

ALLIED RESEARCH LABORATORIES

Report of Investigations for June, 1942

M. VAN LOO

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

In order to expand the field of usage of 1526 dry and to provide for any shortage of 412 dry which might develop due to difficulties in ore procurement, the Pigment Division has spent considerable time improving the color of 1526 by calcination. Early lots of calcined 1526 showed rather considerable drop in viscosity characteristics compared to the original untreated pigment, but improvement has been made in subsequent calcinations. Lot 1342 X Calcined 1526 used in SWP Gloss White - Rex 471 to replace 412 dry on an equal ZnO basis showed slightly less body but was equal in brightness to the formula using straight 412 dry, Lot 2771 for the leaded zinc. Regular 1526 was much grayer and bluer. Samples are being stored for observation of viscosity changes and tendencies toward settling. Exposures will be prepared of these pigments in SWP White and the white tinted, and in SWP Cream. There are possibilities that the calcination may improve the stability of the pigment and tend to eliminate fines.

#97 - SWP 471

Due to a heavy schedule of exposure painting and the necessity of erecting two additional vertical exposure fences, certain house paint series have been delayed considerably this spring. Progress is now being made in catching up on this work. One such series which was finished during the month covered comparisons of paints varying in leaded zinc and TiO_2 content as suggested by Krebs in their bulletin #190. The formulas include:

1. Regular "Ti-Sil" formula, 50/50 Ti-Sil/35% leaded zinc oxide.
2. 70/30 Ti-Sil/35% leaded zinc oxide.
3. 50/30/20 Ti-Sil using R 510/35% leaded zinc oxide/magnesium silicate.
4. 112./45/43.8 R 510/35% leaded zinc oxide/magnesium silicate.
5. 5/32/45/18 Anatase TiO_2 140S/Ti-Sil/35% leaded zinc oxide/B.C.W.L.
6. 50/25/25 Ti-Sil/35% leaded zinc oxide/basic carbonate white lead.
7. 10/20/20/50 Anatase TiO_2 1403/magnesium silicate/35% leaded zinc oxide/
B.C.W.L.

Exposures are at Chicago and Coffeyville, both in the white and tinted to Rex 375 Colonial Yellow.

In last month's report a statement was made that evidence from work in tinted metal protective paints had indicated that during storage of zinc oxide containing paints the formation of zinc soaps increased the tendencies toward checking and cracking. Panels covering this point are now on exposure at Chicago (6339-C - 6350-C). Paints used included batches of 450 Undercoater, 471 Gloss White, 462 Cream, and 375 Colonial Yellow

N14202

M. VAN LOO
Cont.

#97 - Cont.

approximately two years old and the same formulas freshly ground, using all possible combinations of old and new Undercoater under old and new top coats.

A number of exposures of Family Paint White - Rex 300 were put out during the month at Chicago and Coffeyville. Formulations include the regular formula of 10-13-41 based on lithopone/zinc sulphide/1526 leaded zinc; a special 36/36/28 414 dry/magnesium silicate/Titanox RC; the regular formula of 6/6/41 based on a pigmentation of lithopone/ Titanox RC/1526 leaded zinc; a special suggested by Mr. Budziak pigmented with lithopone and 414 leaded zinc with mica in the inert portion; two similar formulas with increased 414 and mica and other variations in the inert; a special, 43/28.5/28.5 Cryptone MS-130/412 leaded zinc/ magnesium silicate; another special with 414 leaded zinc/Titanox RC/magnesium silicate/mica, and a similar formulation replacing Titanox RC with Titanox RCHT. (Panels 6329-6338 C and Cof.)

#150 - Durability Studies of Zinc Sulphide Pigment Combinations

A total of 204 panels (6351-6458 C and Cof.) were prepared during the month for exposure at Chicago and Coffeyville covering a series of basic tint retention studies. The pigmentations have been mentioned in previous reports. They cover the use of zinc sulphide in the Cryptone MS-130 type of pigment in conjunction with leaded zinc and lead titanate. The MS-130 is varied from 30% to 85%, 412 from 0% to 50%, and lead titanate from 0% to 15%, some with mica and/or magnesium silicate added. The exposures were prepared in white and tinted to Rex 353 - SWP Light Lead and 385 Straw, both over 450 Undercoater and self-primed.

#12 - Exterior Primers

Further work was done on SWP Undercoater - Rex 450 at 39% p.v.c. to reduce crawling tendencies of the top coat to simplify the formula. It was necessary to increase the higher bodied (48) at the expense of (785) previously used in order to obtain satisfactory body without resorting to a number of inerts. The Celite-110 was increased from 60 to 80 pounds. The zinc oxide content is 15% and the hiding is 159 units per gallon. Factory batches will be run as soon as manufacturing facilities are available, and the new formula will be distributed if satisfactory.

