ALLIED RESEARCH LABORATORIES

Report of Investigations
For the Month of January, 1946

M. VAN LOO

#182 - Study of Improved Mixing and Grinding Practices

Acto 450 has been used successfully to control flooding in some factory batches. Excessive flooding in Rex 157 Porch and Floor Enamel Mahogany was eliminated by adding 1% Acto 450 by volume to the finished paint. Smooth films were obtained with CH 5249 Freight Car Red through the same addition, where the paint previously showed shriveled top drying.

The Chicago Technical Service Department has found that with Lustral Enamels the flooding control with Acto 450 is variable, sometimes improving the condition but never making it worse. Best results are obtained with oxide colors, poorest with grays and variable with blues and greens. Better results are obtained when the Acto 450 is ground in rather than mixed in.

Although 1 - 2% Acto 450 generally did not affect the drying, gloss, or elasticity of these enamels, there have been cases where the drying has been speeded up slightly and a few cases where it has slowed the drying to some extent and lowered the elasticity.

An examination of about 40 laboratory batches of Enameloid Rex 710 which have aged from 3 to 7 months showed no consistent effect by Acto 450 on the drying, seeding, settling or viscosity. These batches contained a variety of vehicles and several types of titanium dioxides. The differences in each with and without Acto 450 were small.

A production rate study was made with 2229 dry TiO_2 ground in alkyd (3109) with varying percentages of thinners in the grinding liquid, and using 2% Acto 450 on the weight of the pigment. Paste consistency was kept constant by adding more pigment as the per cent N.V.M. was lowered. The production rate arose steadily from 70% N.V.M. to 50% N.V.M. and then decreased sharply due to difficulty in getting the paste to feed through the rolls.

When calcium stearate or aluminum stearate is added to 2229 dry TiO_2 ground in (3109), with or without Acto 450, the production rate is increased but the paste is more difficult to handle on the mill and is more puffy after milling. Pastes containing stearate and a low proportion of N.V.M. are also more difficult to reduce.

CV-5021, a linseed alkyd was tried in Rex 710 Enameloid White as a replacement for (3109) and (4100). Batches containing aluminum stearate, calcium stearate, and no stearate were all very seedy and undesirable, compared with only slight seeding in the regular formula. Set-to-touch time was slightly longer with CV-5021 and hardness over night about equal to regular.

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#148 - Examination of White Lead

A study of the mixing and grinding properties of various white pigments has been continued from the point reached in the November report. These are pigments which are normally used in house paints and were ground in a vehicle of 60% (2) and 40% (48) as used in SWP.

A determination was made of the amount of oil required to bring each pigment to a uniform milled paste consistency of 50 Plastograph units. The pigment and oil for these pastes were mixed together in the Plastograph for 20 minutes, then mixed on the pony mixer for 20 minutes, and finally milled on the 3-roll Kent mill. Plastograph and Brookfield Viscosimeter measurements were made at each step. From the Brookfield measurements the plastic viscosity, yield value, and thixotropy were determined.

In the following table the oil absorption values were determined by the standard rub-out method and were assumed to give the amount of "bound" oil of the total oil in the paste.

Milled Pastes of Equal Plasticity

Pigment	Lbs. Pigment/ 100 Lbs. Oil	Plasticity			Total Oil/100 Gal. Pigment	Oil Absorption/ 100 Gal. Pigment	Free Oil/100 Gal. Pigment	Free Oil/ Pig. + Bound	Total Oil ÷ Oil Abs.
		Peak	20 Min.	Pony Milled					
Sublimed B.S.W.L.	550	1020	265	180 50	123.2	66.5	56.7	34.1	1.85
S-W QP B.C.W.L.	662	700	163	127 54	109.0	51.9	57.1	37.6	2.10
Dutch Boy Dutch B.C.W.L.	665	680	190	81 47	108.0	49.8	58.2	38.8	2.16
Dutch Boy HTS B.C.W.L.	650	525	162	112 46	111.0	47.6	63.4	42.3	2.33
Dutch Boy 111 B.C.W.L.	388	1100 +	225	133 50	185.5	75.0	110.0	62.8	2.33
Ozlo 412 Leaded Zinc	500	1100 +	262	80 47	133.5	65.0	68.5	35.5	1.89

