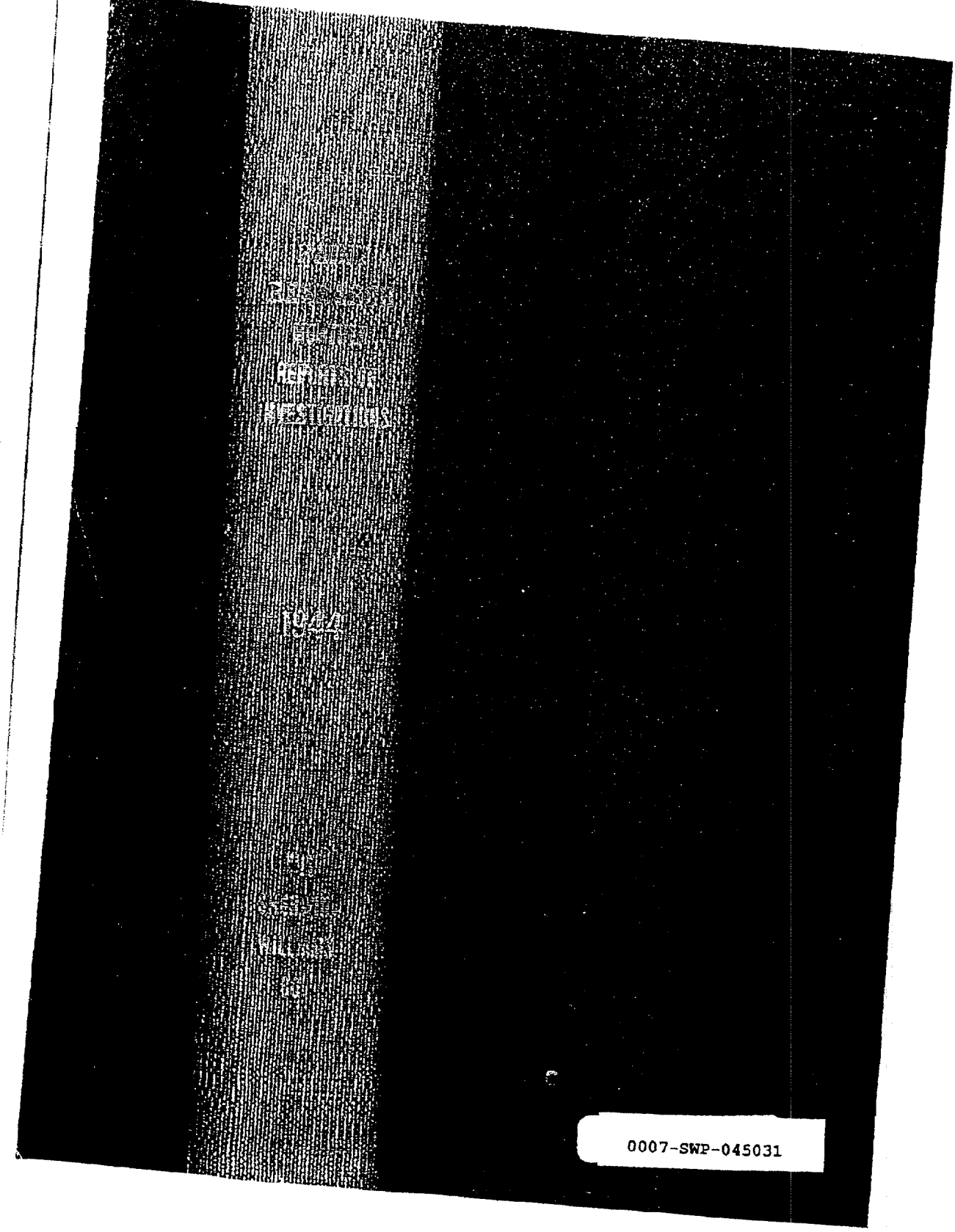

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M. VAN LOO
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#86 - Durability of Pigments with Special Reference to Leaded Zinc and White Lead

A special report was prepared on panels 4500-45 F, covering exposures of lead-zinc house paint formulas initiated by C. H. Adams. These paints have now had three years of exposure, two coat work over 450 Undercoater on cedar.

The fundamental pigmentation was based on that of Rex 471 of 1-4-40, comprising:

29.1% Zinc Oxide
15.7% Basic Sulphate White Lead
14.3% Titanium Oxide
18.1% Basic Carbonate White Lead
22.6% Magnesium Silicate

Various co-fumed leaded zincs and mechanical mixtures of lead sulphate and zinc oxide were used. The most important indications, briefly stated, are as follows:

(a) Mechanical mixtures are much inferior to co-fumed leaded zincs in general durability. All of the latter are in good condition after three years' exposure, south, Florida.

(b) St. Joseph A-label zinc oxide (non-acicular) shows poor durability. New Jersey's XX-50 and XX-503 are rather inferior, although better than the St. Joseph oxide. Azo's acicular zinc oxides #22, #11, and #33 are somewhat better, with #33 preferred.

(c) National Lead's acicular basic lead sulphate is the poorest of the lead pigments used in mechanical mixtures. There are few differences in performance between Q. P. and H.T.S. carbonates, or regular lead sulphate.

(d) Co-fumed leaded zincs show no serious differences but rate in the following order of decreasing durability.

1. 412 dry Ozlo leaded zinc
2. Lehigh 60
3. Azo 35 L

(e) Lehigh 635 was slightly inferior to the pigments in (d), but superior to Eagle-Picher's leaded zinc.

(f) Eagle-Picher's 70% leaded zinc is definitely inferior to those in (d), but compares favorably with most of the mechanical mixtures.

M. VAN LOO
Cont.

#177 - Pigment Studies

A series of paints were prepared for exposure to determine the durability characteristics of a special calcined leaded zinc. The pigmentation selected was a post-war combination:

30% Zinc Oxide
30% Total Lead
15% TiO_2
25% Extender
100%

The special leaded zinc was compared with 412 dry, and competitive co-fumed and mechanically mixed leaded zincs, such as Azo ZZZ-33, XX 50, and XX-503 zinc oxides blended with lead sulphate and carbonate, and Lehigh 635, Azo 35 L, and Eagle-Picher 35/65 and 50/50 leaded zincs.

In addition to the above, additional formulations were prepared incorporating several suggestions made by Mr. Fasig, such as the use of 12-1/2% of R 200 TiO_2, the use of 7 to 10 gallons of a Q bodied oil, also Lowe Brothers' V-35 oil.

#12 - Exterior Primers

Investigation of the relative absorption of oil by wood from conventional vehicles as compared to "neutralized" oil vehicles has continued as described in previous reports. Freshly prepared samples of Rex 450 Undercoater, both current and 1939 formulas, and of Titanium Pigment Corporation's EX-4140 White with oil neutralized by sodium hydroxide, were used. A few trials of volatile losses were run, with results as follows:

Rex 450 – 1939 formula – 77.7% of total volatile given off in four hours air dry.

Rex 450 – current formula – 81.3% of total volatile given off in four hours air dry.

EX-4140 – 84.7% of total volatile given off in four hours air dry.

On the main problem of oil absorption, results were limited by difficulties experienced with the extracting solvents, (a) in taking up too much colloidal material from the pigment, acetone and ether being poorest in this respect, and (b) in failing to remove the semi-dried vehicle binder effectively. In this last respect petroleum ether appears least satisfactory. Previous results with petroleum ether had been doubtful except at short drying periods, such as two hours.

M. VAN LOO
Cont.

#12 - Cont.

Using the "percolation-extraction" method on films scraped from wood after four hours' drying, petroleum ether removed approximately 40% of the original oil, acetone about 80%, and ethyl ether about 72%, with variations from the average greater with the latter two because of suspended material taken up. A fairly effective remedy for this defect was found in the use of a Pyrex fritted glass filter. With this disturbing factor eliminated it became more apparent that the efficiency of the solvent was the most important factor.

As a result, work has been started on extractions of semi-dried films using different solvents. Using the same technique previously employed except that the sample was drawn down on glass, petroleum ether extracted 98 - 99% of the original binder solids, and ethyl ether 100%. A special blended ether-benzol-methanol solvent removed 99.8% of the binder solids, calculated on the basis of "weight lost from sample." However, determination of the "weight of extracted material found," gave the anomalous result of 150%, requiring further work to determine the source of the extra solids found.

#102 - Studies in Flat Wall Paint Formulation

Flat Wall Paints

Formulas were developed for Flat-Tone White and tints using 50% 2132 Titanox RC HT and 50% 461 L lithopone to conserve on titanium calcium. Paintercraft One Coat Flat #10 has also been revised to use the same pigmentation. Satisfactory working properties have been maintained in the alternate formulas.

An examination was made of four flat wall paints submitted by Titanium Pigment Corporation. These formulas, F 3794, F 3796, F 3797, and F 3798, were designed to employ rutile titanium calcium with "neutralized" vehicles employing linseed and dehydrated castor oils. The paints required reduction before application, they were puffy in consistency, and after reduction lacked the proper "feel" under the brush. The flow properties were not equal to Flat-Tone.

The linseed samples were somewhat deficient in drying, while the castor oil formulas showed better drying. When tinted gray, the experimental paints showed definite lapping and oil ring on a ten minute lap, and the sheen was not as uniform as with Flat-Tone. When applied over glue size, with 72 hour dry, washability was poor compared with Flat-Tone. Flat-Tone with (3880)E is superior to the "neutralized" binder formulations in all respects.

Porch and Deck Paints

The shortage of titanium pigments makes further revisions necessary in some trade sales formulas. Porch and Deck formulas have called for 2140 dry, rutile titanium-calcium. It would be advantageous to go to a leaded zinc pigmentation, but the present vehicle is reactive with zinc oxide. During the month a number of "neutral" varnishes were tried out experimentally, and it appears that a 40 gallon, ester gum-Dehydrol varnish could be satisfactorily used with leaded zinc in Porch and Deck Paint.

M. VAN LOO
Cont.

#162 - Cont.

The experimental varnishes which were furnished by the Varnish Research group had the following characteristics:

No.	Resin	Oil	Length	Loss	N. V.	Body	Color	A. V.	Cost
ARV 3344	Ester Gum	Dehydrol	40 gal.		50%	F	5	4.6	$74.64
ARV 3345	" "	Linseed	"	6%	"	G	8 L	3.17	79.57
ARV 3345 #2	" "	Linseed	"	14%	"	E +	7 L	3.00	85.78
ARV 3348	" "	Linseed	"	21.4%	"	F	3-7 L	2.93	122.04
ARV 3364	" "	Dehydrol	"	-	"	G-H	7	0.85	-
ARV 3365	" "	Dehydrol	"	-	"	E +	5	1.46	-
ARV 3375	" "	Linseed	"	-	"	F	5	-	-

Porch and Deck paint made from these varnishes dried about the same over night as the present standard. Brushing was satisfactory with somewhat poorer leveling. Gloss was in line with present production, the experimental linseed varnishes being a trifle better than the Dehydrol products. All experimental paints showed up better than the present standard on a 24 hour cold water test. The Dehydrol formulas were ahead of the linseed formulas in this respect. Soap resistance (3 hours - 1% solution) of all experimental paints was equal to or better than the present standard.

A factory run of ARV 3344, - V 11167, did not duplicate the laboratory batch and was too high in acid value. Experimental paint batches showed undesirable "bodying" where zinc oxide was used as pigment.

A factory run of ARV 3365, - V 11168, had an acid value of 1.59, color of 5 L-5, and a body of F at 51% solids. This vehicle was checked in both laboratory and factory batches of Porch and Deck Rex 69, and looked promising. Samples are being retained for future inspection of package condition.

A series of exposure studies on Porch and Deck Paints is being prepared. A number of pigmentations will be compared in two types of vehicle - (1) V 11168, a neutral 40 gallon Dehydrol-ester gum varnish, and (2) ARV 3375, a similar varnish with linseed oil replacing Dehydrol. The present standard Porch and Deck formula pigmented with rutile titanium calcium and using a P. E. rosin linseed vehicle, will be used as one guide in the series. The other control will be the china wood oil modified phenolic formula adopted in the fall of 1936. This formula was pigmented with leaded zinc.

#103 - Metal Protective Paints

Paints are being prepared for an extended series of exposure tests of metal protective and chemical resistant maintenance finishes. Standard Metalastic, Kemelastic, and A and A Resistant finishes will be compared with special formulations containing Parlon, Vinylite, n-butyl methacrylate polymer, and other materials possessing chemically resistant properties.

ALLIED RESEARCH LABORATORIES

Report of Investigations for February, 1944

M. VAN LOO

#177 - Pigment Studies

An extensive program for the evaluation of the brightness and opacity of the various white pigments is under way. While the observations recorded are still too limited to permit setting up opacities for specific pigments, the general plan is submitted for comments and suggestions.

We hope that when this work is concluded an index system will be established with which the formulator may blend opaque pigments accurately with extenders to obtain any desired opacity level in the finished paint. It is anticipated that the various pigments will behave differently in formulations of different types, depending on the proportion and kind of binder, pigment packing, etc.

For the current work, four types of formulations will be investigated:

1. Exterior oil type house paints.
2. Interior "varnish type" flat wall paints.
3. Interior water emulsion flat paints.
4. Interior high gloss enamels.

A suitable range of pigment-volume-concentrations will be covered in each group. For the first analysis we intend to prepare separate index systems for each paint type being studied.

The technique will be patterned after that employed by the New York Production Club as reported in "Paint, Oil, and Chemical Review," November 18, 1943, "A Critical Survey of Methods of Measuring Dry Hiding Power of Paints."

The test method consists of (1) the application of the paints by the draw-down method over a black-white contrast, (2) the calculation of the spreading rate by the wet/dry factor method, (3) a determination of contrast ratio and brightness by photo-electric measurement, and (4) plotting the contrast ratios versus spreading rates or film thicknesses so that the opacities may ultimately be expressed in square feet per pound at a given degree of hiding.

#97 - SWP 471

Further work on Gloucester TiO_2 2233 M confirms previous findings that it is not suitable for use in white top coats, even as a part of the TiO_2 used.

Panels 7976-7 were prepared for exposure at Chicago south and north, and Florida south, to compare SWP Gloss White with Dehydrol replacing (48), as described in the last report.

Panels 7978-84 were prepared for exposure at Chicago and Florida to supplement previous TiO_2 conservation series. Besides the New Jersey Zinc lithopone-leaded zinc-mica-asbestine formula H-0376-AEI a variation was added to introduce more opacity, as:

#164 - Cont.

Materials Tested	Rating
SWP-Conservation Tint Base, Slate, using R 610 TiO_2 and high inert.	Serious fading, but clean. (A single test of this paint tinted Cream, however, shows good color, better than regular Cream.)
Same, but using R 510 titanium	Equal to R 610 formula.
T.P.C. EX-3746 low N.V.M. Tint Base P.V.C. 21%. Vehicle as EX-3742, about 1/3 each of lead titanate, leaded zinc and asbestine.	No chalk, no fading, very dirty. No failure.
T.P.C. EX-3748 Low N.V.M. Tint Base. P.V.C. 21%. Pigment 30/70 Leaded Zinc-Titanox RC, vehicle as above.	Practically same performance as preceding.
Rex 363 - C 3152. Pre-conservation Tint Base, Slate.	Very little fading, but moderate chalk and fairly heavy dirt. This is best for tint-retention. The conservation bases (above) are best for self-cleaning, but fade seriously.

The Chicago panels after 11 months' exposure show much the same results. A detailed progress report is in preparation.

#86 - Durability of Pigments with Special Reference to Leaded Zinc and White Lead

There has been considerable discussion among formulators as to the necessity or desirability of using lead pigments in exterior house paint formulas. A study has been initiated to determine the optimum concentration of lead pigments. A series of paints have been prepared for exposure, which include:

(1) Variations in lead pigment content from 35% down to 0%, zinc oxide held constant at 30%.

(2) Variations in lead pigment content from 35% to 0%, zinc oxide content ranging from 30% to 36% to keep TiO_2 content at minimum for 18,000 units of opacity.

(3) Study of titanium calcium pigmentations, including combinations of 30% leaded zinc and 70% of Titanox RC, Titanox RC HT, and anatase titanium calcium, respectively; and 30% acicular zinc oxide Azo 222 #33 with 70% of Titanox RC HT and anatase titanium calcium, respectively.

Exposures will be at Chicago, Coffeyville, and Miami.

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#86 - Cont.

Paints were prepared for exposure based on Oakland's S-W Liquid Ozlo, and a variation of the Liquid Ozlo formula with an improved vehicle combination similar to that of SWP Gloss White. Exposures will be put out in Chicago and Florida, both self-primed and over Rex 450.

Paints were prepared for exposure comparing the regular oil conservation formula of 1-22-43 for SWP Gloss White with the lead-zinc-extender formula of 8-10-29, a variation of the latter using 7% mica to reduce checking, and lead-in-oil using Replacement Oil for reduction. The following comparisons are interesting:

Top Coat Paint	Brightness	Opacity	R. M. Costs
OJ 28 H Rex 471. Reg. form. 1-22-43	83.9%	19,834 units	$135.58
OJ 222 H " " " " 8-10-29	81.0%	16,216 "	176.57
OJ 224 H As 222 H but M-332 vehicle	81.2%	16,216 "	151.94
OJ 225 H As 224 H but 7% mica	-	16,216 "	-
Rex 16 - Lead with Replacement Oil	84.7%	17,495 "	192.97

The high initial brightness of lead-in-oil is interesting, also the cost comparisons versus current SWP.

#12 - Exterior Primers

To reduce the amount of pure TiO_2 used in Rex 450 SWP Undercoater, two alternate formulas were developed, in one of which all the TiO_2 was introduced as titanium barium pigment, and the other carrying 50 pounds pure TiO_2 and the remainder as titanium barium. The formulas have been distributed to the factories to be used when titanium barium is available and pure TiO_2 is in limited supply.

A series of experimental SWP Undercoaters were prepared for exposure to compare the current formula with the older type using (2281). For this series the (2281) was prepared respectively from tung, oiticica, and cacahuananche oils. The oiticica and cacahuananche modifications dried almost as fast as the tung oil type. Exposures will be run at Chicago and Miami.

Investigation of the absorption of oil by wood from various vehicles has continued as described previously. It is felt that a summing up of the progress of this project is desirable.

The project was started with one-coat house paints and primers as the main subject of interest, especially the possibilities of use of the so-called "neutralized" oils, which are known to have low penetration properties. The work done by Dr. Holley and F. M. Nelson, presented in Bulletin RC-52 in August, 1939, was used as a starting basis. Since this work was for the purpose of sales publicity, a number of changes were required in the method in order to obtain quantitative accuracy. It was also established that a rapid

#12 - Cont.

Titanium Pigment Corporation's "neutralized oil" paint, EX-4140. Values from recent runs which seemed to be free from all the main sources of error and which we expect to verify soon, are:

Paint	Solvent	Hrs. Dry	Surface	% of Total Oil Found	Absorbed by Wood
Old Rex 450	Blended	4	Cedar	73.0	27.0
			Glass	98.0	-
New Rex 450	"	4	Cedar	74.8	25.2
			Glass	101.8	-
EX-4140	"	4	Cedar	76.9	23.1
			Glass	(No valid check as yet)	-

#162 - Studies in Flat Wall Paint Formulation

Flat Wall Paints

Some difficulties have been encountered with sheen and body on the new formulas for Flat-Tone white and tints. The regular formula in which the opaque pigment was entirely rutile titanium calcium has been revised to use magnesium silicate 20 L and Micro Velva A 2188 as the extenders to increase the sheen and body. The alternate formulas with lithopone and rutile titanium calcium gave higher sheen, and thought is being given to the use of Celite 281, 2077 dry, to reduce the sheen. Factory runs are being made at different grinding times in the pebble mill to determine the effects on grinds and sheen.

An Interior Flat or Eggshell Paint was made up on a proposed specification submitted by the U. S. Maritime Commission. It was evaluated with respect to brushing, flow, drying, and washability. The paint had satisfactory brushing and drying qualities but was short in flow. The washability was not equal to Flat-Tone but was rated as fair compared with an average flat wall paint. Our results were reported to Cleveland.

Enamels

The continued shortage of titanium pigments has made it necessary to conserve them wherever possible. Studies were made of alternate pigmentations for Enameloid White Rex 710, which calls for 290 pounds of anatase TiO_2, 1403 dry, to reduce the amount of pure TiO_2 required, and to use lithopone, if possible. Attempts to replace any substantial amounts of TiO_2 with lithopone gave enamels with lowered brightness and opacity. It is impossible to introduce sufficient lithopone to maintain hiding without getting excessive body.

Rutile TiO_2 such as 2269 Titanox RA-10-MO, and rutile titanium calcium pigments like 2132 gave enamels which were decidedly yellow in tone as compared with standard. Blends of 2269, rutile TiO_2 and 1271, anatase titan-

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#162 - Cont.

ium calcium, were tried and they proved slightly better for color than straight 2152. It was found that the yellow cast of the rutile pigmented enamels could be eliminated at the expense of brightness by tinting with a violet toner. The resulting color impresses the observer as being "neutral" but it is noticeably less bright as compared with that of enamel made with anatase TiO_2.

CP 498, Permanent Methyl Violet, was used in our experiments.

The following pigment combinations (pounds required for 100 gallons of standard formula) had theoretical opacities and brightness readings as shown.

Pigment	Opacity	Brightness (1 brush coat on filled white paper)
290 pounds 1403	17,690 units	87%
72 pounds 1403, 360 pounds 2132	17,712 "	85.8%
240 pounds 2132, 145 pounds 1403	17,725 "	86.4%
480 pounds 2132	17,760 "	85.6%
300 pounds 461 L, 145 pounds 1403	14,635 "	85.8%
300 pounds 461 L, 240 pounds 2132	14,676 "	84.6%
450 pounds 461 L, 72 pounds 1403	13,077 "	84.9%
600 pounds 461 L	14,670 "	85.3%
235 pounds 2269	17,860 "	87%
400 pounds 461 L-R7, 127 pounds 1403	15,467 "	85.4%
400 pounds 461 S-R7, 127 pounds 1403	15,467 "	85.4%
400 pounds 461 L-R7, 210 pounds 2132	15,490 "	84.3%
400 pounds 461 S-R7, 210 pounds 2132	15,490 "	84.4%
300 pounds 2132, 285 pounds 461 L-R7	16,600 "	84.8%
240 pounds 1271, 145 pounds 2269	17,740 "	-

The possibility that Order M-332 may be relaxed to allow the use of more oil, led to some work in connection with Class 3. It was deemed advisable to see what types of enamel could be made with 3 - 3.25 pounds of oil per gallon, particularly if they were pigmented without the use of titanium.

A number of experimental enamels were prepared, using 8-1/2 pounds of lithopone per gallon, and 3 to 3.25 pounds of oil. Some of these enamels showed good gloss and brushing properties, and were similar in properties to our old Enamelastic. Typical formula and sample were forwarded to Cleveland Technical Service Department.

A brief evaluation was made of National Aniline's "Anti-Skinning Agent B - BC 46326." A laboratory batch of Enameloid Ivory, formula dated 8-31-39, was prepared, omitting the amount of (1767), guaiacol solution called for. The vehicle in this Enameloid formula is a modified phenolic wood oil varnish and normally shows bad skinning properties. The enamel was divided into small portions and varying amounts of different anti-skinning agents were then added. The condition of the enamels in open containers and

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Cont.

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in closed containers half-filled was observed at the end of 24 hours. The drying of the enamels was checked using .003" draw-downs on glass plates.

The following table shows results:

Lab. No.	Description	Open Can 24 Hrs.	Closed Can 24 Hrs.	Drying Set	Drying 24 Hrs.	Sward Hardness
(1)	No anti-skinning agent	Skins	Skins	90'	TF	12
(2)	2% by vol. (1767) as in Enameloid formula 8-31-39	Skins	Skins - tender	90'	VVST	12
(3)	2% by volume (5026)	Sl. gunny	Gumminess - partial skin	90'	VVST	12
(4)	2% by volume Special Solution	O.K.	O.K.	90'	VVST	12
(5)	3% by volume (5026)	O.K.	Gumminess	90'	VST	12
(6)	3% by volume Special Solution	O.K.	O.K.	90'	VST	12
(7)	5% by volume (5026)	O.K.	O.K.	90'	ST	12
(8)	5% by volume Special Solution	O.K.	O.K.	90'	ST	12

Special Solution - 20% BC 46326 in mineral spirits.
(1767) - 14% Guaiacol in " "
(5026) - 20% BC 97261 in " "

At the end of two weeks all samples in both open and closed containers had skinned over. Samples containing BC 46326 were the last to show skin formation.

The color of BC 46326 is better than that of guaiacol or National Aniline's BC 97261. It seems more effective as an anti-skinner than either of these materials. The odor is bad.

#105 - Metal Protective Paints

Dr. Ruthruff supplied us with samples of a solid rust inhibitive coating material obtained from Kendall Refining Company, and also a gallon of the material in naphtha solution. These materials were put on exposure at the Chicago exposure farm on cold rolled steel panels, and will also be subjected to Weather-Ometer and salt spray tests. A coal tar pitch T-607 was obtained from the Coal Tar Plant and will be used as a comparison material. T-607 has 68.3% solids, and a melting point of 75° C.

M. VAN LOO
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1103 - Cont.

A program was instituted recently to extend earlier work done by C. West and R. Van Nordstrand, on protection afforded by the use of thin layers of fatty acids and bodied oils on ferrous surfaces. Special attention is being paid to increase or decrease in blister resistance in salt and distilled water immersion, salt spray resistance, and effects on rust creep and general durability on exterior exposure.

Four different primers with fourteen different unpigmented film-forming materials are being evaluated. The first coats comprise the following series:

1. Stearic acid
2. Oleic acid
3. Linseed oil fatty acids (2120)
4. Dimerized fatty acids - Diamer A
5. Bodied linseed (48)
6. " " (324)
7. Sulphuryl Chloride treated linseed, Bilinco 101
8. Dehydrated Castor (2325)
9. Soya alkyd - (3128)
10. 50% (3128) - 50% (48)
11. Phenolic varnish (3950)H
12. (3950)H - 50%; (48) - 50%
13. Raw linseed (2)
14. Highly polymerized ester gum varnish (3880)E

All of the above except stearic and oleic acid contained drier as 0.5% Pb and 0.05% Co based upon total solids. All of these materials were reduced to 3% solids and sprayed out as a thin coat on steel panels, which then received a top coat of one of the following primers: 52-P-18, 52-MC-29, Class XXII Red Lead and Rex 16174 - Kromik.

Blistering tests have been completed on this particular series but discussion will be deferred until next month, when salt spray tests will be sufficiently advanced for evaluation.

A sample of strontium chromate was received recently from the Dry Color Department for evaluation versus zinc chromate. In accelerated tests in the 52-P-18 specification it may be said that the material is superior to D 2689 and calcium chromate in blistering properties, both in distilled and salt water. It behaves similarly to Zinc Tetroxy Chromate in this respect. However, on the basis of salt spray tests, it is inferior to D 2689, but at least equivalent to calcium chromate.

Some months ago, salt spray tests were run on a sample of strontium chromate versus other chromates. At that time the chromates were rated in 52-P-18 as follows with respect to performance in salt spray:

#163 - Cont.

There has been no further progress in arranging for house painting tests on the one coat house paints in Florida. We hope to get some house tests in Chicago suburbs this spring and summer. Both white and tint base are available.

#86 - Durability of Pigments with Special Reference to Leaded Zinc and White Lead

Panels 8061-66 were prepared for exposure at Chicago and Florida to compare Oakland's S-W Liquid Ozlo and SWP Gloss White. The Liquid Ozlo formula is interesting because of its good hiding and low TiO_2 content at low raw material cost. A special formula was also included in which an improved vehicle combination similar to SWP was used.

#12 - Exterior Primers

Study of the absorption of oil by wood from various vehicles has continued on a much more satisfactory basis than was true previously. It is felt that we now have an accurate and efficient method of determining the absorption for the usual house paint formulations. The difficulties presented and the steps involved in their solution were presented at some length in the last monthly report.

The final procedure involves the steps: (1) brushing of the paint on selected siding panels at a given spreading rate, (2) air-drying at 4 hours, (3) scraping off the semi-dry paint as the sample to be tested, (4) extraction by percolating with a benzol-ether solvent, (5) centrifuging and decantation (twice, using the percolation bottle directly in the centrifuge), and (6) final washing, drying and weighing. The "loss" from the bottle is used to check the basic results, i.e., weight of oil found. A correction is made for the retention of volatile by the semi-dry film, and uniformity of handling seems to eliminate all the other sources of error quite effectively.

The following brief summary of results, as regards paints previously examined will be supplemented by a more complete study as soon as time permits:

1. SWP Undercoater Rex 450, as of late 1943, fresh laboratory batch, gave uniform results with the perfected method, entirely logical as compared to a large number of earlier results, which were rejected due to known errors. 35% by weight of the original vehicle solids seems to be the true amount absorbed by wood, with a probable error of less than 2%.

2. The old Rex 450 of 1938, run many times in an attempt to check the results obtained by F. M. Nelson, gave some fairly uniform results at a slightly higher oil absorption value than new Rex 450, but much less than reported by Nelson. However, difficulty in making fresh batches of correct viscosity halted the study of this material before it was possible to obtain such reliable data as described in (1).

#177 - Pigment Studies

Opacity Studies

In the February report of investigations a program was outlined for the evaluation of white pigments as regards opacity and brightness. Work on this investigation has now progressed to the point that we have completed a preliminary exploration in the first and second type formulations, i.e., the exterior oil type house paints and the interior "varnish type" flat wall paint formulations.

Although results thus far are only exploratory, we feel very much encouraged by the fact that the correlation between the test series is good. As would be expected, the flat wall formulations develop approximately 10 - 15% greater opacity per pound of hiding pigment than do the same pigments in the oil type formulation. The results of these tests will be reported in detail as soon as they have been verified by repeat tests.

2233 M

The examination has been completed of Gloucester TiO_2 - 2233 M dry in the Rex 450 Undercoater formula and in a special formula based on Rex 450 except that the titanium is the only opacity pigment. There were five lots of 2233 M available in the plant at the time these tests were started. Each of these lots were made into the standard Rex 450 by displacing the TiO_2 normally used as 2269 dry. The results of this comparison are reported under Series I below. The variation between various lots of 2233 M is illustrated in the hiding figures. However, it is notable that uniform color has been accomplished by reviewing the brightness values. These are measured over the white portion of the Morest hiding charts used.

Series I - Rex 450 Undercoater

Pigmentation as of 9-24-43 - Card 18

80	pounds	1552 dry	Celite
3	"	547	Aluminum Stearate
200	"	20 L	Magnesium Silicate
120	"	Titanium Oxide	
144	"	413	Leaded Zinc
386	"	18	White Lead Carbonate

Hiding Comparison

Paint No.	TiO_2 Pigment	Brightness	Hiding as Sq. Ft./Gal. 91% C.R.		93% C.R.	
RB 382	2269 Dry Titanox RA 10 MO	84.3%	678	100*	584	100*
383	2233 M Lot G 379 X	81.9	492	72.6	380	65
384	" " G 379 T	81.4	464	68.4	360	61.6
385	" " G 379 W	81.3	532	78.5	448	76.7
386	" " G 379 S	81.4	544	80.2	460	78.7
387	" " G 379 U	81.3	500	73.7	424	72.6

M. VAN LOO
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1177 - Cont.

Mathematical ratio between hiding of 2269 dry paint RB 382 as standard equal to value of 100 and the test paint containing 2233 M equal to X.

Series I and II paints were started at the same time. One 2233 M lot was selected at random for the evaluation as a single pigment against 2269 dry. Unfortunately the lot selected, G 379 T, was the lowest in hiding of all those tested but there was no way of knowing this when starting the test. Series II reported below evaluates 2269 directly against G 379 T. The results are self-explanatory.

Series II

Single hiding pigment test paint.
P.V.C. = Rex 450, card 18.
Ratio - TiO_2/extender = ratio in standard Rex 450, card 18.

Pigmentation

80	pounds	1552 dry	Celite
5	"	547	Aluminum Stearate
365	"	20 L	Magnesium Silicate
219	"	Titanium Oxide	

Hiding Comparison

Paint No.	TiO_2 Pigment	Brightness	Hiding as Sq. Ft./Lb. TiO_2 91% C.R.		93% C.R.	
RB 388	2269 Titanox RA 10 MO	87.6%	326	100*	278	100*
RB 389	2233 M Lot 379 T	82.7%	189	58	162	58.3

In summary, Gloucester TiO_2, lot G 378 T is deficient in hiding as compared with 2269 dry by 42% and is lower in brightness by a 4.9% differential.

414 Dry - Leaded Zinc

Coffeyville has been in production on the new 414 dry leaded zinc since about the middle of March. Samples of this material have been submitted daily for our test. To date it may be reported that the product is a marked improvement over the old 414 dry from the standpoint of color. Numerous batches of paint have been made which show that from the standpoint of color the material is readily usable for whites as well as for tints. This is true for all 414 lots up to lot #964 except the first lot #774 and lots 924, 934, and 944, which were deficient in whiteness.

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The prevailing fault which has been associated with the new 414 dry to date is the texture. This is apparent when making a rub-up as a very gritty feeling under the spatula. In the plant this texture is reflected by a 60 - 70% drop in production rate on the Premier mill and a drop of 25 - 30% in the production rate on the roller mill. Acme has reported that it did not greatly affect the production rate on the 30 inch stone mill.

Coffeyville is making every effort to improve the texture. A recent sample ground on the Stedman mill shows a considerable improvement in texture and wettability, and a sufficient quantity has been requested for a production run at Kensington.

In connection with the work on 414 dry, the limits on brightness were checked to determine whether it would be possible to make the more difficult tints of SWP, such as 496 Ivory, 369 Light Blue and 383 Pea Green (latter two inactive but selected for purposes of test). As a minimum standard Lot 185 of the previous production run of 414 W was selected. Using the specified shading bases, the color matches against the standards were considered satisfactory. Since the current production of 414 is much better in color than Lot 183, there should be no difficulty in this respect.

A set of experimental paints were prepared for exposure of laboratory processed leaded zinc 414 from the same source as the current Coffeyville production. This amplifies the series mentioned in the January report.

#103 - Metal Protective Paints

Panels 7998-8001 were prepared for exposure at the Chicago Exposure Farm of the rust inhibitive coating materials received from the Kendall Refining Company, described in the last report. They were compared with T-607 from the Coal Tar plant. Panels were also prepared for salt fog testing and for the humidity cabinet.

A synthetic Wool Grease emulsion was prepared for exposure on panels 8071-2 to supplement the 1943 series of natural wool grease emulsion series. The formula submitted by the Coal Tar laboratory was:

Synthetic Wool Grease	22.5%
Rosin	9.0%
Paralite	9.0%
(a coal tar bituminous material from Standard Oil)	
Water	54.1%
Ammonia (28%)	5.4%
	100.0%

The panels were exposed as one coat work on a steel panel against one coat of Kem Kronik, at Chicago only.

7103 - Cont.