In order to determine whether Exterior Prefab Primer - CH 3285 could be applied by dipping, the primer was reduced 25% with (63) V M and P Naphtha, (1636) Apco Troluol, and (2646) Solvesso #1, respectively. Stability tests were run on the reduced primers. After several hours of agitation, the primers reduced with (63) and (1636) produced a break and the primers bodied up considerably. The primer reduced with Solvesso #1 proved to be satisfactory on the stability test and produced a uniform film when applied by dipping. The necessity for the use of high solvent thinner will restrict its usage by dipping.

M. VAN LOO
Cont.

#12 - Cont.

A request was received through Mr. Thomson's office for a prefab olive drab primer formulated along the lines of CH 3285 for use on barracks. A formulation CH 3449 was developed and submitted to Mr. Threadgill, at Dallas, for tests. Due to shortages of ferrites it was necessary to resort to domestic ochres which introduces an element of doubt as to performance. It is believed, however, that the formulation will help to overcome the difficulties experienced with the early ochre primers. The label analysis is as follows:

Pigment by weight - 46%

Ochre	74%
Magnesium Silicate	25.5%
Lampblack	<u>0.5%</u>
	100.0%

Vehicle by weight - 54%

Treated Vegetable Oils	37.5%
Driers and Thinners	<u>62.5%</u>
	100.0%

In general, the performance of CH 3449 is similar to CH 3285 although over night recoating is preferred.

#162 - Studies of Flat Wall Paint Formulation

During the month further work was done on the problem of ghosting in flat wall paints, with special attention to the use of wetting and emulsifying agents. These included Nacconol NRSF, HG, and LAL, combinations of Nacconol NRSF and Palm Oil fatty acids, and 2-amino-2 methyl-1 propanol. The comparative wetting action of naphthenate driers was also studied.

The above wetting agents when introduced into the titanium calcium-titanium dioxide formulations produced decided decreases in viscosity. However, so far only slight improvements in ghosting were evident. Naphthenate driers produced no improvement. The most promising agent so far is 2 amino-2 methyl-1 propanol which apparently produced soaps with the fatty acids present in the vehicle. Work will be continued on this problem, including the study of wetting agents on the tinting colors used.

Further work was done on the elimination of the use of lithopone in Semi-Lustre White. A titanium dioxide - titanium calcination was developed with a vehicle somewhat similar to the present formula. A preliminary formula was sent to Mr. Holton, in which several changes were introduced in the vehicle to increase viscosity and improve brushing qualities.

M. VAN LOO
Cont.

#77 - Mildew Inhibitors

So-called "burial tests" were conducted on treated and untreated Osnaburg cloth to determine relative efficiencies of fungicides for treatment of sand-bags. The treatments were as follows:

- #1. 3% solution of Dowicide 6 (tetrachlorophenol) in (348). Dowicide 6 equivalent in weight to 2.2% that of the weight of the cloth.
- #2. 10% solution of copper tallate (ARV 2629). The copper deposited on the cloth was equivalent to approximately 0.7% of the weight of the cloth.
- #3. 5.75% solution of "Protela" in (348), containing approximately 1% of Diazopon as a wetting agent. The copper deposited on the cloth was equivalent to approximately 0.5% that of the weight of the cloth.
- #4. 5% solution of copper naphthenate in (348). The copper deposited on the cloth is equivalent to approximately 0.4% of the weight of the cloth.

Two untreated strips of cloth were tested along with the treated strips. They were buried in ordinary garden soil containing Milorganite equal to 1% of the weight of the soil. The soil was kept moist by wicks fed from a reservoir of water. The test was run at room temperature.

After two weeks the strips were examined. The two untreated controls were completely rotted. As far as could be determined the treated strips were all in perfect condition. The tests of the treated strips were therefore continued for an additional two weeks or longer as will be required to note differences in the fungicidal efficiencies of the agents used in the test.

A report was drawn up during the month summing up the results of special mildew-resistant variations of Commonwealth Barn Red - Rex 54 exposed at the Frank Flowers farm at Churubusco, Indiana, April 12, 1939, which have been on test for about 37 months. Complete details as to location, composition, and relation of these paints to other mildew tests may be obtained from Research Bulletin RC-55 and earlier reports. There are 15 panels of old, mildewed wood and 3 using new Douglas Fir. The panels were exposed on the north side of a barn where mildew previously had been very troublesome. The lower half of each panel was repainted in the fall of 1939 to test the effect of painting at that time of the year.

5% of cuprous oxide and the use of 1/2 pound of zinc oxide gave practically complete protection, with both mercuric and mercurous chlorides quite effective, and Mer-Q-Ree fairly so. Besides the untreated Rex 54 control paint, the following showed bad mildew on the old lumber: asymmetrical trichlorophenol, "Rex 888," and a treated soybean oil vehicle.

M. VAN LOO
Cont.

#77 - Cont.

