage. On the concrete surfaces of the greenhouse comparisons were made of Pliolite, PVAc 81-900 and acrylic AC-33. All are O.K., the Pliolite the whitest, the AC-33 a trifle gray and streaked.

Humphrey house

This house is more or less a repetition of the other house tests. Both brick and wood surfaces previously painted with oil paint were repainted in May 1954, two coats white, comparing an 80/20 610/FF Elvacet 81-900 paint with a conventional oil paint. The PVAc is cleaner and brighter but again shows some peeling, either from the substrate or intercoat. This applies to both wood and brick surfaces.

0007-SWP-000115301

Knotts house

This house was painted in September 1951, after considerable of the old oil paint was burned off because of bad peeling. The paints used in the 1951 test were a non-reactive pigmentation in Aroplaz 1271 using straight FF TiO_2 and magnesium silicate at 30% PVC with 0.2% PMO added, and an 80/20 FF/610-leaded zinc-magnesium silicate oil paint at 31.4%. Both were used two coats self-primed. The alkyd paint is whiter and shows less dirt collection than the oil paint. Both the alkyd and oil paints again show some peeling, but the alkyd paint has not peeled where the old oil paint was burned off.

Clark house

This house is of wood and brick construction previously painted with oil paint. It was painted in October 1953 using coral paints (tinted with iron oxide). The paints included a bodied oil paint at 39.8% PVC using R 610, zinc oxide and calcium carbonate, and an alkyd non-reactive pigmented tint base using R 610 and magnesium silicate at 30% PVC, with 0.2% PMO added. In the earlier stages of exposure the alkyd collected less dirt. At this point the gloss on the two paints are about equal, with a slight edge for the alkyd. The regular oil paint now shows better tint retention which may be due to less retained chalk face. The non-reactive pigmented alkyd paint shows no copper staining from the screens, the zinc containing oil paint does. The regular oil paint shows some peeling toward the top of the chimney.

We inspected a limited number of the panel series at the du Pont Newport exposure farm. The highlights of these observations follow:

White house paints - High TiO_2 content, "One Coat" - Blends for chalk retardation.

The 11211 and 11220 series were exposed in September and October 1953 as washing tests using a black painted board at the bottom of each single vertical group of white panels, with a red brick wall built up from the ground to the bottom of the fence. The paints were made at equal free binder substitution starting with 4.25 pounds of oil with the base pigmentation of TiO_2, leaded zinc and magnesium silicate. Various titanium oxides and combinations were used with Azo ZZZ-33 zinc oxide and International's Asbestine.

Ti-Pure FF, washes both south and north.
80/20 FF/610, still washes but also some mildew.
75/25 FF/610, " " " " " "
50/50 FF/610, still some wash but definite mildew.

All R 610, only one not washing, no mildew as has fungicide added. Color not as white as above.

0007-SWP-045929

0007-SWP-000115302

If the semi non-chalking anatase Y-CR is used instead of FF:

All Y-CR + inhibitor, washes
50/50 Y-CR/FF, bad wash
2/1 Y-CR/R 610, some control of washing, very slight mildew on north.

Y-CR does a slightly better job of controlling chalk wash than FF. The Y-CR paint with one-third of the TiO_2 as R 610 and normal zinc oxide with magnesium silicate controls wash quite well. If a change is made to calcium carbonate extender and straight R 610 the paint is gray on the north exposure with slight mildew, with no wash. This, of course, would be considered as a tint base, not a white. A Y-CR/ZnO/ calcium carbonate paint looks quite good now but ultimate durability has not been proven.

Mildew Inhibitors

We inspected a number of series on mildew inhibitors. We will give some detail but will also combine some observations to reduce reading time.

In a series 11145 put out in April 1953 the paints were exposed north vertical and the control paint with no fungicide has bad mildew. Agents tested include 0.05, 0.2 and 0.5% Hg as phenyl mercury oleate or Super Ad-It or Butrol 8. All required 0.2 or 0.5% Hg, with definite improvement at 0.2% but still some mildew at 0.5% Hg. Vancide 89 was tested at 1/2, 1, 2 and 5% on the weight of the paint. 2 and 5% look good but would be expensive. We get checking if we use too much Vancide 89. In another group, 2% Vancide 89 controlled mildew for a while but mildewed later. Certain experimental fungistatic oils prepared by A-D-M show incorporation of the mercury into the oil molecule is no more effective than adding phenyl mercury later.

In one series now four years old 1/2, 2 and 5% of a 10% solution of PMO now shows mildew at even 5%, suggesting that the phenyl mercury oleate may volatilize or leach out of the film on long exposure. Phenyl mercury salicylate at 2 and 5% looks good but would be very expensive.

A paint carrying 4-1/4 pounds of leaded zinc showed no mildew if FF TiO_2 was used but mildewed with R 610 TiO_2. Calcium carbonate replacing magnesium silicate reduced mildew. In an inactive pigmentation clay is associated with mildew as is magnesium silicate, even with 12¢ worth of PMO (0.2%). However, when a half pound of zinc oxide is used with the clay plus 12¢ PMO, clay is much superior. Therefore, a good colored clay which would produce gloss paints could be interesting.

0007-SWP-000115303

du Pont has found as others have that cuprous oxide is outstanding as a fungicide when used from 2 to 5% of the weight of the paint. They are playing with the idea of using smaller amounts of Cu_2O in whites and tints as color will permit, then supplementing with other fungicides not completely effective by themselves. They have used from 0.1 to 0.3% Cu_2O plus Butrol with fair results but still encounter some mildew. We must introduce a word of caution. SWP Flat White and tints with Cu_2O develop brown streaks on exposure in the Weather-Ometer. Normal outdoor exposures have not been out long enough to verify this. We have encountered particles of metallic copper in our cuprous oxide.

du Pont has a tint series consisting of twelve different white tint bases, which are tinted with (1) lampblack, (2) raw sienna, (3) zinc yellow, (4) PC Green, (5) PC Blue and (6) parachlor red. An R-610/leaded zinc/magnesium silicate paint mildews unless 0.2% PMO is added. An R 610/2-1/2 pounds zinc oxide/ calcium carbonate paint shows better color retention and with PMO mildew is controlled much better. When the zinc oxide is reduced to 1-1/2 pounds or 1/2 pound the mildew problem becomes more severe. A lead-zinc paint of 1927 vintage shows severe fading when the parachlor red is used. There is some suggestion that higher lead causes more fading.

An Aroplaz 1271 paint looks good at 30% PVC but not as good at 20% PVC. A PVAc with 2 pounds per gallon of R 610 at 19.6% PVC is not a good white (mildews) but makes a good tint base. Rather uniquely, two coats of this PVAc tint base holds a good pink color using parachlor red, but shows some indication there will soon be some film failure.

du Pont makes the following supplementary remarks: "Our tests indicate that mildew growth may be retarded by the following materials.

1. Zinc oxide
2. Calcium carbonate
3. Phenyl mercury and pyridyl mercury compounds.
4. N-trichloromethylthiotetrahydrophthalimide (NTCM).
5. Cuprous oxide, salicylanilide and copper-8-quinolinolate (poor color).
6. Glycerine, diphenyl, chlorinated phenols and chlorinated paraffin."

0007-SWP-000115304

Titanium Pigment Corporation - Sayville, N. Y.

Titanium Pigment Corporation has no house tests but we were impressed with the thoroughness of their panel exposure program of testing exterior emulsion paints. It is true that all of their emulsion paint tests are of relatively brief duration. However, we have the benefit of seeing these tests at this point and Frank Smith has promised to give us an interim report late this fall.

Individual series may be reported as follows:

Sherwin-Williams Cooperative Series

Both TPC's and S-W's panels have been retired after four years' exposure. This cooperative series will be described in a separate report.

Commercial Paints

A. 1950 series

3 coats self-primed on cedar and white pine.

These panels were examined briefly and comments appear only where paints show definite or unusual failure.

1. 100% BCWL - typical failures of lead-in-oil.
2. 60/30/10 BCWL/ZnO/Extender - gray, checked and cracked.
3. 50/50 titanium magnesium/leaded zinc.
4. 13.3% Titanox A MO/13.7% Titanox AA/55.5% PbZn/17% Mg Silicate - better than 50/50 formula above.
5. National Lead Bright White #110 - O.K.
6. SWP 471 - more erosion than 4.
7. Devoe #547 - very yellow (rutile yellowing).
8. du Pont #40 - equal to 4.
9. Patterson-Sargent #218 - mildews.
10. Montgomery Ward Super #75-1.
11. Benjamin Moore #100.
12. Sears #143 - slightly yellow but perhaps best in series.

0007-SWP-000115305

B. 1951 series

Also three coats self-primed over cedar and white pine.

1. White lead in oil - characteristic check.
2. 60/30/10 BCWL/ZnO/Extender - checked.
3. 50/50 titanium magnesium/leaded zinc - O.K.
4. 13.8% Titanox AA/13.7% Titanox A Mo/55.5% leaded zinc/ 17% Mg Silicate - O.K.
5. Lowe Brothers - Yellow cast, some cracks.
6. Montgomery Ward #75-1-White, some cracks.
7. Sears #143 - White.
8. du Pont #40 - White.
9. SWP 471 - White, some cracks.
10. Devoe 547 - very yellow, poor condition.
11. Benjamin Moore - some cracking.
12. Pittsburgh - yellow.

Actually all the 1951 series show some cracking.

White house paints - Additions of rutile oxides

Painted June 1952 two coats self-primed on cedar and white pine siding.

This is a rather complex series. Rather than describe each pigmentation in detail, we believe it would suffice to mention certain trends. A 20% Titanox A MO/50% PbZn/30% Mg silicate paint is white and clean but shows erosion, checking and cracking. If either 13% RA 10 or 10% RA is used replacing that amount of A MO there is evidence of rutile yellowing. The current TPC recommendation would be to use Titanox RA 50 for better durability, but if too much RA 50 is used a fungicide must be added. Both RA 50 and RANC were used at 5% with 15% of A. If calcium carbonate replaces magnesium silicate there is more control of erosion but a greater tendency toward rutile yellowing. This is shown even with 20% Titanox A 168.

0007-SWP-000115306

In another series, where details of formulation are not important, TPC reports greater rutile yellowing with lead containing paints as they chalk more. (Could it be that the chalk is more adherent and builds up a heavier layer, conducive to rutile yellowing?) Our experience is the reverse - the lead-free paints are more inclined to yellow, other things being equal. TPC ascribes rutile yellowing to photochemical oxidation to TiO_3. They find greater yellowing if dirt or mildew collects on the paint surface.

One Coat House Paints

This series was painted one coat over one coat of primer on cedar and white pine in November 1953.

1. Pittsburgh - slightly yellow.

2. SWP 476 - O.K.

3. Jones Blair - no data.

4. Devoe - dirty, streaky gray.

5. Socony Paint Products - gray, slight mildew.

Certain TPC formulations with high TiO_2 content look good. Where 25% of the binder is Chlorowax the film still looks good. Use of calcium carbonate as part of the extender again produces rutile yellowing.

Lead and Zinc-free Paints

This series of paints were exposed in October 1952 as two coats self-primed on cedar and yellow pine. The paints compare pigmentations with zinc or leaded zinc and non-reactive pigmentations, all at 35% PVC. Details of pigment and vehicle formulations and present condition follow.

1. 10% Titanox A MO/10% Titanox RA/39% PbZn/16% BCWL/25% Mg silicate
   75% Refined L.O./25% Bodied L.O.

   The film is in good condition, a trifle yellow.

2. 28% Titanox A/28% Titanox RA/44% Mg silicate
   40% Linseed/35% Long oil alkyd/25% Chlorowax 70

   Whiter, should retard chalk as eroded and cracked.

3. 10% Titanox A MO/10% Titanox RA/50% PbZn/30% Mg silicate
   75% Refined L.O./25% Bodied L.O.

   Good condition, slight cracking.

0007-SWP-000115307

4. 13% Titanox A 168/12% Titanox RA/35% ZnO/40% extender
75% Refined L.O./25% Bodied L.O.

Extender half magnesium silicate, half carbonate. Very yellow on north vertical.

5. 28% Titanox A MO/72% Titanox RCHT
40% L.O./35% long oil alkyd/25% Chlorowax 70.

Cracked, eroded and mildewed on south and north.

In the same group TiO_2 and linseed oil are completely off the panel. Paints 2 and 4 had 20 cents of phenyl mercuric oleate added per gallon of paint.

Exterior Tint Base Paints

Details of composition of this series are not important. However, it is interesting from the standpoint of use of Terra Alba. Titanox RC at 40 to 42%, 20 to 34% Terra Alba, used in conjunction with leaded zinc, straight zinc oxide or zinc oxide plus lead carbonate or silicate. Terra Alba looks promising from the standpoint of tint retention - it will mildew but this is controlled with 10¢ worth of PMO per gallon. Unfortunately, Terra Alba is not available which will grind well to provide gloss. TPC's ideas on a tint base are to avoid lead, use RC with zinc oxide and extender.

In another tint base series put out in June 1953, comparisons are made of extenders on tint retention. All are in an oil vehicle at 33% PVC. The first group all carry 40% Titanox RC and 35% zinc oxide. The results with various extenders are as follows:

Calcium carbonate - on south exposure good tint, some streaks. On north exposure, good tint retention.

ASP 400 clay - south, fades. North, fades, less mildew than Terra Alba.

Terra Alba - south, good tint. North, trifle more fade than with calcium carbonate.

Lorite - fair tint south and north, less fade than with clay.

Asbestine - south, poor tint, some mildew. North, less mildew than with clay, slight mildew.

0007-SWP-000115308

Much the same results were obtained with a pigmentation of 20% Titanox RC/20% zinc oxide/60% extender, but the differences are greater than in the first group which used only 25% extender. Exceptions are that in the second group Terra Alba shows the best tint retention. Fading is bad with clay, magnesium silicate and Lorite. Mildew is worst with magnesium silicate.

Another series of tint bases, also out in June 1953, compares Titanox RANC plus extenders against Titanox RC, in yellow (chrome) and green (phthalo blue plus lemon ferrite). The two pigmentations are (1) 15% Titanox RANC/20% ZnO/65% extender, and (2) 50% Titanox RC/20% ZnO/30% extender. In the yellows, with pigmentation (1); calcium carbonate makes a dirty and dingy tint, ASP 400 clay fades, Terra Alba gives a better tint than calcium carbonate, while Lorite is cleaner with some fading. In the pigmentation (2) RC looks better than RANC for clean, bright tints, with calcium carbonate best and the others quite good. In the greens RANC is best, RC next, then RCHT, with Titanox C 50 showing the most fading. There is a need for a chalk resistant equivalent of C 50.

The final tint series inspected was put out in July 1953, consisting of low gloss, lead and zinc-free tint bases, evaluating some typical wall paint vehicles. This series should be watched in view of our long range intention of studying our own alkyd flat vehicle in SWP Flat. Details are recorded because of future interest.

1. 20% Titanox RANC/80% Terra Alba. Vehicle 40% linseed oil, 35% alkyd, 25% Chlorowax 70, at 33% PVC.

   In a yellow tint, this paint is dirty.

2. 19% Titanox RANC/81% Terra Alba. Vehicle 77% Syntex 131, 23% Syntex 32, at 50% PVC.

   This paint shows some failure on yellow pine.

3. 24% Titanox RANC/76% Terra Alba. Vehicle is 100% Admerol 400 RS, at 50% PVC.

   This paint has failed badly.

4. 21% Titanox RANC/79% Terra Alba. Vehicle is 100% Wallkyd 1952, at 50% PVC.

   This is the best paint, with Jones-Dabney second.

   Note that the higher PVC's give brighter tints.

0007-SWP-000115309

Mildew Inhibitors

Two series of mildew inhibitors were examined at Sayville. One was put out in November 1950 on small cedar panels, two coats self-primed. The control paint had a pigmentation of 50% Titanox RCHT/ 25% zinc oxide/25% magnesium silicate, in a linseed oil vehicle, at 33% PVC. The control paint has mildewed badly and shows yellowing. It does not yellow if the mildew is controlled by a fungicide. Pyridyl mercuric stearate (35% Hg) controls the mildew if used to provide from 0.5 to 1% Hg on the solids. Phenyl mercuric borate in the same concentration of Hg does well. "Ad-It" did not do well.

In a second series put out in January 1953, various fungicides were tested at 10¢ worth per gallon. The control paint had 5% Titanox A M0/ 35% RCHT/30% zinc oxide/30% magnesium silicate, in an oil vehicle, at 33% PVC. The paints were applied two coats on cedar. Results are tabulated for north vertical exposure.

1. No additive. Bad mildew.

2. Di(phenyl mercury) dodecenylsuccinate (Super Ad-It). Slight mildew.

3. Phenyl mercuric octoate (Naphthone AC). Slight mildew, more than 2.

4. Phenyl mercuric naphthenate. Bad mildew.

5. Phenyl mercuric acetate plus orthophenylphenate (Butrol). Just starting to mildew.

6. Phenyl mercuric acetate. No mildew (more mercury as low cost source).

7. Phenylmercuric-8-oxyquinoline (Butrol 8). Very slight mildew.

8. Copper-8-quinolinolate. Definite mildew.

As an added note, TPC found that a conventional paint applied over a zincless primer took 2% of Vancide 8 to hold mildew for two years to date, but the paint had a brown discoloration.

0007-SWP-000115310

Exterior Latex and Emulsion Paints

As stated earlier, TPC's exposures of emulsion paints are still of short duration, but their program is extensive and eventually should develop information of considerable value. Details on individual series follow.

In September 1954 TPC put out a variety of latexes and emulsions using 70% Titanox RANC/30% magnesium silicate at 35% PVC. The exposures are both south and north vertical as follows:

2 coats on regular asbestos shingles
2 coats on glazed asbestos shingles
2 coats on stucco
2 coats on cement blocks
2 coats on new cedar siding
1 coat over house paint primer on new cedar siding
1 coat over chalking paint on wood

The latexes or emulsions used were:

Butadiene styrene	Dow 512 K
Polystyrene	Bakelite BKS 92
Polyvinyl acetate (copolymer)	Dewey and Almy Norvan G
Polyvinyl acetate (post plasticized)	Bakelite WC-130
Acrylic	Rohm and Haas AC-33
Acrylic - alkyd modified	AC-33 plus 25% Glyptal 2503

Weathered asbestos shingles were treated over the left half of each panel with silicone solution, the right half left untreated. After nine months the BKS 92 polystyrene paint has failed over the silicone. The other paints are still O.K.

Over the glazed asbestos shingles the BKS 92 paint again is failing, while the others are O.K.

On weathered stucco all the paints are O.K.

On new cedar siding two coats self-primed BKS 92 again is failing. WC-130, Norvan G and AC-33 are starting to crack. All are much better when applied one coat over one coat of house paint primer. When applied one coat over old chalked lead-zinc-titanium-extender oil paint most of the emulsion paints are gone entirely. The AC-33 paint is still in quite good condition but mildew has come from the old oil paint through the AC-33 film.

A similar series using the same paints as above was put out in December 1954, one coat over old chalking paint. The first group was painted in cold weather, below 40° F., and the second in warmer weather, above 50° F. The condition of the panels on July 1 was as follows:

0007-SWP-000115311

Painted below 40° F.

Butadiene styrene 512 K.	Just starting to flake.
Polyvinyl acetate WC-130.	Flaking.
Acrylic AC-33	O.K.
Acrylic AC-33 + alkyd	O.K.

Painted above 50° F.

Butadiene styrene 512 K.	Starting to flake.
Polyvinyl acetate WC-130.	Flaking
Acrylic AC-33	O.K.
Acrylic AC-33 + alkyd	O.K.

Another series put out in November 1954 included a considerable variety of latexes and emulsions. The common pigmentation was 70% Titanox RA 50/30% magnesium silicate, all at 35% PVC. The condition over various surfaces as of July 1 was as follows:

45° exposure south one coat over small chalked paint panels. Half of each panel was wet with water just before painting, the other half left dry. We did not obtain details as to how the panels were wetted, so differences later may be due to the water and/or because the chalk was rubbed off. The condition of this group as of July 1 was as follows:

1. Polyvinyl acetate (Copolymer) Dewey and Almy Norvan G.
   All off on dry area, O.K. on wet.

2. Polyvinyl acetate (post plasticized) Bakelite WC-130.
   Off both wet and dry areas.

3. Polyvinyl acetate (post plasticized) Cal Ink.
   Coming off both areas.

4. Polyvinyl acetate (Copolymer) Beechnut EC-101.
   Coming off both areas.

5. Polyvinyl acetate (Copolymer) National Starch 12 K 51.
   O.K. on both.

6. Polyvinyl acetate (post plasticized) Crown Oil Polycrown AX.
   Slight chipping on dry area, O.K. on wet.

7. Polyvinyl acetate (post plasticized) Borden Polyco 522.
   Popping on both areas.

8. Polyvinyl acetate (post plasticized) du Pont Elvacet 81-900.
   Almost off on dry, better on wet.

9. Polyvinyl acetate (post plasticized) Monsanto SC. Off both.

10. Acrylic Rohm and Haas AC-33. O.K. on both.

11. Butadiene Styrene Dow 512 K. Wrinkled, looks ready to pop. Whiter than AC-33.

12. Butadiene Styrene Dow 762 W. Wrinkled, looks ready to pop.

13. Vinylidene chloride - Acrylonitrile. Dow Saran. No data recorded.

14. Polyvinyl acetate (Copolymer) Colton Vinac P-100. Chipping on both areas.

Note that at this relatively early stage, AC-33 acrylic and 12 K 51 PVAc are the best and doing equally well. This corresponds to our own selection.

Over chalked paint exposed vertically, paints made with 512 K, WC-130, Cal Ink PVAc, Dow 762 W and BKS .92 are showing advanced failure. Minor flaking has shown up on Norvan G and Saran, while the others are still O.K.

On weathered asbestos shingles which were wet just before painting, then painted two coats, most are in good condition. WC-130 and Beechnut EC-101 are starting to fail by bubbling.

Two parallel series were put out in November 1954 as two coat work on regular cement asbestos shingles. The series were designed to test the chalking rates of various types of titanium pigments in polyvinyl acetate Norvan G and in acrylic AC-33, respectively, all at 35% PVC. The titanium pigments used and the chalking as of July 1 were as follows:

	South exposures - Chalk	
	AC-33	Norvan G
70% Tx RA 50/30% Mg Sil.	Very slight	Very slight
70% Tx RANC/30% " "	Very slight	Very slight
100% Tx RC	None	None
100% Tx RCHT	Slight	Slight
100% Tx C 50	Definite	Definite
57% Tx RA 50/13% TX A 168/30% Mg Sil.	Quite free	Quite free
35% Tx RA 50/35% Tx A 168/30% Mg Sil.	Quite free	Quite free
14% Tx RA 50/55% Tx A 168/31% Mg Sil.	Quite free	Quite free

While the data indicate equivalence in chalking, the AC-33 paints show slightly more chalking than the parallel paints based on Norvan G.

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As a variation of the above comparisons, a common combination pigmentation of 70% Titanox RA 50/30% magnesium silicate was used in both AC-33 and Norvan G, this time increasing PVC's in 5% steps from 15 to 40%. In this case neither group shows any chalking as of July 1 up to and through 35%. However, at 40% PVC the Norvan G paint is just starting to chalk while the 40% PVC AC-33 is not. This reverses the findings in the previous series. The Norvan G panels all have a yellow cast.

If any anatase is added to pigmentations as used in the above series, chalking is accelerated.

Another series varied extenders but has not shown any differences to date. It is interesting that comparing Norvan G and AC-33 paints, the same amount of tinting color with the same amount of titanium always developed more color in the AC-33 paints.

National Lead Company - Sayville, New York

Only a brief time was spent looking at National's exposures and very little of value was observed.

Study of Available Active Pigment for Film Stabilization

This series was put out in October 1953, two coats self-primed over cedar and yellow pine. The basic formula carries 1.75 pounds Titanox A MO in a 5 pound oil vehicle, with magnesium silicate varied to maintain PVC at 33.1%. The percentages considered as available reactive pigment in these comparisons: zinc oxide - 100%, 45 X basic silicate white lead - 45%, basic carbonate white lead - 35%, and basic sulfate white lead - 20%. The weight percentage of available active pigment on oil was varied through 10, 20, 40, 55, 80 and 100%, with some obvious omissions.

