PAINT RESEARCH
PROJECT No. ____
(from J. du)

Inspection Trip
Exposures - du Pont Pigment Division
Titanium Pigment Corporation
National Lead Company
June 21 - 22, 1951

General Statement

On June 21 Mr. E. W. Fasig and the writer inspected the panel exposure tests of the du Pont Pigment Division at Wilmington, Delaware. On June 22 we inspected the panel exposures of the Titanium Pigment Corporation, and the cooperative basic silicate white lead exposures of the National Lead Company, both at Sayville, Long Island, New York.

In some instances, we re-examined exposures which have been reported in previous years and in such instances compositions will be repeated only briefly, since details are available in the earlier reports. New series will be described in more detail to bring out pertinent variations.

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Certain general statements may be made before proceeding with details of individual groups of panels.

1. Both du Pont and Titanium Pigment Corporation are increasing the attention paid to "non-reactive pigmentation" formulations, i.e., no lead or zinc, as stain resistant and blister resistant paints.

2. Higher PVC bodied oil house paints are established permanently as superior to pre-war high oil low PVC paints.

3. As lead content in house paints decreases, tendencies toward mildew and dirt collection increase, and chalk resistant titanium pigments must be used with increasing caution. du Pont and TPC confirm our findings that co-fumed leaded zincs are superior to mechanical blends in mildew control.

4. du Pont reports that rutile titanium calcium used in white house paints on occasion has shown "rutile yellowing." One example was also observed in the TPC exposures.

5. du Pont continues promotion of calcium carbonate extenders in tints. We must continue to watch their use of $CaCO_3$ with lower zinc oxide contents to control total basicity.

6. Properly formulated basic silicate house paints seem to be performing satisfactorily.

du Pont Pigment Division - Wilmington, Delaware

(a) White House Paints (including Lead-Free Paints)

Fundamentally, our inspection of the conventional white house paints revolved around the use of various titanium pigments, pure and extended, in three types of pigmentation, marked by high, low and no lead contents. An example of the "high lead" pigmentation would be:

10/22.5/45/22.5 - Ti-Pure FF/Mg silicate/55% leaded zinc/basic carbonate white lead

This formula would calculate out to contain a little over 38% total lead, with 0.97 pounds TiO_2 per gallon.

The "low lead" content paint was the typical "Ti-Sil" formulation of:

15/50/55 - Ti-Pure FF/55% leaded zinc/Mg silicate

The "Ti-Sil" formula, of course, figures out to 17.5% lead pigment, so that even du Pont's so-called "low lead" paint contains more lead than current SWP Rex 471, but is more in line with Lowe Brothers' High Standard No. 328 White. The TiO_2 content is 1.27 pounds per gallon.

The "no lead" formula was more or less typical of a lead-free "fume proof" pigmentation, such as:

17.2/57.3/45.5 Ti-Pure FF/Acicular Zno/Mg silicate, and similar variations.

The fundamental comparisons were of Ti-Pure FF, free chalking anatase TiO_2; Ti-Pure Y-CR, semi-nonchalking anatase TiO_2; Ti-Pure R-110 semi-nonchalking rutile TiO_2; and Ti-Cal R-25 rutile titanium calcium (on the basis of equal hiding). R-200 TiO_2 was used in some cases. A number of series were inspected ranging from five years' exposure duration down to recent series exposed in August, 1950.

We will not discuss every set individually, but try to bring out the major points established. In general, the Ti-Pure FF panels showed the best self-cleaning properties, both north and south, were the whitest and had the best general appearance, but were less durable. After relatively short exposure the R-110 panels are somewhat gray, with the R-25 panels definitely gray. At this stage the "low lead" paints hold a trifle less dirt than the "high lead," but later equalize and even reverse. In the early stages the lead-free paints look good, but such dirt as does adhere has a spotty character.