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Milled Pastes of Equal Plasticity

Pigment	Lbs. Pigment/ 100 Lbs. Oil	Plasticity Peak	Plasticity 20 Min.	Plasticity Pony	Milled	Total Oil/100 Gal. Pigment	Oil Absorption/ 100 Gal. Pigment	Free Oil/100 Gal. Pigment	Free Oil/ Pig. + Bound	Total Oil ÷ Oil Abs.
Anatase TiO_2 Titanox A	127	240	68	65	51	325.0	127.1	197.9	87.0	2.55
Rutile TiO_2 R-200	161	520	128	73	50	380.0	120.5	259.5	117.5	3.15
Magnesium Silicate	190	130	55	47	50	159.5	63.5	96.0	58.7	2.50
Zinc Oxide XX 50	316	745	255	118	50	188.6	86.5	102.1	54.8	2.18
Zinc Oxide XX 503	426	760	270	183	50	140.0	63.2	76.8	46.6	2.21
Zinc Oxide ZZZ 33	290	1100 +	335	295	52	209.0	100.0	109.0	54.5	2.09

Pigment	20 Minute Mix Yield Value	20 Minute Mix Plastic Visc.	20 Minute Mix Thixo-tropy	Pony Mix Yield Value	Pony Mix Plastic Visc.	Pony Mix Thixo-tropy	Milled Yield Value	Milled Plastic Visc.	Milled Thixo-tropy
Sublimed B.S.W.L.	24.0	93	24	24.0	76	14	15.0	21	4
S-W QP BCWL	20.0	52	64	19.0	58	6	10.0	28	1
Dutch Boy Dutch B.C.W.L.	23.5	62	13	11.0	38	4	3.5	25	0
Dutch Boy HTS B.C.W.L.	23.5	57	7	16.5	46	2	4.5	22	1

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Pigment	20 Minute Mix Yield Value	Plastic Visc.	Thixo-tropy	Pony Mix Yield Value	Plastic Visc.	Thixo-tropy	Milled Yield Value	Plastic Visc.	Thixo-tropy
Dutch Boy 111 B.C.W.L.	23.5	75	39	14.0	49	5	9.5	20	1
Ozlo 412 Leaded Zinc	37.5	134	33	15.0	37	4	9.5	22	2
Anatase TiO_2 Titanox A	14.0	37	5	18.0	36	9	19.0	28	6
Rutile TiO_2 R-200	25.0	55	2	22.0	33	6	19.5	21	7
Magnesium Silicate	8.0	22	3	7.0	18	1	10.0	21	2
Zinc Oxide XX 50	33.0	110	40	-	-	-	8.0	22	1
Zinc Oxide XX 503	15.0	130	27	14.0	74	6	9.5	19	3
Zinc Oxide ZZZ 33	36.5	162	44	39.0	103	18	12.0	26	6

The plastic viscosity values of the milled pastes as determined by the Brookfield viscosimeter are near a common value of 24, compared with a common Brabender plasticity value of 50.

With the leaded pigments and zinc oxides the yield value and thixotropy decrease with increasing dispersion.

As a final step in this study we intend to prepare multiple pigment pastes to determine whether or not the properties of the individual pigments may be used to predict the properties of the combinations.

Paints were prepared f or exposure studies of pigment combinations in the proposed National Lead Company's ready mixed house paints. The principal purpose is to compare the durability of 412 co-fumed leaded zinc with mechanical mixtures of Azo ZZZ-33 and XX-503 zinc oxides with National Lead's HTS and 111 lead carbonates and acicular basic sulfate and Eagle-Picher's sublimed lead sulfate. The exposures will be self-primed and over SWP 450 Undercoater and Titanium Pigment Corporation's MW-401 Primer (zincless).

