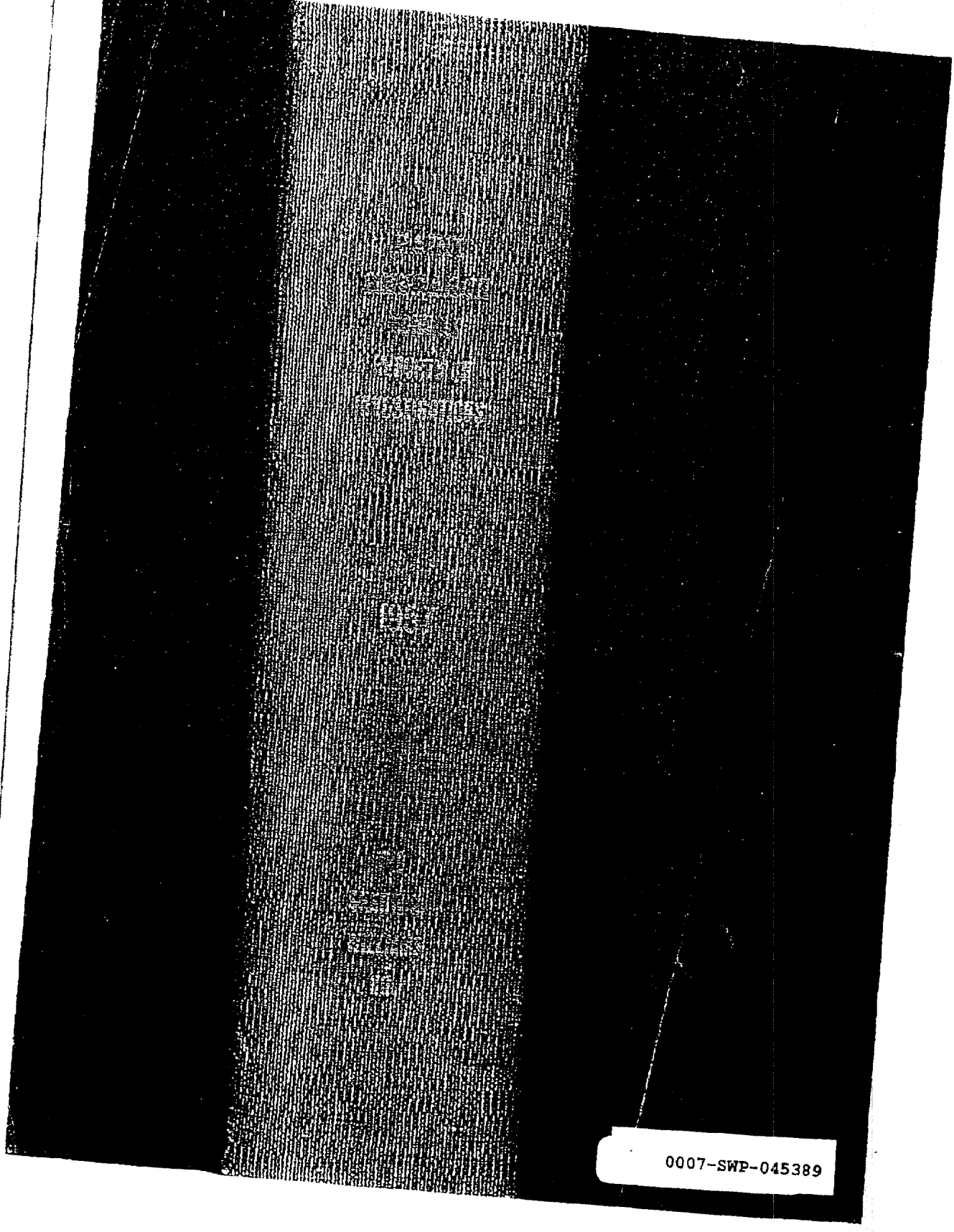

0007-SWP-045389

Project #177 - Pigment Studies

Panels 24176 - 24179 C have completed six months 45° south exposure at Chicago. This series evaluates polyurethane and Resimene 814 coated pigments in SWP Flat Java Brown Al N 15. The purpose of the resin extended pigments was to attempt to eliminate white chalk face and fading from dark colored house paints upon exposure. The results show that the polyurethane coated pigment is no better than the standard SWP Flat while the Resimene coated pigment is much poorer on fading. These results agree with those found on accelerated tests under the Uviarc ultraviolet lamp. These exposures are being discontinued although work on this project is being continued along other lines.

Panels 24108-25 C and F have been inspected after six months' exposure in Chicago and Florida. In this study a number of titanium dioxide pigments are being evaluated against each other in Exlon automotive vehicle, (37 C 62). The exposures were made in straight whites and in blue tints. A table is listed below in which loss of washed gloss is used to indicate the relative durability of the pigments being evaluated.

Florida Exposure - 6 Months

	White 60° Photovolt Gloss			Blue Tint 60° Photovolt Gloss			
Pigment	Original	Washed 6 Mo.	Loss in Gloss	Original	Washed 6 Mo.	Loss in Gloss	Total Loss White/Tint
OR 640	97	85	12	93	78	15	27
R 610	92	85	7	93	75	18	25
RANC	93	83	10	94	73	21	31
OR 540	92	82	10	94	66	28	38
R 510[1]	93	45	48	94	43	51	99
R 510[2]	93	72	21	93	61	32	53
RA 50	94	74	20	94	67	27	47
R 110	93	58	35	93	51	42	77
R 610[3]	96	63	33	94	57	37	70

[1]Chloride Process [2]Sulphate Process [3]Kem Transport Vehicle Control

0007-SWP-000114762

Project #177 - Cont.

From the table it can be seen that little differences exist between the non-chalking type titanium pigments. However, in the semi-chalking titanium class some significant differences do show up. du Pont's R 510 pigment made with the chloride process has relatively poor chalk resistance. du Pont's R 510 pigment made by the sulphate process and Titanium Pigment's RA 50 show fair chalk resistance. Calco's OR 540 shows the best chalk resistance of the semi-chalk pigments and approaches the chalk resistance of the non-chalking pigments. du Pont's R 110 sample also was a chloride process pigment and would be expected to be about equal to R-510 chloride process. The loss in gloss for the Kem Transport control was largely due to dirt pick-up and mildew.

In Chicago the panels have not reached significant chalking at six months except for the chloride processed R 510 pigment. The panels will be re-exposed in Chicago and in Florida.

0007-SWP-000114763

Project #162 - Studies in Flat Wall Paint Formulation

The Varnish-Resin Laboratory has prepared two thixotropic vehicles for evaluation in Flat-Tone based on a revised pigmentation. The two vehicles coded CTV 9545 and 9567 produced excessive viscosity with sticky brushing properties. A vehicle with lower body has been requested for use with the new pigmentation, and work will be continued.