The above results would indicate that Zinc Tetroxychromate does have good performance characteristics in both synthetic and oil vehicles, giving results on actual exterior exposure which exceed those obtained in accelerated tests.

A series of steel rod slurry tests were run during the month on a group of pigments. The technique has been described in past monthly reports. The series tested includes the following dry numbers:

45 Day Immersion

18	Basic Carbonate White Lead	Heavy coating of lead on rod.
412	Leaded Zinc	" " " " " "
45	$CaSO_4$	Cons. staining, no apparent rust.
1817	Surfex	Slight " , " " "
20 L	Asbestine	Cons. " , " " "
108 N	ZnO	Dark " , " " "
ZZZ-53	ZnO	" " , " " "
12054	Zinc Chromate	Slight " , very slight rust.
D 2689	" "	Questionable staining; quest. rust.
1503	Red Lead	No staining, slight rust.
12093	Basic Lead Chromate	Slight staining, cons. rust.
54	Fe_2O_3	V. dark " , no apparent rust.
354	Black Iron Oxide	Deep staining, cons. rust.
315	Blue Lead	No staining, bad rust etching.

The results are difficult to interpret because of the questionable nature of the staining phenomena, which may or may not be related to corrosion incitation, which immediately poses the question of its practical value. However, on the basis of freedom of staining and rust, the results at least indicate that Surfex, 12054 Zinc Chromate, D 2689 Zinc Chromate and 1503 dry Red Lead are the pigments which show the greatest effect in reduction of rusting.

7162 - Studies in Flat Wall Paint Formulation

Flat Wall Paints

Because of the limited availability of magnesium silicate, the Alternate A formulas of Flat-Tone White and tints, and Paintercraft Flat #10 to use 2205 dry Carbola Talc have been sent to Cleveland for distribution.

A number of tests were conducted during the month to evaluate deodorized thinners submitted by the Commerce Petroleum Company, Oil Research, and Resin Research. The entire volatile in the Alternate A formula for Flat-Tone White was replaced by each thinner in turn. The paints were applied on Upson board and the odor tests conducted in an enclosed space built up of the Upson panels.

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Mr. Jagd's order of selection was: (1) Resin Research sample, (2) Commerce Petroleum Company's Apco #125 (deodorized mineral spirits and Apco #467 (deodorized kerosene), (3) Oil Research sample. Opinions differed on this, but Mr. Jagd objected to the rather sweet odor of the Oil Research sample. Part of the odor differences lie in the comparative volatilities of the various thinners. After the paints had dried over night there was little to choose between the samples, as then the drying odors from the binder prevail. The actual ratings were as follows (ORJ):

Flat-Tone White	Initial Odor	Up to 8 Hours	Over Night
1. Resin Research Thinner	Slight - very good	Slight - very good	Trace - very good
2. Deodorized Apco #128 and 467	Slt. to def. - good	Slt. to def. - good	Trace - good
3. Oil Research thinner	Very sweet - fair	Very sweet - fair	Trace - good
4. Regular (348) and (3020)	Characteristic - rather bad	Characteristic - rather bad	Trace - good

Resin Research is continuing their work and will supply deodorized samples of mineral spirits and kerosene so that paints of normal brushing and volatile character can be prepared.

Enameloid

In the October, 1943 report, a comparative evaluation of typical Enameloid formulas and competitive products was described. Results of this evaluation, with the exception of exposure data, were given in the November report. We now have available results of a 10 week exposure test in Florida, 45° south.

Most of the white enamels showed from considerable to very bad chalking and a decided loss in gloss. None of these enamels showed checking or cracking. Several showed slight mildew and dirt accumulations, the Devoe enamel being worst in this respect.

Devoe's enamel was slightly the best of the group for gloss, followed closely by Enameloids made with the following alkyd vehicles, - (3111) and (4100), (3119) and (4100), and (6138), (4100) and (6100). Enameloid made with (2847)S, maleic vehicle was approximately equal to the alkyds for gloss retention and equivalent to Nu-Enamel and du Pont's enamel.

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The next group with respect to gloss was composed of Enameloids made with (2848)N, (3848)E and (4850)N. Gloss retention in this group was best with (2848)N and poorest with (4850)N, but differences were slight.

The poorest gloss retention in the series of white enamels was shown by Sears Roebuck and Pittsburgh products and Enameloid made with a wood oil-phenolic vehicle (2946)EA.

In the series of Ivory Enamels, bad chalking and fading was evident on all panels except one finished with Devoe's "Honey Color (N)." This product was given a general appearance rating of "fair" as compared with "poor" for others in the series.

A number of gray enamels were included in this exposure series. The vehicles used in the enamels were single varnishes, all of which have been used at one time or another in Enameloid, - either alone or in combination with other vehicles. The gray enamels were all pigmented with rutile TiO_2, non-chalking, 2174 dry, and tinted with Lamp Black. The P.V.C. was the same in all enamels.

At the end of 10 weeks the alkyds (3111) and (4100) showed good gloss and color retention and were rated best of the series. (2843)GS and (3850)N showed considerable fading and chalking and presented a poor general appearance. (1567) showed considerable checking.

The following chart gives detailed readings for the gray series:

Exposure test for 10 weeks in Florida at 45° south.
Gray enamels pigmented with non-chalking rutile TiO_2, 2174, and Lamp Black (same P.V.C. in all enamels).

Panel	Varnish used in Enamel	Fade	Gloss	Check-ing	Mil-dew	Dirt	Chalk-ing	Gen. App.	Rain Spotting
7480	(4100)		(G)					G	S
7481	(2946)EA		(G)		(S)		C	G	S
7482	(2848)N	S	G				(S)	F	S
7483	(2847)S		(G)				(S)	G	(S)
7484	(3848)E		(G)		(S)	(S)	(S)	G	(S)
7485	(4850)N	(S)	E	(S)			(S)	G	S
7486	(1567)		(C)	C				F	C
7487	(3111)		G					G	S
7488	(6100)	(S)	(G)		(S)			G	S
7489	(2945)EA		E		(S)		(S)	F	S
7490	(2843)G	S	E		(S)		C	F	S
7491	(3850)N	C	E				C	P	S
7492	(2841)G	S	(G)				C	F	S
7493	(2843)GS	C	E		(S)		C	P	S

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Porch and Deck Paints

Panels 7602-31 F were returned for examination after 10 weeks' exposure at Miami, 45° south, of various Porch and Deck paints covering variations in pigmentation and vehicle. These were described in the October, 1943 report.

The panels are 8" x 24" medium quality Douglas Fir panels, given two coats of each paint, applied by brush, with care taken to apply equal film thicknesses. After 10 weeks of exposure there are wide variations in appearance but very little in durability. Pitch spots are very noticeable, but their frequency may be more a function of the wood than of the coating.

Disregarding the pitch spots, in general the paints using 2140 titanium calcium pigment show poorer color but better gloss than the leaded zinc formulations. Chalking is no more than slight in any case, mostly on the leaded zinc panels, so that apparently the fading of the 2140 formulas is chemical fading rather than "chalk-mask." A single test of 2174 rutile non-chalking R 610 TiO_2 and Micro Velva A shows up better than the average in all respects.

With respect to the vehicles, differences in performance are still small. (1567)A, an ester gum-chinawood linseed varnish is very bad in all respects, but improves with phenolic added. (3850)N Velsicol varnish is one of the poorest in both color and gloss. The alkyds (4100), (6100), and (3111) tested only with Titanium Calcium RC, show up very well. The panels will be re-exposed. At Mr. Mills' suggestion, a special test is being arranged to combine horizontal exposures with occasional scrubbing, and eventual recoating, particularly to determine the importance of chalking, and adhesion.

#182 - Study of Improved Mixing and Grinding Practices

Mr. Clingan is undertaking a survey of mixing and grinding operations to see what opportunities may exist to reduce costs of mixing and grinding operations, or to expedite production rates. The work up to the present has involved a review of the literature on this subject, including the Production Clubs' reports, and technical information on wetting and dispersing agents, and grind aids. A selected series of such chemicals have been ordered. We will attempt to use the Brabender Plastograph in our evaluation.

No work done during the month on:

#160 - Painting of Bricks

#148 - Examination of White Lead

#150 - Durability Studies of Zinc Sulphide Pigment Combinations

#178 - Studies of Dark Colored House Paints

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#86 - Durability of Pigments with Special Reference to Leaded Zinc and White Lead

A mimeographed report was circulated April 25 on the results of a study made by C. H. Adams and J. W. Chapin of the leaded zinc exposure series 4500 -4635 C, Cof. and F. This study and report is supplementary to those made about a year ago, and presents detailed readings and general conclusions on durability and tint retention. All exposures are being continued.

Panels 2291-2316 C were given a final examination at 59 months' Chicago exposure, vertical south. All paints are 3-coat self-primed work on Ponderosa pine. Pittsburgh's #1-50 formula, essentially 11.5% asbestine and the balance 60/40 lead/zinc, is used to test the following lead-zinc combinations: Ozlo 65/35, Ozlo 50/50, Azo 35 M; New Jersey XX-92, Anaconda, and American Zinc's Azo ZZZ-11 and ZZZ-22 zinc oxides blended with 1140 basic carbonate white lead, 9 dry basic sulphate, and National's acicular basic lead sulphate. A straight lead-zinc formula is also used. Considering the differences probably due to wood, a few definite general conclusions can be stated. (1) In this series, Ozlo 50/50 shows up very well in durability, also Azo ZZZ-11/1140 and Azo ZZZ-22 with all white leads except National's sulphate. (2) Azo 35 M and Ozlo 65/35 are not showing up as well as would be expected. (3) New Jersey's XX-92 is responsible for most of the poor durability in mechanical mixes. (4) As to fading, the co-fumed materials rate as follows: Azo 35 M fair, Ozlo 65/35 not as good, and Ozlo 50/50 very much the worst of the series. The mechanical mixes show ZZZ-11/1140 very good in color, though bad in dirt collection. Anaconda zinc oxide shows bad fading, and National's acicular sulphate is poorest of the white leads in this respect. 9 dry basic sulphate seems to be fairly good.

#150 - Durability Studies of Zinc Sulphide Pigment Combinations

Panels 2259-45 C were examined at 62 months' Chicago exposure. Regular Krebs Ti-Sil pigment, used 50/50 with 65/35 leaded zinc, is tested against a similar combination using Cryptone MS-131 and another based on Coffeyville's zinc sulphide CPP-320. The guide paint is Acme Big Six which uses a blend of 412 leaded zinc at 41% and MS-131 zinc sulphide-mica at 59%. There is also a special panel carrying three coats of Rex 471 Gloss White (old 1403 type). All panels are 3-coat work on Ponderosa pine, and all the paints except Rex 471 are tested both as white and tinted to cream. The tints are all badly faded now, but the Acme guide held satisfactory color the longest, and 50/50 Ti-Sil was probably worst in early fading. Rex 471 seems somewhat superior to the other whites, mainly because of resistance to erosion. The Acme guide is poorest in durability because of both erosion and cracking. The special formulas are intermediate, with Ti-Sil slightly fair, MS-131 next, tending toward failure by checking and cracking and CPP-320 mediocre, showing not much cracking but erious erosion.

Panels 2344-55 C were examined after 58 months' vertical south at Chicago, all 3-coat self-primed work on Ponderosa pine. The purpose was direct comparison of several micas, varying mainly in particle size, in a 65/35% Cryptone MS-130/leaded zinc formula. Blends of each mica with Coffeyville zinc

#150 - Cont.

sulphide and asbestine were used. Rex 471 Gloss White of early 1938 was used as guide, and is by far the best paint of the series because of its resistance to erosion. Micatone asbestos ground to 5 microns or less is the best special extender tested, nearly as resistant to erosion as the guide; Biotite Micatone is similar but allows more checking and cracking. The only other reasonably good extenders, in resistance to erosion, are water ground mica 1779 dry and that carried in regular Cryptone MS-130 (the zinc sulphide component may be a factor). Micatone A and Micatone B-1000 (of the order of 625-mesh) are extremely poor, with Micatone B-2000 and Pyrophyllite, a talc ground to 5 microns or less, also very unsatisfactory. Alsibronz #12 is nearly equivalent to 1779 dry, but the remaining two, English 325-mesh and Cryptone MS-131 (different zinc sulphide component) are definitely poor. Evidently particle size alone is not the controlling factor in the performance of micaceous extenders in this type of formula.

Panels 2782-4 C, CY, exposed 47 months at Chicago vertical south were examined. The purpose was to test New Jersey Zinc's two-coat system, 70/30% of Cryptone MS 130/412 leaded zinc as top coat, against our Rex 450 Undercoater-Rex 471 Gloss White system, using 1403 titanium in the Rex 471, as of late 1939. In addition, the New Jersey Zinc formula was tested using Coffeyville zinc sulphide-mica blend CPP-566 for MS-130. The SWP system is definitely best in durability at 47 months, with very little checking, cracking or erosion, except as might be expected on yellow pine wood. There is some cracking with the New Jersey Zinc system, but its main deficiency is in erosion. Regular MS-130 seems slightly better than the Coffeyville blend in this respect, but wherever the wood used is equally good, these two formulations are practically equivalent.

#163 - One Coat House Paint

We are inspecting a number of houses in the Chicago area for selection of a group suitable for one coat house paint tests this spring and early summer.

Panels 3800-41 Cof. were examined after 52 months' exposure at Coffeyville, vertical south. These panels are similar to another group, 4100-55, also exposed at Coffeyville only, and studied quite extensively in connection with the recent interest in One Coat House Paints. The older series has less variations in formulation, but is even more conclusive than the other set because of a year longer exposure time and the fact that not only one coat on repaint wood was used, but also one coat on new cedar and Rex 450-primed work on new cedar. The pigmentation is 50% of 50/50 leaded zinc, 15% rutile titanium, 9% basic carbonate white lead, 6% lead titanate and 10% each of asbestine and barytes. One group uses a vehicle based on acid refined linseed oil at 35% p.v.c. and another tests exactly the same combinations at lower pigment and higher oil content to give a p.v.c. of 32%. The only substitutions of materials are the following liquids, on a 4 gallon basis: (140) China wood oil, (2159) alkyd, V-11083 "kangaroo oil" at each p.v.c., (2325) Dehydrol at 35% p.v.c. and (3017) Dehydrol at 32% p.v.c.

#12 - Cont.

5. Aluminum Primer is intermediate between Marvelac and Shellac.

6. Metalead with ARV-2289 resin varnish vehicle is definitely poorer than #3, above.

#177 - Pigment Studies

414 Leaded Zinc

The evaluation of the pigment properties of 414 dry leaded zinc has continued during the month. It will be recalled that the chief objections to 414 as it has been made have been (1) wetting and (2) texture. These features were reflected in plant operation as hard mixing and low mill production rates. Two dry grinding trials on 414 have been carried out; one at Coffeyville, on their Stedman mill and the other at Chicago, in the equipment of the Raymond Mill people. At Coffeyville one run was made on the Stedman mill at optimum operating conditions, while at Chicago Mr. Stevens arranged a group of runs on the Raymond equipment so that the product would receive an intermediate and a maximum amount of grinding on the Raymond Midget Roller Mill. This would correspond to a large Roller Mill type of dry pulverizing. As a secondary to this trial one run was made on the Raymond "Imp" mill, which is a hammer mill of the micro pulverizer type.

In the laboratory each of the test pigments was made into the Post-War SWP formula making the substitution on an equivalent zinc oxide basis. The results of these tests are as below:

Paint No.	Leaded Zinc Used	Texture	Viscosity	
RB 442	412 dry standard	3M-4-1/2	29"	) Paint ground
443	414 " Lot 964 (un-milled)	2P-3-1/4	30"	) at fixed
444	414 " Stedman milled	2P-3M 4	28"	) mill setting.
445	414 " Raymond "Imp" milled	2P-3M 4	26"	)
448	412 dry standard	2P-3M 4	30"	) Paint ground
447	414 " Raymond (max. roller milled)	2P-3-3/4	27"	) at fixed
446	414 " Raymond (intermediate roller milled)	3M 4-1/4	26.2"	) mill setting.

The zinc oxide pigments were compared for ease of mixing and grinding on the Brabender Plastograph. For a description of this instrument see Project #182 below. In tests made with the zinc oxides 10.64 oz. of oil (60% (2) - 40% (48)) was first placed in the mixer. To the oil was added 42.57 oz. of pigment (as quickly as possible). The mixer was then allowed to operate for 25 minutes. Samples which wet with difficulty show a sharp rise in consistency as pigment is added, while those wetting easily show only a minor rise in consistency which quickly levels off. The Plastograph readings at the end of 25 minutes gave the relative consistencies of the pastes under test.

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The results of the tests are summarized in the table below:

Leaded Zinc	Initial Consistency	Consistency after 25 Minutes Mix
412	450	105
414 un-milled	880	280
414 Stedman	415	100
Raymond R4 "Imp" Hammer Mill	150	55
Raymond R3 Roller - Inter.	70	18
Raymond R5 Roller - Max.	35	7

From the above it can readily be seen that dry pulverizing takes care of the wetting problem.

In the plant three 300 gallon batches of Rex 471 were made, one with Ozlo 412, lot 524, a second with 414 Stedman milled, and a third with 414 Raymond roller milled (blend of R3 and R5 reported above, as the leaded zinc constituent in each case), the leaded zinc being the only variable between the runs. Milling was on a 5-roll production mill.

Results of these trials are as follows: (Run 4-20-44)

Rex 471 Tank	Leaded Zinc	Mill Time	Grind	Wetting in Mixer
7	CW 1974 414 Stedman milled	3 hr. 25 min.	Good 2M	Normal
10	CW 1972 414 Raymond milled	3 hr. 35 min.	Not quite 2P	"
2	412 dry	3 hr. 45 min.	Good 2M	"

In addition to the above tests, laboratory trials were run attempting to adjust the roller and stone mill settings to maintain a 2 P grind. The results were as follows:

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Rex 471 Formula - Alt. C, Card 38

Stone Mill
(Setting Varied)

Paint	Leaded Zinc Zn	Make-up Pb	Grind Time	Fineness	Immediate Viscosity #3 S-W Cup
RB 455	412	-	14'	2 P	34"
456	414 - Stedman	18 dry	16'	2 P	42"
457	414 - Stedman	BW 103*	20'	2 P	54.4"
459	414 - Raymond R5	BW 103*	18'	2 P	49"
461**	414 - Raymond R5	BW 103*	13'	2 P	49.2"
463**	414 - Raymond R5	18	15'	2 P	34.8"

Roller Mill
(Setting Varied)

RB 452	412		6' 35"	2 P	27"
453	414 - Stedman	18 dry	7' 14"	2 M	26.8"
454	414 - Stedman	BW 103*	8' 27"	2 M	38.6"
458	414 - Raymond R5	BW 103*	8' 2"	2 M	27"
460**	414 - Raymond R5	BW 103*	7' 50"	2 P	24"
464**	414 - Raymond R5	18 dry	10' 40"	2 P	18"

*BW 103 added in the thin-down.

**Quantity of oil in mill base reduced to increase mill paste consistency for better grinding.

After the above tests were completed it was apparent they should be confirmed by similar runs in which the mills would be set to give a standard 2 P grind on 412 in the Post-War formula, letting the resultant fineness of grind on the 414 pigments be the variable.

Rex 471 Formula - Alt. C, Card 38

Stone Mill
(Setting Fixed)

Paint No.	Leaded Zinc Zn	Pb	Grind Time	Fineness	Viscosity Immediate #3 S-W Cup
471	412	-	28' 14"	2 P	39"
472	414 - Stedman	18 dry	25' 37"	2 P	38"
473	414 - Stedman	BW 103*	18' 15"	2 M	49"
474	414 - Raymond	BW 103*	24'	2 P	42.8"
475	414 - Raymond	18 dry	30' 40"	2 P	29.2"
476	414 - Lot 2011	18 dry	30' 30"	2 P	40"

*BW 103 added to thin-down.

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Paint	Leaded Zinc Zn	Roller Mill (Setting Fixed) Make-up Pb	Time	Fineness	Viscosity Immediate #3 S-W Cup
RB 469	412 dry		7' 45"	2 P	32"
470	Old 414 - Lot 2011	18 dry	7' 25"	2 P	33"
466	414 - Stedman	18 "	7' 54"	Good 2 M	23"
468	414 - Stedman	BW 103*	7' 03"	2 M	39"
435	414 - Raymond R5	18 dry	7' 08"	2 P	20.6"
467	414 - Raymond R5	BW 103*	7' 12"	2 P	29"

*BW 103 added to the thin-down.

An interesting study developed of stone mill grinding at a fixed setting, comparing paste consistencies with mill rates. For this work the consistencies of the milled pastes were measured on the Gardner Mobilometer. Two weights were used, recording the times for a unit fall of the plunger.

Stone Mill Rate vs. Paste Consistency

Paint No.	Leaded Zinc	1000 gm wt.	500 gm wt.	Mill Time	Fineness of Grind
475	414 Raymond + 18 Dry	10.2"	30"	30' 40"	2 P
471	412 - Standard	10.8"	29"	28' 14"	2 P
476	414, Lot 2011 + 18 Dry	12"	32"	30' 30"	2 P
472	414 Stedman + 18 "	16"	57"	25' 37"	2 P
474	414 Raymond + BW 103*	25"	1' 59"	24'	2 P
473	414 Stedman + BW 103*	40"	3' 47"	18' 15"	2 M

*BW 103 added to thin-down.

Summing up the data in the above tables, it is felt that plant testing of mill rates is much more reliable than the short run laboratory trials. It is also evident that paste consistencies are very important in determining mill rates, and that much can be done by proper control of this factor. It is our impression that the Stedman milling has greatly improved the wetting of 414, and has effected some improvement of the texture. The material is not equal to 412 dry, but is superior to the unmilled 414.

The opacity of 414 has been checked against 412 dry by reflectometer measurements, using the post-war house paint pattern. For the standard, 412 dry and magnesium silicate were introduced at 18,000 Holley units, and at 31% p.v.c. In the comparison formulas, 414 was used to replace 412 pound for pound, and on equal chemical basis, using 414 plus basic carbonate white lead. Using draw-downs at various spreading rates, the following comparisons were reached at 93% contrast ratio:

RB 390	412 + 20 L	500 sq. ft./gal.
391	414 + 20 L	440 " " "
392	414 + 18 + 20 L	420 " " "

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Further work is under way, and the above figures should be verified before they are accepted as final.

Panels 8139-66 C, F, and Cof. were prepared for exposure at Chicago, Florida, and Coffeyville to evaluate the durability characteristics of 414 dry leaded zinc versus 412 Ozlo 35/65 leaded zinc, Lehigh #6 leaded zinc, and Lehigh 635, Eagle-Picher 35/65 and 50/50, Azo 35 L leaded zinc, and mechanical mixes of zinc oxides Azo ZZZ-33, New Jersey's Horse Head XX-503 and XX-50 with basic sulphate 9 dry, and basic carbonate 18 dry. The basic formula was the so-called "post-war" house paint. The 414 pigment appeared to give adequate color, the consistencies were slightly higher than when regular 412 was used, but did not approach the consistencies obtained with the mechanical mixes.

182 - Study of Improved Mixing and Grinding Practices

It has been recognized for some years that properly selected surface-active agents are valuable aids in the mixing and grinding of paints. Most investigators in this field have come to the conclusion that no one wetting agent is equally effective with all pigments or in all vehicles, and that often a compound producing desirable properties in one paint formula will produce equally undesirable properties in some other formula. In other words, the physical and chemical phenomena involved are so complex, that the only way to judge the value of a wetting agent is to try it in the specific paint formula one plans to use.

In this laboratory, we are setting up a standard procedure for evaluating wetting agents, which we believe will enable us to pick out the compounds which could be effectively utilized in any given formulation.

When a surface-active agent is added to a pigment-vehicle mixture, there is usually a profound change in the consistency or plasticity of the paste. In some instances there will be a tremendous increase in pigment flocculation, and the paste will become "short" and stiff. In other cases, the addition of a surface active agent will cause an immediate drop in the plastic viscosity, or a "thinning out" of the paste.

In evaluating wetting agents for use in any specific formulation, therefore, it is important first of all to determine its effect on the plasticity of the pigment-vehicle paste. The Brabender Plastograph is proving useful in this phase of the work. The instrument consists of a small mixer driven by a freely swinging dynamometer mounted in ball bearings. The resistance which the material under test exerts toward mixing is transferred to the dynamometer, whose housing tends to equalize this resistance by turning in the direction opposite to that of the driving shaft. The resultant thrust is transmitted through levers to a scale system and recorded by an electrically driven writing device on a chart moving at a constant slow speed synchronized with the time divisions printed on the chart paper. Consistency units are given in meter-grams. The mixer is water jacketed and the temperature is closely controlled by a thermostat and pump arrangement.

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With reference to the sharp reduction of grinding time shown above, it is interesting to note that this is considerably greater than was to be expected from just the lower volume of paste brought about by use of less varnish in conjunction with the wetting agent. It seems that the wetting agent in a paste of this viscosity also increases "tack," which further speeds up the grind.

The proportion of 25 gallons of (3848)E to 290 pounds 1403 dry for roller mill grinding, as shown on the standard formula record, gives a mill paste somewhat heavier than is desirable in plant practice. The paste will not flow readily in chutes feeding the mills. In actual operations the mill man would probably prefer 30 gallons of (3848)E to mix with 290 pounds 1403.

Plastograph tests indicate that the consistency of such a mixture can be equalled with 290 pounds 1403, 24 gallons of (3848)E and 5-3/4 pounds SP 717. Grinding times on laboratory batches using these proportions for the mill paste gave relative grinding times of 3' 56" for standard vs. 2' 28" for batch containing the wetting agent (same mill setting); Mill pastes at this consistency were easier to handle and reduced more readily. There is still a large saving in mill time through the use of this wetting agent, but the extra speed gained by increased "tackiness" at high paste consistency is lost to some extent.

It is planned to continue the evaluation of wetting agents in Rex 710, and practical factory runs to check laboratory results have been arranged. If factory results are favorable, other rexes can be studied and suitable wetting agents selected.

In connection with the use of wetting agents to increase grinding efficiency, it should be recognized that a compound which is effective for roller mill grinding may not be effective in ball mill or pebble mill grinding. While in this case, lowering of the paste consistency by the wetting agent to enable us to grind more pounds of pigment per gallon of vehicle is important, the yield value of the adjusted mill paste must be carefully watched. If the use of the wetting agent increases this yield value, the free cascading of the pebbles is hindered, and mill times increased. For more efficient ball mill grinding, wetting agents which do not increase yield value of the paste should be selected.

#162 - Studies in Flat Wall Paint Formulation

Besides the House Paint Primer formula using Linogel suggested by A-D-M, formulas were also offered for Wall Sealers, Flat Wall Paint, Enamel, and Enamel Undercoater. These were ground out, and were compared with our regular trade sales products of similar type.

Linogel Wall Primer #1 and #2 were compared with Wall Primer and Sealer Rex 19681 by brushing on the unsized reverse side of an Upson Board, to check the sealing properties.

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	Wall Primer and Sealer Rex 19681	Wall Primer No. 1 511 H	Wall Primer #2 513 H
Brushing	Good	Very good	Very good
Flow	"	Good	Good
Sealing	"	"	"
Drying, over night	Hard	Hard	Hard
Viscosity	-	24" on #3	27" on #3

The Linogel primers both brushed very well, and did not strike into the surface as much as Wall Primer and Sealer Rex 19681. The sealing properties were all rated equal. No alkali resistance test was run.

The lithopone Linogel flat wall paint, OJ 508 H, was compared with Flat-Tone. The brushing of the Linogel paint was very free, although the flat was puffy in body. Flow and over night drying were rated as good. Uniformity of tint on a ten minute lap was poor and considerable ghosting was evident. Washability over glue size was very poor.

The Linogel white enamel #14, OJ 512 H, appeared satisfactory except for color and body. The lack of brightness apparently was largely due to the dark color of the Linogel, although it was partly due to the use of the rutile titanium calcium pigmentation. It was compared with Rex 26639. It was rated good in flow and satisfactory in brushing characteristics. The enamel was thin, 13 seconds, and probably would soon show settling.

The Linogel enamel undercoater #7, OJ 510 H, was compared with Flat-Rite Undercoater on Upson Board and on new wood. The batch was satisfactory for flow but brushed too freely. The sanding properties were not as good as Flat-Rite, due partly to lack of film thickness and hardness.

#103 - Metal Protective Paints

As an extension of an exposure program previously reported, a series of special 52-MC-29 metal protective primers were made up at p.v.c.'s of 25%, 30%, and 35%. It was felt that in previous exposures of variations of the 52-MC-29 specification, too much attention had been paid to blistering properties. For a post-war alkyd type of zinc chromate primer the consideration of film integrity as a function of exposure is not necessarily related to blistering resistance.

A second set of zinc chromate primers were also made up at the standard p.v.c. of 40%, with the following substitutions:

1. 30% by weight of the zinc chromate was replaced by calcined Micalith.
2. 30% by weight of the zinc chromate was replaced by Micalith G.
3. For comparison, 30% by weight of the zinc chromate was replaced by Impedex (ferrous ammonium phosphate).

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little difference in durability between the self-primed and special-primed tests, and the high lead titanate shows surprisingly little difference from the regular in either dirt or fading at present. A combination of very slightly better cleaning and less fading gives the regular Rex 450-primed test a slight appearance advantage over the others. The high lead titanate formula, however, has never shown either unusually bad dirt or especially good color-retention. Rex 471 Gloss White of 7-19-40, 150 pounds of 2030 semi-nonchalking TiO_2, is compared in the same way with one very similar except that about half (7-1/2% of the total pigment) the titanium is as lead titanate. In this case, special priming has resulted in better durability. The lead titanate special is at least equal to the regular in durability, but shows up poorly because of yellowness and imbedded dirt.

#86 - Durability of Pigments with Special Reference to Leaded Zinc and White Lead

A sample of off-colored leaded zinc from American Zinc Sales was examined as a possible replacement for 412 dry Ozlo 35/65 leaded zinc in SWP tints. Tests showed the sample to have a distinctly yellow color, but it could be used, assuming that it is a co-fumed pigment.

#163 - One Coat House Paint

A number of one coat house paints were prepared during the month, for additional house paint tests. The variations include the replacement of all the R 200 TiO_2 by half R 200 and half anatase 1405 dry; 32% p.v.c. vs. 34%; Triple A Mica CW 1782 versus Alsibronz #19; and comparisons of the regular Rex 471 SWP Gloss White formula of 10-4-43 versus the Post-War SWP Gloss White CH 5051, and One Coat Gloss White CH 4697.

Inspection of early one coat house painting tests show that where bare wood has been exposed it is advisable to touch up such spots with Rex 450 Undercoater or One Coat House Paint before proceeding with the over-all application of one coat of paint. This applies where bare wood is exposed for any reason, such as flaking, blistering, burn-off, scraping, or replacement of defective boards, etc. This touch-up will equalize the repaint surface, and avoid later differences in gloss, chalking rate, fading, etc., caused by unequal loss of oil by penetration.

#77 - Mildew Inhibitors

Some interesting information on granulation of house paints may be gathered from hot storage tests of 11 months' duration on SWP Mildew Resistant Treated SWP, Rex 63057. When this formulation was established on the original high oil vehicle under date of 11-25-41, using tetrachlorphenol as the fungicide, restrictions had to be placed on the shelf life of the paint because of granulation tendencies. When the formula was revised on 4-5-43 to the oil-conservation vehicle under M-332, storage tests were put away, comparing vari- old and new formulas.

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The mildew resistant treated Exterior Prefab Primers for the Curtis Companies, Inc. of Clinton, Iowa, have received further attention during the month. Samples are now ready to be sent, together with samples of clear sealers prepared by the Varnish Laboratory. These will be evaluated by A.S.T.M. methods for rot and moisture resistance.

A number of insect repellent paints have been made using 3% of diethyl phthalate, dimethyl phthalate, and D.D.T. in SWP. When weather permits, outdoor painting tests will be made against regular SWP.

112 - Exterior Primers

Preparations have been made to carry out a comparison of Orange Shellac 02739, Zinlac, and a special shellac substitute CAC 5-21, based on zein, to check their performance as sealers for knots in exterior painting. Exposures will be made at Chicago and Florida.

112 - Fire Retardant Paints

Samples of fused calcium borate, barium borate, strontium borate, and magnesium borate have been received from the Pemco Company, and will be evaluated for their fire retardant properties. Formulations have been set up for both interior and exterior paints.

177 - Pigment Studies

414 Leaded Zinc

Results were described in the last report of mixing and grinding tests on experimentally ground samples of 414 leaded zinc. While Stedman or Raymond mill grinding gave acceptable wetting properties and effected some improvement in texture, it was concluded that it was still inferior to 412 dry.

Coffeyville has completed the installation of the Stedman mill, and a trial grind on production 414 has been made in F Department at Kensington, with the following results:

Paint Characteristics	Paint Rex 471 - Card 38, Alternate C 412 Dry - Standard Formula Rex 471, Tank 19, 5-25-44 1350 Gallons Total Run	 414 Dry - Test Formula Rex 471, Tank 20, 5-25-44 1800 Gallons Total Run
Total time	10 hours	14-1/2 hours
Gals. output per hour (calculated as finished paint)	135 gallons	124 gallons
Grind (fineness)	Good 2 M	2 M
Viscosity (finished paint)	26"	31"
Weight per Gallon	T 15.61 - A 15.68 Standard	T 15.74 - A 15.83 Standard

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Commenting on the above test, these observations should be added:

1. The test formula substituting 414 for 412 was made up by substituting 74 pounds 414, 26 pounds lead carbonate, and 2 pounds magnesium silicate for each 100 pounds of 412 dry called for in the standard formulation. In this test the lead was added as BW 103, lead pulp, to the paint thin-down.

2. Mill feed pastes were adjusted for consistency so that greater grinding efficiency might be obtained on the mill. This was done by holding out a portion of the grinding vehicle. Paste viscosities were 32" on the standard and 51" on the 414 test, as measured on the Gardner Mobilometer using a 200 gm. weight. This difference in viscosity is in favor of the 414 test. It was the impression of the foreman that the 414 was probably being ground out at just about its optimum efficiency. The 412 run could possibly have been improved slightly by holding out a little more of the grinding vehicle.

3. Commenting on fineness, viscosity, and weight per gallon on the paints, it was felt that this test showed excellent control on the two batches. The difference in fineness was only very slight. The viscosity difference was due to the additional water introduced with the BW 103 in the test formula.

4. Commenting further on the 414 batch, it was of interest that greater fineness could not be accomplished in the plant by tightening the paint mill beyond the point of this operation. This is not true of the standard material.

5. This production run confirms the previous conclusion that Stedman milled 414 dry is not equal to 412 dry for texture and the question of usability still rests with the factory.

6. The opacity of 414 has been checked again against 412 dry using the Post-War House Paint pattern. As the standard, 412 dry and magnesium silicate were introduced at 18,000 Holley units, and at 31% p.v.c. In comparison formulas, 414 was used to replace 412 pound for pound on an equal chemical basis using 414 plus basic carbonate white lead. Using draw-downs at various spreading rates, the following comparisons were reached at 95% C.R.

