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

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68.2% Leaded Zinc
18.2% Lithopone
9.1% Mica
4.5% Magnesium Silicate

This formula would lack brightness, hiding would still be low, the film would accumulate dirt, which probably would shed unevenly, and the film would check.

A low TiO_2 pigmentation was also included, with:

71.2% Leaded Zinc
20.7% Titanium Magnesium
8.1% Mica

Panels were prepared in both white and tints, using both R 200 and R 610 TiO_2 in the low TiO_2 paints.

Panels 7985-91 were prepared for exposure using the CW 1581 - Mineralite extender replacement (5% and 7%) for 20 L in SWP Gloss White, as discussed in the January report.

Exposure panels 7992-4 were prepared for Chicago and Florida covering a temporary formula for SWP tints to conserve 2174 dry, R 610, through the use of lead titanate, which was available for limited production. The basic tint formula of 2-10-43 with 116 pounds 2174 dry was used, also the Alternate B formula of 12-30-43, with 44 pounds of 2174 and 225 pounds 2140 dry, Titanox RC. The special carried 40 pounds of 2174 and 80 pounds lead titanate.

A series of house paints was prepared for exposure to study more precisely the effect of variations in pigment-volume-concentrations. In this series the p.v.c.'s were varied in 1% steps from 25% up to the regular of 10-4-43 which runs 36.7%. Insofar as it was possible to do so, the pigmentation was held constant, also the amount of (48) bodied linseed oil, varying only the raw linseed oil, and adding mineral spirits when necessary to ease brushing. Exposures will be south vertical Florida, and south and north vertical Chicago. Results will have bearing on our post-war formulations.

We have had difficulty in reproducing viscosity measurements for some types of formulations. To determine the most accurate method of making viscosity measurements, the viscosity of a sample of SWP Gloss White was determined over a period of 15 days, using various standard methods. A fresh sample was used for each test.

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The S-W Flowmeter was used, both by overflowing the cup and by scraping the paint level with the top of the cup. The Stormer viscosimeter was used in the normal manner, using a given weight and timing 100 revolutions of the paddle. An attempt was made to obtain yield values by slowly adding sand at the rate of 112 gms./min. up to the first movement of the paddle.

The paint was prepared for the viscosity determinations in different ways. In some instances, the samples were not agitated in any way prior to taking the viscosity, some were shaken, and others were agitated continuously. With the house paint sample differences observed in viscosity readings were slight and for practical purposes no preference was found for any one method. It is planned to extend this work using formulations which have given trouble in the past, to try to establish a more satisfactory method for this test.

#178 - Studies of Dark Colored House Paints

Drying tests were run during the month on normal storage samples of SWP Modern Brown and French Green mentioned in earlier reports. After 18 months' storage of samples with and without zinc oxide the following set-to-touch times were observed, as compared with earlier readings:

Paint	Set-to-touch		
	One Week	10-1/2 Mo.	18 Months
1. SWP Modern Brown-ZnO as 25# 414 W	3 hr. 40 min.	6 hr.	6 hr. 45 min.
2. SWP Modern Brown - no ZnO	4 " 50 "	6 "	8 " 50 "
3. SWP French Green-ZnO as 25# 414 W	5 " 30 "	8 "	10 "
4. SWP French Green - no ZnO	7 " 30 "	45 "	80 "

Improvement through the use of zinc oxide is very apparent.

When this investigation was started it was planned to use acetone soluble determinations to check sol-gel ratios as a function of exposure time, in an attempt to learn something about the "softening-back" of old films of dark colored house paints. However, after the films had been on exposure for some time, the acetone soluble determinations reversed themselves due to the solubility of the zinc soaps formed in the films of the paints carrying zinc oxide. While it is a relatively simple matter to determine the zinc oxide solubilized in the form of zinc soaps, it is difficult to correlate the zinc oxide with the fatty acids with which it is combined. Because of the inconclusive results, acetone extractions are being discontinued, at least for the time being.

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

Paints have been prepared for exposure to amplify an earlier series, by comparing old and new revisions of Rex 436 SWP Fume Resisting White and Rex 610 Gas and Fume Resisting White, and adding four tint base fume resisting

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paints tinted Cream and Slate Gray. All paints will be exposed both self-primed and over Rex 450 SWP Undercoater, to determine the effect of lead pigments in the primer. The exposures will be at the Chicago exposure farm and the Gloucester Titanium Plant, if possible.

A series of oil conservation tests (6885-6912 FP) were examined after 12 months' exposure Florida, south vertical. The paints include some of Titanium Pigment Corporation's low p.v.c., low n.v.m. house paints with neutralized vehicles, and Lowe Brothers' T-2022 and T-2023 developments, as well as some proposed tint bases. The panels are Ponderosa pine siding, prepared in such a way that the following systems are compared on each panel:

(a) Regular Guide Rex 471 SWP Gloss White over Rex 450 SWP Undercoater.
(b) Test Paint over Rex 450.
(c) Test Paint as one coat only.

The condition of the Florida panels after 12 months' exposure may be summed up as follows:

Materials Tested	Rating
Regular Rex 471 Gloss White, pre-conservation.	Poorest as to checking, also yellowish cast and considerable mildew.
T.P.Corp. EX-3742. P.V.C. 21%. No inert, mechanically mixed lead-zinc, VM 1939M5 bodied oil vehicle.	Poorest all-around. Check, crack, and tendency to erode. "Thin" appearance.
EX-3743. P.V.C. 21%. Similar, but asbestine used.	No failure; clean and white. One of the best.
EX-3742 Reformulated to use co-fumed Pb-Zn.	Rather poor. Appearance good, but a peculiar failure is starting. Shows pits in vicinity of mildew spots.
EX-3743 Reformulated to use co-fumed Pb-Zn.	Somewhat better. Appearance good, but shows cissing.
Lowe Bros. T-2022 - leaded zinc, high inert, R-200 TiO_2, LA 740 bodied oil vehicle.	Good durability; would rate with the best except for yellowing, as on guide.
Same as preceding, but using (48) bodied oil (this is nearest to our Rex 471 Oil Conservation White as finally adopted.)	Equivalent to preceding.