	CTV 9545	CTV 9567
Resin	Rosin, Versamid 930	Rosin, Versamid 930
Oil	Soya	Soya
Polybasic Acid	Maleic and phthalic anhydrides	Maleic and phthalic anhydrides
Polyol	P.E.	P.E. and Di-P.E.
Body	Gel	Gel
Cure	23"	18"
Acid Value	3.1	8.9
Solids	40.0%	40.0%

An investigation is under way to compare the odor, drying properties and anti-skinning characteristics of three experimental Flat-Tone Whites using the anti-oxidants listed below.

Paint	Anti-Oxidant Used per 100 Gallons
510 U	1 gal. (1954) - 17.5% methyl ethyl ketoxime solution.
511 U	1 gallon OR 303 - 17.2% cyclohexanone oxime in 5% (415), 95% (329).
512 U	1 pound Antioxidant D - cyclohexanone oxime from National Aniline Division of Allied Chemical and Dye Corporation.

(415) - Ethyl cellosolve

(329) - High Flash Naphtha

Samples of the test paints were evaluated by the Paint Research Department, Cleveland, Gibbsboro and Newark Technical Service Departments for odor, drying and anti-skinning properties. The various reports indicate that antioxidant OR 303 is better in odor characteristics than (1954), methyl ethyl ketoxime solution, and slightly superior in anti-skinning properties. The drying properties of Flat-Tone made with OR 303 are retarded slightly but would be considered satisfactory for this material.

0007-SWP-045392

0007-SWP-000114764

Project #162 - Cont.

It has been suggested that the Cleveland Technical Service Department obtain the reaction of the Sales Department relative to the improvement in odor of Flat-Tone made with Antioxidant OR 303.

The Chicago Varnish Plant has produced several plant batches of (37 C 70) which were used in the manufacture of our new Flat-Tone White. The new production has increased in viscosity somewhat more than desired due primarily to the high body and substandard characteristics of the (37 C 70). Our formulation work has indicated that (37 C 70) should be made with the following characteristics to obtain satisfactory paint stability:

Body	C to D
Cure	20 to 30
Color	8 maximum
Solids	29.5 to 30.5%
Acid Value	24 maximum
Spec. Gravity	0.823 $\pm$ 0.005

0007-SWP-000114765

Project #187 - Physical Properties of Pigments

The concept of Critical Pigment Volume Concentration is a very useful tool for the formulator. The lengthy and sometimes inaccurate method for determining CPVC discourages more frequent use. To overcome these obstacles, work has been done to develop a more accurate and efficient method for running CPVC. This new method involves the following changes:

1. Pressure filtration has been substituted for vacuum filtration. More rapid filtration is gained by this change and evaporation in the fritted filter is reduced. The pressure used is 15 pounds per square inch which is approximately equal to the pressure exerted on the cake by the atmosphere in the vacuum filtration so no error will be introduced through compressing the cake.

2. A larger filtering area is used to reduce time for the cakes to form on the filter and to increase the volume of the cake that can be filtered conveniently.

3. A gravimetric rather than volumetric method is used to determine the size of the cake.

The above changes in the CPVC method should enable an individual to make a complete determination in a half hour. Previously, the determination would range in time from a few hours to days. As soon as certain details have been finalized a more complete description of the apparatus and procedure will be given.

0007-SWP-000114766

Project #196 - Emulsion Wall Primer and Sealer

The raw material cost of the proposed PVA Wall Primer and Sealer was lowered to that of the present B71 W 4. This was achieved by reducing the solids from 45 to 43% by weight. Butyl carbitol acetate and butyl cellosolve acetate are effective low temperature coalescing agents, but they have an adverse effect on freeze-thaw resistance. It was established that for each gallon of either one of these glycol-ether esters three gallons of ethylene glycol have to be used to restore the freeze-thaw stability of emulsion paints.

Adhesion of the present and proposed B71 W 4 PVA Wall Primer and Sealer to glossy paint surfaces was evaluated. Where the glossy surface was dulled with trisodium phosphate solution, both primers adhere well. Over untreated glossy paint surfaces, the adhesion is not as good.

About six months ago Resin Research submitted a sample of RE-8406 for evaluation. This material is a PVA emulsion of the WC-130 type. When used in the B71 W 4 formula in place of Elvacet 81-900, the original viscosity was 69 K.U. which has increased to 100 K.U. after six months. When RE-8406 is the vehicle in the multi-purpose primer, the viscosity of the sealer changes very little in six months.

The surface wetting properties of this formula still need improving. Recently Resin Research submitted a sample of RE-8425 which is a pilot plant batch of RE-8406. The pilot plant batch of the PVA resin emulsion shows somewhat better performance in the above two formulas than the laboratory batch did. Additional work will have to be carried out with Resin WC-130 type of PVA vehicle before a safe PVA Wall Primer and Sealer formula is obtained.

0007-SWP-000114767

Project #162 - Studies in Flat Wall Paint Formulation

The Chicago Varnish Plant has made approximately 1200 gallons of standard (37 C 70) for use in Flat-Tone White Rx A45 W 3. The characteristics as run by the Varnish-Resin Laboratory are as follows:

	Batch Characteristics	Standard Characteristics
Body	C - D	C - D
Acid Value	12	24 max.
Color	8	8 max.
Cure	18	20 - 30
NVM	29.9	29.5 - 30.5

Two drums of the (37 C 70) are being held by the Varnish Department to be distributed to the various laboratories as requested by the Cleveland Technical Service Department, after sufficient time has elapsed to study the stability of the Flat-Tone made with this varnish.

The Chicago Varnish-Resin Laboratory has furnished several thixotropic vehicles for evaluation in flat wall paints. CTV 9586 and CTV 9624 have good brushing, flow and thixotropic properties. CTV 9624 did not produce as firm a gel as CTV 9586 but appeared to be slightly better in brushing and roller coating properties. CTV 9621 and CTV 9630 did not exhibit the thixotropic properties required for a gelled type paint. The Chicago Varnish-Resin Laboratory has experienced considerable difficulty in the development of these thixotropic vehicles. Work will be continued on this investigation.

In the September, 1956 report a reference was made to the use of Viscotrol (Ferro Chemical Corp.) and (25 C 11), comparing them as bodying agents for Flat-Tone. Paints containing 1 to 3 pounds per 100 gallons of each agent have now been in storage for six months. It has been reported by the manufacturer that Viscotrol A possesses certain advantages over other thickeners in that its ability to body organic liquids is not affected by impurities such as water, phenols, polar solvents and slightly basic or acidic components. Consistency characteristics of the paints containing two and three pounds of Viscotrol A are better in stability than the paints bodied with (25 C 11). Test data appear in the following table.