When these exposures have progressed as much as three years some very definite trends develop. Mildew and dirt collection seem to be more severe this year on the du Pont panels than during previous inspections. Taken as a whole, the "high lead" series looked better than the "low lead" series, and in turn, better than the "no lead" series. This means that differences in dirt collection and mildew such as between Ti-Pure FF and Ti-Cal R 25 become greater as the lead content is reduced. Higher lead formulas can tolerate more chalk resistant titanium pigmentations.

This may well explain previous differences in opinion between Mr. Fasig and the writer as to the use of any considerable amounts of rutile titanium calcium in white house paints. When S-W reduced the lead content of SWP Gloss White to about 10%, Lowe Brothers did not do so. The du Pont exposures would indicate that Lowe Brothers can tolerate more rutile titanium calcium in their white than can S-W before dirt collection becomes too conspicuous. Also it suggests that considerable caution is indicated in translating results from the one formula to the other.

There are a number of special points which developed during our examination of the du Pont white house paint panels.

1. If half the TiO_2 in a white house paint is introduced as anatase free chalking TiO_2 there is a definite improvement over any of the more chalk resistant forms used 100%. But even with half Ti-Pure FF, Ti-Cal R-25 is gray compared with straight FF.

2. du Pont has found on occasion that Ti-Cal pigments can develop the well-known "rutile yellowing."

3. Titanox RC HT is appreciably more chalk resistant than du Pont's R 25.

4. Ti-Pure Y-CR was disappointing. It showed a definite tendency to mildew. The R 25 paints looked better than the Y-CR or R-110 paints. All were grayer than the FF paints but those made from Y-CR or R-110 tended to hold dirt and develop mildew in streaks. This concerns us in Rex 436 Fume Resisting White, which carries the TiO_2 as half 1405 and half 2050.

5. Broeker likes a crystalline type of silica such as 1X or Nytal 200 L because the particles are smoother and more compact. They are too coarse for good grinding.

6. Most of the substitutions in the various series were made on du Pont's equal "free binder" approach. This was explained on page 1 of R. R. Bruhn's Inspection Trip Report for 1950. We do not agree with all phases of their thinking on this point.

7. If lead-free formulas are set up on this basis, very economical costs may be achieved using XX 503 zinc oxide instead of Azo ZZZ-33 and Nytal 200 L for 3 X Asbestine. Low oil demand nodular zinc oxides permit higher PVC's than aciculars and so far give equal performance.

8. du Pont agrees with our findings that Azo ZZZ-55 zinc oxide performs satisfactorily in house paints.

9. du Pont uses 1/2% of lecithin in the grind in house paints to improve suspension.

10. In all cases, the "oil conservation" vehicles show better clean-up and better mildew resistance than the paints with high oil contents. Lead-free paints, especially, should be formulated with low oil contents.

(b) High TiO_2 House Paints. Ti-Pure FF and blends -

Cleaning and Washing

As reported previously by Mr. Bruhn, du Pont has adopted the technique of catching chalk wash from white house paints by placing a row of rough red bricks at the bottom of each exposure section. We are now employing the same technique with considerable success, and have combined with it a large over-hanging eave to emphasize dirt collection on protected areas, as suggested by Mr. Holton.

One group of paints involve the following pigmentations:

(1)	15/50/35 TiO_2/35% leaded zinc/Mg silicate	1.27# TiO_2 per gal.
(2)	20.9/41.1/38 TiO_2/Acicular ZnO/Mg silicate	1.40# " " "
(3)	20.8/49.2/30 TiO_2/35% leaded zinc/Mg silicate	1.80# " " "
(4)	26/52.2/21.8 TiO_2/35% leaded zinc/Mg silicate	2.22# " " "

The (4) formula at 2.22# per gallon is considered as a one coat house paint. The series has been on exposure for somewhat less than two years. The pigment variations include Ti-Pure FF/R-610 combinations ranging from 100/0, 75/25, 50/50, 25/75 to 0/100, at equal hiding and "equal free binder," using pigmentation (1) as the base pattern.