	Paint	Leaded Zinc	Sq. Ft./Gal.
Trial 1	RB 390	412 + 20 L	500
(Reported April)	RB 391	*414 + 20 L	440
	RB 392	*414 + 18 + 20 L	420
Trial 2	RB 439	412 + 20 L	505
	RB 440	*CW 1974 + 20 L	458
	RB 441	*CW 1974 + 20 L + 18	425
Trial 3	RB 477	412 + 20 L	500
	RB 478	*CW 1974 + 20 L	475
	RB 481	*414, Lot 2011 + 20 L	500
	RB 480	*CW 1974 + 18 + 20 L	425
	RB 479	*414, Lot 2011 + 18 + 20 L	460

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In the above tests, the leaded zinc pigments are as follows: In Trial 1, the 414 used was prepared in the laboratory; in Trial 2, CW 1974 is Coffeyville Stedman milled production of 414, while in Trial 3 414, lot 2011 is a sample of 414 dry as produced at Chicago in 1941.

So that the evaluation of 414 dry might be complete, exposures have been initiated that will illustrate the durability and tint retention characteristics of the material with respect to the degree of dry milling which the 414 pigment has received. This is done testing in both the current Rex 471 formula and the "Post-War" formulas for whites and tints.

182 - Study of Improved Mixing and Grinding Practices

Last month's report described the use of certain surface active agents as aids to grinding on roller mills. All of the original work was done with Enameloid White - Rex 710, in which the only pigment called for was anatase TiO_2 - 1403 dry. Subsequently, tests have been made with the alternate formula for Rex 710 which contains 1897 dry - Barium Titanox, in addition to 1403 dry. Tests indicate that Stanco, Inc. SP 717 is effective with this pigment combination, and laboratory grinds show comparative times of 6' 3" for a batch containing SP 717 and 10' 4" for a batch with no surface active agent (same mill setting).

The package condition of all batches made with wetting agents recommended in the last report has been checked. In no instance was the settling tendency different from that of standard material, and viscosity changes have been the same or less than with control batches.

Work using surface active agents in other rexes will be started soon, and additional wetting agents will be evaluated as rapidly as time permits.

162 - Studies in Flat Wall Paint Formulation

The development of a super one coat flat wall paint has not progressed to any satisfactory degree. The aim is to develop a one coat flat equal or superior to Paintercraft Flat #10 in other respects, but with a dead flat or low sheen. Formulations using diatomaceous silicas show streaking due to orientation of the inert particles along the brush marks, and also poor washability. Formulations with low binder ratios show poor washability. The introduction of all hiding as rutile titanium oxide and all extender as Celite 281, with a V/P volume ratio of 0.7 was also poor in washability. Work continues.

Semi-Lustre

Work has been carried on to evaluate varnishes (3848)E and (3850)N made from esterified black oil V 18643. The Varnish Research Division submitted the following for test:

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(3848)E Series

ARV 3334 - Standard (3848)E made from (320) Bodied Linseed. Body S.
ARV 3335 - " " " " (2325) Dehydrol. Body S.
ARV 3490 - (3848)E made from bodied esterified black oil V-18643. Body S.

(3850)N Series - Blown

ARV 3488 - Standard (3850)N made from (320) Bodied Linseed. Body E-F.
ARV 3483 - " " " " (2325) Dehydrol. Body E-F.
ARV 3491 - (3850)N made from bodied esterified black oil V-18643. Body G.

(3850)N Series - Unblown

ARV 3493 - (3850)N made from (320) Bodied Linseed. Body E.
ARV 3471 - " " " (2325) Dehydrol. Body E-F.
ARV 3492 - " " " bodied esterified black oil V-18643. Body G.

Experimental batches of Semi-Lustre tints, Enameloid tints, Porch and Deck paints, and Floor Enamels are being made with the above varnishes. Where (48) is used in conjunction with (3848)E or (3850)N, the formulations are checked in two ways: (1) substituting the (3848)E or (3850)N with the special based on V-18643, using standard (48), and (2) using standard varnishes replacing (48) with V-18643.

Enameloid

The Varnish Research Division submitted three variations of (3848)E to be checked against the standard varnish in Enameloid White, Rex 710. The principal variation was the dehydration of raw castor by dehydrated castor fatty acids:

ARV 3480 - 25 gallon raw castor dehydrated with rosin and Synthenol acids.
ARV 3481 - Raw castor dehydrated with Synthenol acids.
ARV 3487 - 25 gallon varnish. Rosin, Synthenol acids, P. E.

Ground into Rex 710, results of drying tests were as follows:

		Set-to-Touch		18 Hour Dry		24 Hour Dry		Sward Hardness	
Formula	Varnish	.003" Film	.005" Film	.003" Film	.005" Film	.003" Film	.005" Film	.003" Film	0.005" Film
BC 991	Std. (3848)E	1 Hr.	1 Hr.	ST	ST	VVST	VVST	8	4
BC 1001	ARV 3480	"	"	ST	ST	VVST	VVST	8	4
BC 1002	ARV 3481	"	"	ST	ST	VVST	VVST	8	4
BC 1003	ARV 3487	"	"	ST +	T	ST	VST	6	2

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Gloss - Cont.

Other properties of the enamels are described by the comments below:

Formula	Color	Gloss	Flow - Sagging	Silking	Soap Resistance 1½-3 Hr.	Water Resistance 24 Hrs.
BC 991	Best - std.	Std.	Std. OK	None	Some dulling and whitening	OK
BC 1001	3rd	OK - tr. low	Less flow than std. OK	Slight	"	"
BC 1002	Poorest	"	Like std.	Cons.	"	"
BC 1003	Dirty - tr. yellow	Cons. lower than std.	Too much brush-marking	Slight	"	"

None of the experimental vehicles would be satisfactory in whites as a substitute for standard (3848)E. ARV 3480 shows possibilities for tints.

Porch and Deck Paint

Some difficulty was encountered at the Chicago plant in the manufacture of (4880)E. Several batches proved too reactive with zinc oxide to use in the current Porch and Deck formulas. An alternate pigmentation of 2140 and 2188 was worked out so that the reactive lots of (4880)E could be safely used.

Subsequent factory batches of (4880)E using the formula calling for ester gum rather than rosin, proved to be entirely satisfactory. A recheck of original batches of Porch and Deck made with (4880)E some months ago showed the package condition to be excellent, with no gain in viscosity. A repeat laboratory run of Porch and Deck paint using some of the first (4880)E made in the plant, also showed no bodying tendency. It is felt that there will be no future difficulty in making (4880)E.

(3848)E Stability

During the month a number of factory batches of (3848)E were checked in Enameloid and Semi-Lustre laboratory batches for stability. Although this vehicle is being held very closely to standard for body, acid value, percentage of non-volatile, etc., some lots have a tendency to give high, puffy consistencies in Enameloid White or Semi-Lustre. No satisfactory explanation for this tendency has yet been offered. The following consistency data illustrates the difficulty.

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Material	Pigment	Varnish Used	Viscosity #3 at 75° F.	Viscosity #3 at 75° F.
Enameloid White	1403	(3848)E Tank 95	5-4-44 46"	6-6-44 61.2"
"	"	(3848)E Batch 153	5-12-44 34"	6-6-44 70"
"	"	(3848)E Batch 152	5-12-44 38"	6-6-44 53"
"	"	(3848)E Tank 119	6-1-44 51"	6-6-44 1' 38"
"	"	(3848)E Tank 124	6-1-44 48"	6-6-44 73" + 1/4 cup
Semi-Lustre White	2132-461-L 2247-2188	(3848)E Tank 302	4-24-44 48"	6-6-44 44"
"	"	(3848)E Tank 303	4-24-44 42"	6-6-44 39.6"
"	"	(3848)E Tank 119	4-25-44 28.6"	6-6-44 34.4"
Semi-Lustre Ivory	1897-461-L 2188	(3848)E Tank 119	4-29-44 24.3"	6-6-44 31.8"
"	"	(3848)E Tank 95	5-4-44 45"	6-6-44 51.6"
Semi-Lustre White	2132-461-L 2188	(3848)E Batch 153	5-12-44 51"	6-6-44 51.4"
"	"	(3848)E Batch 152	5-12-44 42"	6-6-44 49"
Semi-Lustre Cream	2132-461-S 2188	(3848)E Tank 119	6-1-44 34.2"	6-6-44 36"
"	"	(3848)E Tank 124	6-1-44 38.2"	6-6-44 34.2"

Standard viscosity Enameloid White 35 - 40"; for Semi Lustre 25 - 30".

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(3850)N

Some lithopone shipments have shown a tendency to body up in paints containing (3850)N. Wall Primer and Sealer was revised several months ago to replace 461 with a titanium calcium pigment because of this tendency.

A number of modifications of (3850)N were submitted by the Varnish Research Division in an attempt to make a vehicle which would be safe even with a reactive lithopone. Experimental batches of Wall Primer and Sealer, Enameloid Ivory, and Floor Enamel Slate were made, using these varnishes and a reactive lithopone from a recent shipment. None of the experimental vehicles produced paints with lithopone which were as stable as those which could be made with titanium-calcium.

The following data was obtained:

ARV 3478 - Standard Linseed (3850)N. 25 gallon varnish, Linseed-Velsicol-Rosin, blown. Body F-G.

ARV 3483 - Standard Dehydrol (3850)N. Body E-F.

ARV 3488 - Standard Linseed (3850)N. Body E-F.

ARV 3472 - Velsicol-Dehydrol varnish. Body D.

ARV 3471 - Velsicol-Dehydrol varnish. Body E-F.

ARV 3489 - Velsicol-Dehydrol varnish with 1-1/4% Pb vs. 1/2% in standard. Body D-E.

Material	Pigment Used	Exp. Varnish Used	Viscosity 5-9-44	Viscosity 5-10-44	Viscosity 5-24-44
W.P and S Card #19	1271 - 566	ARV 3478	20.2"	22"	33"
" " #18	461 S - 566	"	80.6"	3' 35"	Too hvy
Enamel. Iv." #15-A	461 S - 1403	"	47"	1' 13"	3'
" " " 15	2132	"	23"	24"	25"
W P and S Card #19	1271 - 566	ARV 3483	16"	17"	24"
" " #18	461 S - 566	"	19.2"	53"	1' 30"
Enamel.Iv. " #15-A	461 S - 1403	"	23"	36.8"	67"
" " " 15	2132	"	16"	17"	19"

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Material		Pigment Used	Exp. Varnish Used	Viscosity 5-13-44	Viscosity 5-17-44	Viscosity 5-24-44
P and S Card 18		461-S - 566	ARV 3488	54.2"	Too hvy	Too hvy
"	" 18	Albalith Red Label-566	"	21.8"	50"	36"
"	" 19	1271 - 566	"	20"	28.2"	40"
"	" 18	Albalith Red Label-566	ARV 3472	13"	19"	22.8"
"	" 19	1271 - 566	"	12"	15"	20"
"	" 18	461 S - 566	"	14"	26"	31"
				5-15-44		
"	" 19	1271 - 566	ARV 3489	14.2"	15"	17"
				5-16-44		
"	" 18	461 S - 566	"	23"	36"	50.6"
"	" 18	Albalith Red Label-566	"	13"	15.4"	21"
				5-4-44	5-5-44	
"	" 18	461 S - 566	ARV 3471	51.6"	1' 43"	Too hvy
"	" 19	1271 - 566	"	19"	19"	23"
Enam. Iv.	" 15-A	461 S - 1403	"	24"	42"	1' 45"
"	" 15	2132	"	19.6"	21.8"	22"
Floor Enamel Slate	Card 20	461 S	"	18.6"	30"	1' 25"

183 - Pretreatment of Metal Surfaces for Painting

A program of study concerning the pretreatment of metals for painting has been initiated with the purpose of evaluating in general the proprietary metal cleaners now commonly used. Emphasis in this work will be placed upon those cleaners which are particularly used in aircraft construction, where considerable difficulty has been encountered in obtaining satisfactory cleaning schedules and adequate adhesion of finishing systems.

This study will consist of cleaning the more common aircraft skin metals such as 24S-T, 24S-T Alclad, and anodized 24S-T and common magnesium metals such as Dowmetal H and J-1. After typical cleaning, the metals are to be dip coated with a standard aircraft primer such as Rex 70110 and topped with a regular finish such as Rex 72000. These coated metals will then be submitted to salt spray, salt water immersion, adhesion tests, and outdoor exposure in order to determine the effect of the various methods of pretreatment.

#77 - Mildew Inhibitors

Work is under way to improve the brushing qualities of SWP Mildew Resistant Treated Gloss White - Rex 63057. Three variations were made on the regular formula:

1. Introduction of 10 gallons of CW (1993) Linogel.
2. Replacement of 20 L Magnesium Silicate by Aluminum Flake #5.
3. Introduction of 4 pounds Flaxoap.

The Flaxoap was most effective in reducing the "feel under the brush" but at least 8 pounds would be required per hundred gallons. Work continues.

A number of cedar panels have been returned by Koppers Company, Wood Preserving Division, after impregnation with chromated zinc chloride, for tests as to paintability. This treatment is supposed to impart fungus resistance and some degree of fire resistance. The paints to be included are the regular S-W system of 450 Undercoater and 471 Gloss White, also the post-war SWP One Coat House Paint and an alkyd house paint, over Rex 450, lead-in-oil, and New Jersey's Cryptone MS 130/leaded zinc paint, to cover a wide variety of types. Nail tests will be included to see if there is any action from the chromated zinc chloride.

#177 - Pigment Studies

414 Leaded Zinc

In the last report grinding and opacity characteristics were reported for the various 414 Leaded Zinc samples. Since that report, additional tests have been made on what at the time was believed to be micronized 414. After the work was completed it was learned that the sample actually was 412 dry, which received the micronizing treatment.

It is of interest to note that in comparing opacities the micronized 412 dry showed an advantage of between 10 to 15% over that which was not micronized. From this it seemed apparent that even a fumed pigment such as 412 dry would agglomerate in the fuming process, to the degree handicapping the opacity developed.

The exposures of 414 dry have been prepared to the point of painting. Shading of both the Grays and Colonial Yellow tints has been completed.

Special Studies

White Pigment Hiding

During the month tests were made on ten emulsion type flat wall paints. These tests were negative in nature insofar as results are concerned. The technique being used now is not suited to this type of formula and introduces errors which nullify the work completely. Work is under way to improve the method.

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White Pigment Hiding - Cont.

Further work is under way to extend the coverage of Table I index values over more white pigments than those reported last month.

Exposures

Paints for the evaluation of the buff and gray Titint pigments have been shaded and are ready for exposure.

#182 - Study of Improved Mixing and Grinding Practices

Work in previous months showed that SP 717 (Stanco, Inc.) was effective as a wetting agent when used in Enameloid White - Rex 710. The amount used in early tests was 2% by weight of the pigment. In order to determine whether this is the optimum percentage, Plastograph determinations were made in which the amount of SP 717 was varied from 1% to 2-1/2%. The readings below show no reduction in paste consistency where more than 1-1/2% of the wetting agent is used.

Enameloid Paste	(no wetting agent)	- Plastic Viscosity	-	240	meter-grams.
" "	(plus 1% SP 717)	- " "	-	95	" "
" "	(plus 1-1/2% ")	- " "	-	60	" "
" "	(plus 2% ")	- " "	-	60	" "
" "	(plus 2-1/2% ")	- " "	-	60	" "

Three surface active agents which were useful in Enameloid White, namely Stanco's SP 717, Tergitol #7 and Span #60 were evaluated in Enameloid Ivory. Both pigment and vehicle are different in this formula from that used in the white. The pigment is titanium calcium and the vehicle (3850)N, a Velsicol Dehydrol varnish. SP 717 and Tergitol #7 were effective in this formula but Span 60 instead of lowering the paste consistency caused flocculation and higher viscosity. This emphasizes the point previously brought out, that surface active agents are quite specific and must always be checked before use in the exact formula to be manufactured.

Plastograph Data

Pigment	Vehicle	Wetting Agent	Plastic Visc. (Meter-grams)
400 lbs. 2132	22 gals. (3850)N	None	120
" " "	18 " "	6 lbs. SP 717	25
" " "	15 " "	" " SP 717	110
" " "	14 " "	" " SP 717	140
" " "	15 " "	" " Tergitol 7	140
" " "	16 " "	" " Tergitol 7	80
" " "	17 " "	" " Tergitol 7	50
" " "	17 " "	" " Span 60	200

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162 - Studies in Flat Wall Paint Formulation

In our efforts to develop a super one-coat flat wall paint with low sheen, we have tested Stroba Wax and Santocel as possible flatting agents. Both produce a slight drop in sheen but not sufficient to be of interest, particularly since washability is still low. Both will be tried in #10 Flat, which has good washability, along with Acrawax C. 2198 dry, #282 Georgia Kaolin Clay was also tested, but was found to produce too high a sheen to be of any value.

For a time it appeared that there might be a shortage of Titanox RC HT, - 2132 dry. du Pont's Ti-Cal R 20, our 2142 dry, is more sensitive to moisture, and in general tends to produce much higher consistencies than Titanox RC HT, and is not a consistently satisfactory replacement for the latter. du Pont now offer Ti-Cal R 25 as a closer match for RC HT, being less water-sensitive than Ti-Cal R 20. R 25 appears to be equal to RC HT in all respects, except that the body is slightly higher, when used in Flat-Tone or #10 Flat.

Viscosities - Flat Wall Paints

		Fresh Reduced	48 Hrs. 25%, #4 Orifice	4 Days
750 H	Paintercraft #10 Flat using Titanox RC HT	6.6"	9"	9.4"
751 H	" " " " Ti-Cal R 25	8.4"	10.2"	11.8"
		Full body, #5 Orifice		
752 H	Flat-Tone White, Alt. A, using Titanox RC HT	9.8"	13.2"	14"
753 H	" " " " Ti-Cal R 25	11.2"	15.2"	17.6"

We have been informed that it will not be necessary for us to accept deliveries of R 25. However, its position relative to 2132 dry and 2142 dry should be noted.

There have been some complaints on the brushing qualities of Paintercraft #10 Flat since the oil content had to be reduced to conform to M-332. The formula has been revised to ease the brushing through the introduction of 3 to 4-1/2 gallons of CW (1996) Linogel for an equal volume of (5880)E varnish solids. Production batches have been made and found to be satisfactory in all respects. The new formulas effect a slight reduction in cost.

The following inerts have been evaluated in Flat-Tone, paralleling the tests in SWP:

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1. Lesamite. Thompson, Weinman and Co., Inc. A calcium carbonate with controlled particle size ranging from 5 to 15 microns, with all the fines removed. No particular advantage over 566 dry Mineral Whiting could be found, whether in sheen, brushing, flow, or washability, all of which were equal. Consistency was lower.

2. Aluminum Flake #5. Aluminum Flake Co., Akron, Ohio. Said to be an anorphous, plate-like aluminum silicate. The outstanding characteristic of this extender is the ease of brushing, apparently imparted by the plate-like structure. The flow, sheen, and washability were very similar to 566 dry. A 50 pound bag was ordered for further tests.

3. A.S.P. Clay #1 and #11. Commerce Petroleum Co. A.S.P. #1 is recommended as a non-priority substitute for Multifex. The special clays were both higher in viscosity, puffier, and lacked flow compared with Micro Delva A, and they were not equal in washability.

Semi-Lustre

A considerable amount of time was spent in developing temporary formulas to use (4880)E instead of (3848)E and to eliminate lithopone. Many check batches using various lots of (3848)E cooked to different viscosities were also made and tested. In addition to the difficulty with stability of (3848)E, as described in previous reports, it was found that (48) purchased from Werner G. Smith was a factor in producing heavy, puffy Semi-Lustre of uncertain sheen characteristics.

The use of (3020) in place of some of the (348) to produce a longer "wet edge" in Semi-Lustre, also proved to be a factor in producing "smokiness" or flow sheen.

Enameloid

A series of enamels using (3848)E and 2174 dry, non-chalking rutile TiO_2, was prepared and checked for opacity. Comparisons of both tinted and untinted enamels were made.

It was found that 3.5 pounds of rutile TiO_2 per gallon, gives "practical" one coat hiding in a white brushing enamel, and that this same amount of pigment is required to give one coat opacity to light tints of Ivory, Jonquil Yellow, Cream and Peach similar to those in the Kem-Tone line.

In deeper tints such as Avalon Blue, Stratford Green, Aqua, etc. 4.75 pounds of rutile TiO_2 gives satisfactory hiding.

The following table gives brightness readings over white and black, and the contrast ratios for the experimental white enamels.

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Pounds of Rutile TiO_2 Per Gallon of Enamel	Brightness Over White	Over Black	Contrast Ratio
1.75	86.8%	79.1%	91.2%
2.00	88	80.2	91.2
2.25	88.2	82.4	93.5
2.50	88.2	83.3	93.8
2.75	88.8	84.2	94.8
3.00	89.2	85.2	95.6
3.25	89.5	86.2	96.3
3.50	89.9	87	96.8
Control 2.90 (anatase TiO_2)	88.8	82.9	93.4

Porch and Deck Paint

A special 4 ft. x 4 ft. yellow pine platform was constructed for rizontal exposure at the Chicago Exposure Farm of a series of porch and ck paints. Special attention is to be paid to chalking and fading compared th 45° exposure, and to the effects of periodic washing. Half of each int surface is washed with soap and water once every two weeks. The formu- include the current type of leaded zinc - (4880)E type except that the in glycerin Dehydrol varnish V 11168 was used; the 1943 Titanox RC - 4848)E formula; the 1942 Titanox RC (4100) alkyd type; and the 1936 leaded inc modified phenolic-tung oil formula. This test is now under way.

105 - Metal Protective Paints

The development of a post-war trade sales metal primer has proceeded the point of selecting some of the more promising formulations which have cently been made and further modifying and testing them.

The most promising material has been the special zinc chromate, iron ide, zinc oxide, magnesium silicate in bodied linseed oil primer. This was iginally formulated at 33% P.V.C. A 38% P.V.C. is being tested at present. ariations in the vehicle at 33% and 38% P.V.C. include the use of (2159) lkyd, 52-MC-21 alkyd vehicle, V 18339 phenolic tung oil varnish, and V 15116 E. alkyd. The original work using (2159) alkyd is being repeated with pre- ous anomalous results in mind.

Since the color of this special primer may not be as popular post- as the yellow zinc chromate color for a metal primer the iron oxide was placed by magnesium silicate as another variation. Another modification made by substituting leaded zinc 412 dry by volume for the zinc oxide, justing the P.V.C. in one case with magnesium silicate and in another case ith zinc chromate. Zinc tetroxy chromate was substituted by volume for the inc chromate.

ALLIED RESEARCH LABORATORIES

Report of Investigations for July, 1944

M. VAN LOO

177 - Pigment Studies

During the inspection trip in the east we had some discussion with Pont as to the significance of so-called "free" and "bound" oil in determining the performance of house paints. Because we believe that these factors y be important for more intelligent formulation approach, we have undertaken few simple experiments to weigh the significance of these values.

Mr. J. F. Broeker, of du Pont, has defined the "bound" oil in paint roughly the amount of oil required to satisfy the oil demand of the pigments, and the "free" oil that portion of the binder over and above the amount cessary to satisfy the oil absorption. Therefore, as applied to flat wall ints the pigment volume/free binder ratio is the factor largely controlling ch properties as brushing, leveling, enamel hold-out, washability, etc., ther than the over-all pigment/binder ratio. If, for example, in a reformution a low oil absorption pigment were simply replaced by one identical in mposition, but having a higher oil absorption, the substitution would crease the "free" oil in the paint.

In exterior paints, the same would apply. For example, a co-fumed eaded zinc would have a much lower oil absorption than a mechanical blend of icular zinc oxide and acicular lead sulphate, and an equal volume substitution of the mechanical blend for co-fumed leaded zinc would tie up more of the il as "bound"oil. The replacement of a low oil absorption magnesium silicate ch as 20 L by higher oil absorption extenders, particularly such as Surfex, c., would do the same. Such substitutions would have the same effect as pigting at a higher p.v.c. Wolff has written several articles along such lines.

Our first approach was the familiar oil-absorption tests (spatula thod) using the pigments which appear in SWP Gloss White, and a variety of hicles used in this paint. The results were as follows:

ment	Oil Absorptions Expressed as Pounds Oil per 100 Pounds Pigment		
	Using (2) Raw Linseed	50% (2) 50% (48) Bodied Linseed	60% (2) 40% (48) Bodied Linseed*
259 Titanox RA-10-MO	20.4	30.2 - 33	29.1
12 55/65 Leaded Zinc	14.8	11.3	11.25
18 Basic Carb. White Lead	10.1	-	8.7
97 Titanium Barium	20.4	18.8	18.8
41 Magnesium Silicate	27.8	22.6	26.3

ehicle of Rex 471, card 38, without thinners or driers.

Using the above oil absorption figures, and the normal Rex 471 pigment proportions, we calculated the oil absorption requirements for the Rex 71 blend. Then, by extending the vehicle with thinner and required drier to

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give a fluid product, paints were ground on the roller mill, at various fractions of the oil absorption requirements, ranging from 40% to 160% at 20% intervals. These paints were applied by a 0.005" clearance draw-down gauge on primed paper sheets (spreading rate approximately 575 sq. ft./gal.). The films were allowed to dry 24 hours before testing.

The enamel hold-out was checked with Semi-Lustre Pale Green. At and above the oil absorption point, the dried films showed perfect hold-out. At 80% of the oil absorption requirements, the hold-out had fallen away at least 50%, and below 80% the Semi-Lustre flattened out completely on drying.

Perhaps more significant data was obtained by making permeability measurements of these films. The results given below are the permeation of water through the paper and paint films when mounted in Payne permeability cups.

Per Cent of Oil Absorption Requirements*	Permeability/Milligrams H_2O Per Hour		
	Initial 6 Hrs. at 120° F.	Over Night 17 Hrs. at 80° F.	Repeat 7 Hrs. at 120° F.
Blank paper	132	27.3	135
40% O. A.	122	26.8	130
60%	114	24.0	114
80%	32	5.8	31
100%	15	2.0	15
120%	14	2.0	15
140%	15	2.2	15
160%	16	2.3	15.4

*Based on 60/40 blend raw linseed/(48).

It is interesting to note the sharp drop in permeability as the 80% point is passed, the low permeability at the 100% oil absorption requirements level, and then the indication of a slight increase in permeability as oil in excess of these requirements is added.

It would be assumed that below 80% of the oil absorption requirements all oil is "bound" and there is no "free" oil to set up a continuous film. Therefore, these films are porous or permeable. At or shortly above the oil absorption point the film becomes continuous, with maximum packing of the pigment. Since the pigment is impermeable, this would be the point of maximum impermeability of a film in which the pigment is dispersed in this vehicle. As oil is added over and above the oil absorption requirements, the "free" oil would tend to separate the pigment particles. Since the permeability of the binder is finite and less than that of the pigment, the permeability would decrease and eventually approach that of the straight binder.

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From these preliminary tests it is apparent that the "bound" oil in formulation corresponds quite closely to the oil absorption requirements of the pigment blend. This has opened up several interesting avenues for work, and the investigation will be continued. We particularly want to repeat the oil absorption determinations given earlier, as more accurate determinations are desirable because of their importance.

Considering the specific applications of the above on SWP Gloss using the oil absorption values for (2) raw linseed oil, the ratio of "bound" to "free" oil in the pre-oil conservation formula of card 33, 1-19-42, is approximately 0.9 to 1.00. Using 60% raw, 40% (48) oil absorption figures in the oil conservation formula of card 38, alternate C, the ratio of "bound" to "free" oil is approximately 0.85 to 1.00. Therefore, we observe the interesting fact that in spite of the lower total oil content of conservation and the higher p.v.c., the ratio of "free" to "bound" oil is larger in current formulas. The difference obviously is due to the more efficient wetting action of the bodied oil. This ratio of "free" to "bound" oil may help account for the good performance of our oil conservation house paints.

Opacity of Pigments

Additions to the opacity index given in earlier reports are the following:

	Type Formula	Sq. Ft./Lb. at 93% C. R.
dry - Lithopone	I House Paint	49
- Anatase Titanium Calcium	I House Paint	82
- Ti-Bar HH	I House Paint	82
- Double Strength Lithopone	III Flat Wall Paint	89

Durability of Pigments with Special Reference to Leaded Zinc and White Lead

Panels 8352-68 C and Cof. were prepared for exposure at Chicago and Coyville to evaluate the new 414 dry leaded zinc in exterior house paints. Formulas used were SWP Gloss White current oil conservation and "post-war," and SWP "post-war" tint. The leaded zincs used include:

412 dry. Ozlo 35/65 leaded zinc, regular production.
414 dry. Chicago 1941 production.
414 dry. Current production with no pulverizing.
414 dry - CW 1974. Current production - Stedman milled.
414 dry - CW 1972. Current production - Raymond milled.

Substitutions were made on the basis of chemical equivalence.

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New experimental samples of 414 dry leaded zinc have been received tested in the laboratory. These included "412 Special," a mixture of 511 /50 Leaded Zinc and 414 dry to make a 35% leaded pigment, then ground ugh the Stedman mill; 414 Special No. 1, a production lot that had a nd pass through the Stedman; 414 Special No. 2, a surface treated sample; 14 Pilot, a specially processed sample. These were compared with 414 dry 384 selected at random as representing normal practice. The results low:

	Residue C'ville Card	Paint Test Grind	Viscosity	Spatula Rub-up Texture	Color
Std.	-	2 P	28.2"	Smooth; no grits.	-
Lot 1384	1.20	2½-2P	25.0"	Bad; gritty.	Std.
Special	0.17	2½-2P	25.0"	Smooth; sl. grits.	Equal Std. 414
Special #1	0.35	2½-2P	25.2"	Bad; gritty	"
Special #2	1.70	2 M	31.0"	" "	"
Pilot	0.80	2½-2P	28.0"	" "	Sl. brighter than std. but more yellow.

In addition to the above a sieve analysis was run on three of the samples. The results are presented for what they are worth, recognizing short-comings of this type of test.

Sample	% Retained on Screen 150 Mesh	200 Mesh	250 Mesh	325 Mesh
Lot 1384	0.602	1.146	1.230	1.614
Special #1	0.108	0.198	0.192	0.346
Pilot	(1.678	(1.266	(2.158	(1.622
(Duplicate)	(1.842	(2.264	(2.045	(1.398

It will be observed that the 414 Special #1 shows high residues on the 150 and 200 mesh screens. Factory runs will be made on these to determine speed of production, grinding on the Premier mill.

SWP 471

Samples of micronized asbestines were submitted by Micronized Pig- , Inc. and were tested in both the pre-war and the oil conservation mulas for SWP. The micronized extenders were not satisfactory since in instance they caused too much increase in body, and developed a definite under the brush. There was some loss in gloss, occasioned at least in by the sharp brush marks. Durability studies cannot be run with these ples because of contamination during the micronizing, which affects the r, but which we do not believe has any effect on the consistencies.

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162 - Studies in Flat Wall Paint Formulation

So far it has been difficult to obtain a low uniform sheen in the super One Coat Flat and at the same time maintain washability. We have reverted to the vehicle combination of Rex 65310 One Coat Flat, which has a high degree of washability. To reduce the sheen and to eliminate any possible effects on washability of the calcium sulphate extender in Titanox RC HT or Ti-Cal R-20, the pigmentation was made rutile TiO_2 R 200 and magnesium silicate. Washability still was inadequate and further work must be done. As one step, the rutile TiO_2 will be replaced by anatase on an equal hiding basis.

Variations of Flat-Tone White have been made replacing the regular extender combination of magnesium silicate and Micro Velva A with Micalith-G, a micaceous extender offered by Glidden. Micalith-G performed very similarly to the regular inert combination with respect to body, flow, and brushing qualities, while sheen is slightly lower. Washability tests show Micalith-G to be very good in this respect. The principal objection is the gray color. We are waiting for delivery of a sample of white Micalith which has been promised. Costs appear rather high for economical replacement of current extenders.

During the month the following competitive flats were compared with Paintercraft Flat #10, or Flat-Tone White Rex 15185, as seemed indicated by similarity in recommendations or physical characteristics:

Mautz One Coat Flat White #88 - Mautz Paint and Varnish Co.
Unicoat Flat #250 White - T. C. Esser Co.
Intensocote C-2 Washable One Coat Flat White - Patek Brothers, Inc.
Tufcote Flowing Flat White - E. I. du Pont de Nemours and Co.

The principal criticism of all the above competitive flats is their porosity and poor washability, which is particularly pronounced over glue size. Both Paintercraft #10 and Flat-Tone have a high degree of washability. The hiding of some of the competitive flats is higher than the corresponding S-W flat. Detailed reports with photographs were made on each product.

Enameloid

Two experimental varnishes made from ester gum, Dehydrol and oiticica oil were submitted for evaluation in Enameloid. Laboratory batches were ground out and compared with a batch made with (3848)E, the regular P.E., Rosin - Dehydrol varnish. Results of tests are as follows:

Enamel	Varnish	Brushing	Set-to-touch .003" draw-down film	Over-night dry	Flow - Tendency to sag	Color
BC 1231	ARV 3531	O.K.	2 hr. 50 min.	O.K.	Sl. too, much	Sl. yel. Def. "
BC 1232	ARV 3532	Sl. sticky	2 " 25 "	"	"	"
BC 1043	(3843)E	O.K.	3 " 30 "	"	"	Sta...

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Super Enamels

A great deal of time during the month was devoted to the preparation of experimental enamels for the Cleveland Technical Service, who will use them in a series of exposure studies. 15 varnish vehicles have been prepared by the Varnish Division and each varnish is being tested in six different enamels - White, Black, Light Grey, Light Blue, Para Red Deep and Toluidine Red.

/160 - Painting of Bricks

Tests are under way to determine the durability and waterproofing properties of cold water powder paints Aquella and Aquella No. 2, recommended for waterproofing and dampproofing concrete, concrete or cinder blocks, brick, masonry, etc. Bonding Cement, Brick and Stucco Paint, and two sodium silicate paints sent in from Newark are being used as comparison paints. For laboratory tests, the outside of cement building blocks were coated with the test paints and the hollow interior cells filled with water. Although the test has just started, the Aquella paints are performing well at the moment. An actual larger scale basement test will also be run.

/103 - Metal Protective Paints

The panel preparation study undertaken in cooperation with the A.S.T.M. and described in the May and June reports has drawn to a conclusion during the current month, with the exception of the outdoor exposures which have shown nothing of interest at this time.

It will be recalled that the problem was twofold: (1) a comparison of naphtha wipe to trichlorethylene vapor degreasing, and (2) the effect of abrasion on the exposure tests. After 2400 hours of immersion in distilled water and 20% salt solution the panels were partially stripped and the following conclusions drawn:

1. In distilled water and in salt water immersion, blistering and rusting were more serious in the case of trichlorethylene degreased panels. Stripping revealed considerably more pitting and etching of the base metal in distilled water immersion than in 20% salt solution.