0007-SWP-000114768

Project #162 - Cont.

Flat-Tone White Rx A45 W 3

Batch No.	Agent	Viscosity at 77° F. on #5 Orifice					
		Fresh	24 Hr.	1 Wk.	3 Wk.	6 Wk.	6 Mo.
288 U	None	10"	11"	11.2"	9.8"	9.2"	7"
289 U	1 lb. (25 C 11)	13	14	16	11.8	10.6	7.2
290 U	2 " "	13.4	15.2	17	12.2	10	7.2
291 U	3 " "	14	18.8	21.4	14	11.8	7.8
292 U	1# Viscotrol A	10	11.4	11.2	10	9	6.6
293 U	2# "	12.4	15	15.4	15.4	14.2	10.2
294 U	3# "	14	21	22	18.2	16.4	12.2

The proposed Flat-Tone White formulation was compared with the present Federal Specification TT-P-30, dated March 12, 1956, which covers Paints, Alkyd, Interior, Flat and Tints. This specification calls for a minimum of 26% non-volatile matter by weight of the vehicle. If we figure the total vehicle solids to include the combined solids of the BE 336 and AB 63 bases, plus the drier solids and calcium stearate gel, the solids would total 25.9%. The TT-P-30 specification also has a minimum requirement of 23% phthalic anhydride whereas our proposed formula contains 15.2% Isophthalic acid, 4.0% Fumaric acid, and 7.5% rosin, or a total of 26.7%. The proposal is compared with the specification requirements in the following table.

0007-SWP-000114769

Project #162 - Cont.

Quantitative Requirements of Alkyd Flat Paint
Federal Specification TT-P-30

Characteristics	Minimum	Maximum	Proposed Rx A45 W 3
Pigment % by weight of paint	53		64.6%
Non-volatile vehicle % by weight of vehicle	26	-	25.9%
Phthalic Anhydride, % by weight of non-volatile vehicle	23	-	26.7%*
Kauri-butanol value of volatile thinner	-	28	23 - 28
Daylight 45°, 0° directional reflectance %	86	-	90.4
Water % by weight of paint	-	1.0	0.27
Consistency, Krebs-Stormer Shearing Rate 200 r.p.m.			
Grams	175	300	200
Equivalent KU	77	95	89
Set-to-touch, hours at 77° F.	1/2	-	1-1/4 hr.
Dry hard, hours	-	7	6
Specular gloss (without correction for diffuse reflectance)	-	8	3
Fineness of grind	4	-	4-1/2

*Isophthalic acid	15.2%
Fumaric	4.0
Rosin	7.5
	26.7%

0007-SWP-000114770

Project #177 - Pigment Studies

Four months storage tests have been completed on phthalocyanine blue pigments CP 1404, CP 1408, and the standard CP 1037. CP 1404 is the Sherwin-Williams production red shade PC blue while CP 1408 is a green shade. The standard CP 1037 is du Pont BNC, 7710 dry. CP 1404 was converted to the green shade within the first week of storage but it does not show any further change since that time. CP 1408 shows a slight loss of strength but otherwise it is excellent. The control, CP 1037, showed a considerable change in color strength but it still maintains its red shade.

A comparison was made between pebble mill and two roll mill dispersions of CP 1037 and CP 1404 in the vinyl resins. The pebble mill dispersions did not develop as much color strength as the 2-roll mill and therefore less change is found with them, but the change from the red to green shade in CP 1404 is still evident. The final series of tests on these pigments will be made after six months' storage.

Panels 24176-24179 F have completed six months' exposure in Florida. These panels are an evaluation of resin extended pigments in SWP Flat Java Brown formulation. The purpose of this test is to develop a means of preventing the formation of a white chalk face on the dark colored house paints. A polyurethane resin and Resimene 814 were used as protective coatings for the pigments. The Resimene 814 coated pigments faded quite badly and were much worse than the control paint SWP Flat Java Brown Al N 15. The polyurethane coated pigments showed about the same amount of fade as the control. Similar panels exposed at Chicago gave the same results. These are reported in the January, 1957 monthly report. Since no advantage has been found for the resin extended pigments the panels are being retired.

Further work has been done in an attempt to develop a suitable coating for house paint pigments which will control fading and white chalk face. A melamine-alkyd combination (48 C 27) and (40 D 14) has been tried but it also showed fading when exposed under a Uviarc ultraviolet light. The good ultraviolet resistance of Hypalon sounded interesting but the flexibility of this material made it impossible to regrind the coated pigment. Efforts to harden the Hypalon have not proven too successful. Work will continue with other coatings which may prove useful.

0007-SWP-000114771

Project 177 - Cont.

Florida exposures 24260-24265 F were inspected after six months' exposure. These exposures show two experimental titanium pigments from du Pont coded SR 40-1 and 985-B to be slightly inferior to du Pont's R 610 in gloss retention. These panels were re-exposed.

Routine examination for the third year of Florida south exposure has been made on panels 18380-7 F, all cedar bevel siding, and the most recent Chicago south readings are at 46 months. This series continues to be of considerable interest and will be continued on test. It evaluates four colored leaded zinc oxides made as pilot plant batches at Coffeyville by the antimony process. These are varying shades of yellow and are tested as single-pigment paints, compared directly with SWP Tint Base shaded to match. The details of chemical composition are covered in our progress report of February 8, 1956.

At 3 years' Florida exposure, the special samples continue to show much less fading, dirt and mildew than the controls. However, 40 X microscopic examination shows some checking on the specials, with some preference for those based on Ozlo 12 as against those based on Ozlo 35, but this is certainly not serious considering the long exposure. The Chicago panels show the same marked advantages for the special in color and appearance over the regular tint. Furthermore, the remarkably slight failure (mostly erosion) tends to favor the special samples. Their chalking rate is fairly rapid, but the chalk seems to be very adherent and its deep "self-colored" characteristic seems to be the main cause of their good color retention.

0007-SWP-000114772

Project #178 - Studies of Dark Colored House Paints

Exposure series 21640-60 C, F, K was studied recently. Florida vertical south panels have completed 24 months, Coffeyville panels were recalled and retired at 27 months, and Chicago panels were examined very recently at 30 months. The series compares regular formulas of SWP Trim Colors as listed below with special low PVC batches. The latter were made as low in PVC as practicable for drying with the regular vehicle constituents, and were submitted to Cleveland for roller mill production. The series is in duplicate, (a) regular two coat work on new cedar bevel siding with A2 W 2 SWP Undercoater and (b) on repaint cedar as two coats self-primed.