The straight FF paints are the whitest, then progressively become more gray as the R-610 ratio increases. As the TiO_2 content is increased, whiteness or brightness improves. Due to the replacement at equal hiding, 1.38 pounds of R-610 replace 1.8 pounds of FF, and 1.7 pounds of R-610 replace 2.2 pounds of FF. As the amount of R-610 reaches the maximum, the clean-up improves but never equals straight FF, even at the 1.27 pound level for FF.

More extensive comparisons of lead-containing versus lead-free paints include the following:

(1)	20.9/49.2/29.9	TiO_2/35% leaded zinc/Mg silicate	1.80# TiO_2 per gal.
(2)	26.2/40.5/55.5	TiO_2/Acicular ZnO/Mg silicate	1.80# " " "
(3)	28.1/40.4/31.5	" " "	1.92# " " "
(4)	26.6/40.4/55.0	" " "	1.81# " " "

Comparisons include straight Ti-Pure FF and 50/50 blends of FF with Y-CR, R-110 and Ti-Cal R 25, also an 80/20 blend of FF with R-610. As before, the lead-free paints show more dirt and mildew with the same titanium than the lead containing paints. In general, greater chalk resistance is accompanied by less washing. 80/20 Ti-Pure FF/ R-610 is approximately equal to 50/50 FF/Y-CR in chalking and washing, but both are not as white as straight FF (which shows rather severe washing). This is of interest to us as we have had complaints of washing and are considering 82/18 FF/R-610 for lead containing whites and 75/25 for lead-free paints. These ratios perhaps should be reversed.

In connection with some of these series, commercial and experimental one coat house paints were involved. One, which we are sure is Devoe's One Coat, exposed on 8-50-50 looks dirty at this point, while another, which may be Glidden's, looks better. Longer exposures of Devoe's One Coat shows it stays dirty up to 5 years, then shows spotty clean-up but starts to mildew. We must state that exposures of SWP Gloss White at three years have a definite yellow cast, and Lowe Brothers' High Standard White at 2 years is in excellent condition but also has a slight yellow cast. We wondered whether this came from the Ozlo leaded zinc.

(c) Two Coat Systems - Durability

This series is mentioned only briefly, chiefly because of the performance of the top coats over SWP 450 Undercoater. A top coat with the "Ti-Sil" pigmentation of 15/50/35 Ti-Pure FF/35% leaded zinc/magnesium silicate was tested as two and three coats self-primed and over four commercial primers, over a special 12.5/45/42.5 Ti-Pure R-610/35% leaded zinc/magnesium silicate tint base paint and over TT-P-25 Federal Specification Primer.

The general conclusions are as expected: (a) two coat systems are not as durable as three; (b) R-610 is indicated as the TiO_2 to use in primers. An unexpected observation was that the regular top coat performed better self-primed than over Rex 450. du Pont seems to think this is due to a poor panel but we suspect something else, as Rex 450 usually shows up well against self-priming.

References to primers will also appear later under blister and stain resistance.

(d) Calcium Carbonate Extender - Low Zinc Oxide or Leaded Zinc Oxide Levels

du Pont continues to sponsor the use of calcium carbonate extenders in house paint tints, but they do not recommend large scale use in whites at this time. They show the same improvement in tint retention and freedom from mildew in buffs and greys which we have reported previously. In the past two years their interest in $CaCO_3$ seems to have turned toward taking advantage of the basicity of this extender and to study the advantages of using calcium carbonate with lower than normal zinc oxide contents. In this way the total basicity may be restrained within tolerable limits.

Pigmentation details are available on request. The formulas on test range from 2.78 pounds of zinc oxide per gallon down to 0.5 pounds. Due to the higher CPVC (du Pont - "lower free binder requirements") of the carbonate formulas, they are formulated at from 8 to 15% higher PVC. The TiO_2 was increased as leaded zinc or zinc oxide was decreased, to maintain hiding.