As zinc oxide increased from 1/2 pound through 4 pounds per gallon the film performance improved. One pound controlled mildew. At low zinc oxide concentrations acicular zinc oxide is more susceptible to erosion. In the lead series at 10, 20, 40 and 55% reactive lead, basic sulfate films mildewed at low concentrations and eroded at high concentrations. Basic carbonate showed some mildew at low concentrations and gave gray films at high. Basic silicate mildewed at low concentrations but gave clean films at high, with no erosion.

M-50 Pigment

We glanced at a few metal protective paint exposure panels. Those containing M-50 continue to look good, which confirms our findings.

M. VAN LOO

MVL:AR

Director of Paint Research

0007-SWP-045941

0007-SWP-000115314

Paint Research Department - July 14, 1956

Final Report on Exposures 15934-58 C,E,K

St. Joseph Lead Company Cooperative Series

Previous Reports - September 30, 1952
March 29, 1954

Purpose

To compare a number of white house paints using various zinc oxides in both lead-free and lead-containing formulations. The series included Rx 471 SWP Gloss White as a lead-containing type and both Rx 436 SWP Fume Resisting and St. Joseph's submitted samples as lead-free types, patterned after Rx 436. The zinc oxides involved are:

American Zinc's Azo ZZZ-33 and ZZZ-55
New Jersey's Horsehead XX-592, -503 and -50
St. Joseph's Green Label #17, 40 and 42

Preparation and Exposure

The two companies exchanged the paints described above and each painted out a complete series for exposure. Our series is on cedar bevel siding, primed with Rx 450 Undercoater and also as self-primed (both on one panel). The tests have been exposed at Florida, at Coffeyville, Kansas, and at Chicago, all vertical south. The exposure time at each location is very nearly 4 years.

Summary of Results

A comparison of the exposure results of this series with earlier similar studies shows that the bodied oil type house paint formulations are more resistant to checking and cracking failure than the older raw oil types. This has resulted in improved performance of zinc oxides which had been rated as unsatisfactory for house paint usage in earlier tests.

It is our feeling that this change in formulation has done much to bring about a relaxation of our stringent zinc oxide specifications. We would now approve the following pure oxides for SWP usage:

Azo ZZZ-33
New Jersey XX-503
St. Joseph's Green Label #17

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At 4 years, in broad general terms, we can state that general appearance depends upon two factors, (a) dirt and/or mildew and (b) erosion or "thin" appearance. At Chicago and Coffeyville, mildew being no factor, the Rx 436 formulas tend to be cleanest but most eroded, the St. Joseph formulas pretty much the opposite and the Rx 471 samples generally intermediate on both counts. This results in essentially equal general appearance ratings for the majority of all tests at these two locations. Bringing Florida tests, with mildew variations, into the picture, there is less conformity in appearance, but still a rough parallel trend. Exceptions may be seen in the readings below; the ones apparently most significant are:

(a) Florida, stressing mildew growth. Rx 436 seems to allow the most mildew, St. Joseph formulas the least and Rx 471 intermediate. No zinc oxide shows up consistently either good or bad in two or more formula types with respect to mildew.

(b) Chicago and/or Coffeyville, individual exceptions to the above. In two out of three cases, XX-503 and St. Joseph #17 show less than average erosion and more than average dirt; likewise, XX-50 and (quite definitely) XX-592 show maximum erosion and minimum dirt.

Moving to the general consideration of film durability (except that one of its components, erosion, has already been covered), we can make some brief general statements along the same lines as those of the previous report, using the same techniques of examination. There is a considerable range of checking and cracking, partly microscopic, at each location, Coffeyville showing the most visible failure; likewise a range within each formula type, Rx 471 showing generally least failure.

XX-592 -- consistently poorest throughout
St. Joseph #17 -- definitely on the poor side
XX-50, ZZZ-55, St. Joseph #40 -- about average, satisfactory but showing some cases of serious failure
ZZZ-33, XX-503 -- clearly best
St. Joseph #42 -- well above the average

In trying to reach an agreement among the Department's house paint formulators on the general durability ratings of the several paints, a point was raised which suggested a departure from our regular examination techniques. Briefly, it was convincingly argued (a) that low ratings of microscopic checking (with the 40-power microscope) give many exposure samples a worse record than they deserve on the basis of practical durability and protection of the wood, and (b) that in many cases, notably SWP tints, we have ample evidence that such microscopic checking rated as low as 3 at one year may not increase in severity over the next two or three years.

0007-SWP-000115316

In order to eliminate the possible misleading effect of "microscopic failure" ratings, all panels were re-examined with a 2-1/2X linen tester lens. This might be referred to as an "aided eye" or "macro" examination. Most of the failure thus observed, at least in this series, must be rated as cracking, since it is impossible to distinguish between checks and cracks unless they are very obvious. An analysis of the ratings by this "aided eye" technique yields the following results compared with those cited above:

XX-592 again clearly poorest in durability
ZZZ-55 dropping to second poorest, but well ahead of XX-592
XX-50, St. Joseph #40, St. Joseph #42, especially the latter, all dropping considerably, rating "a little below average."
St. Joseph #17 rating the same as the preceding, but this represents a considerable gain over the previous system.
ZZZ-33, XX-503 again clearly best

We are inclined, at least in this particular series, to favor the new type of rating as more indicative of the "practical durabilities" of the paints in question.

The following summation of checking and cracking gives an indication of how these two ratings compare in practice, and also gives somewhat more detailed information on performance than the above comments.

This tabulation is made by totaling the checking and cracking ratings of the four year exposure ratings from Chicago, Coffeyville and Florida. A perfect score would be 30 points.

Lead Free Paints

Panel No.	Zinc Oxide	Micro Self-Primed	Macro Self-Primed	Macro Over Undercoater
15935	Azo ZZZ-33	26	29	30
36	New Jersey XX-503	24	30	30
37	New Jersey XX-50	21	26	24
38	New Jersey XX-592	12	16	17
39	St. Joe #17	18	23	25
40	St. Joe #40	19	22	20
41	St. Joe #42	22	22	21
42	Azo ZZZ-55	18	17	17

0007-SWP-000115317

Lead Containing

Panel No.	Zinc Oxide	Micro Self-Primed	Macro Self-Primed	Macro Over Undercoater
15943	Ozlo 412	24	29	30
44	Azo ZZZ-33	21	25	26
45	New Jersey XX-503	19	23	25
46	New Jersey XX-50	15	22	21
47	New Jersey XX-592	6*	11*	15*
48	St. Joe #17	17*	23*	23*
49	St. Joe #40	13*	19*	22*
50	St. Joe #42	19*	23*	24*
51	Azo ZZZ-55	15	22	20

*Panels of this group did not perform well even on the guide area. The cumulative rating shown here has not been justified in any way to compensate for the poor panels, therefore, it is reasonable to assume that paint performance with these zinc oxides might be expected to be somewhat better than these readings might indicate.

All tests are being retired from exposure.

JWC:ls

0007-SWP-000115318

Examination at 48 Months, Chicago

Panel No.	Description	RB No.	Chalk	Check	Crack	Eros'n	Dirt	Gen. App.
15934	Guide Reg. Rx 450-471	3208	6	10	10	6	6	6
35A	Rx 436 Fume Resistant with ZZZ-33 over Rx 450	3200	6	10	10	5	6	6
B	Self-primed	3200	6	10	8m	5	7	6
36A	With XX-503	3201	6	10	10	6	5	6
B	Self-primed	3201	6	10	10	6	5	6
37A	XX-50	3202	5	10	10	5	6	5
B	Self-primed	3202	5	10	8m	5	6	5
38A	XX-592	3203	5	7m	6m	5	6	5
B	Self-primed	3203	5	6m	3 part m	4	7	5
39A	St. Joe #17	3204	6	10	9	6	6	6
B	Self-primed	3204	6	10	8 part m	6	6	6
40A	St. Joe #40	3205	6	10	10	7	6	6
B	Self-primed	3205	6	10	9m	7	6	6
41A	St. Joe #42	3206	7	10	9m	7	6	6
B	Self-primed	3206	7	10	8m	7	6	6
42A	ZZZ-55	3207	6	10	8m	6	6	6
B	Self-primed	3207	6	10	7m	6	7	6
Rx 471 SWP Gloss White								
15943A	As guide using Co-fumed	3208	7	10	9m	7	5	5
43B	Self-primed	3208	6	10	8m	6	5	5
44A	Mechanical Mix with ZZZ-33	3209	5	10	10	6	6	6
B	Self-primed	3209	5	10	9m	6	7	6

0007-SWP-045946

0007-SWP-000115319

Panel No.	Description	RB No.	Chalk	Check	Crack	Eros'n	Dirt	Gen. App.
15945A	With XX-503	3210	6	10	10	6	5	6
B	Self-primed	3210	6	10	9m	6	5	6
46A	With XX-50	3211	5	10	8	5	6	5
B	Self-primed	3211	5	10	6 part m	5	6	5
47A	With XX-592	3212	6	7m	4 part m	6	5	5
B	Self-primed	3212	5	7m	2 part m	5	6	4
48A	St. Joe #17	3213	6	10	9m	7	6	6
B	Self-primed	3213	5	10	8m	6	6	6
49A	St. Joe #40	3214	6	8m	8	6	5	5
B	Self-primed	3214	6	8m	6	4	5	4
50A	St. Joe #42	3215	5	10	8m	6	6	6
B	Self-primed	3215	5	10	8 part m	6	7	6
51A	ZZZ-55	3216	6	10	8 part m	6	5	5
B	Self-primed	3216	6	10	6 part m	5	5	5
St. Joe Paints (lead-free)								
15952A	Using ZZZ-33	---	6	10	10	6	6	6
B	Self-primed	---	6	10	9m	5	6	5
53A	XX-503	---	7	10	10	6	6	6
B	Self-primed	---	6	10	9m	5	6	5
54A	XX-50	---	7	10	9m	5	6	5
B	Self-primed	---	7	10	7m	5	6	5
55A	XX-592	---	6	8m	4m	7	6	6
B	Self-primed	---	6	8m	2m	6	6	6

Panel No.	Description	RB No.	Chalk	Check	Crack	Eros'n	Dirt	Gen. App.
15956A	St. Joe #17	---	7	8m	5m	7	5	6
B	Self-primed	---	7	6m	5m	7	5	6
57A	St. Joe #40	---	6	10	9m	7	5	6
B	Self-primed	---	6	10	8m	6	5	6
58A	St. Joe #42	---	6	10	9m	6	6	6
B	Self-primed	---	7	10	8m	5	6	5

Examination at 48 Months, Florida

Panel No.	Chalk	Check		Crack		Mildew		Eros'n		Dirt	Gen. App.
		Guide	Test	Guide	Test	Guide	Test	Guide	Test		
15934F	5	--	--	--	--	--	--	--	--	6-7	6-7
35A	5	8m	8m	10	10	8	6	6	6	7	6
B	5	8m	8m	10	10	8	6	6	6	7	6
36A	5	8m	8m	10	10	8	6	6	6	6	5
B	5	8m	8m	10	10	8	6	6	6	6	5
37A	5	8m	8m	10	10	8	6	6	7	6	5
B	4	8m	8m	10	10	8	6	6	7	6	5
38A	4	8m	3m	10	8m	7	5	6	8	7	5
B	4	8m	3m	10	8m	7	5	6	8	7	5
39A	4	8m	5m	10	8m	8	6	6	8	7	6
B	4	8m	5m	10	8m	8	6	6	8	7	6
40A	5	8m	5	10	5	9	6	6	7	6	5
B	4	8m	part m 5	10	part m 5	9	6	6	7	6	5
41A	4	8m	part m 8m	10	part m 10	8	5	6	8	6	5
B	5	8m	8m	10	10	8	5	6	8	6	5

0007-SWP-000115321

Panel No.	Chalk	Check: Guide	Check: Test	Crack Guide	Crack Test	Mildew Guide	Mildew Test	Eros'n Guide	Eros'n Test	Dirt	Gen. App.
15942A	4	8m	6 part m	10	7 part m	8	5	6	8	7	5
B	4	8m	6 part m	10	7 part m	8	5	6	8	7	5
43A	6	8m	8m	10	10	8	7	6	7	6	6
B	6	8m	8m	10	10	8	7	6	7	6	6
44A	5	8m	6m	10	10	7	6	6	7	7	6
B	4	8m	6m	10	10	7	6	6	7	7	6
45A	5	8m	6m	10	10	7	5	6	8	7	5
B	4	8m	6m	10	10	7	5	6	8	7	5
46A	5	8m	4m	10	8m	7	5	6	8	7	5
B	5	8m	5m	10	9m	7	5	6	8	7	5
						EROS'N		MILDEW			
47A	6	2 part m	2	6 part m	6	9	9	3	3	5	3
B	5	2 part m	2	6 part m	6	9	9	3	3	5	3
48A	6	3 part m	3	7 part m	7	9	9	3	3	5	3
B	6	3 part m	3	7 part m	7	9	9	3	3	5	3
49A	6	4m part m	4m	8m part m	8m	9	9	5	6	6	5
B	5	4m	4m	8m	8m	9	9	5	6	6	5
50A	6	3 part m	5	6 part m	7	9	9	5	6	6	5
B	5	3 part m	6	6 part m	7	9	9	5	6	6	5
51A	6	8m part m	2	10 part m	5	6	8	7	5	5	4
B	5	8m	4 part m	10	7 part m	6	8	7	5	5	4
52A	6	9m	9m part m	10	10	7	8	6	6	6	5
B	6	9m	9m	10	10	7	8	6	6	6	5
53A	6	9m	9m	10	10	7	8	6	6	6	5
B	5	9m	9m	10	10	7	8	6	6	6	5

0007-SWP-045949

0007-SWP-000115322

Panel No.	Chalk	Check Guide	Check Test	Crack Guide	Crack Test	Eros'n Guide	Eros'n Test	Mildew Guide	Mildew Test	Dirt	Gen. App.
15954A	5	9m	5m	10	8m	7	8	7	7	7	6
B	5	9m	8m	10	10	7	8	7	7	7	6
55A	5	9m	8m	10	10	7	7	7	7	6	5
B	5	9m	6m	10	8m	7	7	7	7	6	5
56A	5	9m	8m	10	10	7	8	7	7	6	6
B	5	9m	7m	10	10	7	8	7	7	6	6
57A	5	9m	3 part m	10	7 part m	7	8	7	7	6	6
B	5	9m	2 part m	10	5 part m	7	8	7	7	6	6
58A	6	9m	5 part m	10	9 part m	7	8	7	7	6	6
B	6	9m	4 part m	10	8 part m	7	8	7	7	6	6

Examination at 48 Months, Coffeyville

Panel No.	Chalk	Check Guide	Check Test	Crack Guide	Crack Test	Eros'n Guide	Eros'n Test	Dirt	Gen. App.
15934	7	--	--	--	--	--	--	7-8	6-7
35A	7	10	10	10	10	7	6	7	6
B	7	10	10	10	10	7	6	7	6
36A	7	10	7m	10	10	7	7	6	7
B	7	10	6m	10	10	7	7	6	7
37A	6	10	6m	10	10	7	6	7	6
B	6	10	5m	10	10	7	6	7	6
38A	7	10	4m	10	10	7	6	7	6
B	7	10	3m	10	9m	7	6	7	6

0007-SWP-045950

0007-SWP-000115323

Panel No.	Chalk	Check		Crack		Eros'n		Dirt	Gen. App.
		Guide	Test	Guide	Test	Guide	Test		
15939A	7	8m	5m	10	10	7	6	7	6
B	7	8m	3m	10	8	7	6	7	6
40A	6	9m	6m	10	10	7	6	7	6
B	6	9m	4m	10	8	7	6	7	6
41A	7	7m	3m	10	7 part m	7	6	7	6
B	7	7m	3m	10	7 part m	7	6	7	6
42A	7	8m	3m	10	8 part m	7	6	7	6
B	7	8m	3m	10	8 part m	7	6	7	6
43A	7	8m	9m	10	10	7	7	6	6
B	7	8m	8m	10	10	7	7	6	6
44A	7	7m	7m	10	9m	7	7	6	6
B	7	7m	6m	10	8m	7	7	6	6
45A	7	8m	5m	10	8m	7	7	6	6
B	7	8m	4m	10	7m	7	7	6	6
46A	6	8m	5m	10	8m	7	7	6	6
B	6	8m	5m	10	8m	7	7	6	6
47A	5	3 part m	3	5 part m	5	7	7	6	6
B	5	3	2	5	4	7	7	6	6
48A	7	3	6m	5	9m	7	7	6	6
B	7	3	6m	5	8m	7	7	6	6
49A	7	3 part m	4	5 part m	6	7	7	6	6
B	6	3 part m	3	5 part m	5	7	7	6	6
50A	7	7m	7m	10	10	7	8	6	7
B	7	7m	6m	10	9m	7	8	6	7

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0007-SWP-000115324

Panel No.	Chalk	Check		Crack		Eros'n		Dirt	Gen. App.
		Guide	Test	Guide	Test	Guide	Test		
15951A	6	9m	7m	10	10	7	8	6	7
B	6	9m	7m	10	10	7	8	6	7
52A	7	9m	6m	10	10	7	7	6	6
B	7	9m	5m	10	10	7	7	6	6
53A	6	9m	6m	10	10	7	7	6	6
B	6	9m	5m	10	9m	7	7	6	6
54A	7	10	6m	10	10	7	7	6	6
B	6	10	4m	10	8m	7	7	6	6
55A	6	8m	3 part m	10	7 part m	7	6	7	6
B	6	8m	2 part m	10	5 part m	7	6	7	6
56A	7	9m	3 part m	10	7 part m	7	7	6	6
B	7	9m	2 part m	10	5 part m	7	7	6	6
57A	7	9m	5 part m	10	9 part m	7	7	6	6
B	6	9m	3 part m	10	7 part m	7	6	7	6
58A	7	9m	6 part m	10	10	7	6	7	6
B	6	9m	4 part m	10	9m	7	6	7	6

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0007-SWP-000115325

Formulas Involved

SWP Fume Resisting White - RB 3200

Pounds	Gallons	Material
100		1403
100		2030
290		Azo 33
288		20
	28-1/2	(2)
	19	(310)
	3	(5096)
	1-1/2	(543)
	2	(2231)
	1-1/4	(2236)
	4	(141)
	18-1/4	(348)

Wt./Gal. - T 13.29 - A 13.38
Viscosity 46" @ 75 deg. on #3

SWP Fume Resisting White - RB 3201

Pounds	Gallons	Material
Same as RB 3200 except using		
New Jersey XX-503		

Wt./Gal. - T 13.29 - A 13.26
Viscosity 35" @ 75 deg. on #3

SWP Fume Resisting White - RB 3202

Pounds	Gallons	Material
Same as RB 3200 except using		
New Jersey XX-50		

Wt./Gal. - T 13.29 - A 13.33
Viscosity 42" @ 75 deg. on #3

SWP Fume Resisting White - RB 3203

Pounds	Gallons	Material
Same as RB 3200 except using		
New Jersey XX-592		

Wt./Gal. - T 13.29 - A 13.31
Viscosity 32" @ 75 deg. on #3

SWP Fume Resisting White - RB 3204

Pounds	Gallons	Material
Same as RB 3200 except using		
St. Joe #17		

Wt./Gal. - T 13.29 - A 13.33
Viscosity 35" @ 75 deg. on #3

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SWP Fume Resisting White - RB 3205

Pounds	Gallons	Material
Same as RB 3200 except using		
St. Joe #40		

Wt./Gal. - T 13.29 - A 13.30
Viscosity 55" @ 75 deg. on #3

SWP Fume Resisting White - RB 3206

Pounds	Gallons	Material
Same as RB 3200 except using		
St. Joe #42		

Wt./Gal. - A 13.36
Viscosity 55 + 1/8 cup

SWP Fume Resisting White - RB 3207

Pounds	Gallons	Material
Same as RB 3200 except using		
Azo 55		

Wt./Gal. - T 13.29 - A 13.50
Viscosity 50" @ 75 deg. on #3

SWP Gloss White - RB 3208

Pounds	Gallons	Material
275		20
75		2132
150		1403
200		412
200		1424
	32-1/2	(2)
	19	(310)
	1-3/4	(901)
	5/8	(543)
	4	(141)
	16-3/4	(348)

Wt./Gal. - A 14.23
Viscosity 25" @ 75 deg. on #3

SWP Gloss White - RB 3209

Pounds	Gallons	Material
275		20
75		2132
150		1403
306		Azo 33
94		18

Vehicle same as RB 3208

Wt./Gal. - T 14.29 - A 14.30
Viscosity 44" @ 75 deg. on #3

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SWP Gloss White - RB 3210

Pounds	Gallons	Material
275		20
75		2132
150		1403
306		New Jersey XX-503
94		18

Vehicle same as RB 3208

Wt./Gal. - T 14.29 - A 14.3
Viscosity 31" @ 75 deg. on #3

SWP Gloss White - RB 3211

Pounds	Gallons	Material
275		20
75		2132
150		1403
306		New Jersey XX-50
94		18

Vehicle same as RB 3208

Wt./Gal. - T 14.29 - A 14.20
Viscosity 29.2" @ 75 deg. on #3

SWP Gloss White - RB 3213

Pounds	Gallons	Material
275		20
75		2132
306		New Jersey XX-592
94		18
150		1403

Vehicle same as RB 3208

Wt./Gal. - T 14.29 - A 14.29
Viscosity 36.5" @ 75 deg. on #3

SWP Gloss White - RB 3213

Pounds	Gallons	Material
275		20
75		2132
306		St. Joe #17
94		18
150		1403

Vehicle same as RB 3208

Wt./Gal. - T 14.29 - A 14.31
Viscosity 34" @ 75 deg. on #3

SWP Gloss White - RB 3214

Pounds	Gallons	Material
275		20
75		2132
306		St. Joe #40
94		18
150		1403

Vehicle same as RB 3208

Wt./Gal. - T 14.29 - A 14.28
Viscosity 54" @ 75 deg. on #3

SWP Gloss White - RB 3215

Pounds	Gallons	Material
275		20
75		2132
306		St. Joe #42
94		18
150		1403

Vehicle same as RB 3208

Wt./Gal. - A 14.27
Viscosity 52" @ 75 deg. on #3

SWP Gloss White - RB 3216

Pounds	Gallons	Material
275		20
75		2132
306		Azo ZZZ-55
94		18
150		1403

Vehicle same as RB 3208

Wt./Gal. - A 14.33
Viscosity 51" @ 75 deg. on #3

SWP Undercoater - RB 3217

Pounds	Gallons	Material
100		2077
250		20
240		511
120		18
142		2174
3		547
	3/4	(5094)
	28	(2)
	14-1/2	(310)
	4	(141)
	1-1/2	(901)
	1-1/2	(543)
	25	(348)

Wt./Gal. - T 13.73 - A 13.60
Viscosity 14.8" @ 75 deg. on #3

We have no formulas or description of the paints submitted by St. Joseph, other than a statement of the zinc oxide used in each, which is typed with the Florida readings (above).

JWC:ls

0007-SWP-000115329

Paint Research Department - August 13, 1956

Final Report on Exposures 15835-72 F,C

Titanium Pigment Corporation Cooperative Series (1951)

Purpose

To compare exposure results on white and tinted house paints, planned as an extension of a previous series, with special emphasis on comparison of results at our locations with those at Sayville, New York. A progress report was issued on September 24, 1952, at one year, another on December 14, 1953, at 24 months.

Paints Tested

Group 1 -- Fume Resisting House Paints

Paint No.	TiO_2 Variation
RB 3328	Titanox A/AA 50/50 blend
RB 3329	Titanox AA
RB 3330	Titanox A/RANC 75/25 blend
RB 3331	Titanox A/RCHT 50/50 blend

Group 2 -- Lead Containing Gloss White

Paint No.	TiO_2 Variation
RB 3299	Titanox A
RB 3300	Titanox A/AA 50/50 blend
RB 3301	Titanox A/RANC 82/18 blend
RB 3302	Titanox A/RCHT 50/50 blend

Group 3 -- Lead Containing Tint - Colonial Yellow

Paint No.	TiO_2 Variation
RB 3303 Y	Titanox RANC - Mg silicate
RB 3304 Y	Titanox RC - Mg silicate
RB 3305 Y	Titanox RANC - Ca carbonate
RB 3306 Y	Titanox RC - Ca carbonate

Group 4 -- Lead Containing Tint - Gray

Paint No.	TiO_2 Variation
RB 3303 G	Titanox RANC - Mg silicate
RB 3304 G	Titanox RC - Mg silicate
RB 3305 G	Titanox RANC - Ca carbonate
RB 3306 G	Titanox RC - Ca carbonate

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Group 5 -- T.P. Co. White House Paints

Paint No.	
1527-1	10% TxA MO-10% TxRA-38.5% PbZn-15.7% BCWL-25.8% Asb.
1527-2	10% TxA MO-10% TxRA 10-38.5% PbZn-15.7% BCWL-25.8% Asb.
1527-3	20% Tx A168 LO-38.5% PbZn-15.7% BCWL-25.8% Asb.
1527-4	The same paint as No. 2 with all the lead being replaced by 45X on a volume basis.
1527-5	7.5% TxA MO-7.5% TxRA 10-34.6% PbZn-14.7% BCWL-35.7% Asb.
1527-6	35% TxRCHT-10% TxA MO-50% PbZn-5% Asb.
1527-7	The same paint as No. 6 with all the lead replaced by 45X on a volume basis.
1527-8	25% TxRCHT-7.5% TxA MO-35% PbZn-32.5% Asb.
1527-9	15% TxA 168 LO-10% TxRA 10-35% ZnO-20% Asb.-20% Calcium Carbonate.
1527-10	35% TxRCHT-10% TxA MO-35% ZnO-20% Asb.