There is no film failure at any location so far. Mold growth referred to below is at Florida only, and seems to show quite wide and significant variations. Other important general results are: (1) considerably better gloss retention with all low PVC samples, and (2) better color retention with low PVC, but not as consistently superior as in the case of gloss.

Following is a listing of the rexes involved, with whatever notes on results seem to be significant as additions or corrections to the general statements given above:

Rx 416 Ardmore Green, Card 16 regular, 23.1% PVC, versus 12.9%. Regular whitish chalk face; special yellowish, much better. However, special shows more mold.

Rx 482 Hillcrest Green, Card 14, 22.4% PVC, versus 12.8%. Much like preceding pair; regular somewhat better than Rx 416.

Rx 483 Sagamore Green, Card 7, 20.0% PVC, versus 11.9%. Similar to preceding in color, but both show yellowish mask. Low PVC shows a little less mold, but both are poor in this respect.

Rx 417 Verdas Green, Card 17, 18.2% PVC versus same at 14.2% PVC, also versus a 12.7% PVC sample made with PC Blue and Hansa Yellow rather than Shamrocks.
Little if any choice as to mold. Better color and gloss of both low PVC samples is of little avail, as all are far below the level of acceptable color retention.

Rx 418 Solfast Red, Card 12, 21.65% PVC, versus 20.4%; the regular being made with Micro-Velva and Kadox, the special with Atomite and calcium carbonate.
Special quite free from chalk-mask, excellent except for Florida, where both show bad mold.

0007-SWP-045401

0007-SWP-000114773

Project #178 - Cont.

Rx 412 Castilian Blue, Card 15, 24.15% PVC versus 2 batches at 14.2 and 16.8% PVC; leaded zinc in regular vs. titanium in specials.
Regular shows less fading, but tends to bronze, tests seem cleaner, brighter. Both resist mold very well.

Rx 495 Manor Brown, Card 15, 22.6% PVC versus Card 18 , 9.37% PVC.
Minor improvement in color offset by more tendency toward mold.

Rx 493 Woodland Brown, Card 13, 23.46% PVC versus Card 19, 13.82% PVC.
Like preceding, but mold much more serious on both.

Rx 497 Royal Maroon, Card 13, 16.16% PVC versus 10.75%.
Much like preceding two, intermediate with regard to mold.

Three paints were added to series 25480-4 CS, CN, F. The added panels are numbered 25881-3 CS, CN, F (including the repeated guide, which is Rx 477 SWP Westchester Gray, Card 21). The original series consisted (a) of this guide formula versus a special using chromium oxide and iron oxide, and (b) a proposed formula based on BB 1411, BL 44, BO 20 and BY 40 versus the same using chromium oxide and iron oxide. The new additions test the use of (1) 7150 dry black iron oxide and (2) 7100 dry bone black, in the guide formula.

0007-SWP-000114774

Project #86 - Leaded Zinc Pigments

Exposures 26043-80 CS, CN, F, K, consisting of 144 cedar bevel siding panels, were prepared for Chicago north and south, Florida and Coffeyville. This is a tint base study in SWP Colonial Yellow and Westchester Gray. The general set-up is as follows:

A. Ti-Pure R-610 as titanium

$CaCO_3$ as extender - zinc as Ozlo 18 M.
Mg silicate as extender - same.
Mg silicate-$CaCO_3$ blend - same.
Repeat extenders - using zinc as Ozide.
Repeat extenders - using zinc as Azo ZZZ-33.

B. Titanox RC as titanium

$CaCO_3$ - Ozlo 18 M, as above.
Mg silicate - Ozlo 18 M, as above.
Mg silicate - $CaCO_3$ - Ozlo 18 M, as above.
Repeat with Ozide, as above.
Repeat with Azo ZZZ-33, as above.

0007-SWP-000114775

Project #177 - Pigment Studies

108 cedar bevel siding panels, comprising series 25842-80 CS, CN, F, were prepared for exposure at Chicago north and south and at Florida. The purpose of the series is to study the frequency of rutile yellowing, as well as chalking and durability of various titanium dioxide pigments in SWP Tint Base, used both as white, yellow and gray. The basic formula is a special, using leaded zinc, calcium carbonate and mica in an oleoresinous vehicle. The thirteen titanium pigments tested are:

Titanox RA 50
Ti-Pure R 610
Ti-Pure R 750, lot 75004
Ti-Pure R 510 - 10 samples submitted by du Pont, of which 5 are sulfate process and 5 chloride process.

We have seen instances where rutile yellowing appears to develop more frequently with du Pont's chloride process R 510 than with their sulfate process 510. The last item listed above covers this comparison in a broader test. It also will check uniformity of production.

0007-SWP-000114776

Project #162 - Studies in Flat Wall Paint Formulation

At the last Trade Sales Technical Board meeting it was reported that various purchases of Sani-Flat White differed considerably in general performance. In line with the above statement three samples of Sani-Flat White were purchased and evaluated in comparison with the proposed Flat-Tone White. The results of our tests indicate a wide variation in the flow and roller coating properties of the various Sani-Flat samples. Two of the three samples dropped in opacity on drying. The proposed Flat-Tone White formulation is fairly close to Sani-Flat in general performance. However, the new Flat Tone White is higher in opacity and sheen and does not show any drop in hiding from wet to dry.

Proposed Flat-Tone Vs Sani-Flat

Product	Proposed Flat-Tone Rx A45 W 3	Sani-Flat White 4300	Sani-Flat White 4300	Sani-Flat White 4300
Date	C 867	5327	4728	534
Package Condition	-	9	9	9
Viscosity #5 S-W Cup	15.6"	11.2"	8"	13.4"
Stormer viscosity in KU	91	87	81	92
Brushing	Very good	Very good	Very good	Very good
Roller Coat Application	Good	Good	Sags	Sl. short
Flow	Good	Good	Too high	Sl. short
Washability (over glue size)	550 rubs	600 rubs	635 rubs	650 rubs
Sheen - 60° Unit	4	3	3	3
Sheen - 85° Unit	18	8-1/2	8-1/2	8-1/2

(Cont.)

0007-SWP-000114777

Project #162 - Cont.