If zinc is reduced and replaced with magnesium silicate at "equal free binder," mildew increases rapidly and is severe in Wilmington at 3 months at the 0% zinc oxide level. If calcium carbonate is substituted for magnesium silicate mildew resistance is at least fair even at 0% zinc oxide. This is of interest to us in Rex 472 SWP Mildew Resisting Gloss White, where $CaCO_3$ may be beneficial when combined with low zinc oxide contents to avoid checking.

If we were to use a 50/50 1403/2030 TiO_2 combination, especially in low lead or lead-free pigmentations (where mildew is aggravated) we might use half the extender as $CaCO_3$ to protect against mildew in bad areas, and lower zinc oxide to a degree. This would also apply to rutile titanium calcium. Rex 456 SWP Fume Resisting White would be a good test paint.

(e) Stain Resistance (see also (f) below)

Previous reports of inspection trips have mentioned du Pont's efforts to formulate stain resistant house paints. In the 1950 report Mr. Bruhn pointed out that films containing zinc oxide normally have a pH of about 6.5. Mildew control by pigmentation requires that the pH be held as high as possible. In order to avoid precipitation of copper and iron salts the pH must be held below the precipitation point of 5. Therefore, to prevent screen and rust staining, etc. all alkaline constituents must be eliminated - this excludes lead pigments, zinc oxide, calcium extenders, etc. Mildew must then be controlled by a fungicidal additive.

We were shown a group of TiO_2/magnesium silicate paints ranging from 35 to 55% TiO_2 in various alkyd vehicles, with phenyl mercury oleate as the mildew inhibitor at 0.2% by weight of the total paint. The oldest exposures were put out in 1947 but most of the work has been done during the past two years.

Several of these lead-free alkyd paints show promise so far as regards copper and iron staining (and in durability self-primed). Aroplaz 1271 is especially interesting, although other vehicles such as Glyptals 2475 and 2502, Epi-Tex 147 and 148, and ADM's 75-5 at Z viscosity, have given good results.

Brushing is often a problem with such paints. du Pont reports brushing as "Stormer Brushing," which is based on Stormer viscosity. We do not agree with this approach as brushability cannot be evaluated at such low shear velocities. Our own work on determination of brushability at suitably high shear velocities will be reported later. However, du Pont, using their own concepts of "Stormer Brushing" and "equal free binder" report that Stormer brushing is improved by (1) use of high oil demand extenders, and (2) reduction of the finished paint vehicle viscosity.

(f) Blister Resistance

du Pont has built a special blister test house on the roof of their research laboratory. The house is about 14 feet square with the bevel siding test panels forming the exterior walls. The siding is attached to conventional sheathing boards on 2 x 4" studs. The interior faces of the walls consist of Transite panels with four 1-1/2" holes drilled 4 inches from the top and four holes 4" from the bottom of each section between the studs. Alternate stud areas are insulated with a variety of insulation materials, but such comparisons are no longer considered in this test.

All test panels are caulked to prevent leaking around the edges, and each test paint is repeated 12 times over the building at different locations and over areas with and without insulation. The panels were mounted on the test house at the end of October, 1950 and on January 2, 1951 the conditions inside the house were regulated at 75° F. and 70% R.H. Shortly thereafter the east and north sides were sprayed accidentally with water containing considerable iron rust so both blister and stain resistance are tested.

Although the exposure period is still relatively short, the stain resistant paints of the type described under (e) are performing quite well, both as to appearance and resistance to blistering. Good blister resistance is obtained using a Ti-Pure FF-magnesium silicate pigmented Glyptal 2475 paint as a primer. Fair blister resistance was obtained with a zinc-less primer and (rather surprisingly) with a Ti-Pure R-610/35% leaded zinc/magnesium silicate primer, at 40% PVC. Regular house paints self-primed show poor blister resistance.

It is obvious that, as in our own work, repaint studies must follow to establish the real value of stain and blister resistant paints. The effects of zinc pigments in the old paint films may be very bad.