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L.I.A. Adhesion Studies

Attempts are being made to develop a laboratory method for determining quantitatively the adhesion of house paints to the wood surface on which they are applied. Briefly, the procedure being investigated consists of gluing 1/2" x 1/2" end grain wooden blocks to the paint by means of a water dispersed urea formaldehyde glue (Weldwood). After the glue has hardened the block is fitted with a screw eye by means of which a container is hung on the block. The container is weighted progressively with the force being applied normal to the painted surface and the weight required to separate the paint from the base surface determined.

Results to date are only partly satisfactory due to the fact that it has not been possible to get complete separation of the paint film from the wood surface even at forces of 300-350 pounds per sq. in. After this technique has been perfected it will be used to evaluate the adhesion of a series of paints, containing various amounts of white lead as the only variable, which have been subjected to exposure on the blistering cabinet and the blisters allowed to collapse to regain their original adhesion.

#177 - Pigment Studies

Work is being resumed on the study of white pigment opacity factors. The general approach will follow the basic outline given in the Report of Investigations for February, 1944. Preliminary studies were reported in March and July, 1944. Since that time several minor changes have been made in the technique to be used.

In the calculation of contrast ratio as based on reflectance "over black" and "over white" it is deemed advisable to use the reflectance "over white" for the greatest film thickness as the "over white" factor in all determinations of contrast ratio. A second change will be made to report the opacity factors as sq.ft./lb. at contrast ratios of 91, 93, 95, 97 and 98%. After data has been collected for all of the pigments the selection will be made as to which CR group should be used as the opacity factors for this new index.

Chart follows.

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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. To date the following determinations have been made.

Dry No.		% Brightness	Opacity - Sq.Ft./Lb. 91% CR	93% CR	95% CR	97% CR	98% CR
** 9	Basic Sulfate White Lead	83.8	21.7	19.0	(16.2)	12.7	(10.0)
** 18	Basic Carbonate White Lead	86.9	27.9	23.8	19.7	14.7	(11.3)
** 412	35/65 Leaded Zinc	77.8	50.6	44.3	37.2	30.8	(26.2)
* 1271	Anatase Titanium Calcium	89.3	100	87.4	73.3	45.5	(33.6)
* 1405	Free Chalking Anatase TiO_2	88.4	238	214	185	141	118
° 2030	Semi-nonchalking Anatase TiO_2	88.2	244	217	190	155	135
° 2031	Non-chalking Rutile TiO_2 "A-NC" or "O"	85.8	192	157	135	103	90

** Hiding values have been double checked.

* Hiding values have been checked once.

° No check tests have been made.

( ) These values are determined by extrapolation.

Use of 414 Dry

As an emergency it has been found that leaded zinc 414 dry run through the Raymond mill at R7 set or through the Mikro-Atomizer can be used in SWP tints by replacing 412 on a zinc oxide basis. It may also be used in Rex 450 as the total zinc oxide replacement without too serious results. For Rex 471 SWP Gloss White the replacement should be limited to 50% of the zinc oxide with the balance being introduced as a lead-free zinc oxide. By this means the resultant color is similar to a batch made with all 412 dry as the zinc oxide pigment.

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Titanium Calcium Replacement

Frequently it is suggested that pure TiO_2 plus some special extender be substituted for one of the titanium calcium pigments. The most recent suggestion stated, "To obtain a comparable pigment combination to: - 100# Titanox RC HT use 30# Ti Pure R 110 plus 68# Atomite or Lesamite." When this substitution was made in Rex 210 Semi-Lustre White, replacing 475# of Titanox RC HT, it was found that the mixture was about 5% deficient in hiding at a raw material cost increase of $2.63 per 100 gallons.

#97 - SWP 471

Further work is being done 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, fresh and aged in the paint. This work is patterned after that done by the Bureau of Standards and is a recheck on similar work done here a year ago. There is considerable question as to the validity of selection of drier ratios based on kauri reduction values for the paint vehicle. However, it is hoped that an optimum drier combination may be selected to give good drying and maximum retention of elasticity during the life of the film.