2. Abrasion of the panel before coating produced varied results. In distilled water, the abraded portions of the panels were less blistered, but more corroded than the unabraded portions. In stripping these panels there was much better adhesion of the paint film to the abraded than to the unabraded areas.

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#177 - Mildew Inhibitors

The various samples of fungicidal paints for test in Havana, Cuba, have been shipped, together with necessary panels and brushes. The agents were described in the July report. Nuodex NP-321 phenyl mercury naphthenate is included in these tests. It is thought that the naphthenic base would make NP-321 even more toxic to fungus than phenyl mercuric oleate, which has been found very effective to date. A similar but somewhat expanded series has been prepared for exposure in Florida.

#178 - Studies of Dark Colored House Paints

Nuact Paste, recommended by Nuodex to prevent loss of drying has been ground into SWP French Green and Enameloid Black, using 1% of the paste based on the paste weight of the grind. The batches listed herewith will be checked for drying fresh and after ageing for one, three, and six months.

SWP French Green - Rex 362

Formula		Viscosity - #3 Orifice Fresh	5 Days	Drying
OJ 904 H	Reg. formula 3-30-44	35"	63"	Wet at 6 hr. 15 min.
905 H	Using Nuact	32"	60"	Set at " "
906 H	Using 18 dry	29.6"	59"	Wet at " "

Enameloid Black

Formula		Vis. #3 Orifice Fresh	5 Days	Drying
OJ 900 H	Reg. formula 11-22-43 Contains 1128 dry - Litharge	21"	38.4"	Set at 2 hr. 40 min.
901 H	Reg. of 11-22-43 but no Litharge	30"	26.4"	Ditto
902 H	" " " + Litharge and 18 dry	35.2"	40.2"	"
903 H	" " " + Litharge and Nuact	44.4"	49.8"	"
983 H	" " " with Nuact, no Litharge.	25.7"	29.6"	"

#148 - Examination of White Lead

The opacities of various white lead carbonates were determined, and found to be as follows:

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Pigment	Tinting Strength	Hiding Sq. Ft./Lb. at 93% C.R.
18 dry composite 1944	117	27.4
National H.T.S.	120	29.4
National 333	150	35.4
National 111	155	35.1

#162 - Studies in Flat Wall Paint Formulation

Flat Wall Paints

Work continues on the development of a Super Flat Wall Paint. The work to date indicates that magnesium silicate and silica are the most desirable inerts, from the standpoint of washability, considering those extenders which will produce some degree of flatness. However, when the poundage of each is increased to 180 pounds, there is a scratchy feel under the brush, and the washability must be rated fair to good. Further work is needed.

Enameloid - Semi-Lustre

Samples from four factory runs of (3848)E were submitted for checking in Enameloid and Semi-Lustre formulations. All lots were "standard" for body, color, percentage volatile, etc., and were designated as follows:

(3848)E Special #1, made with (2325) and P.E., lot 52 A

(3848)E Special #2 " " (320) " " " 52 A

(3848)E Special #3 " " (2325) " " " 16

(3848)E Special #4 " " (320) " " " 16.

P.E. lot 52 A - hydroxyl value 47.3

P.E. lot 16 - " " 41.3

Laboratory batches of Rex 710, Enameloid White were ground using each of the above lots of varnish. The 1403 dry pigmentation and the alternate blend of 1403 and 1897 were both included. ARV 3530, a 25 gallon Dehydrol ester gum varnish, was also used for experimental batches, and was tested against the various lots of (3848)E.

The following table gives data on drying time and consistency:

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Enameloid

Number	Varnish	Pigment	Touch	Drying O'Nite	Sward Hardness 24 Hr.
BC 1249	(3848) E Spec. #1	1403	2 hr. 22 min.	ST	8
1250	" " #2	1403	1 " 15 "	ST	12
1251	" " #3	1403	1 " 39 "	ST	7
1252	" " #4	1403	1 " 15 "	ST	10
1253	" " #1	1403 - 1897	1 " 45 "	ST	9
1254	" " #2	1403 - 1897	1 " 9 "	ST	12
1255	" " #3	1403 - 1897	1 " 43 "	ST	7
1256	" " #4	1403 - 1897	1 " 8 "	ST	10
1265	ARV 3530	1403 - 1897	1 " 24 "	ST +	6
1266	ARV 3530 + (3012)	1403 - 1897	1 " 37 "	T	6
1267	ARV 3530 + (2231)	1403 - 1897	1 " 20 "	ST	6
1268	ARV 3530 + (3012) (2231)	1403 - 1897	1 " 24 "	ST	4
1269	ARV 3530	1403	4 " +	T	4
1270	ARV 3530 + (3012)	1403	4 " +	T	2
1271	ARV 3530 + (2231)	1403	1 " 22 min.	ST	4
1272	ARV 3530 + (2231) (3012)	1403	1 " 45 "	ST	6

Number	Viscosity		
BC 1249	8-12 32.4"	8-16 41"	9-2 46"
1250	30"	34"	34.4"
1251	39.4"	45.7"	55.8"
1252	27.2"	28.4"	34.6"

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Number	Viscosity		
	8-11		
BC 1253	31.6"	35"	38.4"
1254	29.8"	32.2"	32.2"
1255	33"	37.6"	41.8"
1256	31.4"	31.2"	36.8"
1265	8-9		
	37"	40.6"	42"
1266	36"	45"	47.8"
1267	32"	37.4"	43.6"
1268	33.6"	39.2"	47.2"
1269	35.6"	42.8"	52.6"
1270	8-11		
	28.2"	37.1"	46"
1271	29.8"	35"	46"
1272	8-14		
	27"	32.2"	40"

Laboratory batches of Semi-Lustre White, using the special lots of (3848)E were also ground out. Both lithopone-titanium calcium and titanium calcium-titanium barium pigmentations were used. Included in the series were two experimental varnishes ARV 5530, a 25 gallon Dehydrol ester gum vehicle and ARV 5531, a 25 gallon Dehydrol-olticica ester gum varnish.

Number	Varnish	Pigment	Sheen
1257	(3848)E Spec. #1	2132 - 461 L - 2188	Uneven - streaky
1258	" " #2	" " "	" "
1259	" " #3	" " "	" "
1260	" " #4	" " "	" "
1261	(3848)E Spec. #1	1897 - 2132 - 2188	" "
1262	" " #2	" " "	" "
1263	" " #3	" " "	" "
1264	" " #4	" " "	" "
1273	ARV 5530	461 L - 2132 - 2188	Low; slightly streaky
1274	" 5531	" " "	Uniform - O.K.
1275	" 5530	1897 - 2132 - 2188	Low; sl. streaking
1276	" 5531	" " "	Trifle low

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Number	Viscosity			
BC 1257	8-12 23"	8-14 25"	8-18 26.2"	9-2 25.6"
1258	28"	29"	30"	30"
1259	35"	40"	43"	43.6"
1260	40.2"	42.2"	47.6"	52.8"
1261	17"	17.2"	17"	20"
1262	16.6"	18.2"	20"	19.4"
1263	19.2"	19"	20.8"	21.4"
1264	19"	21"	22.2"	22.4"
1273	8-11 34"	37" +	43"	45"
1274	24"	27"	30"	29.2"
1275	24"	26.6"	29.2"	28.8"
1276	21"	19"	20.6"	19.4"

No definite conclusions could be drawn from these tests with regard to consistency as related to the oil used in (3848)E or the hydroxyl value of the P.E. In Enameloid, the linseed (3848)E dried slightly harder than the Dehydrol (3848)E. Both varieties dried harder than ARV 3530, the Dehydrol ester gum vehicle, even when the latter was treated with drier promoter (2231) and/or small additions of oiticica oil.

One interesting point has arisen with reference to consistency obtained using various (3848)E lots. BC 1249 was repeated after about two weeks using the same special #1 lot of (3848)E and instead of 32" initial viscosity, accompanied by good leveling properties, we obtained a viscosity of 49" and an enamel with poor flow and pronounced brush marking. Since the varnish used was from the same package, the different results obtained could be explained by (1) difference in properties of 1403 used in the two batches; (2) difference in humidity at the time batches were made; (3) change in properties of the varnish itself due to ageing.

It is planned to repeat a number of the other batches to secure additional data.

M. VAN LOO
Cont.

#162 - Cont.

In the Semi-Lustre series, the principal point of interest is the performance of ARV 3551 which gave the best looking paint.

During the month, some difficulty was encountered by the manufacturing department with Semi-Lustre White using (4880)E vehicle and the 2132 - 1887 type pigmentation. Batches came out very high in consistency with no gloss. Laboratory analyses indicated correct proportions of specified ingredients, and laboratory batches using the same lot of (4880)E gave standard gloss and correct body. Small amounts of a wetting agent such as (2182) or SP 717 were effective in reducing the body and raising to some extent, the gloss of the defective factory batch. Apparently poor wetting properties of some vehicles or differences between different lots of pigment cause greater flocculation at one time than another, and may be responsible for some of the difficulties encountered in the manufacture of Semi-Lustre.

Super Enamels

All batches of the super enamels have been completed and have been sent to Cleveland for testing.

Porch and Deck Paints

Panels 8073-8120 F have been exposed 3 months at Florida, 45° south. There are a large number of variations in pigmentation, each of which is used with a V 11168 - (4880)E Dehydrol ester varnish vehicle versus an ARV 3373 linseed ester varnish vehicle. Three phenolic resin varnish specials, including one pre-war regular formula (with chinawood oil) as control, and one more recent regular control formula using P.E.-rosin-linseed-Dehydrol are also tested. The pigment variations include leaded zinc-inert, titanium calcium-inert, titanium-inert, zinc sulphide-inert and several lithopone formulations. The paints were put out as self-primed work on 8" x 24" yellow pine panels and also over Kromik Primer on steel panels. One rather discouraging factor is the wide variation in original tint, occasioned in part by flooding difficulties with some of the paints.

To summarize results, the Dehydrol ester samples, as a whole, run slightly better than linseed ester in durability and appearance. Chalking ranges from very slight to very bad, checking from absent to bad, and fading and dirt collection from slight to very bad. However, each pair of tests (linseed versus Dehydrol) requires study, and some reverse the general trend and favor the linseed ester varnish. 2174 titanium and 2140 titanium-calcium, although quite dirty, especially 2140, are probably best all-around at 3 months. Leaded zinc, in general, is at a disadvantage because of extreme chalk-mask fading. Lithopone with inert only is reasonably good, but with leaded zinc or white lead it shows bad fading and the worst checking of the series. Both control formulas are satisfactory, but due to excessive dirt with the recent type (using 2140-inert) and excessive fading with the pre-war type (using leaded zinc-inert), the 2174 special is preferable to either.

M. VAN LOO
Cont.

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Zinc sulphide, with its dark-colored chalking, is quite acceptable for appearance at the present stage. The special phenolics mentioned show up a sharp contrast between leaded zinc and 2140: the former looks bad because of excessive chalk which is tightly held, the latter is also seriously faded but not due to masking by chalk, which is slight, and has a tightly held film of dirt. The steel panels parallel the yellow pine in practically all cases. It should be emphasized that significant changes may soon occur in some cases, largely due to change in chalking rates.

182 - Study of Improved Mixing and Grinding Practices

Several new wetting agents were given a preliminary evaluation by checking in Enameloid - Rex 710, on the Brabender Plastograph. Proportions of raw materials in test paste were as follows:

290 pounds 1403 TiO_2
1 " 547 Aluminum Stearate
25 gal. (3848) E Varnish
4.35 lb. of wetting agent (1-1/2% of pigment)

Results:

Wetting Agent	Manufacturer	Plastic Viscosity (Gram-meters)
None (control batch)	-	200
2717	Stanco, Inc.	90
2134 Dioctyl Pyrophosphate	Victor Chemical Works	120
Nusfal Concentrate 20% Moisture	E. F. Houghton and Co.	100
Glaurin C-162	Glyco Products, Inc.	130
3307 - Nonaethylene Glycol Di Ricinoleate	" " "	140
3294 - Nonaethylene Glycol Di Oleate	" "	150
3556 - Nonaethylene Glycol Hexaricinoleate	" "	150
Surfax T R	E. F. Houghton and Co.	Extreme flocculation
Emulsifier No. 24) No. B 5221)	Victor Chemical Works	Excessive flocculation; N. G.

ALLIED RESEARCH LABORATORIES

Report of Investigations for September, 1944

M. VAN LOO

#163 - One Coat House Paint

Two additional house tests on One Coat House Paints were completed in Chicago during the month, making a total of seven for the summer in this locality. Three house tests have been completed at Cleveland, with four others in progress, and three to be started. The details of the Newark tests have not been reported as yet.

The two tests completed in Chicago include one white and one tint job. The white test in Palos Heights compares a variation of CH 4697 C 2034 One Coat House Paint using free chalking anatase TiO_2, 1403 dry, and a factory production batch using all TiO_2 as 2173 dry, rutile TiO_2 R 200. A small addition of pine oil was used to improve the brushing of the regular material. The spreading rates were quite similar, both approximately 400 sq. ft. per gallon.

The second test, at 12235 Yale Avenue, Chicago, was done using Cream Gray and Warm Drab tints of CH 4696 C 834 One Coat House Paint Tint Base in one coat application, compared with Rex 450 SWP Undercoater followed by a coat of Rex 485 SWP Warm Drab, and a blend of SWP 360 Cream Gray and 462 Cream, for the respec tive control areas. The brushing was satisfactory although the paint was rather full in consistency. The spreading rates were about 360 sq. ft. per gallon. This test should afford a good test for dirt collection, as there are wide eaves, and dirt collection on the old paint was quite severe.

The various one coat house paints used on the test houses during the summer will also be run as panel tests exposed north and south vertical, at Chicago only. Two formulas similar to CH 4697, the One Coat White, will be included, in which the p.v.c. will be reduced from 34.3% to 32%, and another using 10 gallons of (48). The so-called Post-War SWP Gloss White CH 5051 will also be included.

#150 - Durability Studies of Zinc Sulphide Pigment Combinations

The studies of the behavior of mica described in the July report have been expanded to include Thompson Weinman's AA mica. These tests include Family Paint Rex 300, a 15/50/35 TiO_2/leaded zinc/magnesium silicate paint at 34% p.v.c., and One Coat House Paint, using Pre-War India Wet-Ground Mica, Triple A mica, and Alsibronz #19. Panels 8600-12 have been prepared for exposure at Chicago and Coffeyville.

#97 - SWP 471

Increased pressure on the panel painting program has permitted the completion of some series that have been delayed due to the accumulation of exposure paints. The sets include the following:

Barn Red - Cont.

the same vehicle with a special pigmentation based on asbestine with 134 dry Venetian Red as the only opaque pigment. Petropon oil showed up very poorly, especially in adhesion to yellow pine wood; in both formulas there was serious cracking and peeling as early as 4 months, and the panels were nearly bare at 15 months. On cedar, both were better, but showed serious fading, checking and cracking. The special pigmentation seemed somewhat better with Petropon than the regular.

#86 - Durability of Pigments with Special Reference to Leaded Zinc and White Lead

A special examination was made of a portion of the large lead-zinc exposure series to study the relative durabilities of co-fumed leaded zincs compared with mechanical blends of lead sulphate or carbonate with acicular zinc oxides. Exposures are out at Chicago, Coffeyville, and Florida.

The Florida panels at 40 months are most advanced. The guide for the white series is the formula for Rex 471 SWP Gloss White of 1-4-40, with 45% of 35/65 co-fumed leaded zinc, 412 dry. The guides show some very localized cracks but in general are in very good condition. Mechanical blends of acicular zinc oxide ZZZ-33 show slight checking and considerable cracking with 9 dry, basic lead sulphate, very bad checking and cracking with National Lead's acicular basic lead sulphate, and bad checking and cracking with basic lead carbonate. ZZZ-11 shows the same failure with carbonate. New Jersey Zinc's acicular zinc oxide XX-601 shows very bad failure blended with 9 dry. 412 dry co-fumed leaded zinc with basic carbonate shows no failure, but has considerable checking and slight cracking when National's acicular lead sulphate is used for the lead pigment portion.

The guide for tints is Rex 375 SWP Colonial Yellow, formula of 1-5-40, which carried the equivalence of 46% 35/65 leaded zinc. As usual the degree of failure of the tints is less than on the whites, but the preference still is definitely for the co-fumed leaded zincs. The guide areas are in very good condition, with cracking evident only in a few isolated spots. The fading is less than considerable and general appearance good. A mechanical blend of acicular zinc oxide ZZZ-33 and basic carbonate white lead shows less than considerable fading, no checking or cracking. With 9 dry, basic lead sulphate it shows slight fading, and slight checking while with acicular basic lead sulphate it shows slight fading, considerable checking, and slight cracking; ZZZ-11 with lead carbonate slight checking and cracking; while ZZZ-22 shows considerable checking and cracking in the same combination. 412 dry and lead carbonate show no checking or cracking.

#164 - Reformulation Studies of House Paints to Reduce Dirt Collection

Family Paint White Rex 300 has been revised to replace 2140 dry Titanox RC with 2132 dry Titanox RC HT to increase chalk and to reduce dirt collection. Exposures indicate that even 2132 dry does not chalk enough to ensure the best appearance. Therefore, paints have been prepared for exposure comparing variations of Rex 300 with all the extended titanium

M. VAN LOO
Cont.

#176 - Cont.

Enameloid Black

	Drying	
	Fresh	Aged 30 Days
OJ 900 H	Set at 2 hr. 40 min.	Set at 5 hr. 45 min.
OJ 901 H	"	Not set at 7 hr.
OJ 902 H	"	Set at 6 hr. 20 min.
OJ 903 H	"	Set at 5 hr. 25 min.
OJ 983 H	"	Set at 6 hr. 45 min.

The rapid loss of drying properties is apparent throughout this entire series. So far Nuact is not showing any marked advantage over litharge. Storage tests are being continued.

#177 - Pigment Studies

Coffeyville has submitted a sample of 414 off-grade pigment for evaluation. This material was blended with standard 511 dry in proportions to make a 35/65 Leaded Zinc Oxide. Since color was the chief concern, paints were made substituting this blend for the regular 412 dry normally contained in the Rex 450 SWP Undercoater and in the Rex 496 SWP Cream tint base.

From the standpoint of color this blend of off-grade 414 and 511 dry was entirely acceptable. This, of course, should be qualified to the degree that succeeding production will have to equal the submitted off-grade samples. It was noted that the off-grade material submitted was high in consistency and oil absorption. Coffeyville has given assurance that regular production of this blend will be standard for oil absorption and consistency characteristics, and color equal to the samples submitted.

#77 - Mildew Inhibitors

Panels 8647-58 C, F were prepared for exposure to determine the paintability of siding impregnated with chromated zinc chloride to impart fungus resistance and some degree of fire resistance. Previous reports have mentioned that a set of cedar exposure panels were treated by the Wood Preserving Division of the Koppers Company for this purpose. The paint systems used were:

Undercoater	Top Coat
Rex 450 SWP Undercoater	Rex 471 SWP Gloss White
" "	CH 5051 Post-War SWP Gloss White
" "	CH 4697 One Coat House Paint
" "	OJ 643 H Alkyd House Paint
Rex 17 Lead-in-Oil	Rex 17 Lead-in-Oil (2 coats)
NJZ Cryptone MS-130 Primer	NJZ Cryptone MS-130 Top Coat

M. VAN LOO
Cont.

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These systems are exposed on both untreated and treated panels, both in Chicago and at Miami. The treated panels have a raised-grain appearance and some have warped. They are dark colored, similar to olive drab.

Additions have been made to the latest series evaluating fungicides in house paints by adding mica to the formulations carrying tetrachlorphenol. It was thought that mica may help to counteract the checking tendencies found in the mildew resistant paints treated with tetrachlorphenol. Mica was also added to the paints treated with phenyl mercury naphthenate, although no checking has been encountered with this formula so far.

152 - Studies in Flat Wall Paint Formulation

Flat Wall Paints

Odor tests were run on a sample of "Ridsmel" offered by Holley Chemical Company of New York, using Flat-Tone White. It was found to impart a rather sweet odor during the drying period but it did not mask the odor of the paint any more than other perfumes and deodorizing agents which have been tested in this department .

During the month AZ Flat, offered by R.B.H. Dispersions, Inc. was tested in the proposed super one coat flat wall paint. As high as 20 pounds of AZ Flat per 100 gallons of paint were introduced without any particular degree of flatness resulting.

In further work to achieve a low sheen flat we tried the recommendation of the suppliers of Lesamite, and stirred it in rather than grinding. It was added as a replacement for the Celite-asbestine combination on the basis of oil requirements, which permits the addition of a substantial amount of this low oil absorption extender. The sheen was still higher than that of the Celite-asbestine blend, and the silking tendencies were less, probably because of the higher sheen.

With the thought that sufficient after-flow would upset the orientation of diatomaceous silica along the brush marks and uniform the sheen, Mr. Orley's suggestion was followed to introduce some (324) for a portion of the solids of (3880)E. However, this did not increase the flow or the uniformity of sheen. Work continues.

A special test was made substituting blown fish oil (2387) for blown linseed in the Flat-Tone formula of 2-15-34. This does not produce a satisfactory paint, and odor characteristics compare unfavorably with the current formulations.

During the month two additional competitive oil flat wall paints were examined, because of rather wide claims for usage over all types of surfaces, including those where we normally recommend Rem-Tone. The tests may be summarized as follows:

M. VAN LOO
Cont.

#12 - Cont.

Aluminum Pt. - Rex 471. Serious dark "show through." Very slightly less wood checking than Rex 450 - 471.

Metalead - Rex 471. Bad "show through." Very bad wood checking.

Three Coat Systems

Rex 450-471-471. Very good. Very slight wood checking.

Lead-in-Oil - 471-471. Similar but darker cast and slightly more wood checking.

Aluminum Paint - 471-471. Probably best panel of all, but still slight "show through."

Metalead - 471-471. Still poor, bad "show through" and wood checking.

Chicago panels 6282-91 C on 1' x 3' Douglas Fir plywood, compare SWP 450 Undercoater with CH 3285 Prefab Primer, both as single coats and with a top coat of SWP Gloss White, Rex 471. While the undercoaters were not designed for direct exposure to the weather, it is interesting to note that CH 3285 shows less erosion at 30 months' exposure, and better protection of the wood than Rex 450.

In a special study of speed of recoat of the fast drying CH 3285 Prefab Primer in this series, SWP Gloss White applied over CH 3285 after only 1/2 hour drying is performing better than after the primer has dried for 4 hours, with 1 and 2 hours' drying intermediate. However, performance is still satisfactory up to the end of the test series, 72 hours, and the latter CH 3285-471 panel is still superior to a two coat Rex 450 - 471 system where the 450 was also given 72 hours' drying.

Considering the low degree of paintability of Douglas Fir, either CH 3285 - SWP top coat, or Rex 450 Undercoater - SWP top coat appear to be suitable for exterior painting of plywood.

#86 - Durability of Pigments with Special Reference to Leaded Zinc and White Lead

The large lead-zinc series have been called in from Chicago, Coffeyville, and Florida to be reviewed by Messrs. Chapin and Adams. When the readings have been completed, a summary of the further progress of these exposures will be distributed.

M. VAN LOO
Cont.

#86 - Cont.

A brief inspection was made of Chicago and Coffeyville exposures of house paints containing 414 Leaded Zinc manufactured in the first production run at Chicago in 1941. After 2-1/2 to 3 years of exposure 414 dry appears to have the good durability which characterizes co-fumed leaded zincs such as 412 and 1526.

Exposures 4656-65 C and Cof. were examined after exposure for 46 months at Chicago and Coffeyville, vertical south. This series compares co-fumed leaded zincs and mechanical blends in the SWP Gloss White formula of 1-4-40.

All co-fumed leaded zincs were better than any mechanical mixtures in the series. Regular 412 dry was superior to CPP-1061, a special 412 processed to eliminate "fines," but this in turn was better than another Coffeyville special PRLK-5633. In the mechanical blends with 9 dry basic lead sulphate, New Jersey's large particle size zinc oxide XX-503, the acicular ZZZ-33, and Azo-55 appeared the best, with bad cracking, while New Jersey's acicular zinc oxide was definitely the worst. New Jersey's XX-50, XX-592, and Florence Red Seal-9 were intermediate.

#177 - Pigment Studies

414 Leaded Zinc

Coffeyville has begun production on the "off-grade" 414 Leaded Zinc mentioned in the last report. The term "off-grade" is actually a misnomer, having been assigned when it was found that the fume did not meet chemical assay specifications for white 414. Since that classification it has been learned that almost as suitable a material may be made from this "off-grade" fume as from specification fume by a shift in production technique.

Coffeyville is supplying 414 to the various factories in combination with a special 511 dry so composed that a pound for pound blend of the two approximates the composition of a 35/65 leaded zinc oxide. The Chicago factory and the Martin-Senour factory both report good results using the first cars of the blend of 414 and 511 special. Grinding time is improved over the use of straight 414, and apparently the 511 has cushioned somewhat the abrasive nature of the 414 pigment.

Chicago has run one 1800 gallon batch using this "off-grade" 414 straight to learn if there is real improvement in the texture due to the change in production technique mentioned above. Results of this trial are definitely negative. Therefore, the improved performance of the first lots of 414/511 mixture may be attributed only to the dilution and cushioning effect of the 511 dry. (Subsequent receipts have not equalled the earlier shipments.)

M. VAN LOO
Cont.

#148 - Examination of White Lead

Precipitated White Lead

The White Lead Department has undertaken the manufacture of a precipitated basic carbonate white lead 1031 dry along the lines of a similar product manufactured some time ago. One sample has been received and tested in comparison with our own and competitive Carter process leads as well as competitive precipitated leads.

Opacity relationships in terms of sq. ft. per lb. of pigment at a contrast ratio of 93% are as listed:

18 dry Carter White Lead, composite 1944	27	sq. ft./lb.
National HTS Carter lead	29	" "
National 111 Precipitated Lead	35	" "
National 333 " "	35	" "
1031 dry, sample of 9-29-44	43	" "

From the above it is evident that high opacity has been achieved in the manufacture of 1031 dry. Unfortunately, high opacity lead carbonates have always had high consistency characteristics as an associated property. This is true of competitive precipitated leads as well as those of our own manufacture. It is possible that at some future date improvements may be made in the precipitated leads so that the high consistency and high opacity properties may be separated. For the time being it will be necessary to compromise opacity and oil absorption.

Pigmenting Rex 450 SWP Undercoater on a strict opacity equivalence the following comparison appears. The lead pigment used represents the only variable between the paints.

Opacity Equivalent

Lead Pigment	Pounds Used	Consistency #3 S-W Cup	*Oil Requirement
18 dry Carter White Lead	426	15.5"	183.55#
1031 " Precipitated Lead, no volume make-up.	262	22.3"	193.65#
1031 " Precipitated Lead, 20 L volume make-up.	262	32.8"	211.15#

*Total oil in Rex 450 formula - 334.7#

M. VAN LOO
Cont.

#148 - Cont.

A partial explanation of the consistency difference shown above is one based on the oil requirements of the pigments used. By measuring the oil absorption of the pigment constituents by the spatula method the oil requirements of the composite Rex 450 pigmentation were calculated. It will be recognized that other factors in addition to oil requirement are responsible for the high consistency exhibited by the precipitated lead paints. Panel paint-outs show low gloss and excessive brush marking on the paints made with 1031 dry even when thinned with mineral spirits to a viscosity comparable with the paint made using regular Carter process lead.

Work on the development of this pigment is continuing.

#77 - Mildew Inhibitors

Mr. Jagd made an inspection trip in the vicinity of Lafayette, Louisiana, examining houses painted with the SWP Mildew Resistant Treated system of Rexes 63056 - 63057. The age of the paint jobs ranged from as old as 3-1/2 years to as recent as 6 months.

In general, all the houses painted with Rex 63056 and Rex 63057 are very white in appearance and are free from mildew, except in a few severe isolated spots where dampness is present during the day, due to shade, shrubbery, etc. Other houses painted with ordinary paints may become black under similar circumstances. Recent complaints on the brushing qualities and the color of the freshly applied paints have been entirely eliminated by the last revision.

The only objection to the present formulas is the tendency toward checking introduced by the substantial amounts (.3% by weight of the paint) of tetrachlorphenol required to afford adequate protection. Panel tests which had shown this tendency were confirmed by the houses examined, which show microscopic checking during the second and third years of exposure. These defects will probably become visible to the eye in the fourth or fifth years.

Panel tests have indicated that phenyl mercuric oleate will afford fungicidal protection without the effects on color or durability shown by tetrachlorphenol. Phenyl mercuric naphthenate is said to be even more effective. Arrangements are being made to run house tests at Lafayette.

#162 - Studies in Flat Wall Paint Formulation

Some study was given to the idea of eliminating the grinding operation in flat wall paint manufacture, through vigorous mixing of readily dispersible pigments. The first batches were made by placing

#162 - Cont.

the entire formula in the laboratory size Red Devil Paint Conditioner and shaking. However, it was evident that proper selection of pigments and extenders and mixing in a heavy consistency showed more promise. Micronized titanium calcium RCHT-X was used for the opaque pigment, and Lesamite and 1989 Microne Talc were used as the extenders. The above pigments in the Flat-Tone vehicle (3880)E, to give a heavy paste, were mixed for 30 minutes in the Day Mixer, and then gradually reduced with the balance of the vehicle.

The flat wall paints made by this procedure were smooth and fine in texture, and such properties as brushing, flow, and sheen were quite similar to regular production. This merits further study.

A sample of Aluminum Flake No. 5 was received from the Aluminum Flake Company, and compared with 20 F, magnesium silicate, in Paintercraft Flat #10, Rex 65310, for color, brushing, and flow. This sample was again quite gray in color, similar to their previous sample, so no further tests will be run unless the manufacturer can improve the color. In other respects, such as brushing and flow, it is similar to 20 F.

#182 - Study of Improved Mixing and Grinding Practices

No varnish has yet been selected for an extensive study of wetting agents, and therefore the work on this subject deviated temporarily into a study of the factors that affect the wetting and grinding properties of varnishes.

The first approach was to study the grinding characteristics of varnishes of various types. Using alkyd and oleoresinous vehicles a series of mill pastes was made at similar viscosities. It was found in these tests that a unit quantity of pigment was put through the laboratory roller mill in unit time even though in some cases the proportion, pigment to vehicle, was quite different from others. This work is being reported at an incomplete stage, and therefore conclusions are withheld pending further work.

One series is reported as representative of the above outlined comparative tests.

Paint No.	Vehicle	Gals. Varnish in Paste*	Mill Base Plasticity Meter-gram units	Mill time
RB 636	(3848)E	24	135	20'
637	(4650)N	20	125	19'
638	(4107)	25	115	19' 20"

*All bases contain 230 pounds 1403 dry and 1 pound 547 dry.

L. VAN LOO
Cont.

#86 - Cont.

Chicago, Coffeyville and Florida exposures, show only moderate changes beyond those reported previously. A routine report will be written on the progress of these panels. A number of smaller series, testing similar pigment variations, will be covered in a similar manner, and all panels are to continue on exposure. Mr. Adams is writing a special report on panels 4634-5 C, Cof., which showed some interesting results on SWP vs. Devoe's white and tints, with Devoe's and S-W white lead, and 412 and Azo 35 M leaded zincs as the essential variations.

Panels 7186-9 C, F. were reported after 15 months' exposure at Chicago and Florida, respectively, vertical south. These are 3-coat self-primed work comparing S-W Rex 17, Dutch Boy, and Eagle Old Dutch Soft Paste White Leads, with Rex 471 SWP Gloss White over two coats of Rex 450 Undercoater as guide. All the lead-in-oil samples are inferior to Rex 471 in dirt and general appearance. Rex 17, however, is starting to clean up; Dutch Boy will probably start to clean sooner than Eagle, which has a low chalk rub-off. Rex 17 is also slightly less heavily alligatored than the others.

#148 - Examination of White Lead
Precipitated White Lead

The chief interest in precipitated lead carbonate is in its use in SWP 450 Undercoater. Until more is known of its exposure qualities, it will not be used in large quantities in top coat formulations. However, Martin-Senour has formulated satisfactory Monarch White and tint base introducing half of the carbonate as 1031 dry, S-W precipitated lead.

Work on Rex 450 has been directed toward utilizing the high opacity of this type of lead carbonate to reduce the cost. Best success to date has been achieved substituting 1/3 to 1/2 of the lead carbonate normally contained in the 450 formula. When 1031 is substituted on the basis of opacity for half the 18 dry opacity, the test paint apparently is equal to the standard in every detail. Work will continue using a 50/50 combination of 1031 dry and 18 dry to replace the 18 dry in the original formula, on the basis of opacity. Savings of 6¢ to 8¢ a gallon seem possible.

#178 - Studies of Dark Colored House Paints

The tests on Nuodex Nuact as an aid for drier retention have now been under way for three months. Viscosity and drying data up to 90 days are as follows:

M. VAN LOO
Cont.

#177 - Pigment Studies

414 Leaded Zinc

In the report for October it was indicated that plant experience at Chicago using the 414/511 mixture was not holding up to the excellent easy grinding performance experienced with the first lots received. This trend continued through the month of November to the point that performance was no better than when using 414 alone. An analysis of the difficulty has indicated that the 414 dry was the constituent responsible, being excessively coarse in texture. Some bags had a 325 residue in excess of 3%

During the month additional experimental pulverizing trials on 414 have been evaluated with the following results and conclusions.

The tests were run, as outlined in the table below. The samples tested were:

No.	Description
ARL-2458	412 dry (from stock bag)
ARL-2459	414 dry, regular material (proposed standard submitted by Coffeyville).
ARL-2460	414 dry, Raymond R5 milled (submitted by W. S. Stevens).
ARL-2461	414 dry, Mikro Atomizer milled (Pulverizer Machinery Company, submitted by R. A. Thomas).
ARL-2462	414 dry, micronized in air (International Pulverizer Company, submitted by C. E. Deeds).
ARL-2464	414 dry, micronized in steam (International Pulverizer Company, submitted by C. E. Deeds).

Laboratory Test Results

	325 Mesh	Spatula Rub-up		Paint Trials			
Sample	Residue	Texture	Color	Fineness	Color	Viscosity	Wt./Gal.
ARL-2458	-	No grits	OK	2P 3-3/4	Std.	25"	15.62#
2459	0.55%	V. gritty	"*	2M 2-1/2	"	27"	15.59
2460	Trace	Small grits	"*	2P 3-1/2	"	24.4"	15.67
2461	"	No grits	"*	2P 3-1/4	"	29"	15.65
2462	"	Med. gritty	"*	2P 3-1/4	"	27.8"	15.63
2464	"	No grits	"*	2P 3-3/4	"	26.8"	15.60

*There are differences in the color of the various experimentally ground 414 pigments, but these are small and color drop is not serious.

M. VAN LOO
Cont.

#132 - Cont.