Note: Time did not permit inspection of any of the du Pont house tests.

Titanium Pigment Corporation, Sayville, New York

(a) Decreasing Active Pigment Series

This series of paints has been discussed in several of the previous inspection reports. The pigmentations (given in detail in the 1950, 1949 reports, etc.) involve principally progressive steps from 15/46/19/20 TiO_2/55% leaded zinc/BCML/magnesium silicate to 15/30.8/12.6/41.6 proportions of the same ingredients. In the series put out in 1944 (now 7 years' exposure) the paints made with Titanox A are practically eroded down to the wood. Those made with the semi-nonchalking Titanox AA have much more paint left on the surface. Titanox RA after 7 years still leaves full films but dirt collection and mildew are bad. At 5 years a combination of 2/3 Titanox RA and 1/3 Titanox A is about average in control of erosion.

This series was repeated at 4-1/4 pounds of oil per gallon in June, 1950 and all the experimental paints (using 15% Titanox AMO, 10% RA 10 and 5% A, and 15% RA 10, respectively) look good. Supplementary tests include Devoe House Paint, which is dirty at one year; Sears, which is also dirty; and SWP Gloss White. We are concerned about the fact that SWP shows some cracking.

(b) 1949 Exterior White House Paint Series

This series is fundamentally comparisons of TiO_2 pigments in two basic pigmentations in a 4-1/4 pound oil vehicle.

(1) 20/35/15/30 TiO_2/35% leaded zinc/BCML/magnesium silicate

(2) 20/50/30 TiO_2/35% leaded zinc/magnesium silicate

The titanium oxides are introduced as 20% Titanox AMO; 15% AMO and 5% RANC; 10% AMO and 10% RANC; 15% AMO and 5% RA; 10% AMO and 10% RA. These details are presented so that reference may be made to them in later years. At this time (about 2-1/2 years) all the panels on south exposure look good. On the north, where slower chalking TiO_2 is used, grayness develops, and the RANC paints show some mildew.

(c) 1948 Exterior White House Paint Series

The first group of the 1948 white house paints includes studies of rutile titanium calcium Titanox RCHT in a conventional high oil pre-war vehicle at 28% PVC and in a bodied oil vehicle at 35% PVC. The pigmentations are all lead-free, as follows:

(1) 50/55/15 RCHT/zinc oxide/magnesium silicate

(2) 50/30/20 " / " / " "

(3) 35/5/55/25 RCHT/Titanox A/zinc oxide/magnesium silicate

(4) 35/5/30/30 " / " / " " "

The south vertical exposures of the high oil paints show pigmentation (1) to be somewhat gray, (2) some mildew (lower zinc oxide), (3) better appearance, and (4) again mildew. The north exposures all mildew, (3) least, (4) next, (1) next, and (2) very bad. When the same pigmentations were used in the lower oil content bodied oil paints at 33% PVC all had better appearance and much less mildew than the corresponding paints at 29% PVC. This duplicates the du Pont experience that lead-free paints should be formulated with the "oil conservation" type of vehicle, probably even better at 36% PVC than at 33%, and the pounds of zinc oxide should be maintained at the proper level in relation to the oil.

The second group of 1948 white house paints is somewhat similar to the first but with the titanium pigments held constant and leaded zinc or zinc oxide decreased progressively, increasing extender proportionately, all at 33% PVC, as follows:

(1) 35/10/45/10 RCHT/Titanox A/leaded zinc/magnesium silicate

(2) 35/10/40/15 " / " / " / " "

(3) 35/10/30/25 " / " /zinc oxide / " "

(4) 35/10/25/30 " / " / " / " " /

In general, the first three pigmentations look good, both south and north exposures, with (1) favored, (3) showing slight cracking on south exposure. (4) shows mildew on both south and north, as the zinc oxide content is too low for a lead-free formula.