The variations include the regular drier concentrations and higher and lower metal contents as follows:

Paint No.	% Pb	% Mn	% Co
OJ 626 J	0.344	-	-
OJ 627 J	-	0.014	-
OJ 628 J	0.344	0.014	-
OJ 629 J	0.173	-	-
OJ 630 J	-	0.007	-
OJ 631 J	0.173	0.007	-
OJ 632 J	0.344	0.007	-
OJ 633 J	0.173	0.014	-
OJ 634 J	0.690	-	-
OJ 635 J	-	0.027	-
OJ 636 J	0.690	0.027	-
OJ 637 J	0.690	0.014	-
OJ 638 J	0.344	0.027	-
OJ 639 J	0.344	0.014	0.009
OJ 640 J	0.344	0.014	0.020
OJ 641 J	0.173	0.007	0.009
OJ 642 J	0.173	0.007	0.020

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The grinding of all paints involved in the 1946 cooperative exposure series with Titanium Pigment Corporation has been completed.

Exhibits were prepared for a discussion of advertising claims for SWP made in Good Housekeeping Magazine. Mr. Henderson, of the Good Housekeeping Institute appeared on January 31 and a satisfactory discussion ensued.

Exposure panels prepared during the month include:

1. Extender Studies. 10351-60 C and F. Loomis Talc 20 L, Witco Chemical Asbestol Filler, Stanley Doggett Talc #162, Sierra Talc Fibrene C, Kennedy Warm Springs Talc. 10364-10366 C and F. 20 L, Metronite BXXXX and Micronite.

2. Titanium Conservation. 10376-10383 C, S and N. SWP 450 Undercoater with 85# 2173 TiO_2 and SWP Gloss White with 110# 1403 TiO_2. Also XX-503 zinc oxide plus lead carbonate to replace 412 leaded zinc.

Reports were prepared on exposures now concluded or in progress, as follows:

1. Final report 4975-99 C, Cof. 42 months Chicago and Coffeyville. Tests of leading competitive house paints of 1940 applied as per label instructions. The S-W two coat 450-471 system gave the best over-all performance. With the exception of Benjamin Moore, the systems employing special undercoaters were superior to those recommended for application self-primed. Pittsburgh's and Ward's Super are the only items which, both in white and tint, are essentially equal to SWP at 3-1/2 years in the qualities of durability and appearance. Pratt and Lambert Cream looks good, but has the advantage of deeper shade. Devoe's is good except for erosion at Chicago. The self-primed systems, du Pont's, Patterson-Sargent's and Minnesota Linseed's, are definitely inferior. Probably poorest of the special-primed systems is Benjamin Moore's. This leaves the following for brief mention: Pratt and Lambert White, fair (serious failure, but normal in type and degree); Glidden's system, slightly less than fair; Sears', slightly better than fair; Ward's First Quality, fair; Ward's Coverall, definitely inferior. Photographs were made to record the final appearance of the panels.

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2. Final Report 4100-5 CI, CO. 52 months Chicago. To compare durability of paints applied indoors and outdoors at 33°, with temperatures below freezing before thoroughly dry, using Cold Weather Reducers with V-11073 and ARV-1660 based on (2945)EA-D. The special reducers help in the application of more reasonable film thicknesses at low temperatures and set up the films faster to resist damage by rain, snow or frost. Differences in durability were not large or consistent. Our current oil conservation house paints dry faster and more thoroughly and therefore the need of Cold Weather Reducer has decreased.

3. Progress Report 8121-32 F, C. 18 months Florida and Chicago. Studies of bodied oils of varying acid values in SWP vehicle. Acid values from 2 to 22 added in varying amounts. No significant differences to date.

4. Final Report 4913-27 F, C. 4 years Florida, 5 years Chicago. Substitutions of special oils in the 1940 SWP Gloss White.

Kastolene - Dehydrated Castor Oil - Archer-Daniels-Midland Company
ADM (418) - Raw Soybean Oil - Archer-Daniels Midland Company
P5xL - Extracted Soybean Oil - Pittsburgh Plate Glass Company
(5091) - Treated Linseed - S-W regular.
ARV-1979 - Castor-Soya P.E. Ester - S-W experimental.
ARV-1981 and 1984 - Soya P.E. Esters - S-W experimental.
ARV-1987, 1988 and 1999 - Linseed P.E. Esters - S-W experimental.