Acme Interior Gloss - FL 26 Base for Tints

(2347)S varnishes submitted for test:

	Composition	Body	Color
ARV 3606 Regular	2603, (2518) and (2325)	D-E	4-5L
ARV 3626	Pentalyn A and (2325)	C-D	4L-4
ARV 3627	Pentalyn A, Fumaric, (2327)	C-D	5L

The special (2847)S varnishes were compared for performance in Acme Interior Gloss FL 26, formula of 6-30-44. All paints, including the regular , were low in viscosity as compared with the standard viscosity reading of 27 to 32 seconds, #3 orifice,

The ARV 3626 and ARV 3606 were similar in brushing, flow and drying; ARV 3627 was too high in flow without making some revision in the pigmentation.

Paintercraft Flat Wall Paint #10

A sample of Blown (186), 14 minute body, was introduced into Paintercraft Flat Wall #10 as a replacement for the oil content of (3880)E, with the resin content introduced as (1157). This replacement was not satisfactory due to poor washability, low viscosity, and poor flow.

#182 - Study of Improved Mixing and Grinding Practices

The wetting effect of vehicles has been the subject of considerable work during the past month. Lead as a "cooked in" stabilizer has been compared with lead added to the varnish as naphthenate or tallate driers.

Laboratory varnishes were made for this test by the Varnish Research Division, ARV 3613 - unstabilized (3850)N, and ARV 3614 stabilized (3850)N. Plastograph tests have shown that the "cooked in" lead has a definite wetting action, whereas the added driers do not have this action. A second effect of the "cooked in" lead is that it seems to make the varnish more susceptible to the action of wetting and dispersion agents. In the tests it was found that by titrating a mill paste with wetting agent, flocculation of the paste actually occurred with small amounts of the agent, if the paste were made with unstabilized varnish. On the other hand, using stabilized varnish the reduction in paste consistency is proportional to the addition of wetting agent.

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For illustration of this work, note the paste plasticity values in the table below. This experiment was made using 1403 T as the standard pigment in all tests. Varnish-pigments quantities were standard, the variables being as indicated, the varnish used and the addition agent.

Base formula: 290 pounds 1403 T
3 " 547
23 gallons varnish

Varnish	Addition Agent	Paste Viscosity 1/2%*		1%*	1-1/2%*	2%*
		30' Mix	35'	40'	45'	50'
ARV 3613	-	120 floccu-lated	110	100	50	42
ARV 3614	-	100	95	60	40	32
ARV 3613	1/2% Pb as (4090)	120	115	85	50	40
ARV 3613	1/2% Pb as (2213)	125	130	75	45	40
ARV 3613	4# (2270) - Lecithin	125	60	40	35	35
ARV 3614	4# " "	60	35	30	28	25

*Wetting agent used for test is Starco SP 717. This material was added at the indicated points and allowed to mix five minutes before making the next reading. The percentages of wetting agents used are based upon the pigment weights.

Extending the study of the effects of stabilized versus unstabilized varnish into paints and mill production rates we have made introductory tests of mill production which indicate that although the mill rate is not strictly proportional to the paste viscosity, considerable economies in grinding may be accomplished. This work has not advanced to the point of presenting actual figures but these should be available in the near future.

A second phase of this test is a series to ascertain the effect on stability and can condition using stabilized and unstabilized varnishes, as well as various wetting and dispersing agents. The observation regarding viscosity at 5 weeks' age is that the wetting agent SP 717 causes a

#162 - Studies in Flat Wall Paint Formulation

Utilization of Fish Oil in Flat-Tone, Semi-Lustre, etc.

Additional varnishes, representing further variations of (3880)E varnish using fish oil, have been evaluated in Flat-Tone and Semi-Lustre. The following varnishes were submitted by the Varnish Research Division, and tested in the Flat-Tone White formula of 2-28-44 and the Semi-Lustre White formula of 9-5-44:

Varnish (3880)E Type	Oil Used	Body	Color
ARV 3622 - 2	1/2 (320) Bodied Linseed 1/2 Thermoil A	L-M	6 +
ARV 3622 - 3	1/2 (320) Bodied Linseed 1/2 Thermoil A	P-Q	6 L
ARV 3647 - 2	1/2 (2325) Dehydrol 1/2 Thermoil A	P-Q	6 L
ARV 3654	1/2 (2525) Dehydrol 1/4 Thermoil A 1/4 (2317) Bodied Fish	N	6
ARV 3655	1/3 (2325) Dehydrol 1/3 Thermoil A 1/3 (2317) Bodied Fish	N	6
ARV 3656	1/2 Thermoil A 1/2 (2317) Bodied Fish	I	8 L

The following variations of (4880)E varnish were also tested in Semi-Lustre White:

Varnish	Oil Used	Body	Color
ARV 3638	Unbodied TV 2819 Dehydrated Castor	E	4 L
ARV 3637	Bodied TV 2819 " "	F	4 - 5 L
ARV 3611	Linseed	D-E	7 L

The results to date indicate ARV 3622-2 is satisfactory in Flat-Tone and Semi-Lustre except for body characteristics. This work indicated that a higher bodied varnish such as ARV 3622-3 was necessary to reproduce the consistencies obtained with regular (3880)E Dehydrol varnish. Based on our tests, ARV 3622-3 was developed, similar in composition but cooked to a

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P - Q body. This varnish was satisfactory in both Flat-Tone and Semi-Lustre for body, brushing and drying. A slight drop in brightness, however, was evident in both formulas due to the darker color of the varnish.

The sample of ARV 3647-2 made with half (2325) Dehydrol and half Thermoil A was found to be similar to ARV 3622-3 in all respects. Based on our tests, this varnish had slightly better washability and slightly more sheen than the linseed variation above. All laboratory batches of Semi-Lustre, however, have been low in sheen regardless of the varnish used. Laboratory batches of regular Semi-Lustre have also been low in sheen, similar to the experimentals.

The introduction of blown fish oil (2310)F for (48) bodied linseed in conjunction with ARV 3622-3 and 3647-2, appears to be quite satisfactory for Semi-Lustre. Previous tests indicate that blown (2310)F is more desirable than (2317) Heat Bodied Fish.

The special ARV varnishes 3654, 3655 and 3656 made with higher percentages of fish have been found to be poorer in performance than the 50% replacement varnishes referred to above.

In general the performance of these varnishes is in line with previous experience, - the higher the amount of fish oil, the poorer the performance. ARV 3655 and 3656 produced low viscosities, and 3656 was also poor in color.

The two special (4880)E varnishes ARV 3638 and 3637 made with Cook's dehydrated castor were similar in sheen, body and drying to standard (4880)E.

The ARV 3611 produced too low a viscosity to be satisfactory for Semi-Lustre.

Enameloid White - Rex 710

A fumaric varnish, ARV 3652-3, was also tested and compared with (4850)N in the above rex. The enamel made with the special varnish had better brushing and color than (4850)N but was not quite equal in drying to the regular material. Enameloid White made with this material was also low in body. The lower consistency produced a more free brushing enamel.

Trade Sales Products

A number of du Pont Enamels and Wall Paints were evaluated in comparison with S-W Enameloid, Semi-Lustre, Interior Gloss and Paintercraft Enamel #39. The du Pont products appear weak on the hot water and 1% soap solution tests. Enameloid White was quite good on all tests, but was rather high in flow. Comparisons follow:

Test	OJ 334 I Interior Gloss Rex 26450 Formula 1-10-44	du Pont Interior Gloss - P 77248
Brushing	Good	Slightly too sticky.
Flow	High	Very good - OK.
Color	Standard	Highly blued - not as bright as Rex 26639.
Hiding	Not equal to du Pont's Interior Gloss, but standard for Rex 26450.	Slightly higher than Rex 26450.
Drying	Set-to-touch: 1 hr. 40 min. - through dry (over night): rather soft.	Set-to-touch: 1 hr. 30 min. - through dry 24 hours: good.
Sheen or gloss	Good	Good
Viscosity #3 orifice	31.8"	40"
Weight per Gallon	13.05#	11.52#
Cold Water Whitening after 24 hours	Slight to definite	Slight to definite
Recovery: In 1 hr.	Slight	Slight
In 24 hrs.	95%	95%
Print test after 48 hours. 1# per sq. in. for 24 hours.	Very slight	Slight
Immediate whitening resulting from 1% soap solution for 2 hours. (Panel dried 5 days.)	Definite	Bad
Recovery after 2 hrs.	No recovery	No recovery
Boiling water 3 min.	Very, very slight whitening.	Definite whitening.

Test	S-W Semi-Lustre Rex 16270 - C 2924	du Pont Interior Semi-Gloss P 77251
Brushing	Good	Slightly too sticky.
Flow	OK	Good
Color	Standard	Similar to Rex 16270
Hiding	Rather low.	Considerably higher than Rex 16270.
Drying	Set-to-touch: 2 hr. 15 min. - through dry 24 hours: good.	Set-to-touch: 2 hr. 5 min. - through dry 24 hours: good.
Sheen or gloss	Good eggshell	Good eggshell
Viscosity #3 orifice	23"	26"
Weight per Gallon	12.33#	10.93#
Cold Water Whitening after 24 hrs.	Slight to definite	Definite to bad
Recovery: In 1 hr.	Slight	No recovery
In 24 hrs.	50%	No recovery
Print test after 48 hours. 1# per sq. in. for 24 hours.	No print	No print
Immediate whitening resulting from 1% soap solution for 2 hours. (Panel dried 5 days.)	Definite	Very bad
Recovery after 2 hrs.	No recovery	No recovery
Boiling water 3 min.	Very, very slight whitening.	Definite whitening.

Test	Enameloid White Rex 710 - C 3404	Paintercraft One Coat Enamel No. 39 Rex 26639 - C 2504 B	War Emergency Dulux Super White Enamel Gloss - P 75037
Brushing	OK	Very good	Similar to Enameloid
Flow	Sl. too high	Standard - OK	Very good - OK
Color	Standard	Good	Def. overtinted with a violet cast.
Hiding	Low as compared with du Pont Super White.	Satisfactory	Very good
Drying	Set-to-touch: 2 hr. 55 min. - through dry 24 hours: fair to good.	Set-to-touch: 65 minutes - through dry: not very good.	Set-to-touch: 3 hr. 25 min. through dry 24 hours: fair to good.
Sheen or gloss	High gloss	Very low (sub-std.)	High gloss
Viscosity #3 orifice	47"	73"	32"
Weight per gallon	9.51#	10.71#	10.50#
Cold Water Whitening after 24 hrs.	Very slight	Definite	Definite
Recovery: In 1 hr.	Complete	No recovery	No recovery
In 24 hrs.	"	" "	" "
Print test after 48 hours. 1# per sq. in. for 24 hours	Very slight	No print	Slight
Immediate whitening resulting from 1% soap solution for 2 hours. (Panel dried 5 days.)	Slight	Bad	Definite
Recovery after 2 hours	No recovery	No recovery	No recovery
Boiling water 3 min.	Very slight whitening.	Bad whitening	Very bad whitening.

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#177 - Pigment Studies

Coffeyville has submitted two samples of lithopone, namely K 4147 and K 4148, which they feel represent an improvement in texture over the normal lithopones 461 L and 461 S which they have supplied. These were tested in both Semi-Lustre and in Enameloid White, but the results were not very conclusive, probably due to the fact that both of these formulas carry other pigments as major constituents of the paints.

Plant production tests are under way to check the milling properties of these special pigments. It was found that lithopone 461 L, lot C 2014 gave a body of 112" in Enameloid after 6 days' aging as compared with 50" or lower for other lithopones in the series. Initial viscosities were in the neighborhood of 40" except for the paint using 461 L lot C 2014, which ran 56". A study is under way to ascertain the characteristic responsible for this reactivity.

#148 - Examination of White Lead

Suitable application, viscosity, and dry film characteristics were attained substituting Precipitated White Lead 1031 dry for the entire lead carbonate content of SWP Undercoater - Rex 450, card 20, as shown in the report for December as Formula B, page 6 of the report. Brushing, flow and viscosity were adjusted by reducing the 1552 dry Celite content by 30 pounds and adjusting the volume with asbestine - 20 dry. Vehicle is as the standard card, which uses 18 dry Q. P. White Lead for the lead carbonate constituent.

A sample of Precipitated White Lead - National 111 was obtained recently from Devoe and Raynolds Company. This was taken from one of their regular shipments. The characteristics of this material were found to be: tinting strength - 175, oil absorption - 19.0. Test batches were made on a formula 50/50 18 dry Q. P. White Lead and Precipitated White Lead as formula A in the December report. National 111 made an acceptable product but it was noted that the paint was slightly more puffy and brush marked more noticeably than did a similar one made with our own precipitated lead, 1031 dry. Therefore the two pigments should not be used interchangeably without due caution.

#12 - Exterior Primers

A number of formulas were developed for Rex 450 SWP Undercoater to reduce the basic lead carbonate content to approximately 1.1 pounds per gallon. However, since production of Rex 450 is not possible under existing circumstances, these formulas have been filed for reference. The experimental batches will be placed on exposure, however, including SWP Gloss White self-primed, so that the information would be available should this situation recur.

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From this group the following agents have been selected as meriting further work. Actual grinding trials, storage, and performance tests will be made.

Name	Manufacturer	Per Cent Based on Pigment by Weight
SP 717	Stanco, Inc.	1.5%
SP 302	" "	1.5
Di Octyl Acid Pyrophosphate	Victor Chemical Works	1.5 - 2.0
Rusfal Concentrate	E. F. Houghton and Co.	2.0
Surfax TR	" " "	1.5
Tergitol Penetrant #4	Carbide and Carbon Chem. Co.	2.0
" " #7	" " "	1.5
Nopco #1471	National Oil Products Co.	1.5
Yelkin T.S.S.	American Lecithin Co.	2.0
Santomerse D	Monsanto Chemical Co.	1.5
" #123	" " "	1.5
AM-1160	Armour and Co.	1.5
AMAC-1120	" "	2.0
AM-1180-B	" "	1.5
AMAC-1140A	" "	2.0 - 2.5%

#162 - Studies in Flat Wall Paint Formulation

Flat-Tone White

Work has been under way to reduce the cost of milling and manufacture of Flat-Tone - Rex 15185. Laboratory and factory batches have been made, using rutile titanium calcium RCHT-X, easy mix type, and Lesamite or 1989 dry Microne Talc as inerts, by mixing a heavy paste for a period of 15 to 30 minutes. The paste is not milled but reduced in the usual manner. Based on these tests it is quite evident that flat wall paint can be made without grinding if a proper selection of easy wetting pigments and inerts is used.

Paintercraft Paste Paint

Work on the development of a semi-paste paint for the Paintercraft line was started during the month. This product will be formulated so that it may be reduced for use as a flat, stipple, semi-gloss, enamel undercoater, or Wall Primer and Sealer.

At the present time we are working with a formulation based on rutile titanium calcium and titanium dioxide, with Celite #281 as the inert. The principal vehicle constituents are the usual (3880) E and SW 1996 - Linogel.

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Up to the present time we have not obtained a satisfactory semi-gloss sheen when the paste is reduced with a mixing varnish. A number of reducing vehicles have been used such as the varnish (3848)E, ester gum vehicle (1157), Linogel CW 1996, and ARV 3664 - 25 gallon Oiticica Rosin Varnish. Work is to be continued.

Utilization of Fish Oil in Flat-Tone, Semi-Lustre and Enameloid

In line with the utilization of fish oil for trade sales products, we have investigated a number of varnishes submitted for test by the Varnish Research division. The various varnishes tested during the month, along with their characteristics, are as follows:

	Varnish Type	Test Formula	Body	Color	
ARV 3660	(3848)E	Rex 710 Enameloid White Rex 16270 Semi-Lustre White	D-E	6	100% Fish Oil
ARV 3667	"	"	E	4 L	50% Fish Oil 50% Linseed Oil
ARV 3678	Blown (3850)N	Rex 711 Enameloid Ivory	-E	7 L	Kettle Dehydrated Castor
ARV 3679	Unblown (3850)N	Rex 711	G	7 L	"
ARV 3680	(3680)E	Rex 16270 and Rex 15185 Flat-Tone White	G	5-6 L	"
ARV 3680-3	(3680)E	Rex 15185	N	4 L-4	"
ARV 3681	(4880)E	Rex 53 - Porch and Deck Lead Color and Rex 16270	F	4	"
ARV 3673	(3850)N Sp.	Rex 711	D-E	7-8 L	1/5 (2325) Dehydrol 1/5 (3012) Oiticica 1/3 (2317) Fish
ARV 3674	"	"	-E	7-8 L	1/3 (2325) Dehydrol 1/3 (3012) Oiticica 1/5 Thermoil A

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	Varnish Type	Test Formula	Body	Color	
ARV 3677	(3850)N Sp.	Rex 711	D	7-8 L	1/3 (2325) Dehydrol 1/3 (2317) Fish 1/3 Thermoil A
ARV 3692	(3848)E Sp.	"	N	8	Trojan Powder Co. P. E. Sludge
ARV 3693	"	"	U-V	9L-9	"
Cook's RC-2691-N6	"	"	U	18 (Gardner)	Heydenol P. E. Sludge
ARV 3700	(3850)N	"	E +	9 +	3 parts ester gum 1 " Velsicol AE-5-16
CV 1	(3880)E	Rex 16270 Rex 15185	?	?	1/2 (2325) Dehydrol 1/2 Thermoil A
ARV 3711	(3850)N	Rex 711	F	9	Oil: 1/3 fish, 1/3 castor, 1/3 Oiticica. Resin: 1/2 Velsicol AF-3 and 1/2 Piccolyte
ARV 3675	(2847)S	Acme Interior Gloss FL-26	C-D	4-5 L	Made with part fish.

The results of the tests on the above varnishes can be summarized as follows:

1. ARV 3660 would not be satisfactory in any interior finish due to its fishy odor. However, it was considered satisfactory with respect to drying in both the Enameloid and Semi-Lustre formulas.

2. ARV 3667 appeared to be much superior to ARV 3660 on all tests. This varnish was equally as good in drying characteristics over night as (3848)E and it was definitely faster on set-to-touch time. The flow characteristics, however, were high and a slight revision in the pigmentation of Rex 710, date 5-17-44 was necessary to correct this property. In Semi-Lustre White this particular varnish was quite satisfactory, but it produced a slightly lower sheen than regular (3848)E.

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3. ARV 3678 and ARV 3679 were similar in drying, brushing, flow and water resistance to regular (3850)N. ARV 3678 and regular (3850)N, unblown castor Velsicol type, however, produced low bodied Enameloids.

4. ARV 3681, (4880)E Special, was tested in Porch and Deck and was found to be slower on set-to-touch and slightly softer on over night dry. Other properties were fairly well in line with standard (4880)E. Semi-Lustre White made from ARV 3681, (4880)E Special, and ARV 3680, (3880)E Special was thin in body and slightly slower on set-to-touch. The over night drying, however, was considered very close to standard.

5. ARV 3680, (3880)E Special, was tested in Flat-Tone White. This sample was below standard for body and produced rather thin bodied paint. The drying over night was poor.

6. ARV 3680-3 similar to ARV 3680 but cooked to an N body was also tested in Flat-Tone White. This varnish produced standard viscosities and was similar in drying to standard (3880)E.

7. ARV-3673, ARV 3674, ARV 3677: These varnishes were compared for body, brushing, flow, color and drying characteristics in the Enameloid Ivory formula of 11-20-45. All three variations are similar in performance to standard (3850)N. The special varnishes are all faster on set-to-touch time and have harder drying characteristics over night. All experimentals have less tack than regular (3850)N on over night dry. Due to slightly lower bodies of the experimental varnishes, slightly lower consistencies were obtained on the finished enamels. Brittleness of film was determined on the enamels made from each varnish according to standard practice, and the results or degree of brittleness of film are reported below:

ARV 3683 -	Standard (3850)N Varnish; unblown Dehydrol Velsicol type.	No cracking evident on bent portion of tint panel.
ARV 3673 -	1/2 Dehydrol, 1/3 Fish, 1/3 Oiticica.	Very slight cracking; 2nd best.
ARV 3614-2	Standard (3850)N Varnish (blown linseed Velsicol rosin type).	Slight cracking; rated 3rd.
ARV 3674 -	1/3 Dehydrol, 1/3 Thermoil A, 1/3 Oiticica.	Definite cracking; rated 4th.
ARV 3677 -	1/3 Dehydrol, 1/3 Thermoil A, 1/3 Fish.	Definite plus cracking; poorest.

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8. Two experimental (3848)E varnishes made from Trojan Powder Company's P. E. Sludge, and a similar varnish RC 2691-N6 obtained from Cook Paint and Varnish were tested in Enameloid Ivory. The Cook varnish was made from Heydenol P. E. Sludge.

Cook's RC-2691-N6 varnish produced high viscosities in the Enameloid Ivory formula and was rather sticky under the brush.

ARV 3692 and ARV 3693 represent the varnishes made from Trojan's P. E. Sludge. ARV 3692 produced a slightly lower consistency than standard and ARV 3693 produced a viscosity similar to Cook's RC-2691-N6.

Based on our tests, it is quite evident that the ARV 3692 cooked to a slightly higher body would be the most desirable varnish of the three for Enameloid tints. Draw-down films remained substantially equal to standard in elasticity. Water resistance was good on all the P. E. Sludge varnishes.

9. ARV 3700, (3850)N type varnish using 3 parts ester gum and one part Velsicol AE-5-16 was too dark in color for use in Enameloid tints.

The factory production batch of CV 1 Varnish, representing the laboratory batch ARV 3647-2 of special (3880)E, was tested in Flat-Tone and Semi-Lustre White. This material performed very similarly to regular (3880)E in both formulas. This varnish contains 1/2 (2525) Dehydrol and 1/2 Thermoil A for the oil content.

The sample of ARV 3675, Special (2847)S, tested in Acme Interior Gloss FL 26, appeared to be standard with respect to brushing and flow, but was lower in sheen than standard (2847)S. ARV 3675 was made with part fish oil. No further tests were made on this vehicle.

#105 - Metal Protective Paints

Stagnant harbor waters, usually acid and with dissolved sulphide gas, are usually quite destructive to underwater ship primers. The resistancy of various primers to acid waters was determined during the month. 17 primers were immersed in: (1) water having a pH of 5, (2) 3% salt water at a pH of 5, and (3) water containing 150 p.p.m. H_2S and at a pH of 5. This acidity is slightly greater than is ordinarily encountered in sewage and harbor waters. Results after 800 hours' immersion in quart size tanks which permitted a flow of one gallon of water per 24 hours, is as follows:

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Paint RB No.	Agent	Mill Time	Fineness	Viscosity #3 Orifice Fresh	Viscosity #3 Orifice 11 Day	Gloss	Performance Dry-to-touch	Performance 24 Hr.
796	Rusfal Conc.	4'	5-3/4	28.2"	27.8"	OK	80 minutes	V. hard
797	Dioctyl Acid Pyrophosphate)	3' 28"	6-1/4	37.6"	34.2"	"	160 "	" "
798	Emulsifier 87	3' 8"	5-3/4	25.6"	24.2"	"	105 "	" "
799	Acto 45*	1' 47"	5-1/2	19.0	21.2	"	70 "	" "

*Formerly referred to as Stanco SP 717. This and associated products are now distributed under the "Acto" trademark. The associated number indicates the mahogany soap concentration of the compound.

The vehicle for the above was the alkyd grinding varnish (3128), and the pigment 1403 T, anatase TiO_2. The base formula is patterned after Rex 710 Enameloid White.

In addition to the above tests, plant production trials have been made using the Rex 710 Enameloid White formulation. (2270) Yelkin TS Lecithin and Acto 45 - CW 2001 were the wetting agents tested.

Production rates were vastly different in that the base formula with no agent required 21-1/2 hours for a 300 gallon batch, while the (2270) Lecithin batch required 27-1/2 hours, and the Acto 45 batch milled through in 11-1/4 hours. No adjustment of varnish proportion was made for these tests.

#177 - Pigment Studies

Lithopone Tests

Plant production tests on lithopones, lots K 4148 and K 4186 were made. Rex 711 Enameloid Ivory was the base formula. In these tests the comparison was made between 461 L - lithopone, regular stock, and 461 L lithopone, lots 4186 and 4148. A reference run was made using the alternate formula which contains titanium calcium - 2132 dry instead of lithopone.

Comparative results are tabulated below:

Test Pigment	Rex and Date	Gallons 1 hour	Grind	Gloss	#3 Orifice Viscosity Fresh	#3 Orifice Viscosity 14 Day
461 L regular	711	25-1/2	6	OK	40"	35"
461 L, K 4148	711, C 545	41-1/2	6	OK	37"	37"
461 L, K 4186	711, C 545 A	44-1/2	6	OK	35"	36.6"
2132 dry	711, C 575 B	63	6	OK	35"	27.8"

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From the above it was noted that special lots K 4148 and K 4186 represent a vast improvement over the regular lithopone. Further improvement is required before equivalence with the lower poundage of 2132 dry is accomplished.

#97 - SWP 471

At certain times in the past, both SWP 450 Undercoater and Gloss White have given trouble due to initial high viscosity and tendencies to after-body. Since there have been some variations in the method used to heat body (48), the Varnish Manufacturing Department has cooperated with us to determine whether such variations were the cause of the unusual paint viscosities. They prepared sufficient (48) by each of the following methods to permit laboratory evaluation and to run factory batches:

	Method	Acid Value	Body
1.	Run at 560° F.	7.6	Z_2
2.	Run at 585° F.	11.2	Z_2
3.	Run at 600° F.	12.2	Z_2
4.	Run at 600° F. and drop back to 585° F.	12.2	Z_2-Z_3
5.	Run at 560° F. + SO_2	-	Z_2-Z_3
6.	Run at 585° F. + SO_2	9.5	Z_2
7.	Run at 600° F. drop back to 585° F. + SO_2	9.4	Z_2-Z_3
8.	V 11125. 580° - 600° F. air blown	-	-
9.	Beta-chloroanthraquinone at 585° F. (.05-.05%)	10.5	Z_2-Z_3
10.	#2 - Up heat fast as possible.	12.6	Z_2-Z_3
11.	#2 - Up heat slow (3 hours)	16.4	Z_2-Z_3

Each of the above oils is used as the (48) in the Rex 450 Undercoater formula, Card #20, and the Rex 471 SWP Gloss White formula, Card #41, Alternate B. These batches will be checked for body over a period of time. The results to date are as follows:

SWP 450 Undercoater

Paint No.	(48) Method	Viscosities, #3 Orifice, at 75° F. Fresh	1 Day	3 Days	7 Days
RB 800	No. 1	11"	11"	11"	11.2"
801	2	12.2	12.8	12.4	13.2
802	3	10.8	11.4	11.4	12
803	4	13.2	14.4	14.6	15.4
804	5	13.2	13.8	13.6	13.2
805	6	12.4	13.8	13.8	14.2
806	7	15	17.6	17	17

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#150 - Durability Studies of Zinc Sulphide Pigment Combinations

Panels 6351-6453 C, Cof. were examined after two years' exposure, vertical south. Both cedar and yellow pine siding is used, the cedar being primed with Rex 450 Undercoater and the pine being self-primed. Various combinations of MS-130, leaded zinc and lead titanate are tested against regular stock guides in Gloss White, Light Lead and Straw. A representative, but not complete, coverage of the following pigmentations is the basic scheme: (a) varying MS-130 content from 30% to 85% in approximately 10% steps, (b) varying 412 leaded zinc from 0 to 50%, similarly, (c) varying 1895 lead titanate from 0 to 15% in 5% steps, (d) varying 20 L magnesium silicate from 5% to 15%, (e) inserting 5% Alsibronz #19 mica in several cases, and 5% 1403 free-chalking titanium instead of lead titanate in one; (f) In addition four special samples are tested, using MS-130/leaded zinc only, at 50/50%, 60/40%, 70/30% and 85/15%.

The erosion, checking and cracking encountered is rather serious on the yellow pine panels but the Rex 450-primed cedars are so much better that for the present the only samples rated as poor in durability are one using about 75% MS-130 without leaded zinc, and (though definitely better) the 85/15% sample. The anti-checking properties of even 5% mica are noticeable in several instances. Fading of tints is a much more serious matter. 75% MS-130 (as above) shows an extreme freakish fading, 85/15% is bad in mildew and unsatisfactory in tint-retention, and the other straight MS-130/412 samples are fair to good in color. The bulk of the tints, using lead titanate, magnesium silicate, etc., are quite similar in tint-retention to each other and to the average straight MS-130/412 sample. In general, the color of the test paints is quite definitely inferior to that of the regular guides.

Panels 2317-23 C were examined after 70 months' exposure at Chicago, vertical south. All are 3-coat work on good quality Ponderosa pine siding. The guide is 5 coats of Rex 471 SWP Gloss White of 1938, also tinted Ivory; the tests consist of a special primer plus two coats of Acme Rex 122 New Era House Paint, both as white and tinted Ivory. The special primers, in addition to Acme's Rex 1A157 as a standard primer, test 1538 Coffeyville zinc sulphide in Acme's Proposed Balanced Primer D-66B of 6-15-38 and also New Jersey Zinc's ZS-20 and ZS-30 Zinc sulphides and Coffeyville's special lot XX-130. The Ivory tests all look good, showing little failure. Rex 471, three coats, which usually runs definitely inferior to a system using Rex 450 Undercoater, is about equal to the average test system in this series. The Acme proposed primer seems to give better resistance to checking and cracking than Rex 1A157, with 1538 regular Coffeyville zinc sulphide and ZS-20 tho preferred zinc sulphides, ZS-30 poorest and the Coffeyville special intermediate.

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	Set-to-touch	Through Dry 24 Hrs.	Viscosities, in seconds #3 Orifice Fresh	24 Hrs.	4 Days	9 Days	15 Days
OJ 515 I SWP Undercoater Pigment as 9-27-44 Vehicle as 1-14-42 Using ARV 3659 - Body - F Color - 5	4 hr. 30 min.	Good	11.4	11	12	12.8	13
OJ 518 I SWP Undercoater As OJ 515 I but ARV 3659 with: Body - I Color - 3	5 hr. 5 min.	Good	12	11.4	12.2	13.6	12.8
OJ 516 I SWP Undercoater Formula 9-27-44	4 hr. 30 min.	Good	14.4	14.6	16	18.2	16.8
OJ 517 I SWP Undercoater Formula 9-27-44 but 8 gals. ARV 3659 Body - I for 4 gals. (48) and thinner.	3 hr. 55 min.	Good	16.4	16.8	18	20	19.6

Additional meetings were held of the group interested in the Douglas Fir plywood project, to refine the exposure program. The general form of the exposure panel was approved, and an approximate list of finishing systems selected. Mr. Gross will be in Chicago in March, at which time the final plans for the 1945 exposures will be laid.

#162 - Studies in Flat Wall Paint Formulation

A second 50 gallon batch of Flat-Tone White was made in a B Department paint mixer by mixing the pigments and a portion of the vehicle in the form of a heavy paste for a period of 20 minutes. The paste was then reduced with the balance of the vehicle. The reducing time was 16 minutes for the above batch.

The paint was made from easy wetting pigments and inerts such as RCHT-X Titanium Calcium, Lesamite, and Microne Talc. The Flat-Tone made by this process was equal to the regular production with respect to texture, flow, brushing, drying, etc. A gallon sample was sent to Mr. Mills for his inspection.

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Semi-Lustre and Enameloid

During the month a number of varnishes prepared by the Varnish Research Division were tested in the above products. The various varnishes are listed below, with their characteristics and approximate composition.

(3850)N Type Varnishes

	Body	Color	
CVR 2	- E	8-9 L	1/2 Velsicol AF-3, 1/2 Piccolyte 1/3 oiticica, 1/3 fish, 1/3 castor
CVR 18-2	E	7-8 L	1/2 Velsicol AF-3, 1/2 Piccolyte 1/3 oiticica, 1/3 fish, 1/3 castor Resin as check
CVR 19-2	G	9L-9	As above, but resin cooked in.
CVR 18-3	G	8 L	As 18-2. but G body - color 8 L.
CVR 19-3	H	9	As 19-2, but H body - color 9.
ARV 3711	F	9	1/2 Velsicol AF-3, 1/2 Piccolyte 1/3 oiticica, 1/3 fish, 1/3 castor

(3848)E Type Varnishes

ARV 3712	J	5	Butadiene turpentine resin
ARV 3722	G-H	8L-8	Using crude tall oil
CVR 1	P	7 L	Purified Pentaerythritol Mother Liquor
CVR 5	O-P	7 L	As above, but using crude base.

(4850)N Type Varnishes

	Body	Color	Varnish Oil Used	Resin Used
ARV 3702	H	4	1/3 oiticica 1/3 castor 1/3 fish	Piccolyte
ARV 3709	E	6 L	"	1/4 Rosin 3/4 Piccolyte

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(4850)N Type Varnishes
(Cont.

	Body	Color	Varnish Oil Used	Resin Used
ARV 3720	F	6 L	1/3 oiticica 1/3 castor 1/3 fish	1/4 Ester Gum 3/4 Piccolyte
CVR-28	F	5	"	1/4 Ester Gum 3/4 Piccolyte
ARV 3720	F	6 L	"	1/4 Ester Gum 3/4 Piccolyte
ARV 3720-2	E-F	5-6 L	"	1/4 Ester Gum 3/4 Piccolyte

The (3850)N type varnishes listed above are all similar in composition and differ only with respect to body and cooking procedure. The first development tested was ARV 3711. This varnish was poor in color and produced too thin a body for the Enameloid tints.

The second development, CVR-2, was a definite improvement in color over ARV 3711, but also produced a thin bodied enamel.

The succeeding variations of this liquid were CVR 18-2 and CVR 19-2. CVR 18-2 was made in the same manner as CVR 19-2 except that the Velsicol AF-3 was used as a check, whereas it was cooked in the varnish in the case of CVR 19-2. These varnishes were also too low in body characteristics, so a number of special pigmentations were introduced to increase the initial body of the enamel. The pigmentation was changed from 400 pounds of 2132 rutile titanium calcium to 500 pounds 1271 anatase titanium calcium, and 400 pounds 2132 plus 100 pounds Atomite - 2247 dry. The above pigmentations produced standard viscosities, but decreased the gloss.

Based on the above results, two additional varnishes, CVR 18-3 and CVR 19-3 were made using more lime in the cook than was used in CVR 18-2 and 19-2.

The CVR 19-3 produced a standard gloss and body in the Enameloid tint base using the standard pigmentation. CVR 18-3, however, was still too low in body and no further work was done on this liquid.

Our test work on ARV 3712 was done in connection with Rex 710 Enameloid White, and was compared with standard (5848)E. This varnish produced an abnormally high bodied enamel of 103 seconds. However, when reduced to brushing consistency the film was fairly hard and appeared to

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be much more elastic than any of the varnishes we have tested recently. Films prepared from CVR-1 and 3 were satisfactory after 16 days, and from ARV 3712 satisfactory after 33 days. The other films were brittle.

The sample of ARV 3722 made from Crude Tall Oil was also compared with (3848)E in Enameloid Ivory as well as in Semi-Lustre Ivory.

Floor Enamel Slate was also made with the Crude Tall Oil vehicle.

This varnish was faster on initial drying than (3848)E or the (3880)E and (4830)E combination used in Semi-Lustre. The Crude Tall Oil varnish produced high viscosities in Enameloid and Floor Enamel and low body in Semi-Lustre. The principal objection to this liquid is its apparent property of becoming very brittle upon aging.