In the series of 1948 commercial white paint exposures SWP Gloss White is showing very fine cracking on south exposure on cedar and white pine, three coats self-primed. National Lead's No. 110 White shows fine checking and cracking on south exposure, Sears has a yellow cast and cracks, Devoe's regular 547 White has a yellow cast and Devoe's One Coat (over MW-1178 Primer) is yellow, has mildew and cracks. Nuhide cracks and mildews. Fuller's 2015 White still looks the best of the series. Lead-in-oil is eroded on the south and cracked on the north. 60/30/10 BCWL/XX-2 zinc oxide/magnesium silicate checks and cracks on the south and is very dirty on the north.

(d) 1947 White House Paint Series

The first group consists of lead-free pigmentations using calcium carbonate as half of the extender, at 35% PVC, 4.25 pounds of oil per gallon, as follows:

(1) 15/25/30/30 Titanox AA/zinc oxide/magnesium silicate/calcium carbonate

(2) 15/30/27.5/27.5 " / " / " / "

(3) 15/35/25/25 " / " / " / "

(4) 20/25/27.5/27.5 " / " / " / "

All show some mildew both on south and north exposures except (3) which has the highest zinc oxide content. In supplementary exposures a pigmentation of 1/3 RCHT-1/3 leaded zinc-1/3 magnesium silicate is showing definite "rutile yellowing."

A series of 1947 vehicle studies requires no special analysis at this time except that two out of four paints carrying Driscy show cracking and flaking at 29% PVC (as does a 94% refined linseed, 6% Z_2 bodied linseed paint).

A conventional leaded zinc/BCWL/TiO_2/magnesium silicate paint with 20% magnesia treated linseed oil still looks good after four years, and the initial fine flow is still evident.

(e) TPC Basic Silicate White Lead Paints

The first group, put out in August of 1945 and now almost six years old, has a 15% Titanox A/46% NJZ No. 6 leaded zinc/19% BCWL/20% magnesium silicate pigmentation at 29% PVC as the guide paint. When National's 45 X replaces the basic sulfate white lead only by volume there is some checking but more paint is left than on the control, which is eroded badly. When 45 X replaces BCWL only there is checking and cracking and the same applies to a complete replacement of both lead carbonate and sulfate but in all cases the 45 X paints retain more film. When the lead is removed, ZZZ-35 zinc oxide is used, and therefore durability suffers when a co-fumed leaded zinc is replaced by a mechanical mixture with lead-free zinc oxide.

In the 45 X paints put out in 1948, the first comparison is of 15% Titanox A/38.5% leaded zinc/15.7% BCWL/30.8% magnesium silicate in a pre-war vehicle at 29% PVC and a parallel in which 45 X replaced all the lead by volume. The 45 X paint shows less erosion and less cracking. The second comparison of the same pigmentation at 35% PVC using a bodied oil type of vehicle, shows both paints improved but the differences are the same.

A series was put out in 1949 starting with the basic pigmentation of 50% 45 X/20% Titanox AA/30% magnesium silicate. Then 5%, 10% and up to 35% zinc oxide was introduced, replacing 45 X. Both south and north exposures show that 10% and upwards of zinc oxide controls mildew and the remaining paints stay clean and white.

(f) Tint Base Paints

The first group of tints examined were put out in June, 1948, in buffs and grays. The pigmentations carry 12% Titanox RANC, with zinc oxide ranging from 20% to 50%. The extender is all calcium carbonate (from 68% down to 58%) except in one instance, where the extender is half calcium carbonate and half magnesium silicate by weight. The latter pigmentation is more faded than the others. All are better at 33% PVC than at 29%. There is considerable mildew at the lower zinc oxide levels, which decreases as the zinc is raised, but fading increases in the same order. TPC reports that the calcium carbonate paints are gritty and tend to settle.