The various P.E. esters seem clearly superior to the processed oils in resistance to checking and cracking. Outstandingly bad in cracking are straight (5091), 40/60% Kastolene/ADM (418) and Kastolene/ADM (418)/(5091). ARV-1984 is the only P.E. special which seems below the average of its group; Kastolene (as used alone) is the only processed oil which seems above average in its group. Certain specials in which mica was introduced resisted cracking very effectively.

5. Final Report 5200-29 C, CY. 57 months Chicago. National house paint series. The comparisons of the SWP 450-471 system with the New Jersey two coat Cryptone MS-130 system are of special interest. The N.J.Z. primer was pigmented with 85/15 Cryptone MS 130-35/65 leaded zinc and the top coat 70/30 Cryptone MS-130/leaded zinc.

The SWP system is in good condition at nearly 5 years' exposure, while the N.J.Z. system, even on cedar, is badly eroded, in most cases clear to the wood. N.J.Z. primer under Rex 471 allows some erosion and cracking, and, while perhaps slightly better than Rex 450-N.J.Z. top coat, is definitely inferior to the regular SWP system. The same thing shows up in the tints, much more serious erosion and fading with N.J.Z. In this case, Rex 450-N.J.Z. top coat seems especially

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poor and N.J.Z. primer-Rex 462 relatively good. Three coat jobs of Rex 450-450-471 vs. Rex 450-471-471 are both good, cannot be distinguished.

6. Final report 6107-10 C, Cof. 45 months Chicago, 39 months Coffeyville. Two coats, self-primed. Rex 300 Family Paint White of 6-6-41, with 36% lithopone, 19% 1526 leaded zinc and 13.5% 2140 Titanox RC is tested against a special with no lithopone, 25% 1526 and 34.5% 2140. Asbestine content in both is normal at about 33%. In Rex 320 Ivory, the regular of 6-9-41 contains 57% 1526 and 21.5% each of asbestine and limestone, while the special contains no lead-zinc but 53% 2140, 40% asbestine and 7% mica. The Chicago panels are badly mildewed, while the Coffeyville tests are relatively clean. The 2140 type is much dirtier, except that the white at Coffeyville is essentially as clean as the guide. However, the failure, both erosion and check-crack-flake, is much worse on the lithopone type. There is no worthwhile advantage in tint-retention due to this change, as excessive 2140 results in a heavy adherent chalk-mask. The mildew growth seems inversely proportional to the zinc oxide content, as apparently there was little chance for the gradual chalking which usually halts mildew.

7. Final Report 3042-3 C, CY. 58 months Chicago. The panels compare the 1939 S-W two coat system using 450 Undercoater which then contained no Celite, and the Devoe system with their zincless #239 Undercoater. On cedar, the Devoe primed system is slightly less eroded and less inclined to flake than Rex 450. Erosion is the main defect, and the SWP system has gone beyond the acceptable stage of appearance, while the Devoe-primed system is barely acceptable. The yellow pine board, which seems good and sound, does not show this difference, hence we conclude that the two systems are roughly equivalent.

8. Progress Report 8067-70 F, FY. 1 year Florida. Substitution of a mineral pyrophyllite Pyrax HP from R. T. Vanderbilt for 20 L in Rex 471 and Family Paint. Pyrax HP shows more chalking, better appearance and less checking. Differences are small at Chicago at 17 months. Pyrax HP is more difficult to grind than 20 L.

Spray Painting with SWP

The difficulty of obtaining a continuous film over cracked wood or paint constitutes a major obstacle in developing a house paint formulation suitable for spray application. Numerous wetting agents have been investigated in an attempt to cause the paint to flow into the crevices. Only partial success has been obtained along these lines to date and then

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usually only with the application of an excessively heavy coat. It is believed that the use of a spray gun designed for this type of application would give better results than the suction type gun now being used.