Proposed Flat-Tone Vs Sani-Flat

Product	Proposed Flat-Tone Rx A45 W 3	Sani-Flat White 4300	Sani-Flat White 4300	Sani-Flat White 4300
Date	C 867	5327	4728	534
Stain Removal				
Rubs to remove:				
Blue Ink	508 V. def. stain remaining	500 Def. stain remaining	500 Def. + stain remaining	500 Def. stain remaining
Dust	125	115	135	140
Soiling Compound	175 Def. grease mark after 500 rubs	155 Sl. grease mark after 500 rubs	150 Sl. grease mark after 500 rubs	155 Sl. grease mark after 500 rubs
Contrast Ratio				
Wet Film	.967	.965	.960	.965
Dry Film	.973	.959	.961	.959
Torture Board				
Uniformity of Color	8	8	7	8

The Chicago Varnish-Resin Laboratory has prepared two batches of (37 C 70) isophthalate alkyd in the laboratory using the same alkyd base cut to 30% and 50% solids. Laboratory batches of Flat-Tone White made with these vehicles has performed in a similar manner and have given similar viscosities. However, the paints were either too thin or too high in body and too sticky in brushing. We have suggested to the Varnish Department that an additional batch be prepared with some intermediate body. It would appear from our tests that a Z_2 to Z_3 body at 50% solids may be satisfactory for Flat-Tone.

0007-SWP-000114778

Project #162 - Cont.

The Chicago Varnish-Resin Laboratory has prepared two thixotropic vehicles, CTV 9637 and CTV 9653, for evaluation in gelled paints.

No.	CTV 9637	CTV 9653
Rosin	Rosin, Polyamide	Tall oil, rosin, polyamide
Oil	Soya	Soya
Polybasic acid	Phthalic anhydride	Phthalic and maleic anhydride
Polyol	P.E. and Di-P.E.	P.E.
Body	Gel	Gel
Cure	7"	24"
Acid Value	11.8	12.4
Color	10-11	11-12
Solids	40%	40%

CTV 9653 was evaluated in a flat wall paint formulation 839 U based on the new Flat-Tone pigmentation. This liquid was found to be good in thixotropic properties, but a further move in this direction is indicated to obtain a lower consistency after the paint is shaken. CTV 9637 is not good in thixotropic properties and too high in body for use with the new pigmentation.

The Georgia Marble Company has furnished samples of their 5-25 Whiting and Kalmac for inspection. The two samples were compared with 63 C 9 dry - Duramite in Flat-Tone White. The 5-25 Whiting appeared to be similar to Duramite in sheen characteristics and would be satisfactory as an alternate for Duramite in Rx A45 W 3.

0007-SWP-000114779

Project #162 - Cont.

Flat-Tone White - $CaCO_3$ Variations

	OJ 661 U	OJ 662 U	OJ 663 U
Calcium Carbonate	63 C 9 Dry Duramite	Kalmac	Whiting 5-25
Viscosity #5 - Fresh	10.4"	13.0"	12.2"
" " - 24 Hr.	15.6"	18.4"	15.4"
Brushing	Easy - O.K.	Quite easy - O.K.	Easy - O.K.
Flow	9	9	9
Dry	9	9	9
Uniformity of sheen on lap	8	8	8
Uniformity of tint on lap	8	8	8
Uniformity of tint on spackle board	Good -	Good -	Good -
85° Gloss; or sheen	15	20	15
60° Gloss	3	3	3
Washability (over glue size) Rubs required to remove film.	97 rubs	62 rubs	108 rubs
Stain Removal (number of rubs to remove stain)			
Dust	137	109	114
Staining Compound	91	159	162
Ink	> 500 Def. stain	> 500 Def. stain	> 500 Def. stain

0007-SWP-045408

0007-SWP-000114780

Project #162 - Studies in Flat Wall Paint Formulation

The proposed Flat-Tone White formulation 853 U was compared with an experimental formula 17-34 developed by Cleveland Technical Service. The two formulations were made with the new flat wall paint vehicle (37 C 70). The Cleveland formulation is approximately six cents lower in raw material cost than our proposed development 853 U. Brushing properties, uniformity of tint and washability are not quite as good as our proposal 853 U. Test data are listed in the following table.

Chicago and Cleveland
Proposed Flat-Tone White A45 W 3

Development Tested	Chicago	Cleveland
Material - rex number	A45 W 3	A45 W 3
Experimental No.	853 U	854 U (Cleve. No. 17-34)
Viscosity - Fresh #5 Cup	11.0"	15.6"
K.U.	83 KU	88 KU
24 Hr. #5 Cup	13.8"	21.4"
K.U.	88 KU	95 KU
High Shear Poises	2.3	3.2
Brushing	9	7
Flow	9	9
Sheen - 60° Unit	3	3
85° Unit	15	14
PVC	70.6%	67.7%
CPVC	59.1%	51.2%
Torture Board (Uniformity)	9	9
Uniformity of Tint on Laps	9	8
Washability (over glue) Rubs to remove film	385	450

(Cont.)

0007-SWP-045409

0007-SWP-000114781

Project 4162 - Cont.

Development Tested	Chicago	Cleveland
Material - Rex number	A45 W 3	A45 W 3
Experimental No.	853 U	854 U (Cleve. No. 17-34)
Hiding Contrast Ratio		
Wet Film	.967	.964
Dry Film	.973	.979
Stain Removal		
Rubs to remove:		
Dust	105	110
Blue Ink	500 (Definite stain)	500 (Def. stain)
Soiling Compound	130	175
Raw Material Cost	$134.87	$128.19

The Chicago Varnish Plant has manufactured approximately 1200 gallons of (37 C 70) at 50% solids, color 8, acid value 15.4, cure 19 and body Z-3. Samples of the filtered and unfiltered (37 C 70) were tested in the proposed Flat-Tone White formula and were found to be satisfactory in performance characteristics. However, the unfiltered varnish gave somewhat higher viscosity than the filtered material. The paints are to be held in storage and checked for stability over a period of several months.

		Viscosity #5 S-W Cup			
Paint	Varnish	Fresh	2 Days	5 Days	8 Days
929 U	Filtered	8.2"	10"	12.4"	12.0"
930 U	Unfiltered	12.6"	15.6"	20.2"	20.2"

0007-SWP-000114782

Project #162 - Cont.

The Chicago Varnish-Resin Laboratory has submitted two thixotropic vehicles, CTV 9668 and 9681, for evaluation. The two vehicles are identical in composition and differ only in the size of the batch cooked. CTV 9668 represented a two gallon batch, whereas CTV 9681 was a five gallon cook. Four quarts of thixotropic flat wall paint (OJ 884 U) made with CTV 9668 was sent to Mr. L. T. Statham for his inspection. It is hoped that the Sales Department will make a report as to their interest in thixotropic paints at the Trade Sales Technical Board meeting on June 12 and 13.

Thixotropic paints that have been made to date are slightly high in flow when roller coated. However, slightly higher amounts of titanium calcium pigment and smaller quantities of whiting are being used to reduce flow. CTV 9681 produced more thixotropy or gel structure when calcium carbonate is used as the inert in place of magnesium silicate.