On the old lumber there was practically no difference between the spring and fall applications, but on the new lumber the fall painting gave definitely poorer results except where the mildew was effectively checked by the fungicide. The Rex 54 control showed uniformly bad mildew. There was some indication that tetrachlorophenol and trichlorophenol promote checking, although this observation is questionable due to the bad checking of the old weathered lumber itself.

Mildew paints made on April 17, 1940 were examined for settling, livering, viscosity, and drying time, with the following results:

Sample No.	Type	Settling	Viscosity #3 orifice	Drying Time
Rex 54				
#21	Reg. Rex 54	Appreciable soft	13.9"	4 hours
#22	2% Dowicide 6	" granular	*	4 "
#23	5% Cu ₂ O	" "		7 hrs 45 min.
#24	Rex 203 1-300	Granular		5 hrs 15 min.
#25	Rex 203 1-600	"		5 hrs 30 min.
#26	(1 Hg naphthenate (12 HgCl	Apprec. granular		5 hrs 30 min.
#27	1 HgCl ₂ - 7 HgCl	" "		4 hrs 30 min.
#28	1% Hg naphthenate	" soft	13.4"	4 hrs 40 min.
#29	Merphenyl Cl 1-2000	" granular	13.8"	4 hrs 35 min.
#30	Merphenyl Cl 1-1000	" "	14.0"	4 hrs 35 min.
#31	Merphenyl Cl 1-500	" "	14.0"	5 hrs
#32	1/2# ZnO/gal.	Hard, granular	17.0"	7 hrs

*Samples No. 22, 23, 24, 25, 26, and 27 were very granular and even when stirred vigorously were still too lumpy to give a reliable viscosity reading.

The tendencies toward the development of a granular condition and retardation of drying by cuprous oxide and zinc oxide, the most effective fungicides, indicates the necessity for further work to correct these defects.

#103 - Metal Protective Paints

Two sets of navy tank paints were prepared and put on exposure on hot rolled steel panels at Chicago and Florida. They include non-infra-red reflecting paints Green, Gray, Brown, and Light Earth and parallel infra-red reflecting Gray, Brown, and Light Earth. The vehicle is based on V 15195, with p.v.c.'s ranging from 46% to 50% to produce flat finishes.

M. VAN LOO
Cont.

#103 - Cont.

The colors match the standard camouflage color chips. The infra-red reflecting paints were photographed and compared against minimum and maximum reflectance standards. The following table shows how these paints compared in reflectance with the standard navy color chips:

Std. Brown	24%	S-W Navy Brown	30%
Std. Light Earth	57%	S-W Navy Light Earth	40%
Std. Dark Gray	35%	S-W Dark Gray	45%
	Minimum Std.	22.65%	
	Maximum Std.	53.60%	

Besides the interest in infra-red reflectance from both the concealment angle and from the angle of influence on heat reflection as affecting volatile losses in gas and oil tank storage, special attention will be paid to the comparative durability of infra-red reflecting and non-infra-red reflecting parallel tints. Mr. Holton has pointed out that such comparisons may lead to some knowledge of the effect of infra-red rays and heat absorption on the durability of organic coatings exposed to the weather.

#105 - Synthetic Bulletin Colors

A special non-priority vehicle L-187 offered by Cook Paint and Varnish Company was tried in Kem Bulletin Colors as a replacement for (2159). Viscosities and drying time were satisfactory, but there was a tendency toward sticky brushing, and it produced too much flow. Exposures were put out against regular Kem and Victory bulletin colors.

#112 - Fire Retardant Paints

Work during the month was limited to tests of some fire retardant paint coated Celotex panels sent to us by Professor Arnold, of Iowa State College. Since Celotex is an unusual material on which to run fire retardant tests, due to its low inflammability compared to wood, comparisons were made on the basis of Celotex panels coated with Fire Retardant Paints which have been shown in previous tests to be of value on wood. The materials used were a fire retardant flat, and a Forest Products formulation. The Schlyter method of test was used, and the results of the tests were as follows:

Iowa State College Panel	-	Loss in weight	12%; (18.5%)	Flame spread	10"
Fire Retardant Flat	"	"	21%	"	12"
Forest Products Paint	"	"	10%	"	11"

E. VAN LOO
Cont.

#112 - Cont.

The duration of the test was seven minutes, with flaming ceasing immediately upon removal of the burner. Glowing after removal of the flame was noted in the case of the flat paint and the Iowa State College panels, but none with the Forest Products coated panel. In the case of the Iowa State panel which lost 12%, glowing was immediately extinguished by means of carbon dioxide; in the case of the panel which lost 18.5%, glowing was allowed to continue for 10 minutes.

The results indicate that the material from Professor Arnold had about the same fire retardant value on Celotex as the Forest Products' formulation but was decidedly better than the flat. These tests, however, should be repeated on wood in order that more representative results may be obtained.

#160 - Painting Bricks

The report on the painting of asbestos cement shingles is being delayed because of difficulty in completing the necessary photographic work.

- - -

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

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

#148 - Examination of White Lead