Group 6 - T.P. Co. Tint Bases (Gray)

Paint No.	
1527-11	13% TxRANC-38% ZnO-13% 45X-36% Calcium Carbonate
1527-12	12% TxRANC-35% ZnO-53% Calcium Carbonate
1527-13	53% TxRC-34.5% ZnO 12.5% Basic Lead Silicate 45X
1527-14	20% TxRC-25% ZnO-10% 45X-45% Calcium Carbonate
1527-15	Primer 60% TxRC-20% BCWL-20% Asb. in usual dehydrated castor oil-linseed-ester gum vehicle at a PVC of 40%
1527-16	Primer - 65% TxRC-35% Asbestine in usual vehicle

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Preparation and Exposure

The paints are tested on cedar bevel siding as follows:

a. The left 1/3 of each panel a control using house paint undercoater plus SWP Gloss White or the appropriate SWP tint.

b. The center 1/3 of each panel a test topcoat over undercoater. (Undercoater for SWP groups is Rx 450. For T.P. Co. groups it is their #1527-15; but see also special T.P. Co. primer at end of list).

c. The right 1/3 of each panel the same test as the center 1/3 but self-primed work.

d. First coats at 450 sq. ft. per gallon, topcoats at 550.

Panels have been retired after 36 months at Miami, Florida, vertical south. Chicago panels, north and south vertical, were left on test up to 4 years, and have been retired.

Summary of Results

Group I. Fume Resisting Whites

All normal at Florida, look fair to good. Again, self-primed are a little cleaner and whiter than Rx 450-primed. RB 3329, with all Titanox AA, is least satisfactory because of more mold growth and dirt, slower clean-up than the others. The Chicago tests, considering the added year, also seem quite satisfactory. Here RB 3329 does not stand out as dirty or slow in chalking. A/RCHT shows some rutile yellowing.

Group II. Lead Containing Whites

Florida panels definitely cleaner and less mold growth than guide or Group I. Surface flaking (lack of uniformity of chalking) varies considerably, with A/RANC showing up rather poorly on this account. At Chicago, erosion runs about the same as in Group I, and the tests are generally satisfactory. The A/RANC sample, however, stands out both for rutile yellowing and microscopic checking.

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Group III. Lead Containing Tints -- Colonial Yellow

Fading and chalk-masking rate as before, the two locations agreeing very well and showing RC/calcium carbonate poorest and RC/magnesium silicate best. RC seems to be prone to cause checking, and since this is worse with calcium carbonate, this sample (RB 3306) stands out as poorest. Color retention seems to be the only redeeming feature of the RC/magnesium silicate formula, although at Chicago it seems to resist checking. Neither RANC sample shows checking, and all tests of RANC fall in the intermediate range as regards color and clean-up.

Group IV. Lead Containing Tints -- Westchester Gray

Though not as pronounced, this shade now (contrary to the previous report) shows the same trend as Group III in color retention. Checking again follows the same pattern, serious with RC. The Chicago panels verify the inferiority of the RC/calcium carbonate blend, but do not show up RC/magnesium silicate as well as the Florida panels do. However, this is due to erosion and not to yellow chalk face, as reported at 24 months.

Group V. Titanium Pigment Corporation Whites, With Their Primer #1527-15 (20% BCWL)

This group shows some of the differences in performance noted at 24 months, as may be seen from the readings. The most notable are:

1. Clearly poor durability with #1527-15; self priming better.
2. Paint #5 checking more than #2
3. AMO/RA free of checking, but tends to be yellow, poor in clean-up. AMO/RA 10 very similar.
4. A168-10, somewhat contrary to the 24 month report, by itself shows a little checking but good clean-up, however, the blend with RA 10 tends to check and is quite dirty and yellow.

Group VI. Titanium Pigment Corporation Tints, Gray

Again this group shows heavy chalk masking and generally unsatisfactory appearance. Checking, especially at Florida, has advanced to a serious stage in most cases, considerably more so on the T.P. paints than on the RB 3303G control (as in Group IV). Paint #14 is clearly poorest in durability; in color retention it is best at Florida, but marred by yellowing at Chicago. Paint #12 shows good color retention, presumably largely due to calcium carbonate, without the yellowing, and perhaps could be rated generally best of this group. On durability alone, Paint #11 might be given a slight edge. This would indicate that high calcium carbonate is good for tint retention, but that partial replacement with 45% improves durability.

0007-SWP-000115333

Group VII. (Supplementary)

Checking, noted at 24 months as very slight on the #1527-16 primer-Rx 471 system, has not advanced to a serious stage at either location. This primer, similar to #1527-15 above, but with BCWL removed, now seems to give the same results as #15 with reference to Paint #9 as topcoat. But with Paint #10, especially at Chicago, the leadless primer does much better.

Examination Results

Examination at 36 Months, Florida

Panel No.	Description	RB No.	Chalk	Check	Crack	Surf. Flake	Fade	Mildew Guide	Mildew Test	Dirt	Gen. App.
guide	Rx 450 plus Rx 471 reg.										
15835F	all 1403, left 1/3	3299	5	10	10	5				7	7
SWP Fume Resisting											
36	Rx 436 50/50 Tx A/AA	3328	5	10	10	5		7	7	7	7
36-2	"2's" all self-primed, otherwise as 36	3328	4	10	10	5		7	7	7	7
37	All Tx AA	3329	6	8m	10	4		7	5	5	5
37-2	Self-primed	3329	5	8m	10	5		7	6	6	6
38	75/25 TxA/RANC	3330	6	8m	10	8		7	7	6	6
38-2	Self-primed	3330	5	8m	10	8		7	7	7	7
39	50/50 TxA/RCHT	3331	6	8m	10	8		7	7	6	6
39-2	Self-primed	3331	5	8m	10	8		7	7	7	7
SWP Gloss White											
40	Rx 471 as guide	3299	5	10	10	4		6	5	6	5
40-2	Self-primed	3299	5	10	10	8		6	6	6	6
41	50/50 TxA/AA	3300	6	10	10	7		7	8	6	6
41-2	Self-primed	3300	5	10	10	7		7	8	7	7
42	82/18 TxA/RANC	3301	4	10	10	5		7	7	6	6
42-2	Self-primed	3301	4	10	10	5		7	8	7	7
43	50/50 TxA/RCHT	3302	6	10	10	7		8	8	6	6
43-2	Self-primed	3302	6	10	10	8		8	8	7	7

0007-SWP-000115334

Panel No.	Description	RB No.	Chalk	Check	Crack	Surf. Flake	Fade	Mildew Guide	Mildew Test	Dirt	Gen. App.
SWP Colonial Yellow Guide Reg. 450, White											
15844F	Rx 465 reg.	3303Y	7	8m	10	10	4			5	4
45	Same, but center 1/3 (RANC + 20 dry)	3303Y	7	8m	10	10	4	6	6	5	4
45-2	Self-primed	3303Y	7	8m	10	10	3	6	6	5	3
46	TxRC/20	3304Y	6	3m	10	10	5	5	4	4	4
46-2	Self-primed	3304Y	6	2m	10	10	4	5	4	4	3
47	RANC/566	3305Y	6	8m	10	10	4	5	4	5	3
47-2	Self-primed	3305Y	6	7m	10	10	3	5	4	5	3
48	RC/566	3306Y	7	2m	10	10	3	5	6	4	2
48-2	Self-primed	3306Y	6	2m	10	10	2	5	6	5	2
SWP Westchester Gray Guide Rx 450 White, plus 477											
15849	Left 1/3	3303G	5	8m	10	10	2	--	--	5	2
50	Same but center (RANC - 20 dry)	3303G	5	8m	10	10	2	6	6	5	2
50-2	Self-primed	3303G	5	7m	10	10	2	6	7	5	2
51	RC/20	3304G	6	5m	10	10	4	6	6	5	4
51-2	Self-primed	3304G	7	3m	10	10	4	6	6	5	4
52	RANC/566	3305G	7	7m	10	10	3	6	6	6	3
52-2	Self-primed	3305G	6	7m	10	10	3	6	7	6	3
53	RC/566	3306G	6	2m	10	10	3	6	6	6	3
53-2	Self-primed	3306G	6	2m	10	10	3	6	6	6	3
T.P. Co. Paints, White Guide as 15835, but T.P.'s											
15854	reg. primer 1527-15(left and center parts all this primer)	3299	5	7-9m	10	5		--	--	6	4-6
		T.P. No.									
55	T.P. White, with TxA-MO/RA	1527-1	4	7m	10	8		5	3	4	3
55-2	Self-primed	1527-1	4	7m	10	8		5	5	5	4

0007-SWP-000115335

Panel No.	Description	RB No. / T.P. No.	Chalk	Check	Crack	Surf. Flake	Fade	Mildew Guide	Mildew Test	Dirt	Gen. App.
15856	A-MO/RA-10	1527-2	4	8m	10	9		5	3	4	3
56-2	Self-primed	1527-2	3	8m	10	9		5	4	5	4
57	TxA168-LO	1527-3	4	6m	10	4		5	4	5	4
57-2	Self-primed	1527-3	4	8m	10	6		5	4	6	5
58	As 15856 but 45X	1527-4	6	7m	10	8		5	4	4	4
58-2	Self-primed	1527-4	6	6m	10	7		5	4	4	4
59	A-MO/RA-10 but lead-zinc changes	1527-5	6	2 part m	10	5		6	4	3	3
59-2	Self-primed	1527-5	5	5m	10	4		6	5	5	5
60	RCHT/A-MO	1527-6	4	2	5 part m	8		7	7	5	6
60-2	Self-primed	1527-6	4	6m	10	5		7	6	5	6
61	As 60, but 45X	1527-7	5	2	5 part m	9		5	7	5	6
61-2	Self-primed	1527-7	5	4m	10	7		5	7	5	6
62	As 60, but more extender	1527-8	6	4m	7m	8		5	7	5	5
62-2	Self-primed	1527-8	6	6m	10	8		5	7	6	6
63	A168-LO and RA-10	1527-9	9	3m	10	7		5	7	3	3
63-2	Self-primed	1527-9	9	3m	10	7		5	7	3	3
64	RCHT/A-MO	1527-10	8	2m	10	10		6	8	4	4
64-2	Self-primed	1527-10	8	2m	10	10		6	8	3	3
T.P. Co. Tints, Gray Guide as 49, but T.P. Co. Primer		RB No. 3303G	6	7m	10	10	2				
66	T.P. Special RANC/45X/$CaCO_3$/ZnO	T.P. No. 1527-11	6	4m	10	10	3	6	8	5	3
66-2	Self-primed	1527-11	6	4m	10	10	3	6	8	5	3

0007-SWP-045963

0007-SWP-000115336

Panel No.	Description	RB No.	Chalk	Check	Crack	Surf. Flake	Fade	Mildew Guide	Mildew Test	Dirt	Gen. App.
15867	RANC/ZnO/$CaCO_3$	1527-12	9	2m	10	10	5	6	6	4	5
67-2	Self-primed	1527-12	9	2m	10	10	5	6	6	4	5
68	RC/ZnO/45X	1527-13	7	2 part m	7m	10	3	6	10	6	3
68-2	Self-primed	1527-13	7	2m	9m	10	3	6	10	6	3
69	RC/ZnO/45X/ $CaCO_3$	1527-14	9	0	8m	10	5	6	7	4	5
69-2	Self-primed	1527-14	9	0	10	10	5	6	7	5	5
T.P. White Guide as 15870	with Special Primer before, but T.P. Special Primer, which is 65/35 RC/asbestine	RB 3299	4	8m	10	5				6	5
71	As 15863, but spec. pr.	1527-9	7	2m*	10	10		5	8	2	2
71-2	Self-primed	1527-9	7	2m	10	10		5	8	3	3
72	As 15864, but spec. pr.	1527-10	6	3m	8m	10		5	8	5	5
72-2	Self-primed	1527-10	6	3m	8m	10		5	8	5	5

*This is mostly wrinkles and pitting.

0007-SWP-000115337

Examination at 4 Years, Chicago

Panel No.	SOUTH Chalk	Check	Crack	Eros'n	Fade	Dirt	Gen. App.	NORTH Chalk	Crack	Eros'n	Fade	Dirt	Gen. App.
Guide													
15835	6	10	7-8	5-6		6	6	6	10	6-7		5	5
SWP Fume Resisting													
15836	6	10	7m	6		6	6	6	10	6		5	5
36-2	6	10	8m	5		7	6	6	10	5		5	5
37	7	10	8m	5		6	6	6	10	6		5	5
37-2	6	10	8m	4		7	6	6	10	6		6	6
38	7	10	9m	5		7	6	6	7m	5		5M	5
38-2	7	10	9m	4		7	5	6	7m	5		6M	5
39	7	10	9m	6		6	6	6	8m	6		5	5
39-2	7	10	8m	5		7	6	6	8m	6		6	6
SWP Gloss White													
15840	6	10	9m	5		7	6	5	10	6		6	6
40-2	6	10	9m	4		7	6	5	10	5		6	5
41	7	10	9m	5		7	6	6	10	6		6	6
41-2	6	10	9m	4		7	6	6	10	5		6	5
42	5	10	6m	6		6	5	5	8	6		6	5
42-2	5	10	5 part m	5		6	5	5	8m	6		6	5
43	7	10	9m	5		7	6	7	10	6		6	6
43-2	7	10	7m	4		7	5	6	10	5		6	5
SWP Colonial Yellow													
15844	8	10	10	6-7	4	4M	4	8	10	8	4	4M	4
45	8	10	10	7	4	4M	4	8	10	7	4	4M	4
45-2	8	10	10	6	4	4M	4	8	10	7	4	4M	4
46	8	10	10	5	6	4	4	8	10	6	6	4M	5
46-2	8	10	10	6	5	5	5	8	10	7	6	4M	5

Panel No.	SOUTH Chalk	Check	Crack	Eros'n	Fade	Dirt	Gen. App.	NORTH Chalk	Crack	Eros'n	Fade	Dirt	Gen. App.
15847	9	10	10	7	5	4	5	8	10	7	5	5M	5
47-2	9	10	10	7	4	5	5	8	10	7	5	5M	5
48	9	4M	10	5	3	3	3	8	10	5	3	4M	3
48-2	9	4M	10	5	3	3	3	8	10	6	3	4M	3
49	7	10	10	6	4	6	5	7	10	8	5	4M	4
50	8	10	10	5	4	6	4	8	10	7	5	4M	4
50-2	8	10	10	6	4	6	5	8	10	7	4	4M	4
51	8	10	10	3	3	6	3	8	10	6	5	5M	5
51-2	7	10	10	4	3	6	3	7	10	7	4	5M	5
52	8	10	10	4	Y3	5	4	8	10	6	5	5	6
52-2	8	10	10	4	Y3	6	4	8	10	6	4	5	5
53	8	7m	10	4	Y2	5	3	8	10	6	4	5	5
53-2	7	7m	10	5	Y2	5	3	8	10	7	4	5	5
T.P. Co. Paints, White													
54	6	10	7-8	5-6		6	6	6	10	6-7		5	5
55	6		8m	5	Y	5	4	6	10	6		4	4
55-2	5		9m	5	Y	5	4	6	10	6		4	4
56	5		8m	5	Y	5	4	6	9m	7		4	4
56-2	5		9m	5	Y	5	4	6	6m	7		4	4
57	6	5m	4 part m	4		6	5	6	7 part m	5		6	4
57-2	5	5m	4 part m	4		6	5	6	7 part m	5		6	4
58	6		8m	4	Y	6	5	6	10	6	Y	5	4
58-2	6		8m	4	Y	6	5	6	10	6	Y	5	4
59	7		8m	4	Y	5	4	6	8 Part m	5	Y	4	4
59-2	6		8m	3	Y	5	4	6	5 part m	3	Y	4	3

0007-SWP-045966

0007-SWP-000115339

Panel No.	SOUTH Chalk	Check	Crack	Eros'n	Fade	Dirt	Gen. App.	NORTH Chalk	Crack	Eros'n	Fade	Dirt	Gen. App.
15860	7		8m	4	Y	5	3	7	8 part m	5	Y	4	4
60-2	6		7m	3	Y	5	3	6	7 part m	4	Y	4	3
61	7	3	3 part m	3	Y	5	2	7	8 part m	5	Y	4	4
61-2	7	3	3 part m	3	Y	5	2	7	5 part m	4	Y	4	4
62	7		5 part m	4		7	4	7	8	5		4M	4
62-2	7		4 part m	3		7	3	6	7 part m	4		5	4
63	8		9m	5	Y	5	4	7	10	7	Y	4	4
63-2	8		9m	5	Y	5	4	7	10	6	Y	4	4
64	7		6 part m	4	Y	5	4	6	8	6	Y	4	4
64-2	7		5 part m	3	Y	6	4	6	6 part m	5	Y	5	4
T.P. Co. Tints, Gray													
15865	8	10	10	6	4	6	5	8	10	6	5	4M	4
66	9	10	10	4	5	4	4	9	10	5	4	4	3
66-2	9	10	9	5	4	5	5	9	10	5	4	5	4
67	9	10	10	3	5	5	3	9	10	4	5	4	3
67-2	9	10	9	5	4	5	4	9	10	5	5	4	4
68	9	10	8	3	Y5	4	3	9	10	4	4	4	3
68-2	9	10	8	5	Y4	4	3	9	10	5	4	5	4
69	8	2m	6	2	Y3	4	2	9	10	3	Y5	3	2
69-2	8	2m	7	4	Y4	5	4	9	10	5	Y5	3	3
T.P. White with Special Primer													
15870	6	10	7-8m	5		6	6	6	10	6-7		5	5
71	7		9m	5	Y	5	5	7	10	7	Y	4	4
71-2	7		9m	5	Y	6	5	7	9	6	Y	4	4
72	7		9m	4	Y	6	4	6	10	6		5	5
72-2	7		8m	4	Y	6	4	6	8	6		5	5

0007-SWP-045967

0007-SWP-000115340

Formulas Involved

SWP Undercoater - Rx 450 - RB 3322

Pounds	Gallons	Material
100		2077
250		20
240		511
120		18
142		2174
3		547
	3/4	(5094)
	28	(2)
	14-1/2	(310)
	4	(141)
	1-1/2	(901)
	1-1/2	(543)
	25	(348)

Wt./Gal. - T 13.73 - A 13.80
Viscosity 19" @ 75 deg. on #3

Tint Base - RB 3305

Pounds	Gallons	Material
440		412
137		1004 Titanox RANC
375		566
	1/2	(5094)
	32-1/2	(2)
	19	(310)
	1-1/4	(901)
	3/4	(543)
	4	(141)
	1/4	(5027)

Wt./Gal. - T 14.65 - A 14.61
Viscosity 23" @ 75 deg. on #3

Tint Base - RB 3306

Pounds	Gallons	Material
440		412
325		2140 Titanox RC
230		566
	1/2	(5094)
	32-1/2	(2)
	19	(310)
	1-1/4	(901)
	3/4	(543)
	4	(141)
	11	(5027)

Wt./Gal. - A 15.16
Viscosity 33" @ 75 deg. on #3

Tint Base - RB 3304

Pounds	Gallons	Material
440		412
325		2140 Titanox RC
200		20
	1/2	(5094)
	32-1/2	(2)
	19	(310)
	1-1/4	(901)
	3/4	(543)
	4	(141)
	13	(348)

Wt./Gal. T 15.00 - A 15.02
Viscosity 37" @ 75 deg. on #3

0007-SWP-000115341

Tint Base - RB 3303

Pounds	Gallons	Material
440		412
137	1004 -	Titanox RANC
325		20
	1/2	(5094)
	32-1/2	(2)
	19	(310)
	1-1/4	(901)
	3/4	(543)
	4	(141)
	17	(5027)

Wt./Gal. - T 14.38 - A 14.31
Viscosity 22" @ 75 deg. on #3

SWP Gloss White - RB 3302

Pounds	Gallons	Material
250		20
175	2132 -	Titanox RCHT
100	1403 -	Titanox A
200		412
200		1424
	32-1/2	(2)
	19	(310)
	1-3/4	(901)
	5/8	(543)
	4	(141)
	15-3/4	(348)

Wt./Gal. - T 14.46 - A 14.50
Viscosity 26" @ 75 deg. on #3

SWP Gloss White - RB 3301

Pounds	Gallons	Material
30	1004 -	Titanox RANC
140	1403 -	Titanox A
200		412
200		1424
325		20
	32-1/2	(2)
	19	(310)
	1-3/4	(901)
	5/8	(543)
	4	(141)
	16-3/4	(348)

Wt./Gal. - T 14.25 - A 14.23
Viscosity 21" @ 75 deg. on #3

SWP Gloss White - RB 3300

Pounds	Gallons	Material
85	1403	- Titanox A
85	2030	- Titanox AA
200		412
200		1424
325		20
	32-1/2	(2)
	19	(310)
	1-3/4	(901)
	5/8	(543)
	4	(141)
	16-3/4	(348)

Wt./Gal. - T 14.25 - A 14.30
Viscosity 25" @ 75 deg. on #3

SWP Gloss white - RB 3299

Pounds	Gallons	Material
170	1403	- Titanox A
200		412
200		1424
325		20
	32-1/2	(2)
	19	(310)
	1-3/4	(901)
	5/8	(543)
	4	(141)
	16-3/4	(348)

Wt./Gal. - T 14.25 - A 14.31
Viscosity 25" @ 75 deg. on #3

Fume Resisting White - RB 3328

Pounds	Gallons	Material
100	1403	Titanox A
100	2030	Titanox AA
290		2059
288		20
	32-1/2	(2)
	19	(310)
	3	(5096)
	1-1/2	(543)
	2	(2231)
	1-1/4	(2236)
	4	(141)
	14-1/4	(348)
	4	(348)

Wt./Gal. - T 13.29 - A 13.33
Viscosity 42" @ 75 deg. on #3

Fume Resisting White - RB 3330

Pounds	Gallons	Material
126	1403 -	Titanox A
42	1004 -	Titanox RANC
290	2059	
314	20	
	32-1/2	(2)
	19	(310)
	3	(5096)
	1-1/2	(543)
	2	(2231)
	1-1/4	(2236)
	4	(141)
	14-1/4	(348)

Wt./Gal. - T 13.22 - A 13.23
Viscosity 41" @ 75 deg. on #3

Fume Resisting White - RB 3329

Pounds	Gallons	Material
290	2059	
288	20	
200	2030 -	Titanox AA
	32-1/2	(2)
	19	(310)
	3	(5096)
	1-1/2	(543)
	2	(2231)
	1-1/4	(2236)
	4	(141)
	14-1/4	(348)
	3	(348)

Wt./Gal. - T 13.29 - A 13.31
Viscosity 41" @ 75 deg. on #3

Fume Resisting White - RB 3331

Pounds	Gallons	Material
290	2059	
112	20	
75	1989	
246	2132 -	Titanox RCHT
74	1403 -	Titanox A
	32-1/2	(2)
	19	(310)
	3	(5096)
	1-1/2	(543)
	2	(2231)
	1-1/4	(2236)
	4	(141)
	14-1/4	(348)

Wt./Gal. - T 13.48 - A 13.45
Viscosity 32" @ 75 deg. on #3

J. W. CHAPIN

JWC:ls

0007-SWP-000115344

Inspection Trip
Exposures - du Pont Electrochemicals Department
du Pont Pigments Department
Titanium Pigment Corporation
National Lead Company
June 20 and 21, 1957

- - -

General Statement

On June 20 Mr. Fasig, Harvey Gehring, Clovis Adams and the writer examined some of the exterior emulsion paint panel exposures of the du Pont Electrochemicals Department. We also examined some of the exterior house paint panel exposures and a few of the house tests put out by the du Pont Pigments Department in or near Wilmington, Delaware. On June 21 Adams, Gehring and the writer examined some of the exterior paint exposure panels of Titanium Pigment Corporation at Sayville, N. Y. Mr. Adams and I also reviewed very quickly some of the 18 M S-W leaded zinc and 45 X basic silicate white lead exposures put out by National Lead Company, also at Sayville. We had time only to glance at some M 50 basic lead silico chromate tests. Mr. E. W. Boughton of the R. T. Vanderbilt Company accompanied us on the trip.