The most desirable variations of (3848)E that have been tested are CVR-1 and CVR-3. These liquids were made from Pentaerythritol Mother Liquor. CVR-1 represents the purified base and CVR-3 the crude.

Enameloid Ivory made with these varnishes had standard bodies and drying characteristics, as well as standard water and soap resistance as compared with (3848)E.

A number of (4850)N varnishes, made from 1/3 oiticica, 1/3 castor, 1/3 fish; and 1/4 rosin plus 5/4 Piccolyte for the resin content, have been tested in Enameloid White. All experimental (4850)N varnishes required the introduction of part titanium calcium for part of the titanium dioxide normally used in order to increase the pigment bulk and initial viscosity of the enamel. ARV 3720-2 and CVR-28 were the most desirable from a consistency standpoint, but both varnishes require special pigmentations which reduce the gloss below standard. The above varnishes also produced a definite drop in brightness as compared with standard (4850)N.

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No work was done during the month on the following projects:

#77 - Mildew Inhibitors

#112 - Fire Retardant Paints

#148 - Examination of White Lead

#160 - Painting of Bricks

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#162 - Studies in Flat Wall Paint Formulation

Work under this caption has centered on an investigation instituted at the request of the Bureau of Ships on 52-P-22 (Int.) Paint, Inside, Semi-Gloss, White; Fire Retardant. The work is based on a proposed revision, and covers the reformulation to improve washability and color retention, as well as maintenance of fire retardancy, including variations in both pigment and vehicle.

A number of varnishes have been submitted by Resin Research, including interesters, rosin maleic soya varnish, and rosin styrene varnishes. The comparisons will include the discontinued alkyd varnish formulation, the previous ester gum-bodied oil blend, and the new low temperature "dispersion cook" ester gum - bodied oil vehicle.

Inert studies will be made, both for straight replacement of fibrous magnesium silicate, and for improvement in grinding in the interests of faster and more economical production.

Rosin Conservation

A number of resins were investigated during the month to conserve and replace rosin.

The varnishes listed below were submitted by the Varnish Research Division for evaluation:

	Type	Body	Color	Resin Content	Oil Content
CVR 44	(3850)N Special	I	9 L	1/2 Velsicol AF-5 1/2 Piccolyte	1/3 Castor 1/3 Fish 1/3 Oiticica
CVR 45	Esterified Tall Oil	86"	8	Tall oil glyceride	
CVR 64	(3850)N Special	F	9 +	100% Velsicol AF-5 Resin cooked in varnish.	1/3 Fish 1/3 Castor 1/3 Oiticica
CVR 67	(3850)N Special	D	9 +	Same as CVR 64, but resin added as check.	
CVR 66	35 gal. varn. to replace (3850)N	- F	8L-8	Tall oil ester oiticica varnish	
CVR 66-2	"	G-H	8 L	" " " " "	
CVR 72	(3850)N Special	E	7L-8	" " " " "	

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	Type	Body	Color	Resin Content	Oil Content
CVR 71	(3850)N Sp.	S	18	100% Velsicol AF-3	Linseed
CVR 12	(4880)E	F	4		Kettle dehydrated castor
CVR 58	(4880)E	- G	5-6L	Ester Gum	(2325)
CVR 13	(3850)N	- G	6-7L	Velsicol	Kettle dehydrated castor
CVR 53	(3850)N	E	8 L	"	(2325)
CVR 17	(3680)E	H	4 L	Ester Gum	Kettle dehydrated castor
CVR 59	(3880)E	- J	3	" "	(2325)
CVR 54	(3848)E	S	4-5L	P. E. Ester Gum	Kettle dehydrated castor
CVR 57	(3848)E	T	5L-5	" " "	(2325)

CVR 44 is similar to CVR 19-3, as referred to in the monthly report for February, but was made in the agitator kettle. This material was satisfactory for body, brushing, flow, and drying, as compared with regular (3850)N varnish. The film upon aging, however, became more brittle than regular (3850)N, which in itself is not good in this respect after the film has aged for a few days.

The esterified Tall Oil varnish CVR 45 was compared with the regular vehicle combination used in the Semi-Lustre Ivory formula of 10-18-44, but was found to be short in flow, thin in body, and too free in brushing for proper application. The above comparison was made on a resin and oil replacement basis. The esterified Tall Oil varnish was also very poor in drying.

CVR 64 and 67, made from Velsicol AF-3 and equal parts of fish, castor, and oiticica, were tested in Enameloid Ivory. Both liquids produced low gloss, so further tests were discontinued. Our results indicated that CVR 67 could be shaded to an Ivory but CVR 64 could not, due to its inherent color.

The two Tall Oil-oiticica varnishes CVR 63 and 72 listed above were also compared with regular (3850)N and CVR 71 (AV-1) in Enameloid Ivory. The two Tall Oil-oiticica varnishes were slower in drying and

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lower in viscosity than regular (3850)N or AV-1. The Tall Oil varnishes, however, showed an improvement in color and produced a more elastic film upon aging. Based on these results, the Tall Oil - Oiticica Varnish CVR 66 was cooked to a G-H body. The new development (CVR 66-2) was a definite improvement over CVR 66 with respect to drying and body characteristics. It was very slightly slower on set-to-touch than (3850)N but the over night drying was rated good. CVR 66-2 produced a standard viscosity in the lithopone-titanium dioxide pigmentation of formula 3-7-45, but was slightly low in viscosity when used with the rutile titanium calcium pigmentation of formula 11-20-43. Aged films of Rex 711 - Enameloid Ivory based on CVR 66-2 were more elastic than regular (3850)N.

CVR 12, 13, 17 and 54 representing experimental varnishes based on kettle dehydrated castor were compared with regular (4880)E, (3850)N, (3880)E and (3848)E made with Dehydrol. The above varnishes were tested in Porch and Deck, Enameloid Ivory, Flat-Tone White and Enameloid White. The results would indicate that in general the kettle dehydrated castor varnishes are equal in general performance to standard varnishes made from Dehydrol (2325). Tests to check the water and soap resistance are under way and will be reported later.

#97 - SWP 471

Mr. Saunders submitted a number of special inerts for evaluation. These included OME #108 Pinite, OME #82 Sericite, an ore first micropulverized and then fractionated by elutriation to give this fraction which is practically pure mica, OME #83 Sericite similar to #82 except that the preliminary milling prior to elutriation was done in the pebble mill, and OME #84 Sericite, prepared as #83 but at a higher elutriation rate, quite talc-like.

These inerts were tested in oil conservation tints, Gray and Colonial Yellow. The inerts produced heavy bodied paints that were hard to grind compared with 20 F magnesium silicate. All the experimental paints became very gray due to abrasion and iron contamination during the milling procedure.

In connection with the Navy work, a number of inerts were evaluated during the month for grinding properties and consistency characteristics, using the SWP Gloss White formula of 1-19-45. Additional tests are to be made in 52-P-13, 52-P-22, and 52-P-45. Exposure tests will be started as soon as the panels can be prepared.

Data follows:

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Mr. Shiffler, of the Newark Technical Service Department has suggested that we study the possibility of impairment of durability if hot grinding were adopted for SWP, due to excessive formation of zinc soaps. Two batches will be prepared identical in all respects except that one will be run at room temperature, and the other ground after the paste has been maintained at 200° F. for one hour. The final paint will be held for a time at some elevated temperature to simulate the slow loss of heat in a production batch.

Portions of each of these batches will be placed on exposure at once, and exposures then repeated after the batches have been stored at ordinary temperatures for six months. This will check whether the zinc soaps formed are equal in amounts, since Mr. Van Nordstrand's work on Metalastic Gray indicated that zinc soaps built up during storage of paints reduce durability.

#86 - Durability of Pigments with Special Reference to Leaded Zinc and White Lead

Panels 6168-81 C, Cof. were studied after about 32 months' exposure, vertical south, at Chicago and Coffeyville respectively. These tests consist of emergency reformulations of Family Paint Tints, using the 15/85% leaded zinc pigment Ozlo 414, partly for the purpose of testing the pigment, and partly to meet a shortage of lead and zinc pigments then existent. Essentially, the series consists of a regular Family Paint of 6-9-41 for each of six shades versus a new formulation in which 414 is substituted for 1526 35/65 leaded zinc on a pound for pound basis. An important point to note is that some, but not all, of these reformulations are adjusted for lead-zinc content by the addition of white lead. Furthermore, two samples contain 2201 Metronite in place of 20 L magnesium silicate. All are self-primed two-coat work on cedar siding, with one pint of oil added to the first coat.

Although only one has failed badly to date, all except the Light Brown show either definite visible or very intense microscopic checking and cracking and serious erosion. In two shades, the special is definitely inferior to the regular, but, although the lead-zinc content is adjusted, both Metronite and 414 must share the responsibility for this difference. In another case, failure to adjust by adding white lead may have been equally as important as the use of 414 in contributing to inferior durability. This leaves Light Brown, which is good in both formulations because of its deep shade; Dark Blue, which is very poor in both because of its ultramarine color content (as well as high inert and lithopone); and Pea Green, the only one tested with and without Metronite and lead-zinc adjustment. All samples of this shade are relatively good and nearly identical. The logical conclusion is that in this general formula, the use of Metronite and of abnormally high zinc oxide (unadjusted use of 414) are tolerable provided the tinting colors are good and the formula is otherwise sound.

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#12 - Exterior Primers

Progress has been made in the study of finishing systems for exterior plywood, both in the accumulation of the plywood, and arrangement of the exposure program. Mr. Gross is assisting in this work. We must obtain WPB authorization for purchase of the plywood.

#177 - Pigment Studies

A sample of lead silicate has been received for evaluation in metal primers, but tests have not been initiated as yet.

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No work was done during the month on the following projects:

#163 - One Coat House Paint

#164 - Reformulation Studies of House Paints to Reduce Dirt Collection

#150 - Durability Studies of Zinc Sulphide Pigment Combinations

#178 - Studies of Dark Colored House Paints

#77 - Mildew Inhibitors

#112 - Fire Retardant Paints

#148 - Examination of White Lead

#160 - Painting of Bricks

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Cont.

#162 - Studies in Flat Wall Paint Formulation

52-P-22 (Int.) Paint, Inside, Semi-Gloss, White; Fire Retardant

A study of the Bureau of Ships specification paint 52-P-22 was made during the month. This investigation covered the reformulation of 52-P-22 for the purpose of improving the washability and color retention as well as fire resistance of the above material.

A number of varnishes were tested based on a 25 gallon ester gum vehicle made with linseed as well as dehydrated castor. A number of varnishes were submitted by the Resin Research based on inter-ester type soya-dehydrated castor and rosin maleic soya varnishes, and rosin styrene Dehydrol varnishes. The inter-esters and one of the rosin styrene varnishes could not be evaluated in this formulation because of the zinc oxide in the pigmentation. The Bureau of Ships insists on the zinc oxide, which they state:

(1) Acts as an "acid acceptor" in connection with the gradual decomposition of the vehicle, thus neutralizing any tendencies toward accelerated corrosion.

(2) Imparts hardness to the film.

(3) Contributes to the alkali resistance.

The last two features are important because the frequent contact with personnel and repeated washing require these attributes.

The results of our tests to date indicate that the alkyd formula of 2-18-45 for 52-P-22 is far superior in washability to any of the other vehicles tested. The balance of the vehicles were all in about the same class except for the 25 gallon ester gum Dehydrol varnish which was rated rather poor. This varnish will be made over using light bodied dehydrated castor from some other source of supply.

There was no particular difference in the performance of the various varnishes on the fire test. All the experimental paints failed rather badly, apparently due to the priming coat of 52-P-18 as specified for this test. Work will be continued on this problem and further reports will be made at a later date.

Rosin Conservation

A number of varnishes were submitted for test during the month based on tall oil, Velsicol AD-6-3 and P.E. Sludge. The following varnishes were submitted by the Varnish Research Division for evaluation:

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(3850)N Varnishes	Body	Color	
CVR 78-2	F	14-15	(Resin - Velsicol AD-6-3 (Oil 1/2 linseed - 1/2 oiticica
CVR 74-2	F +	6-7 L	(Resin - Velsicol AD-6-3 (Oil - Dehydrol
CVR 66-2	- H	8 L	(Tall oil - oiticica (35 gallon varnish
CVR 66-5	G	6-7 L	Same as above, but revised cooking procedure.
(3848)E Varnishes			
CVR 106	P	15	Linseed, rosin, P.E. Sludge.
CVR 107	P	16-17	As above, but part glycerine.
(3880)E Varnish			
CVR 110	Q	15-16	Tall oil - linseed variation.
(3899)N Varnishes			
CVR 119	O	14-15	Using "D" oil (5055) Sp.
CVR 116	L	15	" Esterified tall oil.
CVR 122	I-J	14	" Refined " "

The (3850)N type CVR 72-2 and 74-2 varnishes were compared with regular material in Enameloid Ivory for body, brushing, flow and drying characteristics. The set-to-touch time was faster on the specials but the over night dry was not as good. Aged films of enamels made with these varnishes became very brittle in 30 days.

The tall oil-oiticica varnishes CVR 66-2 and 66-5 were also compared with regular (3850)N in the Enameloid Ivory formula. The drying properties were similar on set-to-touch and over night dry, and films aged for 28 days indicated about the same degree of hardness as regular (3850)N. The CVR 66-2 film was slightly more elastic than 66-5 after this period of time.

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The two special (3848)E varnishes CVR 106 and 107 were checked for general performance in Enameloid Ivory. These varnishes were very similar to standard (3848)E with respect to flow, brushing and initial drying. However, the films aged for 7 days were very brittle compared with regular (3848)E.

The (3899)N type varnishes CVR 119, CVR 116 and CVR 122 were all tested in conjunction with CVR 45 (esterified tall oil) and CVR 108, special (2281) in the reformulation of Semi-Lustre Ivory. A number of variations were made in order to obtain satisfactory body and drying characteristics. This work resulted in a formulation for Semi-Lustre White and tints that appears equal in all respects to standard Semi-Lustre in the tests run to date. Panels are being aged for washing tests. The new formula, OJ 837 I has been referred to Cleveland for their consideration, and an experimental production batch will be made in the Chicago plant.

CVR 110, special (3880)E was compared with regular (3880)E in Flat-Tone White. The CVR 110 produced a thinner viscosity than standard material and was poor in washability. However, it was about equal to the linseed-Thermoil A formula for (3880)E as it is manufactured at the present time.

A number of Flat-Tone batches were made, to check the properties of a sample of Coated Calcite #311 received from Conrad Trost, of Mellon Institute. It was compared with regular 566 dry and the present inert combination of 20 L and 2188 dry. The coated Calcite was gray in color but mixed and wet in faster than the other inerts tested. The coated material was also definitely higher in sheen.

Flat-Tone White Made with Coated Calcite #311
566 Dry and Regular Inert Combination (20 L+ 2188)

Batch No.	Method of Manufacture	Inert Used	Grind	Sheen	Brushing Properties
OJ 735 I	Roller mill	Coated Calcite #311	2	High	Good
OJ 735 II	Mixed only	"	1	"	"
OJ 736 I	Roller mill	566 dry	3	Medium sheen	"
OJ 736 II	Mixed only	"	1	Slightly lower than above.	"

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Batch No.	Method of Manufacture	Inert Used	Grind	Sheen	Brushing Properties
OJ 737 I	Roller mill	20 L - 2188	3	Medium sheen	Good
OJ 737 II	Mixed only	" "	1	Slightly lower than above.	"

Viscosity #3 Orifice

Batch No.	Fresh	14 Days	Color
OJ 735 I	25"	33.8"	Very gray
OJ 735 II	27.5"	37.4"	" "
OJ 736 I	22.1"	29.8"	Standard
OJ 736 II	25"	29"	"
OJ 737 I	27.2"	43.2"	"
OJ 737 II	33"	54.1"	"

The Coated Calcite #311 was very gray in color but mixed in and wet faster than the 566 dry or the 2188 plus 20 L inert combination.

#97 - SWP 471

52-P-45 (Int.) Paint #27, Outside, Haze Gray (formula #5-H)

At the request of the Navy we are investigating two angles in this specification. The first is a study of the vehicle to replace the current alkyd in the interests of phthalic conservation. The second is a study of durability to determine whether the p.v.c. can be reduced to impart additional durability without difficulties from excessive gloss. As a final step there will be an investigation to develop an exterior hull paint of maximum durability for maintenance of inactivated ships.

The vehicle replacements under consideration include maleic ester and rosin styrene varnishes submitted by the Resin Research Department. The initial steps in p.v.c. reduction involve a drop from the regular 34.7% down to 30%.

Because of shortages of ultramarine blue, 52-P-45 calls for tinting with lampblack only. We were unable to obtain the standard blue tone of gray using 104 dry, Mepham's Black Knight Velvet Lampblack. This was confirmed by the Cleveland Technical Service. Subsequently, the Cleveland factory was able to get a fair match in a 500 gallon batch of 52-P-45 without adding blue.

We reported our difficulties to the Philadelphia Navy Yard, who advised us that Bihn and Wolff's #600 Lampblack was the standard for Navy purchases under Federal specification TT-L-70. We obtained a sample of the Bihn and Wolff black and found it to be stronger, easier wetting, and much better in texture than our 104 dry, which is gritty. However, it

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Brick and Stucco Paint shows no sign of failure to date.

Cementaprime is not satisfactory for waterproofing.

#177 - Pigment Studies

Eagle-Picher Lead Company has given us very complete information which they have collected to date on basic silicate white lead. They indicate it has shown its greatest usefulness in metal primers, using a combination of 80% blue lead and 20% basic silicate white lead. They believe it has special merit in primers for ferrous surfaces, particularly for submerged or alternate submerged exposure. They also suggest consideration in exterior house paints in the order of 10 - 20% of the total pigment.

While Eagle-Picher rate the basic silicate equivalent in hiding power to lead carbonate, the opacity appears to be about 2% weaker than Carter lead, according to Mr. Craig. Its high oil absorption, about four times that of Carter lead, militates against its general use in exterior paint formulations.

Further work is planned.

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No work was done during the month on:

#164 - Reformulation Studies of House Paints to Reduce Dirt Collection

#150 - Durability Studies of Zinc Sulphide Pigment Combinations

#178 - Studies of Dark Colored House Paints

#112 - Fire Retardant Paints

#148 - Examination of White Lead

#86 - Durability of Pigments with Special Reference to Leaded Zinc and White Lead

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Cont.

162 - Studies in Flat Wall Paint Formulation

52P22 (Int.) Paint, Inside, Semi-Gloss, White; Fire Retardant

This investigation covers attempts to reformulate 52P22 for the purpose of improving washability and color retention, as well as fire resistance. The investigation will cover a number of variations in pigmentation and in vehicle composition, including the recent change to the low temperature composite cook, compared with the previous blend of heat bodied linseed oil and ester gum solution. Certain varnishes have been included based on interesters and rosin styrene varnishes.

The interester type proved to be of no particular interest in this instance, due to their relatively high acid value, which caused reactivity with the zinc oxide in the formula. The rosin styrene varnishes can be made with sufficiently low acid value to prevent undue reactivity with zinc oxide. However, in some cases they cause considerable trouble also.

In order to have a point of reference, we made up the original alkyd formula, and it is interesting to note the comparative washability with subsequent ester gum varnishes or ester gum oil blends.

The various paints were tested in accordance with the standard methods of test as covered by Specification 52P22.

Bureau of Ships Specification 52P22
Detail Requirements

V No.	52P22 Formula	Vehicle Type	E-4 Viscosities (K.U.) Fresh	E-4 Viscosities (K.U.) 5 Days	E-6 Drying After 8 Hrs.
1 I	12-15-42	Alkyd	72	73	Medium to hard
2 I	1-2-45	Oil-ester gum solution	68	69	Hard
3 I	Proposed revision	Linseed-ester gum varn.	69	69	Hard
4 I	" "	Dehydrated castor-ester gum varnish; zinc oxide reduced to 5%.	67	69	Hard
5 I	Proposed revision	As 664 I, but zinc oxide reduced to 0%.	68	68	Medium to hard
7 I	1-2-45	Vehicle as proposed linseed-ester gum varnish; pigmentation of 1-2-45.	69	69	Hard

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52P22 - Cont.

OJ No.	52P22 Formula	Vehicle Type	E-4 Viscosities (K.U.) Fresh	5 Days	E-6 Drying After 8 Hrs.
698 I	Proposed revision	Rosin styrene dehydrated castor varnish; acid value 7.9 on base.	69	69	Hard
699 I	" "	Interester, soya, dehydrated castor varnish; acid value 18.6 on base.	110 (Livered)	-	-
700 I	" "	Rosin styrene, dehydrated castor varnish; acid value 12 on base.	Livered	-	-
711 I	" "	Interester rosin maleic soya varnish; acid value 19.7 on base.	128 (Livered)	-	-

OJ No.	E-7 Fire Retardant Properties - 2000° F.	E-8 Color	E-9 Gloss N-S	E-W	E-12 Flash Point	E-13 Reflectance	Washability. Rubs in cycles	Grind
661 I	Large blisters formed; film removed.	OK	18	18	97° F.	84%	21,550	4
662 I	Blisters somewhat smaller, but bad cracking.	Very slightly less violet	13	13	93	82.6	8,885	4
663 I	Blisters formed slowly; film intact.	"	10	10	89	83	7,596	4
664 I	Slight glowing; badly cracked film.	"	10	10	86	85.2	5,470	4
665 I	Blisters formed slowly film intact to end.	"	10	10	89	83.1	6,300	4
667 I	Slight glowing; blisters formed slowly.	"	14	14	86	83.7	6,480	4
698 I	Definite glow; slow to blister and peel.	"	12	12	102	82.7	7,550	4

699 I, 700 I, 711 I - Livered; not tested.

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52P22 - Cont.

While this work is not complete, there are some items of special interest. Obviously the original alkyd formula has a much higher degree of washability than the subsequent ester gum blends or varnishes. In this case, the washability was determined using our scrub machine, in which the film is applied on steel by draw-down, using a 0.005" clearance gauge. The films are allowed to dry for five days. The scrub resistance is determined by using a Pro-phy-lac-tic No. 400 hand brush weighted with a 1-1/4 pound weight, counting as a cycle one complete forward and backward motion over the scrubbed area, and measuring the number of cycles to the point of initial break-through of the film.

Within experimental error, the alkyd formulation will stand about 21,000 cycles, while the other formulas tested fall in the 6,000 to 8,000 cycle range, which might be considered as substantially one group. Additional formulations will be made to make a more direct comparison between dehydrated castor oil and linseed. The series is incomplete, but indicates that zinc oxide can be reduced without substantial loss in washability. Obviously interesters cannot be used with zinc oxide in such formulations and it is difficult to prepare rosin styrene varnishes which will be compatible with zinc oxide.

None of these paints really pass the fire test. Work was reported in 1943 to the Bureau of Ships, in which we pointed out the connection between pigment-volume-concentration and adhesion in the fire test for both 52P22 applied as a single coat and over 52P18 primer. If 52P18 is increased in pigment-volume-concentration to the vicinity of 50 to 60%, adhesion is excellent after the fire test, but corrosion resistance drops sharply. When the various 52P22's were applied over standard pigment-volume-concentration 52P18, blisters are formed in almost every instance. All of the 52P22 semi-gloss paints will survive in single coats.

This project will continue under investigation as time and personnel permit.

As an auxiliary phase of this work we have a study of zinc oxides and their reactivity in the 52P22 formula, which ties in with similar work in the "Zinc Oxide Comparison" under 52P18 Zinc Chromate Primer.

The various zinc oxides are substituted directly in the 52P18 formula on an equal weight basis. The oxides used are identical with those used in the "Zinc Oxide Comparison" under 52P18, and the listing need not be repeated here.

Reactivities will be measured by viscosity determinations over a period of storage. The paints have been made and readings started.

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Special - Gloss Measurements on Semi-Gloss Paints

In cooperative work with the National Bureau of Standards, these factors were found to be of considerable importance in making gloss measurements:

1. Films should be applied to highly polished surfaces for gloss measurement. (Do not use ground glass or any similarly roughened surface.) 48 hour drying time: Semi-Lustre OJ 660 I on polished glass - 60%
" " " " ground glass - 49%

2. The film thickness should be standardized, preferably gauge clearance = 0.005 - 0.006". Semi-Lustre OJ 660 I on polished black glass - 48 hours' drying: 0.005" gauge clearance - gloss 52-1/2%
0.005" " " - " 53-1/2%

3. So far as we can tell, there is no difference whether the polished glass is clear, opaque white, or black when making gloss measurements. Gloss after 5 days' drying - OJ 660 I:

	0.003" gauge clearance draw-down	0.005" gauge clearance draw-down
Polished clear glass	52%	53%
" white "	51%	53%
" black "	51%	55%

Rosin Conservation

During the month a number of experimental varnishes based on tall oil were tested for use in Semi-Lustre and Porch and Deck Paints.

	Type	Body	Color (Gardner)	Oil used
CVR 116	Special (3899)N	L	15	Esterified tall oil.
CVR 119	" "	O	14-15	"D" Oil - (5055) Spec.
CVR 122	" "	I-J	14	CW (2150) Ref. tall oil.
CVR 126	Special (48)	45	4 L - 4	Hempseed Oil
CVR 134	Special (3880)E	P	18 +	Oiticica, linseed, and tall oil ester.
CVR 139	Special (4880)E	F -	16	Tall oil - linseed.

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Rosin Conservation

	Type	Body	Color (Gardner)	Oil Used
CVR 157	Special (4880)E	G +	16	Tall oil - linseed.
CVR 153	" "	G	16-17	Tall oil, linseed, wood oil.
CVR 108	Special (2281)	H-I	10	Oiticica, linseed.
CVR 45	Esterified Tall Oil	86" (S-W tube)	8 (Hellige)	Esterified tall oil.
CVR 120	" "	30" (S-W tube)	14	CW (2150) Refined tall oil.

Considerable time was spent on the reformulation of Semi-Lustre to use Esterified Tall Oil. In order to obtain the desired sheen, body, flow, drying and brushing characteristics, formulas were established using a combination of CVR 120 (CV-82), CVR 122 (CV-83) and CVR 108 (AV-55) for Semi-Lustre White - Rex 16270, Ivory - Rex 16269, Cream - Rex 16276, Jonquil Yellow - Rex 16268, and Pale Green - Rex 16290. The above formula revisions were sent to Cleveland for approval, depending on the performance of initial production batches as made on the above rexes at Chicago.

Based on our initial tests on CVR 116, 119 and 122 it was quite evident the Special (3899)N could be made satisfactorily using crude esterified tall oil (CVR-45), "D" oil - (5055) Special or refined tall oil, depending on the availability of each.

CVR 134, (3880)E varnish made from oiticica, linseed and tall oil, was compared in Flat-Tone White with the present production made from linseed and Thermoil A, and the pre-war (3880)E based on Dehydrol and ester gum. The washability, measured by the number of rubs required to remove the film when applied over a glue-sized surface, was as follows:

	Required rubs to remove film	Rated
1. Flat-Tone (using Ester Gum Dehydrol (3880)E)	Over 300	Very good
2. " " (using linseed Thermoil A (3880)E)	100	Poor
3. " " (using oiticica, linseed, tall oil (3880)E)	70	Very poor

The above results indicate that (3880)E should be made with ester gum and Dehydrol as soon as these raw materials are available.

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#162 - Cont.
Rosin Conservation

A sample of micronized Metronite sent to the Chicago plant was compared with regular Metronite - 2201 dry, versus the regular inert combination of Micro Velva A - 2188 dry and magnesium silicate - 20 L in Flat-Tone White. The initial viscosities of the Flat-Tone batches were as follows:

	Inert	Viscosity - #5 Orifice
OJ 778 I	2188 and 20 L dry	6.6"
OJ 779 I	2201 dry	5.6"
OJ 780 I	Micronized 2201	5.6"

The above paints were applied over a glue-sized panel and checked for washability. The two paints made from Metronite were slightly better in washability than the regular 20 L and 2188 dry inert combination. Additional tests will be made with Metronite as an inert in the post-war flat formulations.

CVR 139 and CVR 157 are (4880)E type varnishes made from tall oil. The above liquids were compared with (4680)E in Porch and Deck Paints. Paints have been prepared for exposure at Florida and Chicago to determine the exterior durability of the tall oil varnishes. Leaded zinc, titanium calcium, and pure titanium dioxide pigmentations are being compared.

CVR 157 is similar to CVR 139 but is higher in acid value and is intended for use with titanium pigmentations. CVR 157 and CVR 153, however, show no particular advantage with respect to drying over CVR 139.

The results of the test work to date indicate that the tall oil (4880)E is slightly slower in drying than (4880)E on set-to-touch and over night drying. However, after 48 hours the through drying properties are equal to standard.

0.005" draw-down films aged for 9 days and scrubbed, using our standard method, indicate that tall oil (4880)E films have less scrub resistance than regular (4880)E when compared in a Porch and Deck or Semi-Lustre formulation.

Tests on water and soap resistance, of tall oil Porch and Deck films indicate about the same amount of whitening with water and slightly less whitening with 1% soap solution than with regular (4880)E. The Porch and Deck exposures will be reported on at a later date.

See chart on next page.

Tall Oil Porch and Deck Formulation

Batch No	Pigmentation	Vehicle	Viscosity Fresh	Viscosity 48 Hrs.	Drying Set-to-touch	Drying 24 Hrs.	Gloss	24 Hr. Water Spot Test	3 Hr. 1% Soap Test	Raw Material Cost
865 II	412, 2188	Reg. (4880)E CVR-58	37"	41.8"	110 min.	Standard	Standard	*Def. whitening	Bad whitening	$106.22
866 II	412, 2188	CVR-139	25"	25"	110 "	Slightly softer than reg.	Very sl. higher than std.	"	Sl. less than 865 II	$108.42
895 I	2140, 2247, 566	CVR-139	20.4"	25.6"	132 "	"	Slightly higher than 866 II	"	Def. whitening, blistered	$85.48
896 I	2174, 2247, 566	CVR-139	23.8"	28.9"	132 "	"	Standard	"	Def. whitening	$91.99
897 I	2140, 2247 566	CVR-157	31.8"	40.8"	-	Sl. softer than reg.	Sl. higher than std.	"	Def. whitening, blistered.	-
898 II	2174, 2247, 566	CVR-157	35.6"	24 hrs. 41.6"	-	"	Bad wrinkling	"	Def. whitening	-

*Note - On the water spot test, the 865 II completely recovered in eight hours, but a small amount of whitening remained in the case of the tall oil varnishes.

.005 inch films of 865 II and 866 II were aged for 9 days and scrubbed using the standard method. The tall oil film did not have the scrub resistance of the regular (4880)E. The film became thin in about 1/3 of the time required for the regular to reach the same point.

#12 - Cont.

A special examination at one month exposure, comprising both rain and strong sunlight, showed all panels normal as to gloss, color and general appearance. There are a few cases of small blisters near edges, in most cases where no sealers were used. The unpainted controls show bad rusting of nail heads, but this is much worse on the regular plywood than on the coated types. Regular plywood already shows signs of grain-raising at one month.

#162 - Studies in Flat Wall Paint Formulation

52P22 (Int.) Paint, Inside, Semi-Gloss, White; Fire Retardant

Zinc Oxide Evaluation

After a period of 21 days' aging viscosity measurements were made on the series of paints made with various zinc oxide pigments. No reactivity has taken place with any of the samples. This absence of reactivity would explain the fact that the presence or absence of zinc oxide does not affect washability materially as long as the pigment volume is maintained.

Rosin Conservation

The varnishes listed below were tested in Enameloid and Semi-Lustre during June;

(3848)E

Type Varnish	Body	Color	
CVR 173	O - P	6	Nelio Rosin, P.E. Sludge No. 1, linseed.
CVR 177	T	12-13	Nelio, glycerine, linseed.
CV 116	O - P	12 +	Factory batch of CVR 177.
CV-116-2	N	11 +	Factory batch of CVR 177 (slight variation in cooking).
CVR 211	O - P	12 +	Nelio, Heydenol #598, linseed.
-	-	-	J. H. Hinz Co. Esterified Tall Oil.
CVR 113	-	-	Similar to CV 82 but D Oil (National Southern Products).
CVR 119	P	14-15	Same as CV 83 but made with D Oil.
CVR 217	P - Q	11-12	Nelio Rosin, glycerine, linseed.

(Cont.)

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(3848)E Type Varnish	Body	Color	
CV 7001	N	10 +	Same as CVR 211 but factory batch.
CVR 214	H - I	10-11	Nelio Rosin, glycerine, linseed (320).
CVR 214-2	F	9-10	" " " " "

CVR 177 and the two factory batches CV 116 and 116-2 made from Nelio Rosin, glycerine and linseed, were tested in Enameloid White as replacements for (3848)E. Similar type varnishes, CVR 175, 211 and CV 7001 made from Nelio Rosin, P.E. Sludge, linseed, were also evaluated in the same formulation.

Based on laboratory tests, the Nelio Rosin, glycerine, linseed varnishes were satisfactory in Enameloid White with respect to brushing, flow, and drying. However, they were not equal in brightness to enamels made from (3848)E.

The Nelio rosin, P.E. sludge, linseed varnishes were similar to the varnishes made from glycerine and were more desirable from a color standpoint.

A revised formula for Enameloid White based on CV 116 has been sent to Cleveland and production is now under way at the Chicago plant.

Due to a shortage of tall oil, work has been under way to revise Semi-Lustre White and tints. CVR 116, 211, 214, 214-2 and 217 have been investigated as a vehicle for this work. However, to date we have not been successful in obtaining a uniform sheen. Work will be continued.

CVR 118 and 119, esterified D tall oil liquids, similar to CV 82 and 83, were tested in Semi-Lustre and found to be too dark for the white but they could be used in the tints.

Esterified tall oil ester, from J. H. Hinz Company, was tested in Semi-Lustre White and found to be satisfactory as a substitute for CV 82.

Paintercraft One Coat Flat No. 10 (Rex 65310)

Some work was done during the month on the development of a post-war One Coat Flat. Several vehicle combinations were tested using various combinations of (3830)E, CV 1396 (Linogel), (785) and (1157) to improve brushing characteristics. Satisfactory flow and brushing were obtained but washability was below acceptable limits. Mr. Walton will make a number of variations of (3830)E for the purpose of improving the brushing characteristics of this liquid. Work will be continued.

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Two coal resin linseed varnishes were submitted for evaluation during June by the Resin Research Laboratory. Varnish CRBO 292 was 20 gallons in length with a body of E at 50% solids. Varnish CRBO 294 was 30 gallons in length with a Q body at 50% solids.

A number of formulations such as Enameloid, Semi-Lustre and Wall Primer and Sealer were made using CRBO 292.

Based on our observations to date, it is quite evident the dark color of the coal resin varnishes will restrict their usage to relatively dark colored paints and enamels. The drying characteristics and film properties appear to be quite good. Our tests are not complete and no exterior exposures have been made to evaluate the durability of this material.