At the request of the Sales Department work has been under way to improve the washability and stain removal of the Paintercraft Heavy Duty Flat Wall Paint B78 W 8. Various wetting agents were tested such as Aerosol OT, triethanolamine and Pluronic F 68 to improve stain removal and washability. The agents actually decreased the washability. These properties were improved, however, by the use of small quantities of zinc oxide in conjunction with some paraffin wax introduced as (2 A 6).

0007-SWP-000114783

Project #177 - Pigment Studies

Sherwin-Williams production of phthalocyanine blue pigments Solfast Blue MDNC, CP 1404, and GDT CP 1408 have completed six months' storage tests in high aromatic-ketone solvent vinyl formulations. Comparison of drawdowns made of the original paints and those made after six months' storage at 25° C. and 50° C. show that the red shade PC blue CP 1404 has been converted to the more stable green shade. The control pigment, du Pont's Monastral Fast Blue BNC, CP 1037, shows some loss of redness but it does not convert completely to the green form. The green shade PC Blue CP 1408 shows only a very slight loss in strength.

Duplicate samples of CP 1037 and CP 1404 were made up in the pebble mill and on the two roll mill to test the effect of heat formation during dispersion on the stability of the pigment. The initial color development was poorer in the pebble mill dispersion but the changes on aging were also much less. The conversion of CP 1404 to the green shade was still apparent regardless of the dispersion method.

0007-SWP-000114784

Project #162 - Studies in Flat Wall Paint Formulation

Samples of thixotropic Flat-Tone White 947 U were sent to Mr. L. T. Statham for evaluation and test. This material is based on a new Polyamide Varnish CTV 9681 prepared by the Chicago Varnish-Resin Laboratory. The raw material costs compare as follows with the present Flat-Tone White Rx A45 W 3.

Present Flat-Tone White Rx A45 W 3		$128.05
Thixotropic Flat-Tone 947 U	$128.84	
Royalty charge	2.75	
	$131.59	$131.59

The new thixotropic flat is superior in flow, brushing and roller-coating properties to the present material.

An investigation was made to check the reactivity or bodying characteristics of various agents and their effect on the stability of paint viscosity on storage. Flat-Tone White Rx A45 W 3, SWP Terrace Green Rx A2 G 34 and SWP Gloss White Rx A2 W 4 were used to check these agents. The experimental paints treated with the various agents have been in storage for 60 to 90 days and the comparative viscosity readings are reported in the following table.

Use of Polyamides and Other Agents for Viscosity Control

Exp. No.	Material	Bodying Agent Per 100 Gal.	Viscosity #5 S-W Cup - 77° F. Fresh	1 Day	7 Days	30 Days	90 Days
729 U	Flat-Tone White Rx A45 W 3	10# BI 336 10# AB 63	10"	14"	-	19"	19.2"
731 U	"	1-1/2# Puffing Agent G. T.	23	37	-	50.4	49.4
732 U	"	8 gal. CTV 9567	23.8	43	-	51.8	61.2
733 U	"	8 gal. Burnok 3540 OS	19.8	37	-	43.4	50.8

(Cont.)

0007-SWP-000114785

Project #162 - Cont.

Use of Polyamides and Other Agents for Viscosity Control

Exp. No.	Material	Bodying Agent Per 100 Gal.	Viscosity #5 S-W Cup - 77° F. Fresh	1 Day	7 Days	30 Days	90 Days
724 U	SWP Terrace Green A2 G 34	No agent	21.2"	22.0"	21.6"	21.0"	20.0"
723 U	"	1 gal. Troykyd 21-BA	-	-	33.0	36.4	30.6
722 U	"	92# BI 72	44.8	45.2	40.8	36.4	32.4
730 U	"	26 gal. Burnok 5040 for (27C7)	51.2	56.4	57.6	60.3	50.2
							60 Days
863 U	SWP Outside White	No agent	24.6	43.8	48.2	39.4	34.6
864 U	"	2# 6210 dry	38.2	61.0	59.2	57.4	51.8
865 U	"	3# 846 dry	26.6	38.4	45.2	39.8	35.6
866 U	"	1/4 gal. (25 C 11)	34.6	60.6+	61.4+	56.8	45.2
867 U	"	8 gal. Burnok 5040	28.8	58.8	65.2+	52.4	37.8

6210 dry Bentone 34
846 dry Calcium stearate
BI 336 Calcium Soyate Base
AB 63 Bentone 34 in Odorless Solvent
Puffing Agent G. T. - Bodying Agent from Kraft Chemical Co.
CTV 9567 Thixotropic Alkyd, S-W manufacture.
Burnok 3540 OS - Thixotropic soya alkyd - 40% solids.
Troykyd 21-BA - Bodying Agent from Kraft Chemical Co.
Burnok 5040 Thixotropic oil for exterior house paints - 70% solids.
(25 C 11) Bodied linseed oil reduced.

0007-SWP-000114786

Project #162 - Studies in Flat Wall Paint Formulation

Special B78 W 8 Batch 948 U

Four gallons of Special Heavy Duty Flat Wall Paint B78 W 8 formulated to improve washability and stain removal properties was sent to Cleveland for test.

The Sales Department has reported favorably on the tests conducted with thixotropic flat wall paint OJ 947 U. However, if a line of colors is to be considered, it will be necessary to have the tinting color ground in to eliminate tinting on the job. Kem Tinting Colors wash out the thixotropic or gel body. This would also be true to a lesser extent with the line of First Quality Oil Colors.

0007-SWP-000114787

Project #162 - Studies in Flat Wall Paint Formulation

Some interest has been shown in the use of sanitizing paints for interior walls. Due to the dangers involved in the handling of the various microorganisms required for this work, it may be advantageous to have any additional work done by some other laboratory. However, a few experimental batches of Flat-Tone have been made using 1% Nuozene based on the total weight of paint.

It has been recommended that cobalt drier and zinc oxide be eliminated from the formulas where Nuozene is used, as these materials reduce the effectiveness of the Nuozene. With the elimination of cobalt drier from the Flat-Tone formula it has become necessary to reformulate for drying and to study the stability of the various paints on storage.