This report is based on the writer's observations and notes. It may differ in content, interpretation or emphasis from those of the other people making the same inspections.

The following comments are offered as general observations:

1. No basically new principles of formulation were presented.

2. Exterior emulsion paints are receiving more attention each year that we make inspections. There is a more tolerant attitude toward application of emulsion paints on wood. However, both du Pont and TPC always make many reservations in such discussions.

3. There was nothing new to report on preservatives (fungicides). Both du Pont and TPC had about the same knowledge of Buckman's "mystery" preservative as we, but no more. Both are paying more attention to possible effects of preservatives on the normal chalking rates of paints containing titanium pigments. There are cases where chalking is retarded definitely.

4. Where comparisons were available on quality control, no evidence was seen that any one of the titanium pigment producers had a consistent advantage in quality over another.

5. We note some relaxation in du Pont's recommendations for use of low zinc oxide - calcium carbonate house paint formulations. They now concede a few of the disadvantages of such formulas which we have pointed out in the past. They now admit some merit in magnesium silicate.

JCW
JUL 19 1957

0007-SWP-045972

0007-SWP-000115345

6. Jack Broeker (retired) of du Pont has a very high opinion of our co-fumed leaded zinc - Ozlo 18 M.

7. du Pont has put out a very high style exposure farm booklet. It is illustrated profusely with color pictures of panels, houses, etc. Nevertheless, it is very difficult to use during inspections. The slick paper is hard to write on and the pasted pictures are lumpy and upset the writing.

Even more objectionable is their system of consolidating all repeats of each main series on one page of the booklet. Since these repeats may have been put out annually or even oftener there may be as many as eight actual series on one page. Usually there are minor variations each year which are not included in the printed information. It is almost impossible to write down the details and make observations and notes during the brief time the panels are being described.

The lesson to be learned from this is that we should adhere to our present system of making up our booklet on our own exposures. We list each panel by number, with the variations from basic formulations described briefly. In this way the observer can jot down his observations of each panel quickly and systematically. TPC follows this same plan.

8. du Pont have a tremendous number of panels on exposure. However, my personal impression was that the variety of ideas studied and the aims of so many series are hard to comprehend in a necessarily hurried inspection. In contrast, while Titanium Pigment Corporation's exposures again are in very considerable numbers, their series are easier to follow, both as to intent and results.

9. du Pont apparently persist in their intention to get out of the production of titanium calcium pigments. They probed every way they could to check the reasons for our interest in 30 and 50% extended titanium pigments. Apparently their method of production is unprofitable, and the capital investment to put them into a new and profitable method of production is considered excessive. We said we did have an interest in such pigments, particularly in C 50.

10. du Pont is proceeding further in the direction of producing TiO_2 by the chloride rather than the sulfate process. We have tests in progress to determine whether some instances detected of more chalking, more fading and more susceptibility to rutile yellowing for chloride pigment are characteristic of regular chloride production.

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du Pont Exposures - Electrochemicals Department, Wilmington, Delaware

Herb Beardsley showed us a few of the some 4100 panel exposures of emulsion paints they now have at Newport. These are in addition to some 2000 panels put out originally by Elchem on their own test farm. Most of the panels we saw at Newport were put out in 1955. They were preceded by about 3-1/2 years of exposure work at their former test location.

The most important comparisons were between their 84-1100 homopolymer polyvinyl acetate, which they are promoting currently, and 81-900 which has been their standard homopolymer for some years. To our knowledge du Pont has not disclosed the fundamental differences between 84-1100 and 81-900. In one series, put out in September, 1955, Elvacet 84-1100 is showing slower chalking than 81-900. The paints were pigmented at 27% PVC using a 90/10 rutile/anatase TiO_2 ratio, with 1/3 pound of mica. du Pont now recommends an 80/20 ratio of rutile/anatase TiO_2 in 84-1100 whites, and straight R-610 rutile in tints.

Another series put out at the same time compares 84-1100 and 81-900 tints with straight R-610 TiO_2 tinted with phthalo blue. These were at 28% PVC and used 15% dibutyl phthalate as the plasticizer. 84-1100 shows better color retention than the 81-900 tints.

In general, 84-1100 seems to accept higher pigment loadings than 81-900 before loss in performance appears. du Pont prefers 30% PVC for 84-1100 paints. 81-900 showed progression in fading, scaling and erosion as PVC's were increased in steps from 15 to 40%. 84-1100 was definitely better after 1-1/2 years' exposure. When painted over weathered (chalky) house paint on wood, and exposed at 45° for 1-1/2 years, comparisons at 25% PVC favor 84-1100 over 81-900. When the PVA paints are applied on glazed cement asbestos shingles, higher PVC's encourage flaking, especially with 81-900.

Lower PVC's tend to collect more dirt, higher PVC's show more flaking. If plasticizer contents are increased to accomplish better film consolidation, dirt collection is compromised. du Pont prefers to use some anatase TiO_2 in the white to control dirt on 84-1100 paints.

du Pont had a number of extenders under study. These were usually used as single extenders although they would prefer to have some mica present. PVC's were held constant at 27.5%. All the paints looked good after two years on glazed and porous cement asbestos shingles. They were also tested on yellow pine, comparing a regular oil type house paint two coat system vs. one coat oil primer plus one coat emulsion paint vs. two coats emulsion paint self-primed. The oil paint in this group looks very bad due to mold and cracking. We feel there is something wrong in the preparation of this part of the panels and Beardsley agreed. A coat of PVA paint over the oil primer looks better than two coats self-primed, but the former usually shows more mold.

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As far as the individual extenders are concerned there was some failure on all. Time did not permit making careful comparisons between panels. Mica looked better than the others, showing less cracking and erosion. Nytal 300 was not equal to mica and both Asbestine 3 X and Mistron HGO-55 showed definite cracking. ASP clays 400 and 500 showed about the same degree of cracking. Diatomaceous silica, Lorite, barytes, Snowflake Whiting and Wollastonite showed perhaps somewhat less cracking.

In December, 1955 du Pont put out a test on so-called "chalky" surfaces. They applied a water slurry of TiO_2 pigment on cement-asbestos shingles, followed by the test paints. On such a surface two coats of Elvacet 84-1100 paint are adhering better than 81-900. The rest of the panels were surface conditoned as listed below, followed by the emulsion topcoats. The present performance of the surface conditioners is as follows:

Elvanol-polyvinyl alcohol in aqueous solution. Looks good here but fails on house tests.

Elvalan-alkali solution of polyvinyl acetate copolymer. Fails.

Beckasol alkyd. Good.

Rez. Good.

Dulux Reinforcing Oil. Good.

Tung oil - 25% solution in mineral spirits. Good.

Pliolite clear. Good.

S-W Masonry Primer. Good.

PVA emulsion plus alkyd stirred in. Good.

PVA emulsion plus tung oil stirred in. Good.

They obtained approximately the same results on actual chalky repaint exposures on wood when surface conditioned, topcoated with 81-900 or 84-1100 paints and exposed at 45°. 84-1100 again performed better than 81-900. du Pont is interested in a surface conditioner which perhaps would be made up of equal weights of a PVA paint and a 25% solids solution of an oil or alkyd, plus some added surfactant to assist in the emulsification of the oil or alkyd.

There was nothing shown us by Electrochemicals group that are unusual or not covered in our own exposures. Both they and the Pigments Department show a definite preference for 84-1100 over 81-900. We have 84-1100 on test, but normally we do not use homopolymers on exteriors.

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du Pont Exposures - Pigments Department - Wilmington, Delaware

We did not take much time in looking at TiO_2 studies in conventional oil type house paints. We have this pretty well covered in our own exposures. However, it is interesting to mention certain of their own conclusions:

(a) Rutile R-610 is the only rutile grade they recommend for mixing with anatase to reduce chalking of white exterior paints "because it shows the least tendency to show chalk yellowing in the formulas tested." Up to now they have been reluctant to admit our contention that R-610 will also show "rutile yellowing," although less than other freer chalking rutiles.

(b) "While straight FF has given good performance in alkyd paints, at least 20% of rutile (on total TiO_2) is needed in linseed oil paints, and 70% to 90% of rutile is needed to avoid early erosion in emulsion paints."

(c) "Using straight R-610 in combination with selected $CaCO_3$ in white exterior paints, the amount of ZnO may be a very important factor in film discoloration (chalk yellowing)." (We find $CaCO_3$ increases the tendency toward rutile yellowing. MVL) In a tint base series out two years, with less zinc oxide and more calcium carbonate, rutile yellowing increased, even with R-610.

We examined certain tint base series we have checked in previous years (see page 6 et seq. 1956 report). The series we looked at were put out in May, 1954 and again in May, 1955, with the latest series put on exposure in May, 1956. The paints are exposed as whites and tints. The tinting colors include lampblack, P.C. Blue, P.C. Green, Green Gold, chrome yellow, molybdate orange and Parachlor Red. The basic pigmentations (all as oil paints) were:

1. R-610/35% leaded zinc/magnesium silicate at 33% PVC, with 3.9 lb. leaded zinc per gallon.

2. R-610/acicular zinc oxide/calcium carbonate at 41% PVC, with 2-1/2 lb. zinc oxide per gallon.

3. R-610/acicular zinc oxide/calcium carbonate at 43% PVC, with 1-1/2 lb. zinc oxide per gallon.

4. R-610/acicular zinc oxide/calcium carbonate at 39% PVC, with 2-1/2 lb. of zinc oxide per gallon.

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These basic paints were supplemented by similar paints plus preservatives, with non-reactive pigmented alkyd blister resistant paints, lead-zinc-inert paints of the 1920's, titanium calcium-zinc oxide oil paints, comparisons of R-510 chloride vs. sulfate, and emulsion paints - 81-900 PVA paints at 18.9% PVC and 26.7% PVC and an acrylic AC-33 paint at 28% PVC.

We will not go through all of the individual observations but will mention certain highlights. In general, paints 2, 3 and 4 showed better tint retention and less mold than paint 1. The lead-zinc-inert paint looked poor, with considerable dirt and mold. The titanium calcium-zinc oxide paints did not perform well, showing fading and mold. The blister resistant tints still looked anemic. The polyvinyl acetate paints were as good in color as any, and were clean. The acrylic paint was slightly dirtier than the polyvinyl acetate paints. In the May, 1956 series Elvacet 84-1100 showed better color retention than 81-900 or the acrylic.

Parachlor Red was still holding a fair tint in the low PVC PVA paint. Molybdate Orange was better than Parachlor Red in the oil paints but poorer in the emulsions. At three years R-510 chloride, R-510 sulfate and R-610 sulfate were about equal in tint retention. At two years there was an indication that R-510 chloride was somewhat cleaner than R-610 suggesting that it may not hold dirt as much as R-610.

We examined a number of bright colored house paint exposures, one series dating back to 1952, another back to 1954. In general, du Pont stress the advisability of keeping white pigments out of deep colors. Extenders act like white pigments in increasing fading. Where whites are used zinc oxide-calcium carbonate paints are better than leaded zinc-magnesium silicate. With non-reactive pigmentations in alkyd vehicles, high PVC's gave poor tint retention, while with low PVC's they encountered blistering and wrinkling. Vannoy pointed out the need for an alkyd vehicle for blister resistant paints which will bond to burned off zinc-containing chalked paint surfaces.

On yellows, normal amounts of zinc oxide are required to control mildew. Green Gold looks good in the alkyd, cadmium yellow does not. Ti-Tint Yellow-zinc oxide-calcium carbonate looks good in an oil paint but is expensive. Parachlor Red-zinc oxide-calcium carbonate looks quite good and bright, but any "milkiness" cannot be improved by dropping the zinc oxide because of mold. P.C. blues with R-610/zinc oxide/calcium carbonate show fair tint retention. Indanthrene blue fades earlier than P.C. blue but does not fade as far on prolonged exposure. R-510 chloride process is about equal to R-610 in P.C. Green tints but shows more fading with P.C. blues. Suprex Clay shows better

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color retention than ASP-400. Nytal 300 with Green Gold in an alkyd vehicle looks clean and bright. Toluidine Red versus cadmium red shows reversals - it is better on vertical north exposures, poorer on the south.

du Pont's exposures of flat exterior house paints are mostly of relatively recent origin (about one year) so they feel their findings are not conclusive. Also they are not very helpful to us as they are mostly high PVC formulas (40 to 70%), using "flat alkyd" vehicles. Their formulas usually include 1/2 pound of diatomaceous silica per gallon, combined with 1-1/4 to 3-7/8 pounds of magnesium silicate or 2-1/2 to 6 pounds of calcium carbonate. Apparently no attention was paid to PVC/CPVC relationships.

Taking the above into consideration, they report the following:

1. When used on wood, flat paints require either special primers or special reduction of the first coat to avoid:

   (a) Early flaking, or

   (b) Staining by leaching of soluble materials from the wood (True if PVC > CPVC - MVL.)

2. Alkaline extenders cause rutile yellowing. (This is terrific as formulas go down in zinc oxide and up in PVC, when $CaCO_3$ is the extender - MVL.)

3. Magnesium silicate gives better chalk fade resistance than $CaCO_3$ in tinted or bright color flat house paints, but more mold.

The following du Pont house tests were inspected:

1. Humphrey house.

The major portion of the house (brick and wood siding) was painted in May, 1954, using a conventional linseed oil primer-house paint system. It is compared with an Elvacet 81-900, polyvinyl acetate paint self-primed, pigmented with R-610 / FF/mica at 27% PVC. The PVA paint looks better than the oil paint and holds less dirt, but it had peeled in some spots on the old oil paint. Tha peeled sections were touched up in October, 1955 by removing the paint down to the wood and two coats of PVA paint were applied. These repaired spots are still intact, but other areas are again peeling over the old oil paint. This shows there is still a moisture problem. There is some intercoat peeling between the PVA paint and the oil paint on the bricks next to the ground.

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2. Powell house.

This house has porous cement asbestos shingles as the siding material. It was first painted on the front and foundation only with an oil paint. This was chalking freely in June, 1954 when two coats of paint were applied. The paint used on the whole house except for the comparison area on the rear (southeast) was a white Elvacet 81-900 emulsion paint, pigmented with R-610/FF/SiO_2 at 27.7%. This paint held well on the unpainted shingles but peeled badly from the chalky oil paint. The comparison paint was a regular primer-oil paint system. The primer was zincless and the top coat was a TiO_2/zinc oxide/calcium carbonate paint. The oil paint held to the old paint very well, but now shows erosion, mold and has a yellow cast. It also holds dirt under the eaves. The PVA paint on the comparison area is clean, is chalking freely but shows no erosion as yet.

In August, 1955, the front of the house was repainted. The peeling paint on the front was removed by steaming and scraping, treated with a commercial conditioner, then given two coats of Elvacet 81-900 emulsion paint. A small amount of peeling has reappeared on the window trim.

3. Kiser house.

The siding on this house was porous buff cement asbestos shingle, painted in July, 1954 with light green paints. The test area is on the rear, which faces north. The paints and their current condition are as follows:

(a) R-610/zinc oxide/calcium carbonate top coat over zincless primer, tinted with P. C. Green. It is uniform and shows the best tint retention of the various paints in this test.

(b) R-610/zinc oxide/magnesium silicate/SiO_2 Pliolite paint. It shows bad fading and definite chalk. PVC was 57.1%.

(c) R-610/magnesium silicate acrylic paint - 30% PVC. Shows good tint retention but has collected some dirt and mold. It shows some chalk.

(d) R-610/mica Elvacet 81-900 paint at 27.8% PVC. It shows definite chalk with some fade due to a white face.

There are no film failures in any of the paints after three years' exposure.

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4. Morgan house.

This is a previously unpainted cement asbestos shingle house, test painted in July, 1956 with two coats of yellow paint, tinted with Green Gold. The test area is on the rear of the house or north side. The paints and their present condition are as follows:

(a) R-610/mica Elvacet 81-900 paint at 20% PVC. In good condition, with slight dirt collection.

(b) R-610/Hi-Sil/mica/diatomaceous silica flat alkyd paint at 36.1% PVC. Good condition, slight mildew here, although it showed definite mold growth on panel tests.

(c) R-610/calcium carbonate/mica/diatomaceous silica flat alkyd paint at 54.4% PVC. Tint retention not quite equal to (b), but is clean and in good condition.

(d) R-610/magnesium silicate acrylic paint at 25% PVC. Tint retention is good but slightly gray, with slight mold.

(e) R-610/mica Elvacet 84-1100 paint at 20% PVC. There is more dirt than on the 81-900 paint, with some streaks of mold. The PVC should be increased for best performance.

5. Walther house.

This house has porous cement asbestos shingles which had been painted with an oil paint. It was chalking freely at the time of the test painting in October, 1956. It was given two coats of paint, tinted with P.C. Blue and lampblack. The tests were applied on the north or rear side. The paints and their present condition are as follows:

(a) R-610/calcium carbonate/mica/diatomaceous silica Pliolite paint at 59.3% PVC. The film is O.K. but flat and faded.

(b) Conventional primer-house paint system. Top coat R-610/ZnO/$CaCO_3$. Considerable fading, white and blotchy.

(c) R-610/magnesium silicate cyclopentadiene oil paint at 31% PVC. This section has a high uniform gloss, with a brown cast.

(d) R-610/mica/calcium carbonate/diatomaceous silica flat alkyd paint at 53.4% PVC. It shows no chalk.

(e) R-610/mica/magnesium silicate/diatomaceous flat alkyd paint at 46.1% PVC. This paint is darker than (d), showing better tint retention.

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Titanium Pigment Corporation - Sayville, Long Island, N. Y.

We have reported previously that Titanium Pigment Corporation put out an extensive group of exposures to check on our question of their quality control of RA NC production. These were put out in August, 1956 and represent the largest single group TPC has ever put out on exposure. The pigments were made into white, green and blue maleic alkyd enamels, at 18% PVC before shading. They were applied one coat over one coat of house paint primer on small cedar panels and exposed 45° south. They were also made into the SWP tint base formula (with Ozlo 18 M) in white, green and blue, at 36.7% PVC. They were exposed two coats self-primed on cedar bevel siding, south vertical. They were also made into four types of emulsion paints - acrylic AC-33, homopolymer polyvinyl acetate Elvacet 81-900, copolymer 12 K 55 and styrene butadiene Dow X-2562. The emulsion paints were applied on unglazed asbestos shingles. The pigmentation in the emulsion paints was 200 pounds TiO_2 plus 78# magnesium silicate, at 30% PVC for the acrylic and polyvinyl acetate paints and 35% for the styrene butadiene paints. Other series include alkyd flat exterior paints and an alkyd-Chlorowax enamel.

Chrome oxide was used for the green paints and P.C. Blue for the blue tints. The emulsion paints were brushed two coats self-primed on unglazed cement asbestos shingles and exposed south vertical.

In most of the series there are:

7 lots of Titanox RA NC (TPC)
5 lots of Titanox RA 50 (TPC)
1 lot of Titanox RA (TPC)
11 lots of Ti-Pure R-610 (du Pont)
3 lots of Ti-Pure R-510 (du Pont)
1 lot of Unitane OR-640 (Calco)
2 lots of Unitane OR-540 (Calco)

In most of the series comparisons are included of the extended titanium calcium pigments, one lot each, of Titanox RC (TPC), Titanox RC HT (TPC), Ti-Cal R-60 (du Pont) and Ti-Cal R-27 (du Pont). One lot of Titanox RA NC (D56F19#7A) was selected for blue tone and was expected to show low chalk resistance.

Gar Schurr examined these panels on April 9 and his report dated April 15 should be consulted as to their condition at that time. In some cases, chalking and fading has advanced definitely since then. The following covers current observations, largely confined to deviations from normal behavior.

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In the pure titanium oxides, the TPC RA NC sample D56F19#7A (S-14) and RA (S-28) are rather weak on fading throughout, as was expected. Ti-Pure R-610 sample S-17, Ti-Pure R-510 sample S-7 and Unitane OR-540 sample S-9 show somewhat reduced chalk resistance compared with other lots of similar grade. Unitane OR-540 sample S-8 is slightly weak. Ti-Pure R-510 sample S-7 varies, slightly weak in one group, better in two others. The non-chalking extended rutile calcium pigments Titanox RC and Ti-Pure R-60 look good, with Titanox RC HT showing more fading but Ti-Pure R-27 definitely the most fading. Care has to be taken in rating the extended pigments as they faded first but apparently do not hold the chalk. Especially in the emulsion paints the non-chalking rutile calcium pigments might rate as better than the pure TiO_2's, but if the chalk face is shed freely erosion may be rapid. In some cases with the pure oxides the first samples to show chalk may look good now, as they, too, shed the chalk.

The styrene butadiene series showed more fading than any of the series. There was some fading on all of the house paint tints based on the S-W zinc containing tint base. The flat house paint series looked a trifle better than the S-W type tints. The enamels were generally better in tint retention. The acrylics showed much less fading than styrene butadiene, and both the homo- and copolymer polyvinyl acetates were very close to the acrylic. The styrene butadiene paints were 5% higher in PVC than the other emulsion paints.

Contrary to TPC's contention that RA-50 has gloss and tint retention at least equal to RA NC, we usually rated RA NC as superior in these series. In addition, we generally rated the R-510 samples higher than the RA 50's, but not equal to RA NC or R-610. There are not sufficient data as yet to comment on any quality differences between RA NC and R-610 as shown in the various production samples under test.

We checked a number of TPC's regular series. The 1952 and 1953 commercial gloss white house paint series include some of our principal competitors' products. The paints put out in 1952 are now as follows:

National Lead #110. Some cracking, some erosion.

Sherwin-Williams #471. Some cracking on one poor white pine board, slight on others. Best paint on north.

Patterson-Sargent #218. Some cracking, looks best on south exposure now but mildewed early. Still shows mold on north.

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Benjamin Moore #100. Some checking and cracking, definite erosion both south and north.

Devoe - checked and cracked, bad yellow-gray color.

The 1953 series are particularly interesting because they show how sensitive the old lead-in-oil and lead-zinc-extender paints were to variations in the wood substrate. Commercial house paints show much less difference over cedar and white pine. Comparing the same paints as in the 1952 series, we observe the following:

National Lead #110. Some cracking.

Sherwin-Williams #471. Very slight cracking on white pine. Looks very good compared with others.

Patterson-Sargent #218. Mold on both south and north. Poor appearance.

Benjamin Moore #100. Some erosion.

A series of commercial white house paints put out in June, 1955 in general are all still in good condition. Special comments are as follows:

National Lead #110. Beautiful flow. Good condition.

Sherwin-Williams #471. O.K. but shows a shallow splitting which showed up immediately on white pine. Frank Smith says this is due to the texture of the wood.

Pittsburgh Plate Glass 1-40. O.K. No special comments.

du Pont #40. Poor flow. Holding dirt under laps of siding.

Sears #143. O.K. No special comments.

Montgomery Ward 75-1. O.K. No special comments.

Devoe #547. Slightly grayer on south, definitely so on north.

In November, 1953 TPC put out a series of high hiding - one coat house paints, one coat over a coat of primer on cedar and white pine. Comments on the proprietary one coat house paints in this series may be of interest. Most are in good condition except Socony's paint. Individual comments follow.

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SWP 476 One Coat House Paint. Looks very good.

Pittsburgh Plate Glass. No special comments.

Jones-Blair. Some spores both south and north.

Devoe. No special comments.

These paints were also applied one coat over bare wood. SWP 476 One Coat House Paint looks good, but not quite equal to one of TPC's specials based on 8% Titanox A 168/15% Titanox RA 50/77% Titanox RC HT in a raw and bodied linseed/long oil alkyd/chlorinated paraffin vehicle at 33% PVC. TPC would now recommend TiO_2 plus extenders. Devoe's paint looks poor and Socony's paint is dirty and mildewed.

Another series of high hiding white house paints was put out in June, 1955. In general, the proprietary paints look good, except for Devoe's which is gray-yellow and mildewed both on south and north. National Lead has nice flow, Sears' is O.K. and Ward's shows very slight mildew on the south and mildew on the north.