To date our work has been limited to the 20 gallon varnish, CRBO 292. This particular varnish was satisfactory for body in Wall Primer and Sealer but was too thin for Enameloid or Semi-Lustre. Future batches will be made using varnish CRBO 294 and these will be reported on at a later date.

Wall Primer and Sealer Tests

		Drying Set-to-touch	Over Night	Viscosity #3 Fresh	Viscosity #3 3 Days	Color	Varnishes Used
943 I	Regular formula Rex 19681 5-14-45	45 min.	Hard	23"	18.9"	Std.	AV 30 (3320)
3 J	Regular formula Rex 19681 10-11-44	-	Hard	22.2"	23"	Std.	(1157) (3848) E (1752)
2 J	As above, but coal resin varnish CRBO 292	40 min.	Hard +	20.8"	17.6"	Poor	CRBO 292
		Semi-Lustre Cream					
8 J	Rex 16274 Form. 6-26-45	25 min.	Good	37.8"	25.6"	Std.	AV 30 (48)
7 J	As above, using varnish CRBO 292	30 min.	Very good	17.2"	15.0"	Very dirty	CRBO 292 (48)

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Enameloid Ivory

		Drying Set-to-touch	Over Night	Viscosity #5 Fresh	3 Days	Color	Varnishon Hood
9 J	Rex 711 Formula 3-7-45	40 min.	Hard	24"	23"	Std.	AV 30
10 J	As above, but varnish CREO 292	20 min.	Hard +	15.8"	16.2"	Very dirty	CREO 292 (AV)

With the assistance of the Cleveland Technical Service Department we checked Hickson's proposed revision of Federal Specification TT-P-56 for Paint; Primer-Sealer, (For) Plaster and Wallboard. Our principal criticisms were that hiding requirements were higher than necessary, that the flexibility tests were rather severe, the lower limit for gloss too low, that tests for second coat uniformity over areas with suction spots were not adequate, and that brushing tests could be made more practical.

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No work done during the month on the following projects:

#150 - Durability Studies of Zinc Sulphide Pigment Combinations

#178 - Studies of Dark Colored House Paints

#112 - Fire Retardant Paints

#86 - Durability of Pigments with Special Reference to Leaded Zinc and White Lead

#148 - Examination of White Lead

#177 - Pigment Studies

#77 - Mildew Inhibitors

#160 - Painting of Bricks

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#182 - Cont.

Reduction of paste consistency with additional (3128) varnish was found to be impractical due to the high viscosity of the varnish itself. On the other hand, the addition of thinners, even if used in moderate amounts, appears to affect excessively the grinding properties of the varnish. The use of wetting agents with thinners appears to overcome this objection and to be even more effective than with the high viscosity varnish mix.

This work is of considerable interest and will be checked with factory runs just as soon as they can be arranged.

#162 - Studies in Flat Wall Paint Formulation

Rosin Conservation

The Enameloid White formula of 12/9/45 was made using the first factory production of the Nelio rosin, Heydenol, linseed varnish, CV-7001. The above varnish was compared with standard (3848)E and was found to be equal in drying, brushing, and flow, and slightly superior in color. The introduction of 10 pounds Witcarb-R increased the body and reduced the flow to a more desirable range than normally experienced with standard (3848)E.

Batch	Varnish Tested	Viscosity		Drying			
		Fresh	2 days	Set-to-touch	24 hrs.	Color	Flow and Brushing
OJ 998 I	CV-7001	33.8"	38.6"	80 min.	Hard	S1. brighter than OJ 980 I	Good
OJ 980 I	Regular (3848)E	33.8"	43"	80 "	"	Standard	Good

Considerable work has been done on the reformulation of Semi-Lustre and Enameloid using CV-116 and CV-7001. In connection with this work, some seeding troubles have been encountered using the above varnishes, as well as with regular (3848)E. Tests are now under way using tallate and naphthenate driers in conjunction with CV-7001, CV-116, AV-59 and (3848)E in Enameloid White. A small percentage of Nuolate Calcium is also being introduced as a stabilizing agent.

In connection with the reformulation of Semi-Lustre White from CV-116 and CV-7001, we encountered low and non-uniform sheen. This trouble was also experienced with previous (3848)E production on Semi-Lustre and on the first factory production using the AV-59 varnish. At Cleveland's suggestion, the (3020) was eliminated from the formulas and

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the hazing disappeared. Alternate formulations for Enameloid and Semi-Lustre using CV-116 and CV-7C01 will be established in the near future.

Two Pentalyn G - linseed oil varnishes listed below were compared with regular (3848)E in Enameloid White.

CVR-235 - One fourth of resin run with oil and balance used for check.

Body - P-Q
Color - 10-11
N. V. - 60%

CVR-237 - Oil gelled and checked with resin.

Body - O-P
Color - 10
N.V. - 60%

The two special varnishes were similar to regular (3848)E in brushing, flow, gloss, and drying characteristics.

Batch	Varnish Tested	Drying Time Set-to-touch	24 hrs.	Tack	Visc. #3 orifice Fresh	Overnight
OJ 37 J	Reg. (3848)E	1 hr. 55 min.	Hard	V. Slight	32"	35"
OJ 67 J	CVR-235	2 hrs.	Hard	OK	42"	37.6"
OJ 68 J	CVR-237	1 hr. 55 min.	Hard	OK	35.6"	31"

Experimental varnish CVR-235 is slightly more desirable than CVR-237 from a body standpoint, but not quite as good for color. Both show considerable superiority to regular (3848)E in soap resistance and are approximately equal to it in cold water resistance.

A number of Coal Rosin varnishes coded CRB-C292, C294, 0315, and 0317 were submitted by the Rosin Research Laboratory for evaluation in Trade Sales formulations. The above varnishes were tested in Wall Primer and Sealer, Semi-Lustre, Enameloid and Porch and Deck Paint. All varnishes tested so far have been too dark to use in whites or tints. Draw-down films have been made on glass and will be checked for elasticity from time to time. Freshly applied paint films become quite brittle after a few days. However, the Rosin Research have found paints aged for several days produce more elastic films. This feature is being checked.

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A sample of Wall Primer and Sealer Rx 19681, based on the Coal Resin varnish CRB-0317, was sent to Cleveland for their inspection. Porch & Deck exposures will be made to determine the exterior durability and film characteristics.

#86 - Durability of Pigments with Special Reference to Leaded Zinc and White Lead

A report was given limited distribution during the month covering the 1943-4 Porch & Deck Paint exposures. These tests were put out to evaluate (a) pigmentation, principally lead-zinc-extenders against rutile types of titanium oxides and titanium calcium extended pigments, (b) vehicles such as alkyds, phenolics, natural resins, ester gum, rosin and other types of varnishes.

One of the groups of tests is on a special horizontal platform of low grade Yellow Pine, exposed at the Chicago Exposure Farm only, with sections of each paint system being washed periodically with soap and water. The other more extensive series were all two coats self-primed, exposed 45° south Chicago and Florida. One group was on Yellow Pine and on steel over Kromik Primer, another set on Yellow Pine only, and a third on Douglas Fir only.

The outstanding and general finding was that the rutile titanium calcium pigmentation such as was used in 1942 is far superior to leaded zinc in resistance to cracking and flaking. Non-chalking rutile TiO_2 plus extenders shows considerable promise, showing outstanding gloss retention in the series on metal. Combinations of leaded zinc with TiO_2, basic carbonate white lead, lithopone, zinc sulfide, etc., range from fair to poor on wood. On steel, erosion replaces flaking as the principal failure - lithopone and zinc sulfide being bad in this respect. Leaded zinc paints do not show the flaking tendencies exhibited on wood.

This agrees with house paint priming experience where the simultaneous use of zinc oxide and varnish rosins is avoided because of flaking tendencies, particularly on Group 3 or 4 woods.

From the standpoint of vehicles, the titanium pigments subordinate differences in vehicle durability, so that even paints made with Velsicol (3850)N and East India (429) show fair performance.

#164 - Reformulation Studies of House Paints to Reduce Dirt Collection

During the month, seven paints were received from du Pont for cooperative exposures against S-W samples at Chicago and Wilmington, plus such supplementary location as each might elect. The object of the tests is to determine the desirability of including some basic carbonate white lead in the formula, and to compare the results of duplicate exposures at Chicago and Wilmington. Our Chicago exposures, particularly of

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applied on a 9-foot siding panel over Rx 450 Undercoater of the same production date. The topcoat of Gloss White was applied in sections after the Undercoater had dried 1, 2, 7, 15, and 30 days. Both Chicago and Florida panels had been out 24 months. There was no failure at either location and no differences were noted except very minor ones in the past record. It is felt that this apparent greater latitude in allowable drying time of Rx 450 should be pointed out in view of the previous findings that prolonged drying of a prime coat is detrimental. Specifically, we had tests several years ago, which showed a very serious impairment of durability of Rx 471 self-primed at more than a 4-day dry. We will not change our recommendations advising relatively early recoating of Rx 450 until the exposures have advanced to the point of break-down.

Exterior Finishes for Plywood

A brief memorandum on the Plywood Exposure Project was issued during the month. Preparation of two repeat panels of CK-1538 Q. D. Primer - CK 1540 Gloss Red Enemel was described, this being necessary because of inadequate coating of the original tests on Super Harborite. An impression was corrected that we had inadvertently given. This particular coated wood required especial care in order to take the CK-1538 - CK-1540 system satisfactorily, though no difficulty was experienced with the other woods. At 30 days exposure, the panels looked excellent, though a few without edge sealers showed incipient blistering. The regular plywood uncoated control already showed signs of grain-raising.

#177 - Pigment Studies

A general examination of 414, 15/85 leaded zinc exposures up to four years duration shows that it performs as a co-fumed product similar to 412, 35/65 leaded zinc, except for slightly more dirt collection.

No work was done during the month on the following projects:

#150 - Durability Studies of Zinc Sulphide Pigment Combinations

#178 - Studies of Dark Colored House Paints

#112 - Fire Retardant Paints

#148 - Examination of White Lead

#160 - Painting of Bricks

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#164 - Cont.

The painting of the panels for the du Pont cooperative exposure test, described in the July report, was completed during the month. The series ran from 9958 through 10,023, for a total of 260 panels. The fundamental comparisons will be between exposure locations at Chicago, Illinois and Wilmington, Delaware, but we will also expose our panels at Coffeyville and Miami. du Pont will also expose at other locations.

Since du Pont do not recommend the use of a special undercoater, the paints are exposed self-primed, over Rex 450 SWP Undercoater, and over Rex 450 tinted gray to emphasize erosion tendencies of the top coats.

#86 - Durability of Pigments with Special Reference to Leaded Zinc and White Lead

The following house test was completed during the month:

Breyfogle House, Dixie Highway and Cedar Road, Homewood. Regular Rex 450 Undercoater over all except large boxed eaves. Test top coats are: OJ 89 J SWP White Special using 9 dry basic lead sulphate, OJ 90 J, same but using 18 dry basic lead carbonate (essentially current regular formula), and OJ 30 J Ti-Sil Outside White. On the eaves and other trim, two Trimbrite Mayfair Green formulas are tested, one using 2188 dry Micro Velva A, the other Ground York Limestone.

#163 - One Coat House Paint

The following house test was completed during the month:

Rietveld house, 14432 Desplaines Street, Harvey. CH 4697, C 1495 One Coat House Paint White, regular, as control, against OJ 186 JJ as regular except eliminating 1895 lead titanate and retaining CW 1971 mica, and OJ 187 JJ which is vice-versa, eliminating mica, retaining the lead titanate.

#12 - Exterior Primers

Acme asked for recommendations for a one coat paint for prefabricated farm buildings for the Evans Products Company. Two formulations were developed along the lines of Exterior Prefab Primer CH 3285, but were not satisfactory due to through drying being too slow. The investigation was turned over to C. H. Williams to try a fast drying alkyd one coat material. However, it was felt that some experience could be gained by exposing the CH 3285 variations, and exposures are planned for Chicago, using Douglas Fir plywood.

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#162 - Studies in Flat Wall Paint Formulation

During the month considerable time was spent on the reformulation of the Paintercraft One Coat Flat Wall Paint #10, Rex 65310. In the reformulation work, a special effort was made to eliminate ghosting and improve the uniformity over non-uniform surfaces. A proposed formulation has been worked out based on (3880)E varnish and CW (1996), Linogel from Archer-Daniels Midland Company, as the principal constituents in the vehicle. The pigmentation is based on rutile titanium dioxide and rutile titanium calcium. The new formula has been increased in hiding over the present material by approximately 40% to insure a more uniform job over surfaces that are difficult to hide.

The new flat can be brushed full body for application over surfaces that are difficult to hide but the best performance will be obtained by reducing it with 1/2 to 1 pint of mineral spirits to the gallon.

The old and new formulations would compare as follows:

	Cost per 100 Gals.	Hiding Units	V/P	Hiding Pigment per 100 Gallons
One Coat Flat #10 Formula 9-13-44	$77.84	21,090	.82	570 pounds 2132 dry
Proposed Revision OJ 198 J	92.03	27,950	.78	550 pounds 2132 dry 100 " 2173 dry

Samples of the new flat have been sent to Cleveland and Newark for inspection and distribution.

A number of popular calcicoaters that are now being sold in the east, were tested for general performance over surfaces such as Enamel, Wall Primer and Sealer, Flat Wall Paint, Kem-Tone and Decotint. All of the calcicoaters were recommended for use over calcimine or porous surfaces. However, we were interested in the uniformity over surfaces that vary in porosity, checking their uniformity of tint and sheen. Based on our results below it is quite evident that materials of this type are not as suitable for wall application as a good flat wall paint.

The calcicoaters include the following products, tested at the reductions recommended:

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Product	Manufacturer	Reduction
Eagle (Kalsa-Koater for calcimine ceilings only)	Eagle Paint and Varnish Works Long Island City, N. Y.	1-1/2 pints (348) per gallon
Ceil-Tone (Flat White for use on calcimine, white-wash and over porous surfaces)	20th Century Paint and Varnish Company Brooklyn, New York	1/2 pint (348) per gallon
Frisco Ceiling Cote (for use over calcimine, casein or flat wall paint)	Frisco and Company, Inc. New York, N. Y.	1 pint (348) per gallon
Ovakal (Flat White for use overcalcimine only)	Art-Tex Adhesive Products, Inc. Brooklyn, N. Y.	1-1/2 pints (348) per gallon

	Eagle	Ceil-Tone	Ceiling Cote	Ovakal
Brushing	Good	Good	Good	Good -
Flow	Very good	Very good	Good	Fair
Wet edge at 8 minutes.	Short on wet edge.	Not satisfactory; set too fast.	OK	Set too fast
Washability (over glue size)	Film removed after 20 rubs; very poor.	Film removed after 100 rubs; fair.	Film removed after 20 rubs; very poor.	Film removed after 20 rubs; very poor.
Uniformity of tint*	Poor	Fair	Poor	Poor
Uniformity of sheen	Fair to good	Poor	Good	Fair

*Sample applied over strips of Enameloid, Wall Primer and Sealer, Flat Wall Paint (Rex 15185), Ken-Tone, and Decotint White for uniformity characteristics.

A number of Coal Resin varnishes coded CRB-0292, 0294, 0315 and 0317 were submitted by the Resin Research for our evaluation. The various varnishes were tested in Wall Primer and Sealer, Semi-Lustre, Enameloid and Porch and Deck Paint. The coal resin varnishes were all found to be

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too dark in color except for Gray Porch and Deck Paints. Draw-down films on glass became very brittle after a few days' ageing. The above tests were made on freshly prepared paints and also on paints that had been aged from one to two weeks. No difference could be detected in the elasticity of the films. Due to the poor elasticity of the coal resin varnishes when compared with varnishes such as AV-50, it is quite evident that the above material cannot be used in trade sales formulations. Exposure tests are under way and will be reported on at a later date.

Work was continued during the month on the reformulation of Semi-Lustre White based on CV-116 Nelio glycerine linseed varnish and CV-7001 Nelio P.E. Sludge linseed varnish. Factory batches have been made based on a lithopone-titanium calcium pigmentation and 20 MSK as the inert. These batches were satisfactory in all respects but they were very slightly yellow in color due, at least in part, to the manganese drier present in the formula. The yellow color has been eliminated by using the lead-cobalt drier combination of the Semi-Lustre White formula dated 5-29-45. The new formulas will be sent to Cleveland within the near future to be established as alternates for Rex 210.

Rosin Conservation

The July report mentioned that tests were under way using tallate and naphthenate driers (0.6% Pb and 0.04% Co) in Enameloid White, using equal volumes (78 gallons at 60% solids) of the varnishes (3848)E linseed modification, AV-59 (rosin-styrene) and the Nelio varnishes CV-116 (glycerine) and CV-7001 (P.E. Sludge). We also followed Cleveland's thought of using a small amount (0.06% Ca) of Calcium Nuolate as a stabilizing agent. The added calcium shows some tendency to increase the body of the (3848)E and AV-59 enamels in which the driers are of the tallate type, but increased degree of hardness on through dry.

No evidence of seeding developed after 6 weeks' storage at either 105° F. or at room temperatures. Drying tests run after various intervals show that the AV-59 enamels set-to-touch the fastest, and dry through the hardest. There was no evidence of embrittlement of any of the films air dried on glass after six weeks.

Space does not permit inclusion of all the data accumulated. Actually the interest in varnishes such as CV-116 and CV-7001 declines with the improved supply situation of pure P.E. For the sake of the record one set of data is included showing the comparisons after 6 weeks of storage of the enamels at room temperatures ranging from 74° to 94° F.

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OJ No.	Varnish	Driers	Viscosities Ini. Sec.	6 wks. Sec.	Set-to-touch Hr.	Min.	Condition at 8 hrs.	Condition at 24 hrs.
128 J	(3848)E	Naph.	37.4	41	1	25	Very tacky	Definite tack; firm.
129 J	"	" + Ca	39.2	44.4	"		Def.+ tack	Tacky; quite hard.
130 J	"	Tall.	37.2	44.4	"		Def. tack	Def.- tack;quite hard.
131 J	"	" + Ca	41.8	49	"		Def.- tack	Slight + tack; hard.
132 J	AV-59	Naph.	39.8	43.6	-	55	Tacky	Slight + tack; hard.
133 J	"	" + Ca	46.4	52	"		Sl. tack	Sl.- tack; very hard.
134 J	"	Tall.	47.0	49	"		Tacky	Sl.- tack; very hard.
135 J	"	" + Ca	46.8	60	"		Sl. tack	V.sl. tack; very hard.
136 J	CV-116	Naph.	37.6	39	1	20	Def.- tack	Sl. tack; hard.
137 J	"	" + Ca	35.6	35.4	"		Sl. tack	Sl.- tack; hard.
138 J	"	Tall.	33.6	27	"		Tacky	Sl. tack; hard.
139 J	"	" + Ca	37.2	35	"		Sl.+ tack	Sl.- tack; hard.
140 J	CV-7001	Naph.	27.2	26	1	45	Def.+ tack	Tacky; hard.
141 J	"	" + Ca	29.4	28	"		Def. tack	Sl. tack; very hard.
142 J	"	Tall.	29.2	28	"		Def. tack	Sl. + tack; hard.
143 J	"	" + Ca	32.2	28.4	"		Def. tack	Sl. tack; very hard.

No work done on the following projects during the month:

#77 - Mildew Inhibitors
#177 - Pigment Studies
#150 - Durability Studies of Zinc Sulphide Pigment Combinations
#178 - Studies of Dark Colored House Paints
#112 - Fire Retardant Paints
#148 - Examination of White Lead
#160 - Painting of Bricks

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#12 - Cont. Exterior Prefab Primer
Cont.

OJ No.	Varnish Under Test	Visc. #3 Or.	Drying Characteristics Set-to-Touch	Drying Characteristics Over Night	Solubility in (348) O'Nite Dry	Linseed Oil Spot Test for 1 hr. O'Nite Dry	P.V.C.
508 J	X 480 - SN 1172	5"	2 Hr.	Typical oil film	Film removed with sl. rub	Film sl. softer under oil after 1 hr.	36
509 J	CW (2253)	6.4	9 Min.	Hard and tough; similar to 505 J	"	"	36
510 J	RB 1220	31.2	4 Min.	"	"	Film def. softer	36

	Body	Color	Solids
RB 1209 - (CV 5006) = Styrene P. E. Phthalate	W	9	50%
RB 1215 - Styrene P. E. Phthalate - 20 length	Y-Z	9	70%
CW(2253) - 50% Styrene - 50% linseed	Z_8+	?	100%
X 480 Oil - SN 1172 15% Styrene Modified Linseed	S-T	?	100%
RB 1220 Styrene linseed	Z_8+++	6 hazy	100%

Exposures will be prepared using plywood exterior grade with SWP Gloss White as the top coat. Regular CH 3285, which carries 11.6% zinc oxide, will be included as well as two variations at 5% and 0% zinc oxide to see if we can reduce the flaking from Douglas Fir plywood.

#162 - Studies in Flat Wall Paint Formulation

Flat-Tone White

Work has been under way to improve the odor of Flat-Tone by the introduction of deodorized thinners. The Varnish Research Division prepared a special (3880)E using Shell's deodorized 8296 Special Mineral Spirits and Shell's 8230 Regular Base No. 1 for the (348) and (3020) normally used.

The Shell thinners were found to be superior in odor to our regular (348) and (3020). Our next move will be to check our laboratory work by painting two rooms, one with regular Flat-Tone and one with material using the deodorized Shell thinners. Further reports will be made at the completion of the above tests.

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Semi-Lustre

Work has continued during the month to determine the cause for the drop in sheen of Semi-Lustre based on (3848)E. Laboratory batches of Semi-Lustre have been made using regular (3848)E (body O) and (3848)E blown with air for a period of 3 days. The blown (3848)E was adjusted for weight by the addition of (348) and laboratory batches of Semi-Lustre White were made using the two varnishes.

The Semi-Lustre made from the blown (3848)E was definitely lower in sheen than the batch made from the unblown varnish. Work on this problem is being continued.

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Aged films on Porch and Floor, Enameloid, Semi-Lustre and Interior Gloss, made from tall oil varnishes CVR 316, were checked for elasticity after six weeks of drying at room temperature.

In the case of Enameloid and Porch and Floor Enamel, the introduction of the tall oil varnish produced very brittle films. The Interior Gloss and Semi-Lustre films, however, remained quite elastic over this period, due to the large amount of (48) used in conjunction with the tall oil varnish. A white enamel formulated with AV 96 (tall oil alkyd) and (6100) also became very brittle after 22 days.

A sample of CVR 360, a special (6173) based on tall oil, was submitted by the Varnish Research Division for test in Semi-Lustre and Porch and Floor Enamel. The above varnish was slow in drying and produced too thin a body for Porch and Floor Enamel or Semi-Lustre. The Varnish Research Division is continuing work to improve the drying characteristics and to produce the body of the tall oil varnish most desirable for pigmentation.

Panels 10201-6 were prepared for exposure on yellow pine and steel, Florida and Chicago, of three Porch and Floor Enamels. The paints include Porch and Deck Paint Extra Dark Slate, regular of 1-11-43 carrying (3848)E and (6173); Rex 151 Porch and Floor Enamel Light Gray, regular of 9-26-45 with AV 97 Rosin P.E. Maleic varnish and (6173); and a special in which CVR 316 tall oil varnish replaces the AV 97.

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Miscellaneous Tests

Standard gloss panels were sent in by Cleveland for check on the instruments available at Chicago. This is in connection with Cleveland's standardization program. Readings and comments follow:

Panel No.	Chgo. Hunter #822 45°	Chgo. Hunter #822 60°	Gardner 60°	Photovolt X	Photovolt 60°	Photovolt O	Addison-Peterson X	Addison-Peterson 60°	Addison-Peterson O	Bureau of Std. 60°
1	21	27	22		10 - 11		14.5	14	12.5	14
2	32	43.5	36		20		23	24	23.5	22.4
3	40	60	49	32	30	28	36.0	34.5	34.0	32
4	47	73.5	63	47	43	41	52	46	48	46
5	50	77	73	47	53	47	55	55	51	55
6	54	84.5	83	65	67	65	67	68.5	63	70
7	56	90	93	80.5	80.5	79	83	83	79	79
8	54	85	85	67	69	66	71.5	70	68	69

It will be noted that on many of the panels three readings were reported for the Photovolt and the Addison-Peterson gloss meters. This was done because the panels varied in some instances. The readings on the Hunter and Gardner are in very poor agreement, while both the Photovolt and Addison-Peterson instruments give readings quite similar to the results reported by the National Bureau of Standards. Panel 6 rating by the Bureau of Standards appears to be out of line.

#103 - Metal Protective Paints

Basic Lead Silicate in Metal Primers

An evaluation program of basic lead silicate in metal primers was started. The formulations used were based upon those suggested by Eagle-Picher. Salt spray tests indicated that basic lead silicate provides poor inhibition to rust in comparison with zinc chromate. Those primers containing zinc chromate show more blistering than where basic lead silicate is used. On 3% salt immersion tests there seemed to be a slight superiority of basic lead silicate over zinc chromate insofar as rust inhibition is concerned.

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Two batches of Rex 710 Enameloid White were made without milling by adding 2% Acto 450 and replacing 547 dry by 10% aluminum stearate gel. The pigment, Acto 450, gel, and small amount of varnish were mixed as a moderately heavy paste on the pony mixer for 20 minutes and then reduced with the remainder of the vehicle. Using a 10% (348) aluminum stearate gel a 5-1/2 grind was obtained. Using a 10% (584) gel a 4-1/2 grind was obtained. 10% calcium stearate in (348) did not form a gel when heated, but dissolved on addition of 2% stearic acid. This calcium stearate solution was ineffective as a replacement for the aluminum stearate gel.

In connection with the seeding problem in Enameloid, the omission of driers reduced the seeding only very slightly. The addition of small amounts of stearic acid, linseed fatty acids, or zinc oxide had little or no effect on seeding.

#177 - Pigment Studies

A review of the zinc oxide pigment listings has been made in an effort to establish the characteristics to be associated with each given dry number.

First, it has been suggested that the following numbers be canceled, since usage during the 1943-44 fiscal year was under one ton or the product did not represent an established grade.

112	682	1546 CW
113	1023	1550
190	1065	1565
527	1092	1607
632	1098	1845
	1382	

It was also suggested that 1044 dry be voided because this number covers Azo 222-22, which is also listed as 2138 dry. The later assignment is generally more familiar throughout the institution due to its wide usage in government specifications during the war period.

After the above cancelations the active list of zinc oxides would be as follows:

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Dry No.	Type	Brand Name	Mfr.
2	French, medium color.	Florence Green Seal #8	New Jersey
	" " "	Florence Green Seal	Anaconda
4	French, minimum color.	Florence Red Seal #9	New Jersey
	" " "	Florence Red Seal	Anaconda
*108	American, fine particle size.	Horse Head XX-592	New Jersey
1415	Palmerton Process, extremely fine particle size.	Kadox Black Label #15	New Jersey
1554	Off-grade ZnO - Any manufacturer at 6¢ per pound or less, each lot subject to specific approval for given end use.		
1704	American, high consistency; medium particle size; good color.	Horse Head XX-55	New Jersey
1707	American, low consistency; medium large particle size; good color.	Horse Head XX-50	New Jersey
2059	American, large particle, nodular; low fines.	Horse Head XX-503	New Jersey
2090	American, very fine particle size; excellent color. (Used as a low cost French oxide.)	Horse Head XX-101	New Jersey
2138	American, large acicular.	Azo ZZZ-22	American Zinc Sales
2143	American, medium-large acicular.	" ZZZ-11	" " "
2202	American, fine; color is off-grade.	Superior Zinc Oxide SZ 100	Superior Zinc Co.
2278	American, fine particle size.	St. Joseph #30	St. Joseph
2295	American, small acicular.	Azo ZZZ-33	American Zinc Sales

*It should be noted that this number has been variously used to cover Azo ZZZ-33, 11, Horse Head XX-2, 92, 592 and Superior Zinc Company's SZ 100. With the exception of Horse Head XX-2 and XX-92 all of the other grades are more specifically covered by other dry numbers in the above listing.

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Classifying the above materials as to type and usage the following groupings are suggested:

Zinc Oxide Pigments for Interior Usage

French Process

2 dry
4 "
2090 " (although an American oxide, this is used by the Chicago Lacquer Dept. as a low cost French oxide.)
1415 "

American

108*
1704
2090
2202
2278*

*It is of interest that 108 dry and 2278 dry are to a great extent being used as intermediates; 108 at Bound Brook, 2278 at the Chicago Dry Color Department.

Zinc Oxide Pigments for Exterior Usage - American Process
(Note: See report for November, 1945, page 11 for preference listings for SWP usage.)

Acicular Oxides

2138 dry
2143 "
2295 "

Normal round or nodular oxides

2059 dry
1707 dry
Azo 55 (no dry number assignment)

It is suggested that standard samples of each of the above materials be set up so that any new products may be tested and fitted to the established line-up as equivalents to be listed under an established number or to prevent listing of dissimilar materials under one number.

#177 - Cont.

Comment on the above outline of zinc oxide pigments is invited since the purpose is to simplify our zinc oxide picture. It should be understood that none of the moves recommended above are official without Cleveland's sanction.

#164 - Reformulation Studies of House Paints to Reduce Dirt Collection

During the past year certain complaints have been received from widely separated points on SWP Gloss White. The complaints were occasioned by a yellow discoloration of the chalk after protracted rainy periods, and the discoloration is said to disappear during subsequent sunny weather. A strong possibility has now developed that this is due to the use of the rutile titanium oxides Ti-Pure R 200 or Titanox RA-10-MO.

As contributing evidence it has been found that one coat house paints, early oil conservation SWP formulations, and certain "post-war" formulations, all employing 2175 or 2269 TiO_2's, were more susceptible to copper and rust staining than the 4-8-42 pre-war SWP which carried anatase TiO_2, 1403 dry. Panels of house paint formulations carrying rutile TiO_2 exposed to the Weather-Ometer to the point of definite chalking show a distinctly yellow chalk compared with anatase TiO_2. Certain exposure panels containing rutile TiO_2 exposed in Florida exhibited this same yellow discoloration.

Evidence on this point is not conclusive and we would appreciate being informed of any observations by other laboratories on this phenomenon. The following points may be cited:

1. The yellowing has been observed only in relatively few cases. It is reported to be a temporary condition which appears only after prolonged rainy periods and disappears in sunny weather.

2. It appears only in films weathered to the point of chalking.

3. The yellowing is in the chalk and may be wiped off, leaving a white film underneath.

4. The yellowing apparently is not noticeable when approximately half of the TiO_2 is introduced as anatase, as has been the case with most of our production.

5. The yellowing may be due to traces of iron. If so, considerable time will be required to revise production methods to eliminate this defect.

6. Similar observations of yellowing have been reported by both Titanium Pigment Corporation and the du Pont Pigment Division.

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A series of one coat house paints of the T.P.C. type, panels 8050-7 F were examined after 18 months' exposure in Florida, as well as a duplicate series 7344-51 CS, CN exposed for 22 months in Chicago. All are over 450 Undercoater, using formulations agreed on after consultation with Mr. Fasig to utilize certain of the T.P.C. ideas but with Lowe Brothers' and S-W vehicles. There are three groups, (a) high p.v.c. at 35% with 15% 2173 dry and 45% leaded zinc, (b) normal p.v.c. at 29% with increased leaded zinc and less inert, and (c) low p.v.c. at 22%, eliminating inert. There are certain vehicle variations.

At this stage all differences are slight and all p.v.c.'s are performing satisfactorily at both locations. The lower p.v.c.'s are showing a slightly lower chalking rate but this has not affected the appearance seriously. This set is interesting since all the panels show some of the yellowing described earlier, but some are striking. There are no clues as to why there are these differences in color.

Instructions were written up for the preparation of exposure panels testing all of the paints used in the 1945 house painting program.

#77 - Mildew Inhibitors

Suggestions were passed on to Cleveland regarding the idea of making all SWP mildew resistant, together with certain ideas on label statements and recommendations for reductions.

#148 - Examination of White Lead

A meeting of the White Lead Research Committee was held in New York City on December 5, and much of the work on white lead carbonate presented in the last report was placed before that committee, and additional work planned.

A meeting was arranged with the research laboratory of the National Lead Company to discuss exposure performance of co-fumed leaded zincs versus mechanical mixtures. Arrangements have been made for the preparation of experimental paints for exposure, including pigmentations involving National's acicular basic sulfate white lead, high tinting strength lead carbonate and basic lead silicate.

Panels 7380-7 F were examined after 24 months' exposure in Florida comparing 414 Leaded Zinc (a composite of production) with 1526 Leaded Zinc in SWP tint base. Performance is approximately equivalent to date, with the 414 showing slightly more adherent chalk and therefore greater fading.

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Photographs were made of the remainder of the series involved in the booklet "Leaded Zinc House Paint Exposures" prepared in February, 1945. Final prints are not yet finished.

#12 - Exterior Primers

Because of requests from various builders of prefabricated houses for a fast drying exterior primer for plywood, work was started to further improve the drying characteristics of CH 3285 - Exterior Prefab Primer.

In connection with this problem, the Resin Research Department submitted certain styrene varnishes mentioned in the last monthly report, and which are again listed below. These liquids were compared with CW (1585) - Bilinco 101 for drying and recoatability. The styrene varnishes were tested individually and in conjunction with X-480 Oil, SN 1172 (15% styrene modified linseed) and CW (2253) which is Dow's X-356 Oil (50% styrene - 50% linseed).

The special liquids under test were:

RB 1209 (CV 5006) - Styrene P.E. Phthalate
RB 1215 - " " "
RB 1220 - Styrene Linseed

The recoatability of the primers with Rex 471 SWP Gloss White after intervals of 5, 10 and 30 minutes is listed in the chart below, as well as the film characteristics after 17, 22 and 35 days on .003" primer draw-down films on glass. As indicated from the data, it appears that the styrene varnishes will become too brittle upon exposure for good durability. From the standpoint of recoatability they are not as satisfactory as the Bilinco 101 CW (1585) used in the regular formula. The styrene varnishes set harder and slightly faster than CW (1585) but when they are recoated with house paint during the early drying period the finish coat dries with a low and uneven sheen.

Exterior Prefab Primer

Primer No.	Varnish Under Test	Zinc Oxide Content	P.V.C.	Recoat with Rex 471 after: 5 Min.	10 Min.	30 Min.
492 J	RB 1215	11.6%	46.7%	P to F	P to F	P to F
504 J	RB 1215	"	36.0%	"	"	"
505 J	CW (2253) RB 1215	"	"	"	"	"

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#162 - Studies in Flat Wall Paint Formulation

Flat-Tone

A sample of Durafilm Flat White - Rex DF 60, formula 10-29-45, was compared for brushing, flow, drying, washability and uniformity of tint and sheen with Flat-Tone White Rex 810. Flat-Tone was rated good under all these captions, while Durafilm had good brushing qualities and uniformity of tint on laps, but was deficient in flow, drying, uniformity of sheen, and washability over glue size.