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

Further confirmation of the idea described in the December report that rutile titanium dioxide may cause a yellow discoloration in the chalk on white house paints has developed in Weather-Ometer tests now exposed for 710 hours. The chalk on SWP Gloss White samples carrying R-200 TiO_2 shows a yellow cast, while the paints with anatase 1403 TiO_2 do not show this fault. The attention of formulators is called to the talks now being given by the New Jersey Zinc Company before the Production Clubs, in which it is stated that in their survey of house paints the paint exposures employing rutile titanium oxides are showing a yellow to brownish discoloration.

Exposure panels 10361-3 C, F were prepared to check the durability of Titanox RCHT-X compared with RCHT in Family Paint. It was also used in combination with anatase titanium calcium.

A progress report was issued after six months' Florida exposures of a series of zincless and lead-less paints. The pigmentations include 2140 Titanox RC, 2132 Titanox RCHT, 1271 Ti-Cal, 2173 Ti-Pure R-200 and 2174 Ti-Pure R-610 in conjunction with asbestine and Alsibronz #19 mica. P.V.C.'s range from 33% to 36.6%, and certain formulas are used with the addition of about 7% of sodium silicofluoride and/or Dowicide G as mildew-resisting agents. The guide is Rex 471 of 1-22-43, using 2173 titanium; minor tests are made of a special tint base using 2174 and mica. These tests, except 1271 and 2173, show very bad mildew in spite of comparatively free chalking. The special agents show no effect except where both are used, still not satisfactory. There is also considerable checking and cracking; 1271 and 2173 (quite free of mildew) are worst in this respect, while 2140 and 2132 (worst in mildew) show it only very slightly. The guides show no failure and only slight dirt. The special tint base seems inferior in color and dirt collection. Chicago panels at 12 months are much better, as there is no failure or mildew. 2140, being dirtiest, rates poorest, 2132 slightly better and 1271 and 2173 quite good.

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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. Bark 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.

#262 - 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 (5880)E (CV 7014). As a second variation a combination of CV 5021 (linseed alkyd) and CW (1998), 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	071.63
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# 2178.	Linseed (3880)E CVR 457	18,275	$88.46
OJ 668 J	"	350# 461 L 190# 1403	"	18,345	91.09
OJ 669 J	"	350# 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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panels but there should be enough confinement so that the relative humidity may reach approximately 75%. Under these conditions filiform corrosion will appear after 10 days' exposure and continue to develop for several weeks. Samples of such corrosion have been produced wherein the length of the rust furrow is one inch long. Following the establishment of these accelerated conditions required for the production of filiform corrosion a study will be made to formulate coatings which will resist this type of corrosion.

An expanded study of the vehicle for Kromik Primer beyond that reported last month was started. Using regular Kromik vehicle as a guide, Dehydrol (2325) was substituted for (48), (48) was substituted for the (2841)G, thus eliminating the resin, (48) and (2841)G were replaced with (2325), a tung-ester gum varnish was substituted for (2841)G, (797) was used in place of (2841)G, and a tung-phenolic varnish (Lin-X) was used in place of (2841)G. Panels have been prepared and are ready for exposure.

A report was received during the month from Newark Technical Service with regard to the testing of several marine primers which were recommended to the Federal Shipyard and Dry Dock Company for comparison purposes. The recommendations made include Lead Industries Association's Pigment J in a cumar-phenolic vehicle, pigment J in (2966)H and the current Kromik pigmentation in the vehicle of Rex 46514. All these are in excellent condition while the U. S. Navy Zinc Chromate Specification Primer has failed rather badly.

A group of panels was prepared during the month for the purpose of investigating the ability of Kromik Primer to adequately warn of recoating when the finish coat has eroded, as suggested by the New Jersey Zinc Company. This is largely a matter of color contrast. The Metalastic colors were included in the group in order to determine the degree of contrast which will appear when the top coat erodes to the primer. The panels will be exposed in the Weather-Ometer where chalking and erosion failures are quite rapid. Both spray and brush applications are being tested.