In June, 1956 TPC put out a group of commercial flat exterior paints, two coats self-primed on cedar siding. Their identification and current condition are as follows:

Brand	Pigmentation	Vehicle	PVC %	Condition
Yellow				
Moore	TiO_2-extender	Alkyd	61	O.K.
S-W	TiO_2-extender*	Alkyd-oil	34	Very slight fade, mildew.
Norfolk	TiO_2-extender	Copolymer oil	46	Bad fade and mildew.
National Lead	TiO_2-lead-extender	Linseed oil	55	O.K.

(Cont.)

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Brand	Pigmentation	Vehicle	PVC %	Condition
White				
Moore	As above	As above	As above	Good color.
S-W *	" "	" "	" "	Mildew north.
Norfolk	" "	" "	" "	Poor color and mildew.
National Lead	"	" "	" "	Good color.

*Note - Recent revision includes leaded zinc to control mildew. We will send TPC new formula for exposure and to test on their blister box.

In October, 1955 TPC put out an interesting series to determine the best type of coating to be used as an exterior tint base. The paints were applied as two coat work over both weathered cement asbestos shingles and cedar siding. There are two gloss tints at 33% PVC in a linseed oil vehicle, with the following pigmentations, respectively (applied over oil primer):

(a) 17.3% Titanox RA NC/29% zinc oxide/33.4% $CaCO_3$/20.3% chrome yellow.

(b) 52.7% Titanox RC/28.2% zinc oxide/19.1% chrome yellow.

The following flat exterior tints were applied two coats, self-primed:

(c) 22.4% Titanox RA NC/50% $CaCO_3$/27.6% chrome yellow at 50% PVC in alkyd vehicle.

(d) 60.4% Titanox RA NC/39.6% chrome yellow at 35% PVC in acrylic emulsion.

(e) 60.4% Titanox RA NC/39.6% chrome yellow at 35% PVC in copolymer polyvinyl acetate emulsion.

(f) 60.4% Titanox RA NC/39.6% chrome yellow at 35% PVC in butadiene styrene emulsion.

The yellow gloss oil paints on asbestos shingles are mottled and show slight fading on both shingles and cedar. The flat alkyd paint is uniform with only slight fading. All the emulsion paints show more fading and the butadiene emulsion paint has faded worst, with a pink cast. Green paints of the same types, using chrome oxide greens, perform in the same order.

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A somewhat similar series of tint studies was put out in May, 1956. The number of surfaces was increased to include:

Cement block	Weathered asbestos shingles
Stucco	New bevel siding
Glazed asbestos shingles	Weathered asbestos shingles
New shakes	

In the case of the two gloss oil paints they were applied as topcoats over a zincless house paint primer. The flat alkyd and the emulsion paints were applied two coats self-primed. The paints were as follows:

(a) 17% Titanox RA NC/29% zinc oxide/34% $CaCO_3$ tinted with chrome yellow, gloss paint with linseed oil vehicle at 33% PVC.

(b) 53% Titanox RC/28% zinc oxide/19% chrome yellow, gloss paint using linseed oil, 33% PVC.

(c) 38% Titanox RA NC/16% $CaCO_3$/46% Hansa Yellow, flat alkyd, 50% PVC.

(d) 68% Titanox RA NC/32% Hansa Yellow, acrylic emulsion paint, 30% PVC.

(e) 68% Titanox RA NC/32% Hansa Yellow, polyvinyl acetate copolymer, 30% PVC.

(f) 68% Titanox RA NC/32% Hansa Yellow, styrene butadiene, 30% PVC.

The color differences were much the same regardless of substrate. The gloss oil paints with chrome yellow are stronger than the rest of the paints, which use Hansa Yellow. The color of the flat alkyd is still fairly good. The emulsion paints fade more than the flat alkyd. The acrylic and polyvinyl acetate paints fade slightly more than the flat alkyd. Again, styrene butadiene shows bad fading with a pink cast.

Another series of flat exterior paints was put out in May, 1956. These paints were put out in tints as gray (lampblack), light blue (P.C. Blue), light green (chrome oxide) and light yellow (Hansa). The paints were prepared at 50% PVC in a straight alkyd vehicle, using the following pigmentations:

(a) 130# Titanox RA NC/365# natural calcium carbonate

(b) 130# Titanox RA 50/365# " " "

(c) 130# Titanox RA 50/320# natural calcium sulfate

(d) 435# Titanox RC/88# natural calcium carbonate.

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The results are about the same for all of the tints. In the blues and greens (b) shows slightly more fading than (a). (c) is quite bright. (d) shows bad fading and chalk mask and more tendency to water spot. TPC rates Titanox RC as suitable for use in tints at lower PVC's but not as high as 50%, as in this series. We avoid using calcium carbonate with titanium calcium as this combination promotes checking and rutile yellowing.

It is worth noting that in another series of whites and greens, a high rosin tall oil varnish is starting to split in one year. We had better success with a low rosin tall oil varnish.

TPC has a complicated exposure series of emulsion paints on various surfaces, put out in September, 1954. Their condition at the time of examination last year is described on pages 22 - 23 of the 1956 report. All the emulsion paints were pigmented with 70% Titanox RA NC/30% magnesium silicate at 35% PVC. Their present condition (after 2-3/4 years) is as follows:

Surface	Butadiene Styrene 512 K	Polystyrene BKS 92	PVA Copolymer Everflex G	PVA Homopolymer WC-130	Acrylic AC-33	AC-33 + 25% Glyptal 2503
2 coats on weathered asbestos shingles	O.K.	Off	O.K.	O.K.	O.K. More chalk than PVA.	O.K. Less chalk than straight AC-33
2 coats on glazed asbestos shingles	Scaling	Peeled	O.K.	O.K.	O.K.	O.K.
2 coats on weathered stucco	O.K.	O.K.	O.K.	O.K.	O.K.	O.K.
2 coats on new cedar siding	Some chipping and erosion	Very bad flaking.	Some cracking	Slight cracking	Slight cracking	Very slight cracking

(Cont.)

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Surface	Butadiene Styrene 512 K	Polystyrene BKS 92	PVA Copolymer Everflex G	PVA Homopolymer WC-130	Acrylic AC-33	AC-33 + 25% Glyptal 2503
1 coat over H.P. Primer on new cedar	O.K.	O.K.	Slight cracking	O.K.	Spotty mildew	Very slight mildew
1 coat on chalky paint	Peeled	Peeled	Peeled	Mostly gone	Quite Good	Best; slight cracking.
2 coats on cement block	Gray spotting, peeling.	Gray spotting, peeling.	Slight chipping	O.K.	O.K.	O.K.

The condition of one coat over chalky paint is a very tough test, and the straight acrylic and the alkyd modified acrylic are doing the best job. TPC is quite high on this alkyd modification of AC-33.

The next series has been reported previously in 1955 and 1956. Using a basic pigmentation of 70% Titanox RA 50/30% magnesium silicate at 35% PVC, it compares the following polymers, two coats on "semi-weathered" asbestos shingles. The series was put out in September, 1954 and now represents 2-3/4 years on exposure.

Emulsion	Asbestos Shingles
Everflex G co-polymer PVA	Good
WC-130 post plasticized PVA	Chipping
Cal Ink post plasticized PVA	Good
Beechnut EC-101 copolymer PVA	Small blisters
National Starch 12 K 51 copolymer PVA	Good
Polycrown AX post plasticized PVA	Good
Polyco 522 post plasticized PVA	Good
TS-22 post plasticized PVA	Good
du Pont 81-900 post plasticized PVA	Chipping
Monsanto SC post plasticized PVA	Good
AC-33 acrylic	Good; chalky.
512 K butadiene styrene	Good
762 W butadiene styrene	Good
Saran vinylidene chloride-acrylonitrile	Bad flaking
Hycar 1552 Acrylonitrile-Butadiene	Very bad flaking (worst)
Vinac P-100 copolymer PVA	Good
BKS 92 Polystyrene	Bad flaking

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TPC put out a series of emulsion paints in August, 1955 to determine the effect of pigment volume concentration on color retention. These are blue tints and rose tints of polyvinyl acetate paints, applied two coats self-primed on weathered asbestos shingles. National Starch's copolymer 12 K 51 at 35% PVC is used as a comparison paint, with the tests including Celanese 202 and Jones-Dabney's Polytex 600 at 30, 40 and 50% PVC. The pigmentation is a combination of Titanox RA NC and calcium carbonate. In each case the 30% PVC paint is the best, 40% PVC intermediate, and the 50% PVC shows considerable fade.

A series was put out in November, 1954 to determine the relative durability of a pigment combination of 70% Titanox RA50/30% magnesium silicate in Norvan G copolymer polyvinyl acetate at different PVC's. The paints were applied two coats self-primed on regular asbestos shingles. All the paints are in good condition after 2-1/2 years of weathering. At 15% PVC there is very slight chalk and about the same at 20%. There is a break in chalk rate at 25% PVC, increasing at 30 and 35%, to definite chalk at 40% PVC. When 25% of the RA 50 was replaced with anatase Titanox A 168 all the paints chalked more freely and were much whiter.

National Lead Company, Sayville, New York

Time did not permit any lengthy review of National Lead's exposures. Again we checked their series 11966-11989 put out in October, 1953. The pigmentation includes 1.75 pounds of Titanox A MO and 5 pounds of oil per gallon with magnesium silicate varied to maintain the PVC at 33.1%. The active pigments - lead and zinc - were varied to obtain the desired percent of active lead or zinc content on the oil present. National Lead considered zinc oxide as having 100% available reactivity, basic carbonate white lead 33%, basic silicate white lead 45 X 45% and basic sulfate white lead 20%. The weight percentage of available active pigment on oil ran 10, 20, 40, 55, 80 and 100%, with some necessary omissions.

There is not much to report as different from previous years except normal progress of exposure during an additional year. It will be recalled that film performance improved as zinc oxide increased from 1/2 to 4 pounds per gallon, with control of mold at one pound of zinc oxide and above. Low lead sulfate contents permitted mold, high contents showed erosion. Basic carbonate white lead looks relatively good - in earlier stages it showed mold at lower concentrations. Basic silicate also showed mold at low concentrations but higher concentrations gave clean films.

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We also inspected another series of reactivity test house paint panels put out in November, 1953, numbered 12032-57. The paints were made at 32% PVC in a linseed oil vehicle and applied as two coats self-primed on Yellow Pine and cedar. Our special interest lay in the inclusion of Ozlo 18 M in one of the paints in the series.

		To replace 100 lb. PbZn		Pounds Per Gallon					
Panel		ZnO	45X	PbZn	18M	45X	ZnO	Mg.Sil.	TiO_2
12032	Control	--	--	4.6	--	--	--	3.07	1.63
12033	Std. 80% Substitution	--	--	--	3.69	--	--	3.48	1.63
12034	45X for BSWL by Vol.	65	22	--	--	1.03	2.98	3.07	1.63
12035		65	18	--	--	.85	2.98	3.2	1.63
12036		65	15	--	--	.69	2.98	3.3	1.63
12037		65	12	--	--	.56	2.98	3.4	1.63
12038		65	9	--	--	.42	2.98	3.5	1.63
12039		65	6	--	--	.28	2.98	3.6	1.63
12040		55	22	--	--	1.03	2.55	3.27	1.65
12041		55	18	--	--	.85	2.55	3.38	1.67
12042		55	15	--	--	.69	2.55	3.47	1.69
12043		55	12	--	--	.56	2.55	3.57	1.71
12044		55	9	--	--	.42	2.55	3.66	1.72
12045		55	6	--	--	.28	2.55	3.75	1.73

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We will not try to describe all details of performance of the various paints. Panel 12033 with Ozlo 18 M looks very good at this time. 12034 with 45X replacing basic sulfate white lead by volume is also good. Panels 12036 and 37 are showing some intercoat peeling. National Lead do not blame the paint for this failure but attribute the peeling to the fact that the panels were painted in November. There would be a good possibility of moisture on the first coat when the second coat was applied.

M. VAN LOO

Director of Paint Research

MVL:AR

0007-SWP-000115364

Inspection Trip
Exposures - Titanium Pigment Corporation
du Pont Pigments Department
June 26 and 27, 1958

General Statement

On June 26 Mr. E. W. Fasig and the writer examined some of the exterior house paint panel exposures at Sayville, New York and two house tests on Long Island, prepared by the Titanium Pigment Corporation. We also spent a few minutes with the National Lead Company, primarily on their M 50 basic lead silico chromate and very briefly on 45 X basic silicate white lead. On June 27 we inspected some of the panel exposures of the du Pont Pigments Department as well as several of their test houses.

The following comments are offered as general observations:

1. We can repeat with considerable firmness statement number four of our 1957 inspection report: "Where comparisons were available on quality control, no evidence was seen that any one of the titanium pigment producers had a consistent advantage in quality over another."

2. Both TPC and du Pont continue to place considerable emphasis on the exposure of exterior emulsion paints, primarily of the polyvinyl acetate and acrylic types, with TPC also doing a considerable amount of work on Lytron 680. TPC has abandoned further testing of styrene butadiene in any new series and will use Lytron 680 instead. The preferred formulations of certain emulsion paints are performing very well on masonry surfaces and some look quite good on wood.

3. Higher pigment volume emulsion paints are showing up somewhat better than had been anticipated. In many cases chalking is less (or less chalk is retained) on the higher PVC paints (as we have found in our own exposures). Erosion will have to be checked at later stages of exposure to determine whether chalking might be faster but less adherent at higher PVC's.

4. An oil primer appears to be essential so far on bare wood under emulsion topcoats to develop optimum performance of the emulsion paints.

5. While we did not explore the area of film preservatives, it is obvious that they have not discovered anything new. Both have a "wait and see" attitude on Busan 11.

6. Flat alkyd paints still hold some interest.

As in all previous inspection trips, Titanium Pigment Corporation, National Lead and du Pont did everything possible to make our trip pleasant and informative. One of the highlights was an opportunity to go through the new Pigments, Plastics and Paper laboratory du Pont has erected at Chestnut Hill.

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Titanium Pigment Corporation - Sayville, Long Island, N. Y.

Previous inspection trip reports have outlined an extensive exposure series put out by TPC in August, 1956 to test the quality control of their production of controlled chalking rutile TiO_2. The titanium oxide pigments include:

7 lots of Titanox RA NC (TPC)
5 lots of Titanox RA 50 (TPC)
1 lot of Titanox RA (TPC)
11 lots of Ti-Pure R-610 (du Pont)
3 lots of Ti-Pure R-510 (du Pont)
1 lot of OR-640 (Calco)
2 lots of Unitane OR-540 (Calco)

Some of the groups in this test include the extended titanium calcium pigments such as Titanox RC and RC HT (TPC) and Ti-Cal R-60 and R-27 (du Pont). One lot of Titanox RA NC (D56F19 #7A) was selected for blue tone with anticipated lower chalk resistance.

The various titanium pigments were used in several different types of paints, generally as white, green tints (chrome oxide), and blue tints (P. C. Blue). These include the following, together with the surfaces on which they were applied:

1. Maleic alkyd enamels. 18% PVC before shading. Exposed 45° south as one coat over house paint primer on small cedar panels.

2. SWP tint base, with 18 M. 36.7% PVC. Two coats self-primed on cedar bevel siding, south vertical.

3. Emulsion paints. Acrylic AC-33, homopolymer polyvinyl acetate Elvacet 81-900, copolymer 12 K 55, and styrene butadiene Dow X-2562. 30% PVC, except 35% for styrene butadiene. Pigmentation 200 pounds TiO_2 plus 78 pounds magnesium silicate. On unglazed cement asbestos shingles.

There were two supplementary series in which the same pigments were exposed in alkyd flat exterior paints and as alkyd-Chlorowax enamels.

In the emulsion paint group, the styrene-butadiene paints have advanced the farthest in fading after the 22 months of exposure. The non-chalking rutile titanium oxides from all three suppliers, whether RA NC, R-610 or OR-640, all show considerable fading in the tints. They would be rated as equal and of uniform quality. It is interesting to note that the freer chalking grades sometimes showed less fading but with more variation between samples. This may indicate that the chalk does not adhere so that there is less chalk mask. Titanox RA 50 shows as much variation as du Pont's R-510.

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Even the extended titanium calcium pigments RC and RC HT or R 60 and R 27 show less apparent fading than the full non-chalking rutile. It is expected that the freer chalking pigmentations eventually will show erosion.

In the maleic alkyd enamel tints the fading was more in line with expectations. Most of the non-chalking rutile oxides, again whether RA NC, R-610 or OR-640 showed definite but uniform fading. The D56F19 #7A RA NC showed more than normal fade, as expected, one out of 11 lots of R-610 showed more than normal fade, and one, less. In general, the RA 50 samples showed less fading than RA NC or Unitane OR-540. du Pont's R-510 varied, two out of the three samples better than average, one poorer. Titanox RA showed more fading, as would be expected, and showed a yellower chalk in the green tint.

The house paints, both gloss and flat, and the other emulsion paints should be very interesting after another year's exposure. The acrylic and PVAc paints are both superior to the styrene butadiene counterparts in tint retention.

As noted in the general observations we could see no evidence that any one of the titanium pigments producers had a consistent advantage over any other. There are some variations between lots of a given grade, which shows the need to compare a number of lots from each producer before any statements can be made as to level of quality or quality control.

Another series, put out in August, 1957 compares a number of titanium pigments in styrene butadiene over unglazed cement asbestos shingles. One of the Titanox RA NC samples was also tested across the board in styrene butadiene, Lytron 680, 12 K 55 and AC-33.

In this series there are four lots of Titanox RA NC, a special super chalk resistant experimental sample MP-1111 (which we also have on test), and one sample each of R-610, OR-640, RA 50, sulfate process R-510, chloride process R-500, and OR-540. After the ten months' exposure as tints there is considerable fading in the styrene butadiene paints with no differentiation as yet between the pigments, except for MP-1111 which is slightly yellow. When the same RA NC (lot D57C21#4) is used with all the emulsion polymers it shows considerable fading in styrene butadiene, slight fade in Lytron 680 and 12 K 55, and very slight fading in AC-33. As a final note the yellow cast of MP-1111 shows that it is difficult to make a highly chalk resistant titanium oxide without some sacrifice in color and other pigmentary properties.

Another series of exterior emulsion paints was put out on cement asbestos shingles and on cedar shakes in May, 1957, in both yellow and gray tints. The pigmentation was 200 pounds Titanox RA 50 plus 75 pounds whiting at 30% PVC using the emulsion polymers listed below. Only the cement asbestos shingles were examined, with the following observations on fading:

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Polymer	Fading	
	Yellow	Gray
Styrene butadiene X-2562	Considerable	Considerable
Acrylic AC-33	O.K.	O.K.
Terpolymer Lytron 680	Slight	Slight
Homopolymer PVAc 81-900	O.K.	Very slight
Homopolymer PVAc TS 22	O.K.	Very slight
Homopolymer PVAc CL 102	O.K.	Very slight
Copolymer PVAc 12 K 55	O.K.	O.K.
Copolymer PVAc Everflex G	Very, very slight	Very, very slight
Copolymer PVAc Polytex 600	O.K.	O.K.
Copolymer PVAc Flexbond 800	None - excellent	None - excellent
Copolymer PVAc CL 202	O.K.	O.K. - very good
Arolon 110	Definite	Considerable
Homopolymer PVAc 84-1100	O.K.	Slight
Homopolymer PVAc Reichhold 9301	O.K.	O.K.
Homopolymer PVAc " 9304	O.K.	O.K.
Copolymer PVAc " 9120	O.K.	Best of Reichhold

For some years we have been reporting on a rather complicated series of exposures of exterior emulsion paints, started in September 1954. A pigmentation of 70% Titanox RA NC/30% magnesium silicate was used at 35% PVC in a succession of emulsion vehicles; styrene butadiene X 2562, polystyrene BKS 92, copolymer polyvinyl acetate Everflex G, homopolymer PVAc WC-130, acrylic AC-33 and AC-33 modified with alkyd. The paints were applied as follows:

2 coats on weathered cement asbestos shingles
2 coats on glazed cement asbestos shingles
2 coats on weathered stucco
2 coats on new cedar siding
1 coat over house paint primer on new cedar siding
1 coat on chalky paint
2 coats on cement block

The series was quite far advanced in failures so no complete examination was made. A few comments may be of interest. Polystyrene BKS 92 is very poor on almost all surfaces. Styrene butadiene is poor on wood both bare and primed. The better polymers are doing quite well on cedar. There is very little left of any of the one coat applications over chalky paint. The alkyd modified acrylic looks good on concrete blocks.

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A more recent series, put out in August of 1957, compares a pigmentation of 200 pounds Titanox RA 50 and 75 pounds magnesium silicate at 30% PVC in various emulsion vehicles. They include copolymer polyvinyl acetates CL-202, 12 K 55 and homopolymer 84-1100, acrylic AC-33 and AC-33 with 25% Aroplaz 1274, and styrene butadiene. The paints were applied as two coats on:

Cement block	Glazed cement asbestos shingles
Aged stucco	New siding
Regular cement asbestos shingles	Primed new siding

Weathered painted siding

Because the series was still relatively new, comments are made only of departures from normal progress of the exposures. In the blue tints, styrene butadiene showed the most fading on all surfaces, bad on wood. Celanese CL 202 shows the best tint retention. AC-33 either straight or alkyd modified is somewhat blotchy on wood. The homopolymer 84-1100 shows more fading than the copolymer polyvinyl acetates. Over weathered painted siding the copolymer polyvinyl acetates show some cracking and flaking, while the homopolymer 84-1100, AC-33 and styrene butadiene look better. This should be rechecked after additional exposure. There is some staining below the bevel overhang on the siding, most on the acrylic modified with alkyd, none on styrene butadiene and some on all the others, with perhaps less on 12 K 55. The homopolymer 84-1100 shows some indication of efflorescence on cement asbestos shingles, and the alkyd modified acrylic and styrene butadiene show slight spotting on such surfaces.

Another series of exterior emulsion paints was put out on exposure in August of 1957, blue tints applied two coats on weathered cement asbestos shingles. These are pigment volume concentration studies ranging from 30 to 55% PVC in 5% steps using a constant 200 pounds of Titanox RA 50 and increasing amounts (from 80 pounds to 255 pounds) of magnesium silicate to effect the increases in PVC. The emulsions were homopolymer PVAc 84-1100, copolymer PVAc CL-202, acrylic AC-33 and alkyd modified AC-33. The CL-202 tints were the best, showing slight fading only at the high PVC's. The alkyd modified AC-33 paints were second best in tint retention, with little difference due to PVC at this point. The straight AC-33 paints at 50 and 55% PVC's showed the worst fading.

An earlier series put out in August 1955 also covers a ladder of PVC's, this time ranging from 15% to 40% in 5% steps, comparing copolymer PVAc 12 K 51 with acrylic AC-33. The TiO_2 is a constant 200 pounds of Titanox RA-NC, varying amounts of magnesium silicate to change the PVC. They are in phthalocyanine green tints and grays. The AC-33 showed poorer color development on grinding. The polyvinyl acetate series shows only normal progression of fading as PVC increases. The acrylics as a whole

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show much more fading and chalking than the 12 K 51 series as they approach three years. TPC has observed this behavior of AC-33 paints in several series, where at about 18 months they start to chalk and fade rather definitely.

In a supplement to this series, in grays at 30% PVC, some comparisons are made of extenders. ASP 400 clay shows good tint retention while Wollastonite is deficient. In every case PVAc is better than AC-33.

In the field of solvent type paints TPC had started a small series of exterior flat house paints in which they had applied two coats of SWP Velvet Flat self-primed without reduction of the first coat. We asked them to repeat the test using SWP Velvet Flat White and Buckeye Yellow, over A2 W 2 or at least reducing the first coat of Velvet Flat 25% with A1 V 2. In the repeat TPC followed both procedures as two coat work on bare cedar and Yellow Pine, exposed in July 1957. They added one of their own exterior flat alkyd paints EX-6232, with 130 pounds Titanox RA NC and 345 pounds calcium carbonate in a 100% alkyd vehicle, tinted to match our Buckeye Yellow. They also tinted our SWP Velvet Flat White to Buckeye Yellow. Both of the SWP Velvet Flats were on the revised formulas carrying one pound of 18 M per gallon.

There are no differences due to the wood at this time, and no mold, even on the north. Films are O.K. Our regular SWP Buckeye Yellow is best in tint retention, while TPC's paint is showing slight fade. SWP Velvet Flat White tinted is showing the most fading, since it is formulated with the RA 50 type of TiO_2 while regular Buckeye Yellow is based on RA NC.