Laboratory batches of Rex 26573 - #73 Flat White wall paint were prepared on the basis of formulas submitted by Newark representing the formulations of April, 1942 and February, 1944. The 1942 formula was pigmented with anatase titanium calcium in a vehicle of (48), (2381), (2525) and (797), while the 1944 formula carries both Titanox RC HT and lithopone in a vehicle largely (3848)E extended slightly with (316). The 1944 formula was definitely superior in brushing, flow, drying, uniformity of sheen and tint, and washability.

Because of the shortage of Dehydrol, efforts have been made to find a temporary substitute for (3880)E in the Flat-Tone formulation. The work to date indicates that a combination of CW (1996), Linogel, and the alkyd (4103), made from soya or linseed, should be satisfactory as a replacement for Dehydrol. Work will be continued on this problem.

After 14 months of storage no differences in suspension properties were detected between batches of Flat-Tone White made on the pebble mill or by mixing only. The above paints were made with Titanox RC HT-X (improved wetting type) and Lesamite (10 dry) or 1989 dry.

Samples of Flat-Tone White made with regular Metro-Nite - 2201 dry or micronized Metro-Nite as the inert, were examined after 8 months' storage. Both samples were found to be similar to the regular inert combination of Micro-Velva A - 2188 dry and 20 L dry, with respect to package condition and body characteristics. Washability tests on the above paints indicated that regular Metro-Nite and the micronized Metro-Nite are both slightly superior to the 2188 and 20 L dry combination when the flats are applied over glue size.

Some work was done during December on the development of a paste wall paint that could be reduced with thinner or varnish for use as a stipple and brushing flat, semi-gloss paint, wall primer and sealer, or enamel undercoater. As a starting point, the paste paint has been formulated similar to the new Paintercraft One Coat Flat #10, with rutile titanium calcium and titanium dioxide in the pigmentation and (3880)E and CW (1996), linogel, as the principal constituents in the vehicle.

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A number of varnishes, such as (4100), (4103), (2830)S, CW (1996), and combinations of (48) and (1157), were tested as reducing liquids for the above paste. Up to the present time, however, we have not found a reducing liquid that would be satisfactory for all these purposes. Work will be continued on this problem.

Semi-Lustre

The four experimental varnishes listed below have been tested in the Semi-Lustre Ivory formula of 10-26-43 and the Porch and Floor Enamel Light Gray formula of 9-26-45.

CVR 374 - Standard (6173).
CVR 396 - Standard (6173) plus 2% Zinc Resinate.
CVR 390 - (6173) made from Tall Oil.
CVR 387 - (6173) made from Tall Oil + 2% Zinc Resinate.

These varnishes were compared for drying, brushing, flow and film characteristics in the above formulations. In the Semi-Lustre formula, we obtained low sheens on all tests compared with the accepted standard. The viscosities, flow, drying and brushing properties are recorded in the chart below:

Semi-Lustre Ivory
(Formula 10-26-43)

Batch	Varnish Under Test	Viscosity #3 Orifice Fresh	24 Hr.	8 Days	Flow	Drying Set-to-touch	Drying Over Night	Brushing
559 J	CVR 374	26.8"	26.8"	32.5"	Good	25 min.	Hard	Characteristic
560 J	" 396	17.4	15.2	18.3	"	"	Hard	Def. less pull than reg.
561 J	" 390	16	14.4	15.4	"	"	"	
562 J	" 387	20	18.4	19.5	"	"	"	

In Porch and Floor Enamel, based on AV 97 and (6173), viscosity relationships were obtained similar to the Semi-Lustres. However, the differences were not as large due to the smaller gallonage of each varnish used.

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Porch and Floor Enamel

Batch	Varnish Under Test	Viscosity #3 Orifice Fresh	24 Hr.	8 Days	Flow	Drying Set-to-touch	Over Night	Brushing
555 J	CVR 374	27.2"	26"	27.4"	OK	60 min.	Hard	OK
556 J	" 396	22.2	20.5	21.7	"	65 "	"	"
557 J	" 390	21.4	19.8	20.8	"	70 "	"	"
558 J	" 387	23.4	22.2	23.2	"	70 "	"	"

Water and 1% soap tests run on the above enamels indicated about equal resistance for each.

These results do not favor the use of (6173) in Semi-Lustre. If a tall oil type of vehicle is to be used, we would prefer to revert to the Semi-Lustre formula of 8-7-45, Alternate A, card No. 1 for Rex 201, and the formula of 9-25-45 for Rex 210, both of which are based on CV 82 and CV 83.

.003" draw-down films on glass were made on the Porch and Floor Enamels to check the film properties on aging. After 14 days the enamel made from standard (6173) produced a good ribbon. The standard (6173) made with 2% zinc resinate and the two tall oil variations were slightly harder at the 14 day period, but were considered satisfactory for elasticity.

Enameloid

A sample of Magnesium Silicate SF was submitted by Harry Holland and Son, Inc. to check against Multifex MM and Witcarb R to prevent the sagging of alkyd enamels. Magnesium Silicate SF is reported to run between 4 and 5 microns in particle size.

Enamels were made on the regular Rex 710 formula, dated 9-19-45, except for the introduction of 25 pounds of Multifex MM - 2209, Witcarb R or Magnesium Silicate SF over and above the regular yield of 100 gallons. The standard formula was also made and used as a guide. Viscosity increases due to the addition of the inerts were not large and gloss and grinding characteristics were not affected.

The introduction of Magnesium Silicate SF in Enameloid gave results very similar to those with Multifex MM with respect to the retardation of flow and film characteristics. Witcarb R gave only a moderate control of flow and showed some signs of sagging, similar to the standard formula.

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With respect to the drying properties of the above enamels, it was quite evident that the introduction of 2209, Witcarb R or Magnesium Silicate SF produced harder films on over night drying. The harder films also showed less whitening on the water spot test compared with regular Enameloid White.

A sample of Falkyd Resin B-41 and a sample of white enamel made from Falkyd Solution B-41 were submitted by Falk and Company for inspection. The Falkyd Resin B-41 is a medium oil length alkyd reported to have the highest resistance to yellowing available in a drying oil type material. It contains approximately 32% phthalic anhydride and is reported to be free from natural resins, phenolics and other modifiers.

The Falk enamel was compared with Kem-Namel Snow White Eggshell (Rex 99) and Enameloid White based on the alkyd formulation. The Falk enamel was similar to Enameloid White on most tests, but was not as good on soap resistance. Panels have been prepared to determine the non-yellowing properties which will be reported on at a later date. The Falk enamel was found to have controlled flow and performed quite well on most tests.

Data on Enamel Tests

	OJ 517 J Interior Non-Yellowing Gloss Enamel - Falk and Co. Formula	Rex 99 - Kem-Namel Snow White Eggshell Cleveland Sample	Rex 710 - C 3315 S-W Enameloid White
Varnish	Falkyd Solution B-41	V 15597 and (4103)	(3109) and (4100)
Weight per Gallon	A 10.32	A 12.19	A 9.58
Visc. at 75° F. #3	40"	26.8"	35"
Set-to-touch	2 hr. 15 min.	50 min.	2 hr. 15 min.
Condition after 4 hr.	Definite tack	Slight tack	Slight tack
" " 7 hr.	Slight tack	Very slight tack	Very slight tack
" " 24 hr.	Tack-free	Tack-free	Tack-free
Sward Hardness: 24 hr.	5	5	7
48 hr.	9	8	9

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	OJ 517 J Interior Non-Yellowing Gloss Enamel - Falk and Co. Formula	Rex 99 Kem-Enamel Snow White Eggshell Cleveland Sample	Rex 710 - C 3315 S-W Enameloid White
Printing after 48 hr. 1 lb./sq. in. for 24 hr.	Very slight OK	Absent OK	Very slight OK
Cold water for 24 hr. (After 24 hr. dry) Immediately	Definite + Water spotting	Slight +	Definite
Recovery from Cold Water Test after 2 hr.	Almost complete	Slight recovery	No recovery
1% Soap Solution for 3 hr. (After Drying for 48 hr.) 1 Hr.	Def. whitening	Definite +	Absent
3 Hr.	" "	Bad	Absent
Recovery from Soap Test after 2 hr.	No recovery	No recovery	-
Boiling Water-3 Minutes	Def. dulling	Bad dulling	Very slight
Film after 48 Hr. Dry	OK	Film brittle	OK
Film after 30 days dry	O.K. Good ribbon	Very brittle	Rather short

The Falkyd enamel requires a percentage of a special solvent such as Solvesso #3 or Union Solvent #40 for best performance, which may rule it out for trade sales. However, it has been suggested to Cleveland that this resin solution merits further investigation.

A re-examination was made of storage samples of Rex 710 - Enameloid White using different vehicle and drier combinations. The various drier combinations are as follows:

A.	2-3/4 gal.	(4230)	1 gal.	(4232)	Naphthenate Driers
B.	2-3/4 "	(4230)	1 "	(4232)	1 gal. 3% Ca Nuolate
C.	2-3/4 "	(5230)	1 "	(5232)	Tallate Driers
D.	2-3/4 "	(5230)	1 "	(5232)	1 gal. 3% Ca Nuolate

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Rex 710 Drier and Seeding Tests
4-1/2 Months' Storage at Room Temperature

Lab No.	Drier Mix	Vehicle	Visc.	Set-to-Touch	7 Hr. Tack	24 Hr. Tack	24 Hr. Through Dry	Seeding	Settling
		CVR 206							
128	A	(3848)E	56.8"	1:10	Def.	Def.	Soft	None	Soft
129	B	"	56.0	1:15	"	Def.-	"	V.V.S.	"
130	C	"	52.6	2:00	Def. +	Def.	Soft -	None	Slight
131	D	"	56.2	2:00	Def.	Slight	Firm -	"	Soft*
132	A	AV 59	63.0	1:55	Def. -	Slight	Firm	None	V. hard
133	B	"	60.0	1:40	"	Slight -	"	V. sl.	Hard*
134	C	"	54.0	1:40	"	Def. -	Firm -	None	V. hard
135	D	"	62.6	1:40	"	Slight -	Firm	V.V.S.	Soft*
136	A	CV 116	50.8	1:25	Def. -	Slight	Firm -	None	V. hard
137	B	"	42.0	1:55	Slight	V. sl.	Hard -	Slight	Hard
138	C	"	39.6	1:50	Def. -	V. sl.	Hard	None	Hard
139	D	"	47.6	1:50	Sl. +	V.V.S.	"	"	Slight
140	A	CV 7001	36.0	2:10	Def. +	Def. -	Hard -	None	V. hard
141	B	"	34.0	2:10	Def. +	Slight	Hard	"	"
142	C	"	33.6	2:10	Bad	Def.	Hard -	"	Hard
143	D	"	37.6	2:10	Def.	V. sl.	Hard	"	Slight

*Skinned in half-filled package.

It appears that calcium naphthenate does not prevent seeding by stabilizing driers, but does increase hardness and improves suspension. The AV 59 samples show some retardation of set-to-touch drying on storage, and AV 59 and (3848)E have lost considerably in through drying.

Miscellaneous

Laboratory batches of SWP Gloss White, Enameloid White and Flat-Tone White made with naphthenate and octoate driers have been checked for drying after ten weeks of storage. As previously reported only minor differences have been noted on past reading. The comparative drying times when fresh, and at 7, 30 and 70 days of storage are reported below:

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Drying Time - Set-to-touch

Formula No.	Type of Paint	When Prepared Hr.	When Prepared Min.	After 7 Days Hr.	After 7 Days Min.	After 30 Days Hr.	After 30 Days Min.	After 70 Days Hr.	After 70 Days Min.	Drier Used
286 J	Flat-Tone White	-	25	-	51	-	50	-	45	Naphthenates
287 J	" "	-	25	-	51	-	50	-	45	Octoates
288 J	Enameloid White	1	35	2	2	2	15	2	45	Naphthenates
289 J	" "	1	45	1	52	2	10	2	20	Octoates
291 J	SWP Gloss White	5	15	5	25	5	40	6	22	Naphthenates
292 J	" " "	5	5	5	20	5	20	5	47	Octoates

Earlier reports of no advantages in drying through the use of Octoate driers are confirmed.

A comparison record is being made of viscosities run on the S-W Conical Flowmeter and the Stormer viscosimeter, using the off-set paddle. So far it appears cup viscosities are relative to Stormer readings within a given type of paint only. There is no apparent relation between house paints and enamels. Work continues.

#103 - Metal Protective Paints

There have been a few cases recently in which tide range exposure results did not duplicate laboratory tests. In order to simulate the tide range exposure a series of panels was exposed to 3% salt spray and 3% salt immersion, allowing for a 2-hour exposure to a carbon arc each 48 hours. At the same time this alternate exposure was in progress, control panels were maintained on continuous exposure in the salt spray and immersion tests.

Nine primers which were included in the test were primarily vehicle variations with the pigmentation of Kromik Primer. In the salt spray tests, continuous exposures were more severe than alternate exposures except in two cases which showed considerable disagreement. Correlation of blistering between the two types of exposures was good.

The 3% salt immersion tests have not shown as great a degree of failure as the salt spray tests, but here the alternate exposures have failed more rapidly than the continuous exposures. Failures on the two exposures were in proportion to each other .

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#77 - Mildew Inhibitors

Laboratory evaluation of fungicides for exterior paints is being resumed. Various agents which have been placed on exterior exposure in recent years will be tested in SWP by laboratory procedure. A sample of phenyl mercuric naphthenate (36% Hg) from F. W. Berk and Company has been received for test in exterior house paint formulations. Paints have been prepared for exposure using this agent and CW (2119) phenyl mercuric naphthenate (Nuocide 321) supplied by Nuodex, in concentrations equivalent to 0.04% Hg based on the total paint solids. The two agents have also been introduced at 0.02% Hg in SWP 450 Undercoater.

Panels 10367-9 C, F have been prepared for exposure in Florida and Chicago comparing cuprous oxide and copper homophthalate in Rex 54 Barn Paint of March 10, 1942.

#12 - Exterior Primers

Exposures 3014-17 CD, CY were examined after 5 years' exposure, vertical south, at Chicago, with Douglas fir and yellow pine siding being used. The following systems are tested: Rex 450 Undercoater-Rex 450-Rex 471 Gloss White; Aluminum Primer-Rex 450-Rex 471 Gloss White (Alcoa-Lowe Bros. formula); Rex 450-Rex 471.

The 2-coat work is nearly eroded to the wood. The 3-coat jobs are roughly equivalent; a slight advantage on the part of aluminum in resistance to cracking and erosion is at least counteracted by the dark "show-through." A careful cross-check of the several samples of each kind of wood shows no evidence for the supposed superiority of aluminum on resinous woods.

Panels 10370-2 C, F were prepared for exposure comparing Celite 110, Celite 281 and Dicalite L in SWP 450 Undercoater.

#162 - Studies in Flat Wall Paint Formulation

Flat-Tone

Due to the shortage of Dehydrol and titanium pigments, work has been instituted to develop a formula for Flat-Tone based on lithopone and TiO_2. In the vehicle, regular Dehydrol (3880)E was replaced by a linseed (3880)E (CV 7014). As a second variation a combination of CV 5021 (linseed alkyd) and CW (1996), Linogel, was used for the vehicle solids.

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The special formulations referred to above were found satisfactory for brushing, flow, drying and uniformity of tint and sheen. However, from the standpoint of washability over glue size, the alkyd-Linogel vehicle was rated poor and the linseed (3880)E only fair as compared with regular (3880)E.

Washability Test over Glue Size

Batch	Rex 810 Formula	Pigment	Vehicle	Number of rubs required to break the film
OJ 606 J	Formula 8-28-45	2132 dry	Regular (3880)E (Dehydrol)	No break at 200 rubs; very good.
OJ 668 J	Special	1403 dry 461 L	CVR 437 - (3880)E based on linseed	125 rubs - fair.
OJ 669 J	Special	1403 dry 461 L	CVR 5021 CW (1996)	75 rubs - poor.

The various formulations that have been developed based on lithopone and pure titanium dioxide, are all higher in cost than the regular formula based on all rutile titanium calcium.

Cost and hiding relationship on experimental formulas are as follows:

Batch	Flat-Tone	Hiding Pigment	Vehicle	Hiding	Cost
OJ 606 J	Formula 8-28-45	495# 2132 dry	Regular (3880)E (Dehydrol)	18,315	071.65
OJ 584 JJ	Special	495# 2132 dry	CV 5021 CW (1996)	18,315	72.31
OJ 647 J	"	495# 2132 dry	Linseed (3880)E CVR 437	18,315	75.87
OJ 660 J	"	750# 461 L 50# 2173	CV 5021 CW (1996)	18,275	86.24

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Batch	Flat-Tone	Hiding Pigment	Vehicle	Hiding	Cost
OJ 646 J	Special	750# 461 L 50# 2148	Linseed (3880)E CVR 457	18,275	$88.46
OJ 668 J	"	550# 461 L 190# 1403	"	18,345	91.09
OJ 669 J	"	550# 461 L 190# 1403	CV 5021 CW (1996)	18,345	87.31

From the above data it is quite evident that rutile titanium calcium is the most desirable pigmentation to use based on hiding units per dollar, and (3880)E, Dehydrol formula, is superior to the linseed (3880)E or the alkyd-Linogel vehicle in uniformity of tint and washability over glue size.

In addition to the tentative formulations for Flat-Tone White, a number of panel exhibits and wet samples of the following materials were supplied for the Trade Sales meeting held in Cleveland the last part of January.

Proposed Flat-Tone White Rex 810 - batch OJ 618 J.
Present Flat-Tone White Rex 810 - batch OJ 606 J.
Proposed One Coat Flat #10 Rex 65310 " OJ 198 J.
Present One Coat Flat #10 Rex 65310 " OJ 620 J.

The four flats compare as follows for hiding and cost:

	Cost	Hiding Units	V/P
1. Flat-Tone White - OJ 606 J	$71.44	18,315	.81
2. Proposed Flat-Tone White, batch OJ 618 J	81.41	22,400	.83
3. Paintercraft One Coat Flat #10, OJ 620 J	79.36	21,090	.82
4. Proposed One Coat Flat #10, OJ 198 J	92.77	27,950	.73

Three experimental reducing varnishes were submitted by the Varnish Research Division for evaluation in the formulation of a Paintercraft Universal Paste for reduction for use as a flat, semi-gloss or gloss wall paints, wall primer and sealer and enamel undercoater. The varnishes include:

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CVR 433 - A 22 gallon glycerol-maleic-resin linseed varnish, 80% solids.

CVR 434 - Similar to CVR 433.

CVR 438 - A 25 gallon Pentalyn A - Dehydrol Varnish.

Based on the work to date, it appears that a universal paste can be formulated to serve the purposes outlined above. CVR 438 shows the greatest promise as the reducing varnish. Work continues.

Semi-Lustre

In connection with the establishment of a new specification for kerosene, a number of tests have been made in the Semi-Lustre formula to determine the effect on sheen when Deodorized Apco 467 (Commerce Petroleum Company) and #8230 Regular Base #1 (Shell Oil Co.) are used.

The above thinners were fractionated in a manner similar to earlier tests conducted with (3020). The two thinners and their various fractions were then introduced for the volatile content of the Semi-Lustre formula dated 9-5-44. This formula is based on (3848)E and has always shown variations in sheen based on the thinner used.

In general, the above thinners behaved very similar to (3020) with respect to the degree of sheen when used 100% in the Semi-Lustre formulation. As in the case with (3020), the highest sheen was obtained with the lowest boiling fractions and the lowest sheen with the higher boiling fractions. The Kauri-Butanol values for the above thinners and their fractions are very close in value and do not show any relationship with the variations in sheen obtained with the various fractions.

Based on the limited work done with (3020), Apco 467 and Shell's Base No. 1, there does not appear to be any particular advantage in having a thinner in the kerosene range, with a Kauri-Butanol value as high as that of (3020). From the standpoint of sheen the Semi-Lustre batches made with unfractionated (3020) and (141) were equally low, with Apco 467 and Shell's Base #1, in the above order, resulting in slightly less sheen.

#103 - Metal Protective Paints

The most favorable environment in which to produce filiform corrosion has been found to be the air over 1% acetic acid solution at room temperature. There must be a free access of fresh air to the

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No differences were noted in production rate or wetting effect. However, the samples have been referred to the producers to determine what degree of uniformity of shipments can be anticipated.

#148 - Examination of White Lead

As a further step in this study we have prepared some multiple pigment pastes to compare with the single pigment pastes previously examined. These two pigment pastes are equal volume mixtures calculated to produce a milled paste of 50 Plastographs units based on the oil requirements of the individual pigments. For example, 18 dry basic carbonate white lead requires a total of 109.0 gallons of oil per 100 gallons of pigment to produce a plasticity of 50. Therefore, 50 gallons of 18 dry require 54.5 gallons. 50 gallons of 1405 dry TiO_2 require 162.5 gallons of oil and empirically a mixture of 50% 18 dry and 50% 1403 dry by volume should require 217 gallons oil per 100 gallons pigment, provided there is no soap formation involved and the oil requirements are simply the arithmetical mean of the components. The plasticities actually obtained are shown in the following table.

		Lbs. Pigment per 100# Oil	Plasticity Peak	20 Min. Mix	Pony Mix	Milled
1403 dry	TiO_2	85	130	49	-	39
20 F	Mg. Silicate	62				
1403 dry	TiO_2	95	360	67	-	39
18 dry	B.C.W.L.	166				
18 dry	B.C.W.L.	268	210	70	50	39
20 F	Mg. Silicate	113				

Referring to the data given for the individual pigments in last month's report it is noted that the peak, 20 minute mix, pony mix, and milled paste plasticities are all lower than the average of the two single pigments. The milled paste plasticities are lower than the 50 units obtained with each of the single pigments.

Brookfield Determinations

	20 Minute Mix			Pony Mix			Milled		
	Yield Value	Plastic Vis.	Thixotropy	Yield Value	Plastic Vis.	Thixotropy	Yield Value	Plastic Vis.	Thixotropy
(1403 dry and 20 F)	12	25	3	-	-	-	16.5	18	3
(1403 dry and 18 dry)	25.5	30	12	-	-	-	18.0	14	2
(18 dry and	15	20	5	11.5	23	1	10.0	17	1

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Comparing this data with the figures for single pigments it is noted that: (1) the plastic viscosities of the milled pastes are lower than the values for the single pigments; (2) the plastic viscosity of the mixed pastes are always lower than the average of the two single pigments; (3) the yield value is always much higher than the average of the two single pigments; (4) the thixotropy is always much lower than the average of the two single pigments.

It has been noted that the consistency of a paste of diatomaceous inert in reduced blown linseed oil is much lower after the addition of lithopone. A heavy paste of 200 grams of Celite 1552 dry in (1752) was mixed on the Plastograph. When 200 grams of lithopone 461 L were added the consistency was lowered slightly and the flow was very much increased. After addition of 1000 grams of 461 L the consistency was still no higher than the original Celite paste alone. This same effect was noted to a lesser degree when other white pigments were added to 1552 dry.

L.I.A. Adhesion Tests

Several difficulties have been encountered in developing the technique of measuring the adhesion of a paint film to its base material by gluing end grain blocks to the paint film and applying force to the surface until the paint film ruptures. It is necessary to use end grain blocks to eliminate failure of the blocks under stress. However, end grain blocks, being very porous, absorb water from the glue mix before it sets, thereby reducing its strength markedly. Preliminary sealers were tried out in an attempt to eliminate this absorption. Shellac, clear and pigmented, as well as precoats of the urea formaldehyde glue containing higher percentages of water were tried. To date, best results have been obtained by applying a precoat of a 50%-50% glue-water mixture to the blocks and allowing them to dry over night before gluing them to the paint film with the regular 66%-33% glue-water mix.

It was also difficult to obtain good bonding between the paint film and the glue. Sanding the painted surface helped but usually it was necessary to remove almost all of the top coat in order to eliminate the brush marks and get a smooth surface. As a result many failures occurred between primer and top coat instead of between primer and wood. Vigorous rubbing of the surface with a cloth containing (348) removed the oily surface film and presented a fairly good surface for gluing.

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Using the latter method it was possible to remove from 75% to 90% of a 2-weeks old Rex 450-Rex 471 film on pine wood. The force required varied from 300 to 400 lbs./sq.in. It is interesting to note that with an edge grain cedar panel, from 50 to 90% of the failure was wood failure, usually confined to the spring wood. The force required on cedar was from 200 to 300 lbs./sq.in. In evaluating various films it will be necessary to average results on a number of tests in which at least 90% of the film is removed from the wood.

Preliminary tests on blistered films in which the edges of blisters large enough to give a uniform surface for testing were trimmed and the film lightly pressed back onto the wood, indicate that the degree of re-adhesion is slight. A film subjected to high temperature and steam for about a week did not possess measurable re-adhesion. Rex 450-Rex 471 panels placed in a water bath and subjected to ultraviolet light for about 3 days showed adhesion, after a week's recovery, of from 30 - 100 lbs./sq.in. It appears logical that the longer a film is distended and the higher the temperature the greater the cure with less re-adhesion. Attempts will be made to develop other methods of producing large blisters rapidly without too great a curing of the film.

#177 - Pigment Studies

Work continues on the study of white pigment opacity factors.

Paint Type I - House Paint - Single pigments plus extender formulated to 18,000 Holley units. P.V.C. constant at 36% by addition of 20 F magnesium silicate.

Determinations during February:

Dry No.		% Brightness	Opacity Sq.Ft./Lb. 91% CR	93% CR	95% CR	97% CR	98% CR
*461 L	Lithopone	86.8	65.4	56.1	40.0	-	-
*1538 N	Zinc Sulfide	85.6	151.0	137.0	113.0	101.0	-
**2030	TiO_2 Semi-nonchalk	88.4	235.0	205.0	176.0	150.0	128.0
**2031	TiO_2 "A NC"	85.7	202.0	179.0	154.0	129.0	117.0
2059	ZnO "XX 503"	79.5	33.9	29.4	24.9	-	-
*2132	Titanox RC HT	87.2	108.0	93.2	78.7	63.4	-
*2140	Titanox RC	87.8	113.0	95.8	78.5	66.0	57.7

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*Hiding values have been checked once.
**Hiding values have been double checked.

Formulators should not use any of the opacity figures given in this work until the pigments have been studied in a variety of materials. In instances of the kind described above the considerable extension given the high opacity pigments may distort the results. This will clear up when the enamels are prepared. In the meantime data is being reported to keep those who are interested informed on the work.

In addition to the above, work was continued on the evaluation of titanium vs. titanium calcium pigments as regards opacity. Results of these tests are not conclusive at this writing.

Photographs were made at five and ten diameters to illustrate comparative failures of mechanical mixtures of lead and zinc pigments as contrasted with co-fumed leaded zinc. These are intended for use in a bulletin to be prepared by the Auxiliaries Department.

Opacity brush-outs show Rex 471 made with 2059 dry, XX 503 zinc oxide to be similar to a standard Rex 471 made using 412 dry leaded zinc oxide.

Opacity comparisons showed that 1403 dry anatase TiO_2 could be substituted for 2173 dry rutile TiO_2 at equal dollar value in SWP Gloss White without lowering the practical hiding perceptibly. At present the TiO_2 is a 50/50 mixture of 1403 and 2173 dries.

#97 - SWP 471

Work has been continued to determine the effect of metal drier concentrations on the kauri reduction values of the vehicle in SWP Gloss White formula of 10-4-43. As stated in last month's report there is some question regarding the validity of selection of drier ratios based on kauri reduction values for the paint vehicle. It is hoped that from the data obtained from exposure tests and from the kauri reduction values an optimum drier combination may be selected that will give good drying with the maximum of durability.

The kauri reduction values have been determined on the vehicle taken from the freshly prepared paints. The results of the tests to date indicate that the lead driers give the highest kauri reduction values and manganese driers the lowest values. When the lead drier is decreased to one-half the regular amount, no increase in the kauri reduction value was evident. However, when the percentage of lead was doubled, the kauri reduction value dropped from 360% to 340%. In the case of manganese, the kauri reduction value was higher with half of the regular metal and also dropped when twice the regular amount of metal was introduced.

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*These, on regular plywood, are in bad condition; about an equal number of similar systems were already bad at 6 months.

A sample of Shell's Tolusol was compared with (1688) in Prefab Primer CH 3285 and found to be a very satisfactory replacement.

#162 - Studies in Flat Wall Paint Formulation

Flat-Tone

Flat-Tone White, Rex 810, has been made on the pony mixer, without milling, using 2% Acto 450 based on the pigment weight. The 3 pounds 547 dry in the regular formula were increased to 9 pounds and added in the form of a 10% gel in (548). The grind was 2 H and the gloss much higher than the regular. Wet hiding and color was slightly better than the regular and dry hiding and color slightly poorer.

A sample of NV 1782, Newark's variation of CV 7014 has been compared with regular CV 7014 in Flat-Tone White. The Newark production was similar to CV 7014 for brushing, flow and drying but was poor in washability. Regular Flat-Tone made with Dehydrol (3880)E was rated very good in washability over glue size showing no break at 200 rubs, while the paint made with NV 1782 was rated as poor, failing at 60 rubs.

A sample of CVR 449 air blown linseed (3880)E was submitted by the Varnish Research Division, and compared in the Flat-Tone White formula of 2-6-46. The color of CVR 449 was found to be too dark for whites but it could be used in tints.

Work has been under way to develop a Paintercraft One Coat Flat Wall Paint similar to Rex 65310 that can be brushed without reduction. The raw material cost is to be approximately 85¢ per gallon. The formulas developed so far have not been satisfactory for washability or uniformity of tint. Work will be continued on this problem.

Thompson Hayward submitted a sample of their heavy blown fish oil S-32 for evaluation. It was thought it might behave in some respects like Linogel, for which there is only one source of supply. However, when S-32 was used to replace Linogel in the Alternate A formula for Flat-Tone White the paint was too thin and was not equal to the Linogel formula in brushing or drying.

Six experimental reducing varnishes were submitted by the Varnish Research Division for evaluation in the formulation of a Paintercraft Universal Paste for reduction for use as a flat, semi-gloss or

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gloss, Wall Primer and Sealer and enamel undercoater. They included Pentalyn A dehydrated castor varnishes using both (3017) and (2325), Pentalyn A-linseed varnishes, and Pentalyn G with castor and linseed. All the mixes of paste with varnish to give an interior gloss paint so far have shown too low gloss initially or the dry film would drop in gloss after a few days. Work continues.

A report, illustrated with photographs, was drawn up (particularly for Newark), to compare the washability of the 1942 and the 1944 formula for Paintercraft Flat #73 over both Wall Primer and Sealer and glue size. The paints were applied on plaster boards and allowed to age for ten months before washing. The penalty in washability when flat wall paints are applied over glue size appears in the following data:

Washability

Paint	Break in Film Over Glue Size	Over Wall Primer and Sealer
Flat-Tone White	250 rubs	No break, but some abrasion at 1000 rubs.
Paintercraft Flat #73, 1942 formula.	185 "	No break at 1000 rubs.
Paintercraft Flat #73, 1944 formula.	770 "	" " " " "

The 1944 formula for Paintercraft Flat #73 has unusually good washability over glue size.

Semi-Lustre

The Varnish Research Division submitted two tall oil varnishes for evaluation in Semi-Lustre. They were CV 7013, a 20 gallon tall oil P.E. maleic rosin linseed varnish and CVR 440, (6173) made with tall oil. The Semi-Lustre batches made with these varnishes were too low in body. CV 7013 produced satisfactory sheen characteristics but the sheen was too low using CVR 440 even though the inert was omitted.

No.	Varnish Tested in Semi-Lustre	Viscosities Fresh	2 Days	3 Days	Gloss	Flow	Brushing
OJ 691 J	CV 7013	20.4"	22.4"	22.2"	57 - OK	OK	Fair - too thin in body.
OJ 689 J	CVR 440	21.2"	-	18"	49 - trifle low	OK	"

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Enameloid

Enameloid White Rex 710 made on the alternate formula using 2147 dry Titanox A #24 had reduced leveling, a blue grey color, and slightly higher consistency than the regular with 2229 R 510 TiO_2. This paint, however, was very clean as to "seeding" compared with the average 2229 batch.

Several batches of Rex 710 Enameloid White were prepared to study the effect of small amounts of basic pigment upon drier absorption. To the regular formula were added: (1) 10 pounds of zinc oxide 108 dry, (2) 20 pounds basic carbonate white lead 18 dry, (3) 6 pounds litharge 1128 dry. These will be rechecked for drying after several months' storage. At present the 1128 gives appreciably faster drying.

A sample of CRB 1127 B 10% lead naphthenate was submitted by Resin Research. It was compared with (4230) regular lead naphthenate drier - outside purchase, for drying and stability in linseed oil and in conjunction with (4231) manganese naphthenate and (4232) cobalt naphthenate driers. Two batches of Enameloid White Rex 710 were made, one with the regular naphthenates and one with CRB 1127 B replacing (4230) at equal metal content.

Drying Time on
Enameloid White Batches

	Driers	Set-to-Touch	Over Night Drying
Batch OJ 701 J	Using regular (4230) (4231) (4232)	2 hrs. 5 min.	Good
Batch OJ 702 J	CRB 1127 B (4231) (4232)	1 hr. 30 min.	Good

The faster set-to-touch using CRB 1127 B probably has no special significance. Linseed oil containing 0.5% Pb as CRB 1127 B or (4230) showed no break after 8 days' storage.

A mixed drier, (2247), was also made using CRB 1127 B, (4231) and (4232). The same percentage of metal was introduced as contained in regular (2247). This liquid was also found to be clear and no incompatibility was evident after 8 days.

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Based on our tests, the sample of CRB 1127 B appears to be satisfactory in drying as well as in compatibility. The scope of our tests was limited due to the size of the sample.

A recheck will be made on the drying of the Enameloid batches after a period of storage.

#183 - Pretreatment of Metal Surfaces for Painting

In connection with the work carried on for Group 6 of Sub-committee VII, Committee D-1, A.S.T.M., additional investigations were conducted on the cleaning of cold rolled steel panels. The phases of this problem are:

1. Possible interference of surface active agents with the water film test for cleanliness.

2. Effects of baking on "cleaned" panels, especially comparing solvent sprayed and trichlorethylene degreased panels.

The first phase of this problem was partially covered in last month's report. It has now been concluded that the use of a running water film test instead of an immersion test will effectively eliminate any interference by surface active agents. Only those surface active agents that are water soluble will interfere in this test. And these agents can be easily flushed off of a panel by means of a stream of water, while the oil would tend to cling to the panel and again cause a water break.

The second phase involves the effect on the cleanliness of the metal surface after cleaning which might arise from the baking operation required by the A.S.T.M. specification for metal preparation. Baking temperatures up to 300° F. were used, on panels cleaned by both solvent spray cleaning and trichlorethylene vapor degreasing.

It was found that with solvent spray cleaned panels which originally would support a water film break-free would not do so after baking, whereas trichlorethylene degreased panels were not affected.

A series of Mears and Evans "activity" tests run on the same panels before and after baking substantiated the fact that the solvent spray cleaned panels were not clean after baking, while the trichlor-ethylene cleaned panels were not affected. The activity of the surface of the solvent spray cleaned panels was materially reduced by the baking operation while the activity of the trichlorethylene cleaned panels remained constant.