A second group of tints put out in 1948 are based on rutile titanium calcium Titanox RC, as follows:

(1)	50/50	RC/	55% leaded zinc		
(2)	50/40/10	" /	"	/ magnesium silicate	
(3)	50/40/30	" /	"	/	"
(4)	20/35/45	" /	"	/	"

These were ground at both 29% and 33% PVC. While the higher PVC's are superior to the lower, there is not the usual spread, as leaded zinc seems to upgrade and level the performance, especially control of mildew. (4) is an exception, showing very bad mildew at 29% PVC and no mildew at 33%.

A group of tints put out in 1949 are divided into two sets, all at 29% PVC. The first set carries 20% BCWL while the second carries 12.7% basic silicate white lead. The extender is calcium carbonate, and zinc oxide varies from 20% to 38%. The basic silicate paints are somewhat better in tint retention and in control of cracking and mildew.

(g) Lead and Zinc-free Paints

TPC is also having some interesting results with formulations carrying no reactive pigments. This is relatively new work, the oldest panels now on exposure for one year. These are two coats self-primed and still look good. The pigmentation consists of 3 pounds of titanium oxide per gallon, half Titanox RA 10 and half Titanox A 168, with magnesium silicate as extender, in the ratio of 60/40 TiO_2/magnesium silicate.

The vehicles vary in nature, but may be covered by the statement that 100% alkyd similar to 52R15 gives the best results on exposure, although brushing qualities should be improved. When some oil is used with the alkyd dirt and mildew develop, and with all oil the paint mildews and practically erodes away in one year.

A second set is now 6 months old. The non-reactive pigment 100% alkyd vehicle paint is whiter and cleaner than a conventional house paint of the same age. Pyridyl compounds used as fungicides to prevent mildew when oil is added were not very successful. A very interesting point was the superior performance of a vehicle with the binder 75% alkyd and 25% Chlorowax 70. This vehicle showed excellent control of penetration. It looks best of the group at this stage, much superior to a straight oil binder and better than oil plus Chlorowax 70. The Chlorowax is ground in with the pigment. This combination of alkyd plus Chlorowax should be tried in trim paints, synthetic automotive finishes, bulletin colors, etc.

As mentioned in the discussion of du Pont's stain resistant paints, the TPC non-reactive pigmented paints should be tested on repaint work to determine the effects of zinc pigments in the old paint films.

National Lead Company - Sayville, New York

(a) Basic Silicate White Lead 45 X

The National Lead panels of the basic silicate white lead house paints which were formulated for cooperative study with S-W were examined after three years' exposure south and north vertical at Sayville. Three methods of substituting 45 X Basic Silicate White Lead and 12/88 leaded zinc for 55/65 leaded zinc in SWP Gloss White and buff and gray tints were employed:

A. Zinc oxide replacement by equal poundage, lead by equal volume.

B. Maintain 55/65 lead/zinc ratio, replace on total volume.

C. Same, but replace on total weight, adjust volume with extender.

In certain instances involving method A, the zinc oxide level was reduced from the regular 52% to 25% and 20%, and in another variation, zinc oxide was introduced as Azo ZZZ-55 instead of leaded zinc.

A rather detailed description of the purpose of the test, the paints involved, and the condition of the S-W Chicago and Florida panels after two years' exposure appeared on page 25 of the Paint Research Report of Investigations for March. Because of the length, these details will not be repeated here.

A special examination of the Chicago S-W panels in this set was made in June just prior to the inspection of the National Lead panels. The Chicago panels had also been out three years at this point. All the Chicago panels looked relatively good, with no major deviations.

The same general comments apply to National's exposures. The performance of practically all the paints would be rated as good, and in our opinion, somewhat superior to the average run of National exposures. If there were any advantage it would favor the paints with basic silicate white lead. The lower zinc oxide paints were inferior in control of dirt and mildew. The panels continue on exposure.

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As usual, Mr. Fasig and the writer were extended every courtesy by du Pont, Titanium Pigment Corporation and the National Lead Company. These inspection trips continue to be informative and helpful.

M. VAN LOO

Director of Paint Research

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