In the field of exterior flats TPC has a comparison between two gloss house paints, a flat alkyd, an acrylic, a PVAc and a styrene butadiene paint, in yellow and green, to determine the best type of coating for use as an exterior tint base. The gloss paints were applied as one coat over a conventional zincless primer, the other two coats self-primed, on cedar and cement asbestos shingles. The formulas are as follows:

Gloss House Paints

F 312	17.3% Titanox RA NC	75% Refined linseed
	29.0% Zinc oxide	25% Z_2 bodied linseed
	33.4% Calcium carbonate	
	20.3% Chrome Yellow	PVC 33%
F 313	52.7% Titanox RC	75% Refined linseed
	28.2% Zinc oxide	25% Z_2 bodied linseed
	19.1% Chrome Yellow	
		PVC 33%

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Flat Alkyd

F 314	22.4% Titanox RA NC	Wallkyd 1952
	50.0% Calcium carbonate	
	27.6% Chrome Yellow	PVC 50%

The remaining emulsion paints were all pigmented with 60.4% Titanox RA NC/39.6% Chrome Yellow at 30% PVC.

F 315 Acrylic

F 316 Polyvinyl acetate

F 317 Styrene butadiene

The flat alkyd has the best color retention in both the yellow and green. The F 312 gloss paint is second best but spotty on the shingles in the yellow, more uniform in the green. F 313 is not equal to F 312 in the yellow on wood but is better in the green. On shingles both the AC-33 and PVAc paints are faded in the yellow, with styrene butadiene showing very bad fading. In the greens on shingles the flat alkyd is again best, the PVAc paint shows a trifle less fade than the acrylic, and the styrene butadiene is poorest. The acrylic green is not too good on wood, with the PVAc showing less flaking and better tint retention.

A similar series was put out in May 1956, comparing the same gloss house paints with similar flat alkyd, acrylic, PVAc and styrene butadiene paints except that in the latter group Hansa Yellow was substituted for Chrome Yellow. This resulted in more fading. Since the purpose was to find the best tint base over a variety of surfaces the paints were put over:

Cement block	New cedar shakes
Stucco	New siding
Glazed cement asbestos shingles	Primed new siding
Weathered cement asbestos shingles	Weathered painted siding

In the gloss paints the Titanox RA NC paint is brighter and a cleaner yellow than the other made with Titanox RC. The flat alkyd is very poor on the glazed cement asbestos shingles, showing bad peeling. Styrene butadiene shows bad fading, as much on the north as on the south. The acrylic paints are not quite as bright as those made with PVAc, and the latter are not quite equal in tint retention to the flat alkyd.

TPC put out a series in September 1956 to determine the durability of various coatings when painted over old, weathered, chalky emulsion paints (based on PVAc 81-900) on cement asbestos shingles. The test paints were applied one coat over the weathered emulsion paint. My notes do not indicate whether the tints are blue or green (I suspect blue). Their compositions and conditions at approximately two years were as follows:

0007-SWP-000115371

Pigmentation	Vehicle	Condition
Titanox RA NC Leaded Zinc Oxide Magnesium Silicate	Linseed Oil	Very bad spotting due to variable suction, causing variations in chalking.
Titanox RA NC Calcium Carbonate	Flat Alkyd Wallkyd 1952 –	More uniform than above, still some fade. Low solids alkyd probably did not penetrate as much as oil.
Titanox RA NC Magnesium Silicate	Acrylic AC-33	Slight fade. Vertical slitting along brush marks. Green cast.
Titanox RA NC Magnesium Silicate	Copolymer PVAc 12 K 55	Less fade than acrylic. Some peeling. Green cast.
Titanox RA NC Magnesium Silicate	Homopolymer PVAc 81-900	Same as 12 K 55
Titanox RA NC Magnesium Silicate	Styrene butadiene X-2562	Considerable fade and general flaking.

Another series of exterior flat paints, put out in January 1957, covers a comparison of extenders (approximately on a volume basis at 50% PVC). The panels have nail heads and copper screens attached to evaluate staining. These are green tints. The results currently involve fading and staining.

Natural Whiting. Some staining.
Magnesium silicate. Very, very slight staining.
Natural calcium sulfate. Faded, very slight staining.
Lorite. Bad staining.
Calcium silicate. Some staining.
Silica. Slight fading, very slight staining.
Barytes. Slight fading, very slight staining.
3 X Mineralite Mica. No staining.

Another series put out in October 1956 compares magnesium silicate and natural whiting as extenders, in gray and green gloss and flat house paints, two coats self-primed on cedar siding. The results may be summarized as follows:

0007-SWP-000115372

(1) 120 pounds Titanox RA NC plus 250 pounds Zinc oxide with extender to 33% PVC in 75% raw linseed, 25% Z_2 bodied linseed.

(a) 390 pounds Natural Whiting - more fading in gray and green than (b).

(b) 410 pounds Magnesium silicate - less fading than (a).

(2) As (1) but 500 pounds Titanox RC for 120 pounds RA NC.

(a) 50 pounds Natural Whiting. Less fading than 1 (a), more than 2 (b) in gray. Yellower than 2 (b) in green.

(b) 55 pounds Magnesium silicate. Less fade than 2 (a) in gray and green, but less than 1 (b) in green. Slightly yellow in green tint.

(3) 200 pounds Titanox RA NC with extender to 33% PVC in 40% linseed, 35% alkyd and 25% chlorinated paraffin.

(a) 420 pounds Natural Whiting. Seems more faded than (1) or (2) but uniform.

(b) 445 pounds Magnesium silicate. As 3 (a).

(4) 130 pounds RA NC with extender to 50% PVC in 100% alkyd vehicle as an exterior flat.

(a) 345 pounds Natural Whiting. As 3.

(b) 385 pounds Magnesium silicate. As 3.

The alkyd flats show less change under the protecting flaps than the gloss tints. As a further note, the calcium titanium pigment with whiting shows rutile yellowing, especially in the green tints. This is aggravated when ferrite is used as a yellow component.

Among the special TPC tests, their storage building has been painted for two years with a paint similar to No. 3 above. This is a repaint on spruce over which the old paint was in very poor condition. The new paint is in very good condition and stays clean even under the eaves.

TPC has started their own testing of Busan 11 from Buckman Laboratories. While, like ours, their tests are too recent to be of much value, we did examine a series of gray paints put out in March of this year on 6 x 12" cedar panels exposed 45° south. The base paint was a Titanox RC/ZnO/$CaCO_3$ oil paint at 33% PVC. They then made the following variations:

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(1) Replace the 250 pounds of ZnO and part of $CaCO_3$ with 215 pounds Busan 11 (equal volume). More fading and streaking.

(2) RA NC for Titanox RC. O.K.

(3) As (2) but replace 250 pounds ZnO with Busan 11. Fading and streaking.

The Busan paints show the fading and streaking without perceptible chalking.

In another series also put out in March, a normal white house paint was used as the control. It was formulated with 1-1/2 pounds anatase TiO_2/1/2 pound rutile TiO_2/5 pounds leaded zinc/2-1/2 pounds Nytal 300 in linseed oil. It is already showing definite chalk. When the leaded zinc is replaced with an equal volume of Busan 11 and an increased amount of Nytal, chalking has been prevented so far, but the color has deteriorated to a grayer cast.

TPC has started an interesting test of white roof paints over asphalt shingles. In March of this year they constructed a mock-up of a typical roof section on one of their 45° fences, with the asphalt shingles thus facing south at a 45° angle. Vertical strips of one coat and two coats of white emulsion paints were then applied over the asphalt shingles, leaving one vertical strip unpainted to check temperature effects. The lower horizontal edge was also left unpainted in order to check for chalk wash. The paints used in this test included Glidden, Nalcrete, Sears, a homopolymer PVAc paint, a copolymer PVAc and acrylic AC-33 paints.

The temperatures under the roof will be checked on metal tabs tacked to the undersurface of the roof boarding below each strip. No data have been recorded as yet. There was a great difference in temperature to the hand on the top surface of the shingles between the unpainted areas and any of the white strips. At that time there were thin clouds and considerable haze, with the air temperature in the high 70's. It should be noted that there was a tendency for the paints to curl the shingles concave, especially on two coat application, worse with AC-33. This would be a bad situation and must be avoided to be acceptable.

TPC has also encountered the problem of intercoat or "tissue" peeling on the lower face of boxed eaves, etc. They have constructed a length of boxed eave with a wide overhang on the top of the north face of one of their vertical fences. They think that the peeling is due to application of paint on this surface when the temperature of the surface is below the dewpoint. They applied one coat of primer and then applied the topcoat under two different atmospheric conditions:

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(a) At midday, high temperature and relative humidity less than 60%.

(b) Early morning, low temperature and relative humidity greater than 90%.

No results are available at this time.

0007-SWP-000115375

National Lead Company, Sayville, Long Island, N. Y.

Time only permitted a few minutes' conversation with the National Lead representatives at Sayville, and inspection of but a few panels. Most of the discussion involved their M-50 in metal protective paints and enamels. Our own evaluation of M-50 is extensive and has been reported elsewhere so no special notes were taken on National Lead's panels.

National Lead has one series which was of special interest. This comprised a wide range of colors in TT-E-485c enamel quality in which the controls were compared with counterparts containing M-50. The amount of M-50 used varied with the color, ranging from 1/2 to 2-3/4 pounds per gallon. In all but one case the M-50 enamels were definitely superior to their controls after 1-1/2 years' exposure 45° south. The exception was the toluidine red enamel. M-50 should not be used with toluidine. The good results in the other colors suggest the use of some M-50 in refinishing enamels where frequently one or two coats of enamel are applied directly on previously painted, weathered and rusted steel, or for improved performance of enamels applied on new steel without an inhibitive primer.

0007-SWP-000115376

du Pont Pigments Department, Wilmington, Delaware.

du Pont had gone to special trouble this year to correct the criticisms we had of their previous exposure books. In addition to their regular, very elaborate"1958 Exterior Paint Exposure Tests" book, they had made up special copies for us, so organized as to give the composition of the paint on each panel and space to make notes on each panel. This was a great improvement and made taking notes much simpler. The regular book is printed in color, including up-to-date color pictures of their house tests. Thus each page lies flat and this takes care of another criticism we had that pasting color photographs on many pages in the previous books made writing very difficult. We appreciated their following our suggestions. They still complicate our writing of reports by having too many formulations and surfaces in one series.

du Pont continues to place more emphasis on exposure of exterior emulsion paints and on series comparing emulsion paints with regular gloss or flat house paints, on various types of surfaces and in various tints. This leads to very complicated series which are not too difficult to inspect but very difficult to describe. Therefore the reader's indulgence is requested and where further information on details is needed this can be given on request.

One exterior emulsion series, exposed in May 1957, was applied on asbestos cement shingles, asbestos cement flatboard, edge grain white pine and flat grain Yellow Pine. du Pont used quite a lot of Ruberoid flatboard "Stonewall" which they say is worse than J-M Flexboard - they understand "Stonewall" has now been withdrawn from the market. The paints used are basically formulations using Elvacet 84-1100 post plasticized with diethyl phthalate, at 27% PVC, Elvacet 81-900 post plasticized, also at 27% PVC, Rhoplex AC-33 at 25% PVC, Lytron 680 at 50% PVC (as per Monsanto's request) and Dow's acrylic X-2647.1 at 35% PVC. Each type of emulsion is then also exposed in a brief PVC series at 20, 40 and 60% PVC. The principal variation in each group is in the TiO_2 used and some substitution of extenders. Supplementary paints include a conventional oil type gloss house paint, some flat alkyds and certain proprietary house paints. Because of this complexity only departures from normal patterns will be described.

Considering the cement asbestos surfaces first, both shingles and flatboard, there is a fair amount of blistering and peeling with the emulsion paints. I have individual notes on each panel but no over-all pattern develops. The PVAc's and Dow's acrylic show some blistering and peeling while AC-33 and Lytron 680 show little or none. The oil house paint and flat alkyds peel and flake over flatboard.

0007-SWP-000115377

Throughout the du Pont exposures where possible we checked the chalking rates of emulsion paints when they were available in a range of PVC's. We told Dr. Vanney that we had some series where the lower PVC's were chalking more (or retaining more chalk?) than higher PVC's. He said he had not observed this but by paying more attention to this point we found several examples. On the cement asbestos surfaces in this series the PVAc's showed more chalk in the lower PVC's. The AC-33's at this time showed little difference, as did the Lytron 680, but the Dow Acrylic showed more chalk at the higher PVC's.

The same pattern of chalking versus PVC held on white pine, and this time Lytron 680 also showed more chalking at lower PVC's. The 84-1100 PVAc is showing some peeling at 60% PVC while 81-900 is still O.K. at 60% PVC. AC-33 also peels from white pine at 60% PVC. On Southern Yellow Pine all the emulsion paints are much better one coat over oil primer (TT-P-25a) than two coats of emulsion paint self-primed. Two coats of 84-1100 PVAc on Yellow Pine are better than two coats of 81-900. The Lytron 680 paints self-primed are not as good as the PVAc's or acrylics. All the emulsion paints fail by flaking at 60% PVC self-primed but are still in the running over oil primer. Several of the proprietary house paints show from considerable to bad flaking.

Another very large and complicated series was put out in August of 1957, including oil type gloss house paints, flat alkyds and both PVAc and acrylic emulsions. The paints were applied on edge grain Western Redcedar for the oil and alkyd paints and on edge grain white pine for the self-primed emulsion paints (to eliminate cedar staining), and on cement asbestos shingles and flatboard. The purpose was to determine the best tint base. Besides the white base paints described below, they were compared tinted as follows:

1. Green - Ramapo Green GP-755-D or Monastral green paste GW-749-P.

2. Yellow - Oil paints with Zinc Yellow Y-658-D, alkyd and emulsion paints with Green Gold YT-562-D.

3. Yellow - Oil and alkyd paints tinted with Light Chrome Yellow Y-433-D, emulsion paints with Toluidine Yellow Paste Y-672-P (Hansa).

4. Pink - Molybdate Orange YE-637-D.

5. Pink - Parachlor Red ET-427-D or RW-738-P.

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The base paints were as follows:

(a) R-610/Leaded Zinc/Mg Silicate in 75/25 Raw/X Linseed at 33% PVC.

(b) R-610/Zinc Oxide/$CaCO_3$ in 75/25 Alkali Refined/X Linseed at 39% PVC.

(c) R-500/Zinc Oxide/$CaCO_3$ in 75/25 Alkali Refined/X Linseed at 39% PVC.

(d) Ti-Cal R-60/Zinc Oxide in 75/25 Alkali Refined/X Linseed at 30% PVC.

(e) R-610/Mg Silicate in 75/25 Long oil alkyd/flat alkyd at 20% PVC.

(f) R-500/Mg Silicate in 75/25 Long oil alkyd/flat alkyd at 20% PVC.

(g) R-610/Mg Silicate/SiO_2/Mica in flat alkyd at 47% PVC.

(h) R-610/Zinc Oxide/Mg Silicate/SiO_2/Mica in flat alkyd at 47% PVC.

(i) R-610/Clay/SiO_2/Mica in flat alkyd at 47% PVC.

(j) R-610/Mica in PVAc 84-1100 + DBP at 23% PVC.

(k) R-610/Mg Silicate in acrylic AC-33 at 25% PVC.

(l) R-610/Mg Silicate/Clay in Lytron 680 at 40% PVC.

On cedar, in the whites the PVAc 84-1100 paint is whiter than the AC-33 paint and overall in the tints would rate as the best tint base. The PVAc tints develop the deepest tint, AC-33 next and Lytron 680 the lightest tints. All the emulsion paints are quite good compared with the oil paints. Again on the overall basis, the paint (d) based on R-60 and zinc oxide would rank second as a tint base but will fade more later.

In specific tints (c) with chloride process TiO_2 and zinc oxide in the greens and Parachlor Reds shows slightly more fading than (b) with R-610 and zinc oxide. In the green tints the emulsion paints on wood, both PVAc and AC-33 paints, are showing some mold and cupping of the panels, Lytron 680 less. The zinc yellows in (a), (b), (c) and (d) are doing well, more uniform than light chrome yellows in the same paints. Green Gold does well in the emulsion paints, quite well in the flat alkyds. The light chrome yellow is poorest in the low PVC gloss alkyd paint, better in the higher PVC flat alkyd. The Hansa Yallow in the emulsion paints is best in PVAc, next in AC-33 and lightest in Lytron 680. Molybdate Orange is poorest in the low PVC gloss alkyds. Parachlor Red does quite well in PVAc, fair in the flat alkyd and shows the most fading in (c) and (d) the TiO_2/zinc oxide/calcium carbonate paints.

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For an all purpose white and tint base of the oil type, the 1-1/2 pounds R-500/2-1/2 pounds Acicular Zinc Oxide/4.9 pounds calcium carbonate in an unbodied and bodied linseed oil blended vehicle at 39% PVC looks quite good.

Over the cement asbestos shingles and flatboard individual ratings of spotting and blistering were made, but there were very few definite patterns. Details are available to interested parties. The Hansa Yellows in the emulsion paints are better than the zinc yellows in solution paints on cement asbestos. All the Molybdate orange paints are poor on such alkaline surfaces, as would be expected. The Parachlor Reds are much better in the emulsion paints than in the solution paints.

A somewhat similar tint base series had been put out in May 1955 on cedar for the oil and alkyd paints and on white pine for the emulsion paints, two coats self-primed. Again, the base paints were exposed as whites and tinted as follows:

1. Gray - Lampblack.
2. Blue - Ramapo Blue BP-366-D.
3. Green - Ramapo Green GP-501-D.
4. Yellow - Light Chrome Yellow Y-433-D.
5. Pink - Molybdate Orange YE-637-D.
6. Pink - Parachlor Red RT-427-D.

The basic paints used were as follows:

(a) R-610/leaded zinc/Nytal 300 in 75/25 Raw/X Linseed at 33% PVC.

(b) As (a) plus 0.2% PMO on weight of paint.

(c) R-610/Zinc Oxide/$CaCO_3$ in 75/25 Alkali Refined/X Linseed at 39% PVC.

(d) As (c) plus 0.2% PMO on weight of paint.

(e) R-610/Zinc Oxide/$CaCO_3$ in 75/25 Raw/X Linseed at 42.8% PVC.

(f) BCWL/Zinc Oxide/Nytal 300 in 75/25 Raw/X Linseed at 27% PVC.

(g) FF/R-610 Zinc Oxide/Nytal 300 in 75/25 Alkali Refined/X Linseed at 27.4% PVC.

(h) As (d) but R-500 for R-610.

(i) R-60/Zinc Oxide in 75/25 Raw/X Linseed at 30% PVC.

(j) R-610/Nytal 300 plus 0.2% PMO in Aroplaz 1271 at 30% PVC.

(k) R-610/Mica in 87/13 PVAc/DBP at 26.7% PVC.

(l) R-610/SiO_2/Barytes in 97/3 Acrylic/TBP at 28% PVC.

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Glancing at all the panels we selected (h) as the best over-all and (d) as second best. This means we selected a 1.5 pounds TiO_2/ 2.5 pounds ZZZ-33 Zinc Oxide/4.9 pounds calcium carbonate paint, with 0.2% PMO as the best all-around tint base, with a slight preference for chloride process R-500 TiO_2 over R-610. The emulsion paints looked streaky and thus were not rated above the oil paints.

In the whites paint (1) with titanium calcium R-60 shows mold, showing that calcium sulfate is not equal to calcium carbonate in mold control. Ti-Cal may look equal to TiO_2 plus $CaCO_3$ for 1 to 2 years, but not thereafter.

In the grays paint (j) shows some fading. The grays made with pure zinc oxide show less fading than with leaded zinc. In the blue tints, paint (f) with basic carbonate white lead shows rather bad mold. The same is true in the green, yellow and pink tints. In the greens, paint (h) with R-500 TiO_2 is definitely cleanest, and (h) also has very good color retention in yellow tints and in the Molybdate pink. With the Parachlor Red tints the lead in paint (f) seems to cause very bad fading. Light chrome yellow fades in the non-reactive pigment alkyd paint (j) while Parachlor Red does quite well in this paint. Parachlor Reds look good in the emulsion paints.

A series similar to the above was put out in May 1954. The paint formulations were almost identical, and the series of tints were much the same. Detailed examination was made of all the panels but the results were so nearly the same as in the previous series that they need not be repeated. In general, du Pont now seems to favor magnesium silicate for whites and calcium carbonate for tints. The Parachlor Red tints are quite advanced in fading in this relatively old series. The fading is least with polyvinyl acetate, worst with the oil paint containing basic carbonate white lead, and considerable in the leaded zinc paints. Again, Parachlor Red does not get along well with lead.

du Pont House Tests

Walther House

This house has been reported in previous inspections. It is a cement asbestos shingle house previously painted with oil paint which had become chalky and mottled. The present test was applied in October 1956 in a blue tint, two coats. The test area is on the north (rear). The paints are as follows:

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1. R-610/diatomaceous silica/mica/$CaCO_3$. Flat alkyd vehicle at 53.4% PVC. Slight fading, some efflorescence under window.

2. R-610/diatomaceous silica/mica/$CaCO_3$. Pliolite S-5 - chlorinated paraffin solution type paint at 59.3% PVC. This is at a higher PVC than Goodyear recommended but at present it is as good as any of the other paints.

3. R-610/zinc oxide/$CaCO_3$ top coat oil paint at 39.5% PVC over an R-610/leaded zinc/magnesium silicate primer. This area is mottled badly as there was no control of penetration.

4. R-610/magnesium silicate in cyclopentadiene treated oil at 31% PVC. (Admerol 75 M). The first coat mottled on application as it is not very non-penetrating. Now there is some fading and gloss is not uniform. Very poor adhesion on concrete foundation.

5. R-610/diatomaceous silica/mica/magnesium silicate in flat alkyd vehicle at 46% PVC. Here the magnesium silicate tint is showing better tint retention than its calcium carbonate counterpart. This is contrary to du Pont's panel experience.

Summers House

This house test was started in October 1954 applying two coats of white paints on new stucco. The house still looks very good after almost four years. It has stayed clean even on protected areas. The paints are on either the northwest (rear) of the house or on the northeast. They are as follows:

1. R-610/FF/mica in 81-900 PVAc emulsion at 27.7% PVC. The rutile/anatase ratio is 90/10. The paint is white and has good adhesion even under vines.

2. As 1 but diatomaceous silica replacing mica. No difference.

3. R-610/FF/magnesium silicate in AC-33 emulsion at 30% PVC. The rutile/anatase ratio is again 90/10 but total TiO_2 is 2 pounds per gallon versus 2.59 pounds in PVAc. It is slightly grayer than the PVAc paint and mudcracked where the film is very heavy.

4. R-610/FF/zinc oxide/magnesium silicate in Pliolite S-5 solution paint at 57.6% PVC. Chalking and slightly yellow.

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Allen House

This again is a porous white cement asbestos shingle house, first painted in 1954 and repainted last October over the same paint systems, in gray. The paints are:

1. R-610/mica in 84-1100 PVAc emulsion at 27% PVC. Practically no change as yet.

2. R-610/calcium silicate in AC-33 at 28% PVC. Some foaming when applied. Slight darkening.

3. R-610/$CaCO_3$/mica/SiO_2 in Pliolite S-5, chlorinated paraffin solution type at 57% PVC. Now lightest gray.

4. R-610/zinc oxide/$CaCO_3$ in 75/25 Raw/X Linseed plus 0.2% PMO top coat at 39% PVC over R-610/BCWL/magnesium silicate primer in 45/53/2 Raw/OKO S-70/M-25 linseed vehicle at 35% PVC. Little change.

Campbell House

We were not given complete notes on the Campbell house. Two paints were flat alkyds based on Aroflat 3025-P40, at 46% PVC, comparing $CaCO_3$ vs. magnesium silicate as extenders. The paints were applied two coats over previously unpainted cement asbestos shingles, in August 1957. At this time the calcium carbonate flat shows more fading than its counterpart using magnesium silicate (is the $CaCO_3$ paint above its CPVC?). A PVAc 84-1100 emulsion paint is holding its color better than the flat alkyds. An experimental chloride process R-500 paint is holding its tint in a flat alkyd better than an R-610 equivalent.

Quillen House

Again we had no detailed information on this house. The house is a test of emulsion paints, applied in October 1957, in Monastral Green tints, two coats self-primed over previously unpainted cement asbestos shingles. Taking the PVAc 84-1100 paint as the standard, the Lytron 680 paint is now yellower (and still soft, at 39% PVC) and a Dow 2647.1 paint is deeper in tint. The outstanding feature of this test is the very poor performance of an Acrylon 110 paint. Even though the test has run only eight months the Acrylon paint has faded considerably and it is peeling and cracking. It has lost practically all its adhesion, perhaps due to lack of alkali resistance.