		(1035)	Viscosity #5 S-W Cup					Drying			
	Nuo-	Dowicide 6		1	7	14	30	Set to			
Paint	zene	Solution	Fresh	Day	Days	Days	Days	Touch	O'Nite	Brush	Flow
265 V	None	None	13.2"	15"	21"	24"	24.8"	55"	9	9	9
266 V	1%	"	15	17	22	37	50.4	42"	7	9	9
267 V	1%	1 Gal.	14	17	20	30	36.8	37"	8	9	9
268 V	1%	2 Gal.	13.2	16.8	19	28	32.8	50"	9	9	9
269 V	1%	3 Gal.	12.2	16.8	22	37 +	66.6	42"	9	9	9

Nuozene: 2, 4 dichloro 6- (O-Chloroanilino)-S-triazine

The Cleveland Technical Service Department has submitted a Flat-Tone White formula 19-2 for our inspection. This development is based on 430 pounds Titanox RCHT, 205 pounds Whiting, and 80 pounds Celite per 100 gallons. The formula was made with Titanox RCHT as well as with Ti-Cal R-27 in order to determine which pigment would produce the closest color match with Semi-Lustre White when shaded with equal amounts of Kem Tinting Colors per gallon. The formula variation made with Ti-Cal R-27 produced a better color match with Semi-Lustre than the Titanox RCHT variation. If used as a tinting white either formula would probably be satisfactory. Both formulas are too low in opacity for Flat-Tone White Rx A45 W 3. Washability and stain removal properties appeared to be better than the present Flat-Tone due to the wax addition.

0007-SWP-000114788

Project #162 - Cont.

Washability and Stain Removal of
Various Proposed Pigmentations for Flat-Tone White

Paint No.	815 U	881 U	228 V	261 V	262 V
Rx A45 W 3	Card 1	Chicago Proposed	Cleveland Formula	Formula 19-2	Formula 19-2 Variation
Titanox RCHT		460#		430#	
Titanox C 50	450#	200#			
Nytal 300	100#				
Whiting	300#			205#	205#
Lorite		100#			
Duramite		100#			
Celite			80#	80#	80#
Ti-Cal R-27			680#		430#
Contrast Ratio					
Wet	.961	.972	.966	.924	.925
Dry	.955	.978	.980	.969	.965
Hold-out					
Torture Board	8	8	8	8	8
Washability over glue					
Cycles to remove film	280	320	360	240	225
Stain removal					
Cycles to remove:					
Dust	70	110	80	70	60
Blue ink	500 Bad stain	500 Bad stain	500 Def. stain	195 Off	250 Off
Soiling Compound	500 Slight grease mark	500 Slight grease mark	500 Def. grease mark	500 Def. grease mark	500 Very def. grease mark
Wax content	None	None	2#/100 G	2#/100 G	2#/100 G

0007-SWP-045417

0007-SWP-000114789

Project #177 - Pigment Studies

Four samples of titanium dioxide have been received from New Jersey Zinc for evaluation. One of these samples, R-99, represents an experimental super chalk resistant pigment. The other three - R 760-1, R 760-2, and R 760-3, represent normal production batches. du Pont has also sent four samples of titanium dioxide. These pigments represent blends of a number of lots for each of the following grades: R 610, R 510 sulfate, R 510 chloride, and R 110 chloride. These samples were submitted by du Pont for the purpose of comparing the various grades of their titanium pigments.

The above pigments are being evaluated in Exlon vehicle (37 C 83). Exposures were made in both white and a light blue tint. Three additional lots of R 610 type, four lots of OR 640 type, and three lots of RANC type titanium pigment were included as controls.

Preliminary tests show New Jersey Zinc's super chalk resistant pigment, R-99, to give a poor dispersion. This is as expected since it is a laboratory sample and has not been jet milled.

Chicago, Florida, Weather-Ometer and laboratory exposures are being run on the above pigments. Exterior exposures are also being made in SWP Trim and Tinting White, and in blue tints of PVA emulsion paints at 35% PVC.

0007-SWP-000114790

Project #162 - Studies in Flat Wall Paint Formulation

Considerable work has been done on the reformulation of Flat-Tone Rx A45 W 3 to obtain tinting strength equivalent to that of Semi-Lustre and Quali-Kote when shaded with KTC. The formula for Flat-Tone White suggested by the Cleveland Technical Service Department produced somewhat lighter tints than Semi-Lustre White Rx A36 W 7 or Quali-Kote when shaded with equal amounts of Kem Tinting Colors. The experimental work done to date by the Paint Research and Cleveland Technical Service Departments shows that the following changes in formulation would be required to standardize the tinting strength of these products.

1. Replace Titanox RCHT with Ti-Cal R 27 at equal poundage in the new pigmentation for Flat-Tone White and light colors.

2. Reduce vehicle solids approximately 10% to improve brushing and uniformity of sheen when applied by Roller-Koater.

3. Use approximately two pounds of wax to improve stain removal and washability.

4. Increase the opacity of Semi-Lustre White at a cost of approximately 7¢ per gallon.

A sample of Keltrol 1059 from ADM was evaluated for general performance in Flat-Tone. This material is a vinyl toluene drying oil copolymer. It was tested in conjunction with the new Flat-Tone pigmentation as well as in A-D-M's suggested formulas 216 P-39 and 216 P-40.

Keltrol 1059

Solvent	Odorless mineral spirits
Non-volatile	40% ± 1
Viscosity	Very soft thixotropic gel
Color	7 maximum
Acid Value	3 "
Sp. gr.	0.842
Wt./Gal.	7.0

Paints made with this liquid were very good in odor, poor in flow and deficient in hold-out over porous surfaces such as the torture board. The A-D-M formulas showed considerable drop in wet to dry hiding.

0007-SWP-000114791

Project #162 - Cont.

An evaluation is under way to check the stability characteristics of Flat-Tone White A45 W 3 when treated with Viscotrol - A furnished by the Ferro Chemical Corporation. This thickening agent and (25 C 11) were used to the extent of 1 to 3 pounds per 100 gallons. The paints have now been checked for viscosity after a period of one year. It was reported by the manufacturer that Viscotrol - A possesses certain advantages over other thickeners in that its ability to body organic liquids is not affected by impurities such as water, phenols, polar solvents and slightly basic or acidic components.

		Viscosity at 77° on #6 Orifice						
Batch	Agent Used	Fresh	24 Hr.	1 Wk.	3 Wks	6 Wks	6 Mo.	1 Year
288 U	None	10"	11"	11.2"	9.8"	9.2"	7"	5.8"
289 U	1 lb. (25 C 11)	13	14	16	11.8	10.6	7.2	6.2
290 U	2 " "	13.4	15.2	17	12.2	10	7.2	6.0
291 U	3 " "	14	18.8	21.4	14	11.8	7.8	6.6
292 U	1 lb. Viscotrol A	10	11.4	11.2	10	9	6.6	5.8
293 U	2 " " "	12.4	15	15.4	15.4	14.2	10.2	9.8
294 U	3 " " "	14	21	22	18.2	16.4	12.2	10.6

(25 C 11) - Linseed oil bodied and reduced.