A device for the testing of chemical resistance of coatings was constructed, based upon suggestions received from the Arco Company. A cotton string soaked with the chemical solution to be tested is drawn over a painted panel at a constant speed. Several weights press the string to the panel at various points. The test is conducted by withdrawing these weights at regular intervals and observing the progressive breakdown of the paint due to the action of the chemical in the string. The method shows considerable promise, particularly in that the results are more objective than those obtained by more conventional methods.

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Initiated by an interview with a representative of Carbide and Carbon Chemicals Corporation, a group of Vinylite Organosol coatings has been formulated. These will be compared to the solution type Vinylite coatings as well as other promising materials in connection with the current study of chemical resistant coatings. A zinc chromate-Vinylite primer is also being considered.

A research bulletin covering the development of the current Kromik Primer formula was written and will be distributed shortly.

Supplementing previous tests conducted with powdered Acrawax, a sample of atomized Acrawax was used with a phenolic-alkyd (3110), Kromik Rex 16174, and current Lin-X at the rate of 0.8% by weight of the N.V.M. in the vehicle. The atomized Acrawax did show considerable advantage in the (3110) as far as salt spray resistance was concerned. However, in Kromik and Lin-X this advantage was very slight.

To show just what effect film thickness has on outdoor exposure, a set of panels was prepared to approximate spreading rates of 200, 500, 800, and 1000 sq.ft./gal. for Kromik Primer. These films were carefully measured by weighing. These panels will be exposed at the Chicago farm.

#183 - Pretreatment of Metal Surfaces for Painting

An evaluation of "Pi B" a "liquid insulation" agent supplied by U. S. Industrial Chemicals, Inc. has shown that it cannot be safely used with paint systems. This agent showed a slight inhibition to rusting when compared to untreated uncoated steel, but under one coat and two coat paint systems serious blistering was encountered. There was no improvement in rust control when the "Pi B" was used as a pretreating agent. Salt spray, salt immersion and tap water immersion tests were conducted.

The validity of the water film-break test for cleanliness of steel test panels was questioned in recent Subcommittee VII A.S.T.M. discussions. To determine the validity of this test, panels were cleaned with solvent spray to which varying proportions of lubricating oil and wetting agent Nacconol NRSF had been added. It was observed that if a relatively large quantity of wetting agent was present an oily panel would support a water film break-free. This quantity of wetting agent was clearly visible and greatly exceeded the quantity which would ordinarily be encountered on stock panels.

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However, it was felt that a panel cleaned by the solvent spray method might carry a trace of oil in spite of its ability to support a water film break-free. Using an alkali cleaned panel as a guide, an attempt was made to photograph these panels in ultraviolet light. This technique is based upon the fluorescence of mineral oils in ultraviolet light. After considerable experimentation it was found that this method would detect only easily visible amounts of oil.

In connection with our panel preparation study it was noted that one side of a panel supported a water film break-free more readily than the other. A close examination of the surface of the panels showed that one side of the panel was rougher than the other. The rough side consisted of sharper contours whereas the smoother side showed more flatted elevations. A series of tests were conducted which gave the following results: Rough faces supported a break-free water film with difficulty, showed low resistance to skid, and allowed a steady skid. Smooth faces supported a break-free water film readily, showed higher skid resistance, and allowed a less steady skid. Skid qualities were measured by drawing a cloth across the face of the panel and observing the amount of force required to do same. When panels were finished with Kromik Primer and submitted to salt spray test it was noted that the smooth faces failed slightly more rapidly than the rough faces. A similar set using 52P18, Navy Zinc Chromate Primer showed no differences between rough and smooth faces.

In conjunction with the water film tests a group of panels has been prepared for adhesion tests, comparing the efficiency of certain cleaning methods. We will also compare the effects of a 300° F. heat after cleaning with room temperature drying.

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No work was done on the following projects:

#163 - One Coat House Paint

#178 - Studies of Dark Colored House Paints

#160 - Painting of Bricks

#112 - Fire Retardant Paints