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Heckman House

This house has been described in reports of other inspections. The previous test area (rear) was painted in October 1955, and was repainted with the current test paints in September 1956. The substrate was PVAc, acrylic and styrene butadiene emulsion paints over weathered cement asbestos shingles. The current tests were applied as two coats self-primed, in a blue tint. The composition of the paints is as follows:

1. R-610/Mica in 81-900 PVAc emulsion at 26.7% PVC.

2. R-610/Mica in 81-900 PVAc emulsion at 20% PVC.

3. R-510/Mica in 81-900 PVAc emulsion at 20% PVC.

The blue was added at a constant ratio of color to TiO_2 in all the paints. Paint 1 appears deeper, perhaps originally not a good color match. There is very slight chalking on No. 1, practically none on 2 and 3. The differences between 2 and 3 are very small, with 3 perhaps showing very, very slightly more fading than 2.

The other sides of the house were painted in 1955 with an 81-900 PVAc blue tint using 2-1/2 pounds of R-610 plus mica at 26.7% PVC. These older surfaces are now showing some spotty fading and there is peeling on the concrete foundation. 2-1/2 pounds of TiO_2 is considered excessive by du Pont.

Morgan House

This house was painted in July 1956, the test area on the north or rear of the house. The paints were applied as yellow tints, using Green Gold, two coats self-primed on weathered cement asbestos shingles. The test paints and their current conditions are as follows:

1. R-610/diatomaceous silica/mica/Hi-Sil in flat alkyd at 36% PVC. Not chalky but has grayed and faded some. Slight mold.

2. R-610/diatomaceous silica/mica/$CaCO_3$ in flat alkyd at 54.4% PVC. Considerable fading, slight mold.

3. R-610/magnesium silicate in AC-33 at 25% PVC. Deepest yellow, some mold.

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4. R-610/mica in PVAc 81-900 at 20% PVC.
Color retention O.K. Some mold. Looks good on rest of house.

5. R-610/mica in PVAc 84-1100 at 20% PVC.
Gray and dirty, most mold. du Pont feels 20% PVC for 84-1100 is O.K. for wood, but it is definitely too low on masonry surfaces.

M. VAN LOO

Director of Paint Research

MVL:AR

0007-SWP-000115385

Inspection Trip
Exposures - du Pont Pigments Department
Titanium Pigment Corporation
June 25 and 26, 1959

General Statement:

On June 25 Messrs. E. W. Fasig, H. T. Gehring, C. H. Adams and the writer examined some of the house paint panel exposures of the du Pont Pigments Department at Wilmington, Delaware. On June 26 we examined some of the exposures of the Titanium Pigment Corporation at Sayville, New York, and, very briefly, a few of the evaluations of M50 basic lead silico chromate of the National Lead Company.

Again we find it very difficult to report on the various du Pont series in a simple manner. They have made further changes in their method of presentation in their exposure book for visitors. They present the basic compositions for a given series in considerable detail. However, they include too many variations in any given series and often apply them over a variety of substrates and repeat the paintings annually. Since one does not see all such groups in a logical order and in a single sequence, notes which are taken become very confusing. Titanium Pigment exposures usually are easier to follow.

One gets the impression that du Pont in recent years has not kept up the quality of their exposures. One sees very few new ideas under test. Actually very little was seen in either the du Pont or Titanium Pigment exposures that is not already on test at our own exposure stations.

du Pont spent considerable time on a presentation of their Johnsonville production of their chloride process TiO_2. This was officially announced as of June 25. Details are given later in this report.

Titanium Pigment Corporation exposures of acrylic emulsion paints are very unfavorable. Rohm and Haas are very concerned about this negative publicity and point out in a special report that TPC's formulations were faulty (e.g. they carry only 3 lbs. of gum arabic as the dispersant). Further details are given later in this report.

In our 1958 report we described an under eave test started by TPC to investigate causes of intercoat peeling. They constructed a boxed eave, applied an over-all coat of primer and then applied the topcoat of house paint under two sets of conditions:

(a) At midday, high temperature with relative humidity less than 60%.

(b) Early morning, low temperature with relative humidity greater than 60%.

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TPC has had no intercoat failures on this test to date so no differentiation can be made. This corresponds with our experience with our own under eave fence test.

du Pont has a high opinion of Sherwin-Williams alkyd XAD 116 and is concentrating practically all their current long oil alkyd work on XAD 116. This is our (3870). We suggested that they also look at our (38 A 16), based on Lowe Brothers' LV 4003, identified under the P. C. and C. designation CA 19815. Dr. Vannoy is very anxious to learn how to improve the brushing of such alkyd paints. Mr. Jagd is doing some work on this problem and has already made some suggestions.

We gain the impression that neither du Pont nor Titanium Pigment are impressed by Busan 11. Details will appear later in this report.

0007-SWP-000115387

du Pont Pigments Department, Wilmington, Delaware

du Pont announced full availability of R 900 TiO_2 as of June 25. The Johnsonville, Tennessee plant is now on stream, with an annual capacity of 45,000 tons. Since du Pont representatives have already visited our various plants to present the story on R 900 only a few highlights will be given here.

It should be pointed out that any samples of so-called "R-900" which were shipped much before 6-25-59 cannot be considered as necessarily representative of Johnsonville volume production. Such samples probably are prototypes of R 900 made on other equipment. Where exposure data are quoted for R 900 this also must apply to prototype material. Therefore it is indicated that any careful evaluation of R 900 should be based on actual Johnsonville production shipped on June 25 or later.

R 900 is considered to be an improved R 500 chloride type TiO_2. It has an oil absorption about equal to R 110 (R 100 is lower, R 610 is higher). Therefore consideration must be given to PVC/CPVC relations where direct pound for pound substitutions are made. Specific resistance is about 1000 for R 900, 1650 for R 100 or 500 and 900 for R 510. Tinting strength is equal to R 510 (200), while R 110, 100 and 500 run about 190.

In house paint exposures R 900 is not as chalk resistant as R 610. It should be noted that charts shown on tints are shown as "Tint Appearance," not "Tint Retention." After 12 months "tint appearance" is rated as better for R 900 than for R 610 (presumably R 900 is cleaner). After one year "tint appearance" seems to fall slightly below R 500, which in turn is better than R 610. Such differences are greater in Florida than at du Pont's other exposure sites. There is a possibility that the chalk from R 900 is not as adherent. The carbon black undertone for R 900 is high, about 11.5 (later reported as 14) against 8.5 for selected R 610 and 7.0 to 8.5 for regular R 610.

In shorter term exposures R 900 is equal to R 610 at 8 months in a green automotive refinishing enamel. In M30J enamels at 10 months there is no difference except a slight superiority over washed areas. In architectural enamels at 12 months R 900 shows less yellow character than R 510 or 610. In refrigerator enamels R 900 is superior to 110.

du Pont visualize great versatility in R 900, where it might replace a variety of other TiO_2 types, where inventories of a number of pigments is a problem. It should be noted that the Chicago Technical Service Department and the Dispersion Research Laboratory have reported favorably on their current evaluation of R 900. It has good dispersion properties, produces higher gloss than R 610, is slightly bluer and cleaner and develops higher opacity.

0007-SWP-000115388

du Pont reports some difficulty in emulsion paints (PVA) where they encounter lower hiding (may be related to PVC/CPVC ratios). R 900 normally would be expected to have less flocculating tendencies. They experienced no difficulties with hiding in solvent type oil paints and gloss or semi-gloss enamels.

We spent considerable time examining the panels on the blister house at the Delaware Test Farm. The value of the tests is reduced in many cases by the small size of some of the test panels, ranging down to a few inches in width and length. The tests were placed on the blister house on November 20, 1958 and the interior humidified in January, 1959. Dr. Vannoy feels that the panels may have been subjected to moisture pressure somewhat faster than normal, although this would not be true in some cases.

On the south side the general impression is that on wood the emulsion paints look better than the oil paints. One series of long boards includes Idaho White Pine, Redcedar and Ponderosa Pine, with the paints applied as two coats self-primed. Idaho White Pine proved to be the most difficult of the three species. A lead-zinc oil type house paint shows poor adhesion over the Idaho Pine, fair adhesion on other sections but usually still some peeling. A fume resisting oil type house paint blisters. An oil type house paint with Busan 11 tends toward cracking. Four commercial oil type house paints do not perform very well and show staining.

A non-reactive pigmented alkyd paint made with XAD 116 is performing well on all three woods. If Busan 11 is added at the rate of 2-1/2 pounds per gallon to this alkyd it shows an alligator type of cracking over Idaho Pine. The original alkyd paint with Bentone 34, MPA or Thixcin also was O.K. A non-reactive pigmented isophthalic alkyd is O.K. but it peels if zinc oxide is added to the pigmentation.

As stated earlier, on the south side the emulsion paints in general look better than the solvent paints. These include Elvacet 84-1100, 1440 and 1423 PVA paints, Lytron 680, AC-33 acrylic and styrene butadiene paints. The last named shows the most staining on cedar.

On cement asbestos Flexboard on the south the XAD 116 alkyd paint over a PVA Elvacet 1423 prime coat shows some failure by peeling, but looks better over a Pliolite primer. Two coats of the XAD 116 paint self-primed shows very bad peeling on Flexboard. A conventional white house paint, two coats self-primed is the whitest and shows the most chalk but has poor adhesion and shows some peeling. The Pliolite paint has good adhesion but is yellow. Most of the emulsion paints show no peeling but all seem to have a yellow cast. They have good adhesion (dry). Elvacet 1423 has blistered.

0007-SWP-000115389

On the north side of the blister house the emulsion paints in general again look better than the oil or solvent type paints. The emulsion paints are O.K. on Flexboard (Lytron 680 has a yellow cast) while an oil house paint and the alkyd paint self-primed show peeling. In other respects, the results are similar to the south side.

Series 16162, put out on southern pine on the 45° fence in March of this year, already shows some results. The pine panels are primed on the left with TT-P-25a, on the right with an XAD-116 zincless primer with R 610 TiO_2, with the center section the test paints two coats self-primed. Emulsion paints are much better over the primers than self-primed. If the first coat is reduced with some tung oil or if XAD 116 is emulsified into the first coat, results are better. Lytron 680 paint at 50% PVC peels if applied on bare wood but is much better over the oil primers. An AC-33 paint at 28% PVC is gray. The styrene butadiene paint at 35% PVC is still O.K. over the primers and a Pliolite S-5 paint is still O.K., even self-primed.

Last year we reported on a very complicated series of tints put out in August, 1957. There are gloss oil type and flat alkyd type house paints, PVA, Lytron 680 and AC-33 emulsion paints. The solvent type paints were applied on cedar, the emulsion paints on white pine (to eliminate staining). Other substrates include cement asbestos shingles and Flexboard. The basic white paints were also tinted as follows:

1. Green - Ramapo Green GP-755-D or Monastral green paste GW-749-P.

2. Yellow - Oil paints with Zinc Yellow Y-658-D, alkyd and emulsion paints with Green Gold YT-562-D.

3. Yellow - Oil and alkyd paints tinted with Light Chrome Yellow Y-433-D, emulsion paints with Toluidine Yellow Paste Y-672-P (Hansa).

4. Pink - Molybdate Orange YR-637-D.

5. Pink - Parachlor Red RT-427-D or RW-738-P.

The base paints were as follows:

(a) R-610/Leaded Zinc/Mg Silicate in 75/25 Raw/X Linseed at 33% PVC.

(b) R-610/Zinc Oxide/$CaCO_3$ in 75/25 Alkali Refined/X Linseed 39% PVC.

(c) R-500/Zinc Oxide/$CaCO_3$ in 75/25 Alkali Refined/X Linseed at 39% PVC.

(d) Ti-Cal R-60/Zinc Oxide in 75/25 Alkali Refined/X Linseed at 30% PVC.

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(e) R-610/Mg Silicate in 75/25 Long oil alkyd/flat alkyd at 20% PVC.

(f) R-500/Mg Silicate in 75/25 Long oil alkyd/flat alkyd at 20% PVC.

(g) R-610/Mg Silicate/SiO_2/Mica in flat alkyd at 47% PVC.

(h) R-610/Zinc Oxide/Mg Silicate/SiO_2/Mica in flat alkyd at 47% PVC.

(i) R-610/Clay/SiO_2/Mica in flat alkyd at 47% PVC.

(j) R-610/Mica in PVAc 84-1100 + DBP at 23% PVC.

(k) R-610/Mg Silicate in acrylic AC-33 at 25% PVC.

(l) R-610/Mg Silicate/Clay in Lytron 680 at 40% PVC.

In general, the emulsion paints at approximately two years show better tint retention and appearance than the solvent type paints. The PVA 84-1100 paints rate the best for tint retention, the AC-33 acrylic next, but is grayer as a white. The Lytron 680 paints look cleaner but also show more fading. Paint (a) looks dingier than Paint (b), which represents a comparison between leaded zinc and zinc oxide. du Pont expects Paint (c) with chloride process TiO_2 R 500 may show better tint appearance than Paint (b) from this point on. They said that at four years R 500 is cleaner and shows less mold than R 610. The non-reactive pigmented alkyds show mold, but if some zinc oxide is introduced mold is controlled. Clay causes fading.

Molybdate orange should not be used on an alkaline surface such as Flexboard. Parachlor Red, which is alkali resistant, is good only in emulsion paints. PVA shows efflorescence on Flexboard, while the acrylics are intermediate in tint retention and dirt pick-up.

In a repaint study put out in September of 1957 an alkyd type surface conditioner was used over old paint rated at 4 chalk. Lytron 680 is the only paint showing peeling, and that only if a one coat application. Lytron 680 plus linseed oil is better as a first coat than straight Lytron 680 although both show some peeling. Arolon 304 is failing as a conditioner.

du Pont has a special test of our samples of SWP Rock Green and Terrace Green in gloss, and Yosemite Green in SWP Velvet Flat. The Rock Green and Terrace Green are O.K. for mildew since they carry leaded zinc, but show some fading. The Velvet Flat with a pound of 18 M per gallon still shows mold.

0007-SWP-000115391

In 1958 and 1959 du Pont has put out what they call their "Rainbow Series." Various colors were put out in linseed oil, in Pliolite S-5, in alkyd gloss, and in acrylic and PVA Elvacet 1423 emulsion paints. The colors used include:

Monastral Violet R	RT-733 D
Monastral Red B	RT-742 D
Orange RK	YT-700 D
Molybdate Orange	YE-637 D
Chrome Orange Med.	YO-54 D
Chrome Yellow Lt.	Y-433 D
Green Gold	YT-562 D
Green Gold/Monastral Green	
Monastral Green	GT-751 D
Ramapo Blue	BP-366 D

The TiO_2 used to make the tints was R 900 prototype material except that the Ramapo Blue tint was also made with R 610 and R 500.

While it is too early for results in all cases, some comments can be made on the "Rainbow Series" at this time. Monastral Reds and Violet have shown what appears to be chemical fading or efflorescence when used over some alkaline surfaces. The emulsion paints are best for tint appearance and absence of mold. PVA is slightly better than AC-33 in tint retention but shows some efflorescence on masonry. Again Molybdate orange is blotchy on alkaline substrates. Pliolite paints show fading. The XAD-116 paints look good.

We inspected a series of red exterior oil paints put out in November of 1957 on cedar and southern pine. These are actually tints of R 900 prototype TiO_2 except for a few cross-overs with R 510 and 610, which show less tint retention at this time. Monastral Red B and Violet R, and iron oxide look good and a 50/50 blend of Monstral Red and iron oxide looks quite good. A 50/50 blend of Monastral Red and moly orange has lost some of its red character. Harmon's Indo Red and Thiofast Red faded. I did not have time to record all the details of this test.

du Pont has a very extensive series known as their 1957 Annual Emulsion Series. There are too many variations to enumerate in detail. They include a variety of TiO_2's, R 610 plus FF, all R 610, R 510, R 500, prototype R 900, and R 110, at 27% PVC in PVA Elvacet 84-1100 and 81-900; at 25% PVC in AC-33; at 50% PVC in Lytron 680 and at 35% in Dow's acrylic X-2647.1. There are also specials using extenders to raise the PVC's from as low as 20% to as high as 60%. Substrates include cement asbestos shingles, Ruberoid flatboard, edge grain white pine and flat grain southern pine.

0007-SWP-000115392

In these series Dow's acrylic X 2647.1 does not look as good as AC-33 but this may be due to the difference in fungicides. Actually the best looking series at the moment is the Lytron 680 paints which clean up better, probably due to the high PVC. 18 ounces of Aroplaz 2508 were added per gallon to the 680 paints for the first coats.

It would seem from this work that a different paint would be required for masonry than for wood. On masonry practically all 60% PVC paints look good, but such high PVC paints peel on wood. AC-33 looks good in general on flatboard, as does Lytron 680. Poor performance on the Ruberoid flatboard is apparent with Elvacet 84-1100, with some formulas with Elvacet 81-900, and with some solvent paints, both regular oil paints and flat alkyds.

On southern pine there are TT-P-25a primer and Admerol first coat plus flat alkyd house paint sections over which the top coats were applied, as well as self-primed areas. They were exposed at 45° south. The Elvacet 81-900 homopolymer PVA paints look best, as we have sometimes observed with homopolymers on bare wood. In general, the acrylics are not as good as the PVA paints, and the Lytron 680 (high PVC) paints do not look good. All show up best over the TT-P-25a zincless primer. The Dow acrylic X-2647.1 paints all look thinner and show more mold than their AC-33 counterparts. A few commercial oil type house paints were included in the southern pine group - they look good thus far.

Another series was put out in June 1955 covering repainting over chalky surfaces. Cedar and cement coated asbestos shingles were used as substrates. The so-called "A" series had two coats of the first paint applied in 1955 and weathered for two years, then given one coat of the second paint in 1957. The present condition is as follows (no remarks indicates satisfactory condition although my notes may not be complete).

Paint	Description	Condition	
		Cedar	Cement Coated Asbestos
No. 1	PVA 81-900 + DBP 28% PVC		
No. 2	Styrene-butadiene/Cl. Paraffin PVC 56%	O.K.	O.K.
No. 1	Styrene-butadiene/Cl. Paraffin		
No. 2	PVA 81-900 + DBP	Bad Peel	O.K.
No. 1	PVA 81-900 + DBP		
No. 2	Linseed oil house paint	O.K.	O.K.
No. 1	Linseed oil		
No. 2	PVA 81-900	Fair	Peel

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Paint	Description	Condition	
		Cedar	Cement Coated Asbestos
No. 1	PVA 81-900		
No. 2	Non-reactive pigmented alkyd	O.K.	O.K.
No. 1	Non-reactive pigmented alkyd		
No. 2	PVA 81-900	O.K.	O.K.
No. 1	PVA 81-900		
No. 2	Portland Cement	Bad peel	Fair
No. 1	Portland Cement		
No. 2	PVA 81-900	-	Peel
No. 1	Portland Cement		
No. 2	Linseed oil	Thin	Peel
No. 1	Linseed oil		
No. 2	Portland Cement	Eroded off	Slight peel
No. 1	Alkyd		
No. 2	Alkyd	O.K.	-
No. 1	Linseed oil		
No. 2	Linseed oil	O.K.	O.K.
No. 1	Acrylic emulsion paint 28% PVC		
No. 2	Styrene butadiene/Cl. Paraffin	O.K.	-
No. 1	Styrene butadiene/Cl. Paraffin		
No. 2	Acrylic emulsion	Bad peel	-
No. 1	Acrylic emulsion		
No. 2	Linseed oil	O.K.	-
No. 1	Linseed oil		
No. 2	Acrylic emulsion	O.K.	-
No. 1	Acrylic emulsion		
No. 2	Alkyd	O.K.	-
No. 1	Alkyd		
No. 2	Acrylic emulsion	O.K.	-
No. 1	Acrylic emulsion		
No. 2	Portland Cement	Fair	-
No. 1	Portland Cement		
No. 2	Acrylic emulsion	Flake	-

0007-SWP-000115394

Paint	Description	Condition	
		Cedar	Cement Coated Asbestos
No. 1	Portland Cement		
No. 2	Alkyd	Thin	-
No. 1	Alkyd		
No. 2	Portland Cement	Eroded off	-
No. 1	PVA 81-900		
No. 2	PVA 81-900	O.K.	O.K.
No. 1	Acrylic emulsion		
No. 2	Acrylic emulsion	O.K.	O.K.

Dr. Vannoy made a number of comments on Busan 11. Normally the zinc oxide will control mold in a representative all-purpose tint base with R 610, acicular zinc oxide, calcium carbonate plus some phenyl mercury oleate in an oil vehicle. If he removes the zinc oxide he cannot control the mold. If he introduces up to 2-1/2 pounds Busan 11 per gallon, there is still mildew. If he then goes all the way to PF and uses 1-1/4 pounds zinc oxide and 1-1/4 pounds Busan 11, the film is O.K.

In certain paints if he uses 2-1/2 pounds Busan 11 rather than one pound he gets more mold as the higher amount retards chalking too much. If he uses one pound of Busan 11 with non-chalking R 610 and calcium carbonate the paint mildews badly. If he replaces the carbonate with talc the mold decreases. He perhaps favors talc plus Busan 11 at 2-1/2 pounds in an XAD-116 alkyd.

0007-SWP-000115395

Titanium Pigment Corporation - Sayville, Long Island, N. Y.

Perhaps the most disturbing element in TPC's exposures is the poor performance of their AC-33 acrylic emulsion house paints. This is contrary to our own work so some time has been spent in analyzing possible reasons for the differences.

It is assumed that TPC got their base formulas from the supplier, Rohm and Haas. The questions then become whether the formulas were of sufficiently recent origin to be considered as modern and technically sound, and whether TPC's variations were technically correct. In both respects, TPC's formulas are not satisfactory.

It is known that even a formula with the proper ingredients in the proper amounts can give either good or bad results depending on the order of addition and the degree of dispersion effected. It appears that lack of dispersion could be the primary cause for TPC's poor results with AC-33. Some specific examples will be given.

In two series put out in 1954 and 1955, respectively, in which acrylics are compared with polyvinyl acetates, both homo- and copolymer types, the total dispersant for the acrylic is 3 pounds of gum arabic while the PVA's carry the 3 pounds of gum arabic plus 16 pounds of Triton X-100. This, of course, would make a big difference! Actually we do not use gum arabic and we think it is outmoded.

In another case put out in 1955 copolymer PVA 12 K 51 is compared with AC-33 over a range of PVC's from 15 to 40%. Three pounds of gum arabic and 8 pounds of Triton X-100 are used throughout. The acrylics show much more fading than the PVA, both increasing at higher PVC's. Besides the indicated elimination of the gum arabic it can be seen that the amount of dispersant is probably too high at low PVC's and too low at high.

In another series the acrylics carry 5 pounds of Tamol 731 as the only dispersant while the PVA with which it is being compared carries the same amount of Tamol 731 plus 8 pounds of Triton X-100! Obviously this is not a sound or fair comparison.

Other similar faulty formulations were found. To correct these situations we understand that Rohm and Haas are working with TPC to evaluate technically sound acrylic emulsion paint formulas, brought up to date in light of current knowledge. This should help in the future to counteract the bad publicity TPC is giving acrylic paints.

0007-SWP-000115396

While it is obvious that we cannot rely much on TPC's tests of emulsion paints, so that we actually will omit details on some series, there are other comparisons which hold some interest. One series put out in May, 1957, compares a variety of polymers using a pigmentation of 200 pounds of RA 50 TiO_2 and 75 pounds of whiting at 30% PVC. The paints are exposed as yellow and gray tints on both cement asbestos shingles and cedar shakes, two coats self-primed. The results after two years are largely fading, which may be summarized as follows:

Polymer	Fading	
	Yellow	Gray
Styrene butadiene X-2562	Considerable	Considerable
Acrylic AC-33	Definite	Considerable
Terpolymer Lytron 680	Considerable	Considerable
Homopolymer PVAc 81-900	Considerable	Considerable
Homopolymer PVAc TS 22	Considerable	Considerable
Homopolymer PVAc CL 102	Slight	Slight
Copolymer PVAc 12 K 55	Definite	Considerable
Copolymer PVAc Everflex G	Slight	Considerable
Copolymer PVAc Polytex 600	Slight	Considerable
Copolymer PVAc Flexbond 800	Very slight	Slight
Copolymer PVAc CL 202	Slight	Very slight
Arolon 110	Bad	Bad
Homopolymer PVAc 84-1100	Considerable	Considerable
Homopolymer PVAc Reichhold 9301	Definite	Definite
Homopolymer PVAc " 9304	Definite	Slight
Copolymer PVAc " 9120	Slight	Slight

Another series of emulsion paints, put out in August, 1957, consists of P.C. blue tints of homopolymer PVA Elvacet 84-1100, copolymer PVA Celanese CL-202, acrylic AC-33 and AC-33 modified with alkyd. All formulas carry 200 pounds of RA TiO_2 plus magnesium silicate to vary PVC's from 30 to 55%. These are applied two coats on weathered cement asbestos shingles. All show more fading at higher PVC's. The copolymer PVA shows the best tint retention, the homopolymer PVA next and the acrylic the most fading. Alkyd modification of the acrylic reduces fading.