0007-SWP-045420

0007-SWP-000114792

Project #163 - One Coat House Paint

Exposures 2224l-53 F, C were studied after 24 months at Florida vertical south and about 30 months at Chicago, north and south. With one minor exception, these are all on repaint siding, involving single coats of various one coat house paints. The guide is the regular SWP 2-coat system A2 W 2 - A2 W 4 (Card 80).

One portion of the project evaluates certain proposed changes in Rx 476 - A2 W 10 SWP One Coat White. Regular Card 8 looks very good at both locations, clean and free from film failure and mold. A change to different bodied linseed oils, principally (27 A 7) and (27 C 7) instead of (2702) non-break oil, results in about the same performance, as does the elimination of basic silicate white lead. A formula based on 18 M leaded zinc, as now used in the current regular formula, looks even a little cleaner and better than the former regular. The same is true of a sample made on Eagle-Picher's PG-10-29 leadless formula.

Another part of the test compares proprietary paints against A2 W 10, as follows:

Glidden's Endurance Imperial - not quite as clean, but good.

Devoe Wonder One Coat - seriously dirty and susceptible to mold, also the only sample showing checking.

Ward's One Coat - considerable dirt and mold, though chalky.

Sears Snowhite - clean, no mold; perhaps best of the competitives, although a little weak on erosion or hiding.

du Pont #41 One Coat - intermediate; tends toward dirt and mold.

A panel carrying regular A2 W 2 - A2 W 4 versus two coats of A2 W 4 SWP Gloss White on new wood indicates that the A2 W 10 compares very favorably over two years, in fact the One Coat tends to show less mold growth.

0007-SWP-000114793

Project #177 - Pigment Studies

Panels 22226-35 F, C were studied recently, after 24 months' exposure at Florida vertical south and slightly longer at Chicago north and south. All are cedar bevel siding. The paints indicated below are compared both over A2 W 2 SWP Undercoater and as self-primed work. The guide paint is A2 W 4 SWP Gloss White, Card 80. The purpose is to test silicone treated pigments, our pigment samples having been sent to Linde Air Products Company to be treated (or coated). Their "Method A," involving methyl oils LM-3 and L-45, was used. Essentially, there are only two parts to the test:

1. Treated pigments 6600 dry anatase TiO_2, 6840 dry 35/65 leaded zinc and 6232 dry Nytal 300 versus same pigments untreated.

   Results: Florida shows the special paint as somewhat cleaner, but having serious checking as against none for the regular.

2. Same comparison, but R-200 rutile TiO_2 used instead of 6600 dry.

   Results: Same with regard to dirt and checking. However, the reduction in rutile yellowing due to the silicones is quite noticeable. Chicago panels show no checking, but definitely confirm the better clean-up of the specials in both categories.

Exposure series 23938-85 F, C (plus 24388-95 F, C) was examined recently after 12 months at Florida vertical south and the same at Chicago. This is one of the several series put out to test chalking rates and tint retention of various titanium dioxides, using paints both in the white and shaded light blue with phthalocyanine. In this case, the paints are latex exterior type at 35% PVC, all using Resyn 12 K 51 PVA copolymer. In the tests using pure titaniums, Wollastonite and mica make up the extender; in those using titanium calcium, it is the only pigment. The test systems include both one coat over A2 W 2 SWP Undercoater and two coats self-primed, all on new cedar bevel siding.

In general, there is no film failure and very little mold growth at either location. There is essentially no chalk rub-off except in the cases specified below. Florida tests are rated down considerably on the special undercoater tests because of a thin or gray appearance as against the better whiteness of the self-primed, but this does not seem to show up much at Chicago.

The results indicate about three categories:

0007-SWP-000114794

Project #177 - Cont.

1. No chalking to date, clean, color of blues good to excellent:

du Pont's 985-B	6632 dry OR-640	6630 dry R-610
du Pont's SR-40-1	6631 dry RANC	6622 dry OR-540
	R-510, Cl process	Ti-Cal R-60
		Ti-Pure 110 Z

2. Slight chalk, slight to moderate fading, not quite as clean:

R-510, SO_4 process	6621 dry RA-50

3. Definitely unsatisfactory to date:

RC-6685	Not very chalky but serious fading.
6680 dry RCHT	More chalky, even worse fading.
6682 dry R-27	Poorest of series; free chalk, extreme fading.

Exposure panels 27070-82 C, F were prepared during the month, all cedar bevel siding primed with A2 W 2 SWP Undercoater. Exposure is to be at Chicago and Florida, vertical south. The purpose is to evaluate ten production samples of Titanox RANC submitted by Titanium Pigments Corporation, uniformity of chalking and fade resistance being of primary concern. Also included is a sample of Japanese TiO_2 which reached us by way of our Sao Paulo plant. The TiO_2 samples are compared in A2 W 8 SWP Tinting White shaded to a light green with phthalocyanine and ferrite bases.

Project #162 - Studies in Flat Wall Paint Formulation

The National Aluminate Corporation has supplied a high area amorphous silica Nalco JG-7 for use as an extender for pure titanium dioxide in flat wall paint formulations. Two special pigmentations were developed using 50 pounds of Nalco JG-7 in conjunction with Titanox RCHT, Ti Cal R-27 and part pure titanium dioxide. The two formulations also contained some calcium carbonate and magnesium silicate as part of the total inert. The vehicle is based on (3938), soya Abitol alkyd.

The experimental formulations increased considerably in wet to dry hiding. The washability was improved to some extent by the use of a small amount of wax. The washability, stain removal and wet to dry contrast ratios have been reported in the data. The recoating properties are poor and further work will be required to improve this characteristic. It will apparently be necessary to reduce the PVC from 68% to a much lower figure to improve these properties.

Experimental Data

Material	Rx A45 W 3 A 3057 Card No. 2	Special Flat Wall Paint 369 V	Special Flat Wall Paint 392 V
Brushing	Good	Good	Good
Flow	Slightly high	Good	Good
Hiding			
Contrast Ratio			
Wet Film	.961	.922	.934
Dry Film	.955	.976	.978
Washability (over glue)	340 cycles	370 cycles	215 cycles
Stain Removal (Cycles to remove stain)			
Dust	110 cycles	220 cycles	190 cycles
Blue Ink	500 cycles Def. + stain	500 cycles Def. stain	500 cycles Def. + stain
Soiling Compound	500 cycles Slight stain	500 cycles Slight + stain	500 cycles Slight + stain
Brushing on Recoating	Good	Poor	Poor
Raw Material Cost	$123.68	$109.90	$109.90

0007-SWP-045424

0007-SWP-000114796