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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 ZZZ #33 with 70% of Titanox RC HT and anatase titanium calcium, respectively.

Exposures will be at Chicago, Coffeyville, and Miami.

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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 23 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

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reflux-percolation method could satisfactorily replace the longer Soxhlet extraction used by Nelson. In general, the test material is applied to the surface at a definite spreading rate, allowed to dry a specified time (usually 4 hours), carefully scraped off and its oil extracted by means of a solvent. Weights of the original sample scraped off, the oil found after drying and the loss from the extracting flask are the essential data required. The main difficulties encountered and the progress toward their solution may be stated briefly:

1. Choice of solvent.

At first petroleum ether was thought to be good because it gave a clear extract, free from colloidal pigment particles, which was not true of acetone and ethyl ether. Earlier reports have stated results based on the use of petroleum ether, which must now be rejected because fairly recently it has been found to be not more than 45% efficient in extracting the semi-dried binder. This was finally settled by running regular determinations using the vehicle binder only rather than the whole paint, part of which work was done in February. As a result, petroleum ether has been rejected as a solvent, and ethyl ether and a blended ether-benzol-methanol-acetone solvent were found to be 100% efficient. Several other solvents were tried; some were suitable, but not readily available.

2. Removal of colloidal pigment particles.

After percolation, it is necessary to clear up the fine suspended matter in order to arrive at the true weight of oil extracted. A fritted glass filter was found to be the only type capable of removing the particles, but in some cases it was useless. Some of the best results obtained so far have resulted from the use of the centrifuge and a "direct method," which consists of carrying out the percolation in a bottle which can be whirled in the centrifuge. Incidentally, considerable time was spent in ignition tests on the final oil obtained to get an idea of the amount of non-organic matter being weighed.

3. Volatile content and miscellaneous.

It was found that we could not assume 100% loss of volatile during the usual 4-hour air-dry. Determinations, mainly during January, showed that definite percentages for each paint, in the vicinity of 20% of the original volatile, were retained by the film, and a correction is now applied. Rather recently it became necessary to do some checking on the effect of permitting the solutions to stand over night, etc., due to the extra time involved in centrifuging. Most runs have included draw-downs on glass to check the "oil found" values.

Due to a temporary shortage of ethyl ether, we could not carry through during the past week or so plans to run final determinations on the paints of main interest so far, namely Rex 450 Undercoater of 1938, Rex 450 of 1943, and

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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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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 5. 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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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. gummy	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.

#103 - 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.

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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:

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1. K. C. #2813 and D 2689; 2. 12054 dry; 3. Zinc Tetroxy Chromate; 4. Diamond Alkali calcium and Kentucky Color strontium chromates; and 5. K. C. barium chromate. The similarity of performance of calcium and K. C. strontium chromate would suggest that the Foote Brothers material behaves similarly to that from Kentucky Color.

With respect to general performance in primers, the question is best answered in terms of exterior exposure results. Recently it has been noted that rather wide differences in salt spray resistance in primers are ironed out when placed on exterior exposure. Based upon blistering properties, however, the material would be of interest in formulations requiring good resistance in this respect, but only on the basis of a volume for volume price equivalence with Zinc Tetroxy Chromate. At the present time it is about twice that of Zinc Tetroxy Chromate.

Special Studies

Barge Primer exposures at Florida, part of which were mentioned in the January report, were given a final examination and summarized. The supplementary set, exposed 9 months, was described previously; CH 3285 Prefab Primer appeared slightly inferior to stock H 6952 Barge Primer, and our approximation of Barge Paint Gray, Specification 52-MC-13, showed more fading than stock H 6959 Barge Gray from Newark, but actually looked better because the latter had a peculiar greenish cast.

The main Barge Primer series, all our experimental primers based on study of Specification 52-MC-12 and quite extensive preliminary tests (including salt and fresh water immersion), were examined after 12 months' Florida exposure, 45° south. It should be remembered that this is essentially the same as regular house paint test conditions, and may not compare very closely with actual barge use conditions. These panels all had the same top coat, the experimental 52-MC-13 mentioned above, and seven white primers were tested, both as 3-coat work (two coats of finish paint) and 2-coat work with an edge left unpainted for extreme weathering. All panels looked very much alike except for wood cracking, and about the only criterion of primer effectiveness was the tendency to peel in the vicinity of cracks. In general, phenolic and bodied oil primers showed up slightly better than alkyd vehicle primers. Rex 450 Undercoater and the two alkyd vehicle primers used were the only ones where a definite peeling tendency was noticeable. The alkyds were incorporated with the same two pigmentations as used with phenolics and bodied oil on other panels, which were in excellent condition. One pigmentation carried no zinc oxide, as per 52-MC-12, the other a small amount so as to make it similar to CH 3285. No difference was noted. CH 3285 itself appeared good, but not quite equal to the specification primers.

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No work was done during the month on the following:

#163 - One Coat House Paint

#77 - Mildew Inhibitors

#160 - Painting of Bricks

#148 - Examination of White Lead

#150 - Durability Studies of Zinc Sulphide Pigment Combinations

#112 - Fire Retardant Paints