This seems to be another case of very questionable dispersion. 1-1/2 pounds of potassium tripolyphosphate and 8 pounds of Triton X-100 are used for all the paints. Obviously, this could not be optimum at all PVC's. The alkyd-modification of the acrylic (25% Aroplas 1274) gave better color development, again indicating lack of pigment dispersion in the straight acrylics.

0007-SWP-000115397

For some years we have been reporting on a rather complicated series of exposures of exterior emulsion paints, started in September 1954. A pigmentation of 70% Titanox RA NC/30% magnesium silicate was used at 35% PVC in a succession of emulsion vehicles; styrene butadiene X 2562, polystyrene BKS 92, copolymer polyvinyl acetate Everflex G, homopolymer PVAc WC-130, acrylic AC-33 and AC-33 modified with alkyd. The paints were applied as follows:

2 coats on weathered cement asbestos shingles
2 coats on glazed cement asbestos shingles
2 coats on weathered stucco
2 coats on new cedar siding
1 coat over house paint primer on new cedar siding
1 coat on chalky paint
2 coats on cement block

Many of these tests have passed the point where they are of much value after five years of exposure. Again the poor dispersant formulation casts doubt on the results. Gum arabic is used alone with the acrylic paints (3 pounds) but 16 pounds of Triton X-100 were added to the gum arabic in the PVA paints.

The polystyrene paint is bad on all surfaces. On wood the styrene butadiene paint is also poor. The alkyd modification of AC-33 reduces the chalking of straight AC-33. The copolymer PVA paint, the straight AC-33 and the alkyd modified AC-33 paint are doing well on unglazed cement asbestos shingles. The copolymer PVA is better than the post plasticized PVA.

A series exposed in August, 1957, compares a pigmentation of 200 pounds Titanox RA 50 and 75 pounds magnesium silicate at 30% PVC in various emulsion vehicles. They include copolymer polyvinyl acetates CL-202, 12 K 55 and homopolymer 84-1100, acrylic AC-33 and AC-33 with 25% Aroplaz 1274, and styrene butadiene. The paints were applied as two coats on:

Cement block — Glazed cement asbestos shingles
Aged stucco — New siding
Regular cement asbestos shingles — Primed new siding
Weathered painted siding

This series compares the six vehicles in paints tinted blue with P.C. blue. The dispersant in each case is 1-1/2 pounds of potassium tripolyphosphate and 8 pounds of Triton X-100. Rohm and Haas consider the amount of dispersant inadequate for the AC-33 paints. This was supported by the poor color development in the AC-33 paints. Chalking occurred as early as at eight months.

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The copolymer PVA's are showing the best tint retention, the styrene butadiene the poorest. The AC-33 paint shows bad fading, worst on old chalking house paint. The homopolymer PVA shows more fading and more efflorescence than the copolymers.

The same six vehicles (with minor exceptions) were used in a series put out in July, 1958, with practically the same pigmentation and identical PVC, using Hansa Yellow to produce a yellow tint. Again the paints were applied on a variety of substrates much as in the 1957 series. The Hansa Yellow shows considerable fading in all of the paints. The copolymer PVA and also the copolymer PVA modified 25% with alkyd showed the best tint retention. The homopolymer PVA followed closely. Straight AC-33 showed slightly more fading than the PVA's and even more fading when modified 25% with alkyd. Lytron 680 showed better tint retention than AC-33, with less graying tendency. We do not have details on the dispersants used in this series and therefore cannot comment on the anomalous results.

In August, 1957, Titanium Pigment put on exposure a group of emulsion paints prepared by our Emulsion Research Laboratory. They were applied two coats on cement asbestos shingles. The paints include a variety of rutile TiO_2's in styrene butadiene and a cross-over of one lot of Titanox RA NC in Lytron 680 terpolymer, 12 K 55 PVA copolymer and AC-33 acrylic. The titanium oxides in styrene butadiene include four lots of RA NC, a special lot of RA NC for reduced chalking, and single lots of Titanox RA 50, Ti-Pure 610, 510, 500, Unitane 640 and 540. All the paints were formulated at 37%, as light green tints using chromium oxide.

The styrene butadiene group all show bad chalking (rated as 4) with little difference between pigments except for a slight advantage for the special lot of RA NC. AC-33 shows slight chalking (7), very slight chalk on Lytron 680 (8) and practically no chalk on 12 K 55 (9). Fading (5) is greatest and about equal on the styrene butadiene, Lytron 680 and AC-33 paints, least (6) on the PVA 12 K 55 paint. These readings were by J. MacGuffie of TPC as the writer did not inspect this series.

It should be noted that last year's report of our inspection of this series after ten months' exposure states that the styrene butadiene paints showed considerable fading, slight fading on the Lytron 680 and 12 K 55 paints and very slight on the AC-33 paint.

Previous inspection trip reports have outlined an extensive exposure series put out by TPC in August, 1956 to test the quality control of their production of controlled chalking rutile TiO_2. The titanium oxide pigments include:

7 lots of Titanox RA NC (TPC)
5 lots of Titanox RA 50 (TPC)
1 lot of Titanox RA (TPC)
11 lots of Ti-Pure R-610 (du Pont)
3 lots of Ti-Pure R-510 (du Pont)
1 lot of OR-640 (Calco)
2 lots of Unitane OR-540 (Calco)

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Some of the groups in this test include the extended titanium calcium pigments such as Titanox RC and RC HT (TPC) and Ti-Cal R-60 and R-27 (du Pont). One lot of Titanox RA NC (D56F19 #7A) was selected for blue carbon black undertone, with anticipated lower chalk resistance.

The various titanium pigments were used in several different types of paints, generally as white, green tints (chrome oxide), and blue tints (P. C. Blue). These include the following, together with the surfaces on which they were applied:

1. Maleic alkyd enamels. 18% PVC before shading. Exposed 45° south as one coat over house paint primer on small cedar panels.

2. SWP tint base, with 18 M. 36.7% PVC. Two coats self-primed on cedar bevel siding, south vertical.

3. Emulsion paints. Acrylic AC-33, homopolymer polyvinyl acetate Elvacet 81-900, copolymer 12 K 55, and styrene butadiene Dow X-2562. 30% PVC, except 35% for styrene butadiene. Pigmentation 200 pounds TiO_2 plus 78 pounds magnesium silicate. On unglazed cement asbestos shingles.

There were two supplementary series in which the same pigments were exposed in alkyd flat exterior paints and as alkyd-Chlorowax enamels. Only a part of the entire series was examined. In group 1, the maleic alkyd paints on cedar, in the green tints the Titanox RA NC oxides were quite good in tint retention except for one sample out of seven. This was the special sample selected for tone. Ti-Pure R 610 showed nine equal to the better RA NC's and two having more fading. The single sample of OR-640 appeared equal to the better RA NC's and R 610's. The samples of Titanox RA 30 showed more fading than RA NC while Ti-Pure R 510 showed two samples having superior tint retention and one showing bad fading. Unitane OR-340 showed rather bad fading. Titanox RA showed considerable fading, with a yellow face.

The ranking in the blue tints was approximately the same as in the greens except that the samples of Ti-Pure R 610 showed more variation, two samples superior to RA NC, six samples slightly inferior and three definitely inferior to the best RA NC's.

The styrene butadiene tints showed the most fading. As at 22 months, some apparent anomalies were observed. The best tint retention was shown by two samples of Ti-Pure R-510, while again the third R-510 sample faded badly. Titanox RA also showed less but spotty fading. All other samples showed relatively bad fading. The apparent anomalies may be due to differences in adherence of chalk.

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The acrylic tints in group 3 show less fading than the styrene butadiene parallels, and more uniform performance with like samples. In all cases the RA NC special sample showed more fading than regular RA NC.

Among the solvent type paint exposures there were two groups of proprietary house paints. The first, put out in June, 1955, two coats self-primed on cedar and white pine, shows the following results:

SWP 471 Gloss White - starting to erode on south, slight cracking on north.

National Lead #110 Bright White - good both south and north.

Pittsburgh 1-54 White - peeling along the lower edge of the white pine on south, thin on north.

du Pont #40 White - some cracking south, quite thin north.

Sears #143 White - bad erosion south, very thin north.

Ward's #75-1 White - cracking on white pine south, thin north.

Devoe #547 White - yellow on south and north, more dirt.

Benjamin Moore #100 White - thin and mold lower edge south, slight mold but good condition north.

The second proprietary series was put out in June, 1957, also two coats self-primed on cedar and white pine. The present condition is as follows:

SWP 471 Gloss White - good south and north, best flow in series, National Lead next.

National Lead #110 Bright White - good south and north, whiter than SWP.

du Pont #40 White - good south and north.

Sears #143 White - good south and north.

Devoe #547 White - yellow south and north.

Benjamin Moore #100 White - cracking south, O.K. north.

Patterson-Sargent #218 White - blue white color, slight mold north.

0007-SWP-000115401

Another series put out in June, 1957 on cedar and white pine, covering high hiding white house paints, includes some proprietary one coat house paints, as well as a few experimentals. The topcoats were applied over primer and also two coats self-primed on bare wood, and as one coat over previously weathered, chalky house paint. The experimental paints are not of much interest so far. Sherwin-Williams' 476 One Coat White, du Pont's #41 White, Sears' #190 White and Devoe's #301-04 White are all in good condition after the two years of exposure. The Devoe paint has a yellow cast, du Pont a reddish tinge, while Sears' is a blue white compared with SWP 476.

A series was put out in October, 1956 to compare magnesium silicate and natural whiting as extenders in gray and green gloss and flat alkyd house paints, two coats self-primed on cedar. The paints tested and their condition after approximately 2-1/2 years are as follows:

(1) 120 pounds Titanox RA NC plus 250 pounds Zinc oxide with extender to 33% PVC in 75% raw linseed, 25% Z_2 bodied linseed.

(a) 390 pounds Natural Whiting - less fading in gray and green than (b).

(b) 410 pounds Magnesium silicate - more fading than (a).

This reverses the order of fading from last year's readings.

(2) As (1) but 500 pounds Titanox RC for 120 pounds RA NC.

(a) 50 pounds Natural Whiting. Less fading than 1 (a), less than 2 (b) in gray. Yellower than 2 (b) in green.

(b) 55 pounds Magnesium silicate. Less fade than 2 (a) in gray and green, but less than 1 (b) in green. Slightly yellow in green tint.

(3) 200 pounds Titanox RA NC with extender to 33% PVC in 40% linseed, 35% alkyd and 25% chlorinated paraffin.

Fading about equal to 1 (a) and (b).

(4) 130 pounds RA NC with extender to 50% PVC in 100% alkyd vehicle as an exterior flat.

Fading like 1 (a) and (b) but more mildew on magnesium silicate.

0007-SWP-000115402

Among the special TPC tests, their storage building has been painted for three years with a paint similar to No. 3 above. This is a repaint on spruce over which the old paint was in very poor condition. The new paint is in very good condition and stays clean even under the eaves.

TPC has a cross-over series of exposures of tint bases, comparing solvent and emulsion house paints. These were put out in October, 1955, on cedar siding and aged cement-asbestos shingles. The gloss paints were applied over a conventional zincless primer while the others were applied two coats self-primed. All are yellow tints, using chrome yellow. The paints included the following:

Gloss House Paints

F 312	17.3% Titanox RA NC 29.0% Zinc oxide 33.4% Calcium carbonate 20.3% Chrome Yellow	75% Refined linseed 25% Z_2 bodied linseed PVC 33%
F 313	52.7% Titanox RC 28.2% Zinc oxide 19.1% Chrome Yellow	75% Refined linseed 25% Z_2 bodied linseed PVC 33%

Flat Alkyd

F 314	22.4% Titanox RA NC 50.0% Calcium carbonate 27.6% Chrome Yellow	Wallkyd 1952 PVC 50%

The emulsion paints were all pigmented with 60.4% Titanox RA NC/ 39.6% Chrome Yellow at 30% PVC.

F 315 Acrylic

F 316 Polyvinyl acetate

F 317 Styrene butadiene

The flat alkyd has the best tint retention in this series - contrary to our own experience and casting further doubt on TPC's early work with emulsion paints. The PVA paint is the best of the emulsion paints in tint retention, but not equal to the flat alkyd. Both the acrylic and styrene butadiene paints are showing bad fading. The gloss oil paints are mottled on the asbestos shingles as they struck in on application.

0007-SWP-000115403

A somewhat similar but more extensive series of tint bases, particularly from the standpoint of substrates, was put out in May, 1956. The paints were applied on:

Cement block	New siding
Stucco	Primed new siding
Glazed asbestos shingles	Weathered painted siding
Weathered asbestos shingles	New shakes

The compositions of the paints were as follows:

Gloss Paints - applied over zincless primer tinted gray.

F 471	17% Titanox RA NC	75% Raw linseed oil
	29% Zinc oxide	25% Z_2 Heat bodied L.O.
	34% Calcium carbonate	
	20% Chrome yellow	At 33% PVC
F 472	53% Titanox RC	As F 471
	38% Zinc oxide	
	19% Chrome yellow	

Flat Paints - two coats self-primed.

F 473	38% Titanox RA NC	Flat alkyd.
	16% Calcium carbonate	
	46% Hansa yellow	At 50% PVC.

All the flat emulsion paints were formulated at 30% PVC using a pigmentation of:

68% Titanox RA NC
32% Hansa yellow

F 474 Acrylic

F 475 Polyvinyl acetate copolymer

F 476 Styrene butadiene

Again the flat alkyd is the best in tint retention but with a reddish cast while F 471 is the best with a true yellow cast. Note that F 471 has chrome yellow while the flat alkyd has Hansa, which would be inferior to the best chrome, especially in an oil paint containing zinc oxide. F 472 with Titanox RC is dirty and gray compared with F 471 carrying pure rutile TiO_2.

0007-SWP-000115404

In the emulsion group the PVA is the best in tint retention while both the acrylic and styrene butadiene paints show bad fading. Tamol 731 - 25% was used as the dispersing agent together with Triton X-100 for the PVA paint, but no Triton X-100 was used with the acrylic. The dispersant requirements were considerably higher than actually used, even without considering that which should have been used in the Hansa yellow paste. Hansa would be expected to show fading, especially over alkaline surfaces.

TPC started a series in January, 1958, comparing extenders in flat alkyd exterior paints at 50% PVC. The paints were applied two coats self-primed on cedar. In the green tints, natural whiting has the best tint retention, showing only slight fade with a yellow cast (rutile yellowing?). Calcium carbonate plus diatomaceous silica shows slight fading, again with a yellow cast. Calcium silicate followed closely in tint retention. Magnesium silicate showed more fading, and slight mold on the north exposures. Natural calcium sulfate, silica, barytes, and mica all showed the greatest degree of fading, all about equal with a slight margin for mica. Calcium carbonate and calcium silicate show more tendency to retain rust stains.

In October, 1958, a series of tint bases were put on exposure to demonstrate the tint retention and chalk resistance of various titanium oxides. Tints were made as follows: grays with lampblack, blues with P.C. blue, greens with Harmon's Opaline Gl, pinks with Parachlor Red, yellows with chrome yellow light, and tangerines (tinting pigment not identified). The base paint is formulated as follows:

120# Titanium oxide	75% Raw linseed oil
250# Zinc oxide	25% Z_4 Heat bodied L.O.
390# Natural Whiting	PVC - 35%

The titanium oxides used included Titanox RA 50 and RA NC as well as Ti-Pure R 500, R 510, and R-610. All the titanium oxides show reasonably uniform tint retention at this stage. Parachlor Red fades in all the pink tints with R 510 slightly better than R 500. TPC finds in general that R 500 chalks like R 510, more than Titanox RA 50, RA NC or Ti-Pure R 610 and is not cleaner in tints.

In a study of isophthalic alkyds, TPC put out a series in December, 1955, with a basic pigmentation of:

150# Titanox A 168
150# Titanox RA
320# Magnesium silicate at 33% PVC

0007-SWP-000115405

The vehicles are listed below, together with notes where there is a departure from normal performance. If my notes are correct, "(75-25)" means 75% of the alkyd plus 25% chlorinated paraffin. "100% linseed-soya (45-45-10)" would mean 90 parts of a 50/50 linseed soya alkyd plus 10% chlorinated paraffin. All the paints contain 2-1/2 gallons fungicide per hundred gallons. The paints were applied two coats self-primed on cedar and Southern Pine.

F 376 — 25% Raw linseed oil
15% Q bodied linseed
25% Long oil alkyd
25% Chlorinated paraffin resin
90% (Apparently TPC error in %'s of components)

F 377 — 75% Long oil alkyd
25% Chlorinated paraffin
(Crack and peel on one pine board. Apparently formula too hard.)

F378 — 100% Long oil alkyd

F 379 — 100% Soya alkyd (75-25) (S-T Vis.)

F 380 — 100% Soya alkyd (85-15) (S Vis.) Eroding.

F 381 — 100% Soya alkyd (85-15) (Z_3-Z_4 Vis.) Better than F 380.

F 382 — 100% Tall oil alkyd (90-10) (V Vis.)

F 383 — 100% Tall oil alkyd (90-10) (Z_1 Vis.)

F 384 — 100% Tall oil alkyd (85-15) (Z_1 Vis.)

F 385 — 100% Tall oil alkyd (85-15) (Z_3-Z_4 Vis.)

F 386 — 100% Linseed soya alkyd (45-45-10) (H-I Vis.) Eroding.

F 387 — 100% Linseed soya alkyd (45-45-10) (Z_3-Z_4 Vis.)
Much better than F 386.

F 388 — 100% Linseed alkyd (90-10) (K Vis.) Eroding.

F 389 — 100% Linseed alkyd (90-10) (Z_4 Vis.)
Much better than F 388.

F 390 — 100% Soya alkyd (90-10) (Z_4 Vis.) Some erosion.

The higher viscosity vehicle in any pair of similar composition alkyds always shows less erosion and less mold. The soya alkyds show more mold than those made with linseed. The tall oil alkyds are performing well so far.

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In TPC's evaluation of Busan 11, they put out one comparison in March, 1958, two coats on white pine. The compositions and current condition are as follows:

G 860	150# Titanox A MO 50# Titanox RA NC 500# 35% Leaded Zinc 245# Magnesium silicate 75% Refined linseed oil 25% Z_2 Bodied linseed	PVC 33%
G 861	150# Titanox A MO 50# Titanox RA NC 245# Magnesium silicate 200# Busan 11 75% Refined linseed oil 25% Z_2 Bodied linseed	PVC 33%

On both south and north exposure the Busan 11 (no zinc) paint G 861 shows more mold than G 860. The chalking is 5 on G 860 and 8 on G 861.

TPC reports that in another series of gray paints it was shown that Busan 11 does not work with titanium calcium.

Another test of Busan 11 was put out in August, 1958, using the paints self-primed on #105 Novelty Southern Pine siding. Here Busan 11 shows some advantage in mold control when used in large amounts. The vehicle in all the paints is based on 75% Refined linseed oil and 25% Z_2 Bodied linseed oil. The pigmentations and current condition are as follows:

H 311	200# Titanox RA 50 500# Magnesium silicate	Bad mold on south and north.
H 312	200# Titanox RA 50 420# Magnesium silicate 100# Busan 11	Some mold south, considerable mold north.
H 313	200# Titanox RA 50 375# Magnesium silicate 150# Busan 11	Slight mold south, slight to considerable mold north.

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H 314	200# Titanox RA 50 335# Magnesium silicate 200# Busan 11	Slight mold north.
H 315	200# Titanox RA 50 250# Magnesium silicate 300# Busan 11	Clean both south and north.

The real break occurs between 150 and 200 pounds of Busan 11.

In the area of industrial finishes, TPC put out a lengthy series in July, 1958, on aluminum, in both whites and grays, exposed 45° south to demonstrate the durability and tint retention of various types of binders. The paints were applied by spray, two coats of enamel over a coat of primer. The pigmentation was straight Titanox RA NC, with certain exceptions noted. It was impossible in the time available to record all details of performance. The main observations were on the gray tints and the comments below cite only departures from normal performance:

No.	Vehicle Gray Tints	PVC	Comments
1	Air Dry Maleic Modified Alkyd	18%	Slight fade.
2	Baked Alkyd Urea	15%	Less fade than 1.
3A	Epoxy Urea (70%-30%)	23%	Bad fade.
3B	Epoxy Urea (80%-20%)	23%	Bad fade.
3C	Epoxy Urea (60%-40%)	23%	Bad fade.
4A	Epoxy Polyamide (50%-50%)	18%	Bad fade.
4B	Epoxy Polyamide (65%-35%)	18%	Bad fade.
4C	Epoxy [illegible] (50%-50%)	18%	Bad fade.
4D	Epoxy [illegible] (65%-35%)	18%	Bad fade.
5A	Epoxy-[illegible]	17%	Bad fade.
5B	Epoxy-Ester-Urea Formaldehyde	17%	Bad fade.
6	Epoxy-Air Dry (Amine Catalyst)	16%	Bad fade.
7	Epoxy-[illegible]lic	17%	Bad fade.
8	Vinyl-Acrylic	22%	Good, very slight fade.
10A	Acrylic-Amberlac (85%-15%)	15%	Excellent gloss, very little fade.
10B	Acrylic-Amberlac (75-25%)	15%	Excellent gloss, very little fade.
10C	Acrylic-Amberlac (85%-15%)	20%	Excellent gloss, very little fade.
10D	Acrylic-Amberlac (75%-25%)	20%	Excellent gloss, very little fade.
11A	Acrylic	15%	More dirt than #10's.
11B	Acrylic	20%	More dirt than #10's.
12A	Polyurethane Air Dry	20%	Lost gloss, faded.
12B	Polyurethane Baked	20%	Lost gloss, faded.

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No.	Vehicle	PVC	Comments
	Gray Tints		
13A	Lacquer (Coconut Alkyd-Maleic Modified)	15%	Lost gloss, faded.
13B	Lacquer (Coconut Alkyd-Maleic Modified)	20%	Lost gloss, faded.
13C	Lacquer (Coconut Alkyd-DBP)	15%	Lost gloss, faded.
13D	Lacquer (Coconut Alkyd-DBP)	20%	Slight fade.
14A	Styrenated Alkyd Low Cost	25%	Slight fade.
14B	Styrenated Alkyd Low Cost	24%	-
	Pigmentation: 100% "TITANOX" RCHTX		
14C	Tall Oil Alkyd - Urea	30%	-
14D	Tall Oil Alkyd - Urea	30%	Very slight fade.
14E	Tall Oil Alkyd - Urea	30%	-
	Pigmentation: 100% "TITANOX" RANC		
14F	Tall Oil Alkyd - Urea	25%	Faded
	Whites		
17A	Polyurethane - Amine Catalyzed	15%	Yellow
17B	Polyurethane - Amine Catalyzed	20%	Slightly yellow.
17C	Polyurethane - One Package	15%	Slightly yellow.
17D	Polyurethane - One Package	20%	Whiter
17E	Polyurethane - Polyester Catalyzed	13%	Yellow
17F	Baked Alkyd Urea	20%	Whiter

National Lead Company, Sayville, Long Island, New York

Again time available permitted only a few minutes' conversation and inspection of only a few panels put out by National Lead. These involved their "Defense in Depth" systems of metal protective paints employing M-50, their basic silico lead chromate. Special attention was paid to the specification systems used by various states for painting structural metal, including systems from Connecticut, Maryland, Texas, etc., which normally employ red lead.

National is using a very large and massive plate to which an I-beam is welded, plus some rivets. The tests are now 2-1/2 years old. In some instances the shop prime coat was applied and weathered for 11 months, then spot primed and the topcoat applied.

In every case the original specification system using red lead as the primer is inferior to the "Defense in Depth" approach where some M-50 is used in all coats.

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