



#86 - Leaded Zinc Pigments

Because of the plans to substitute combinations of 414 and 511 leaded zincs for 412 dry in current house paint production, test batches of SWP Gloss White were made using available samples as representative of the new practices as possible. The 414 dry used was Lot 3207, the 511 dry was Lot 2555. A blend of extenders 2201 - 2203 was substituted for the 20 F extender to emphasize the texture characteristics of the leaded zincs.

The results of the tests may be tabulated as follows:

	<u>RB 2264</u>	<u>RB 2265</u>
Leaded Zinc Used	412 dry	414/511 dries
Texture	O.K.	O.K.
Grind Time	6' 10"	6' 2"
Fineness	3 H	3 H
Gloss	Good	Good
Color	Standard	Very slightly gray
Viscosities #3 orifice		
Fresh	27"	33"
1 day	29"	40"
20 days	27"	34.5"
Wt./Gal.	14.80#	14.84#

The color and viscosity characteristics of the 414/511 combination occasion some concern.

0007-SWP-043995

0007-SWP-000113365

Paint Remarks
April, 1948

-21-

#86 - Leaded Zinc Pigments

The Auxiliaries Department submitted for examination three blends of 414 dry with 511 dry which approximate the chemical composition of 412 dry, 35/65 leaded zinc oxide. These blends were prepared using 511 dry of standard color in conjunction with 414 dry samples which had been rated 70, 60, and 50, respectively. These were substituted in Rex 471 SWP Gloss White for the 450 pounds 412 dry currently being used.

In summary it was reported that all batches were normal as regards viscosity, gloss, grind, and color. The color differences, although perceptible, were very small so that it was generally agreed that it would not cause concern. From the standpoint of color, blends of 414-511 dry equal to or better than the sample submitted under the code No. AURL 931 are satisfactory for use in Rex 471. This sample was prepared with 414 of 50 color. Approval of sample AURL 931 does not constitute approval for all blends made with a 414 of 50 color. Composited color must also equal this standard.

A review of outstanding house paint exposure tests of 414 dry again showed that this pigment performs in a manner typical of a cofumed leaded zinc oxide. In these tests the 414 dry has been substituted on an equal zinc oxide basis, making up the difference in composition by adding either basic carbonate or sulfate white lead. The review included the following series:

1. Exposures 5539-46 C were examined after 5 years' vertical south at Chicago, Ponderosa pine beveled siding primed with Rex 450 Undercoater. Baghouse and Economizer oxides (early 414 types) were tested in Rex 471 SWP Gloss White of 7-11-41 and Rex 462 Cream of 8-7-41, the regulars being used as guides. The specials are made both with regular (5091) and with (3015) non-break linseed oil. The durability of all the whites was satisfactory: (3015) seems slightly inferior due to erosion, but with (5091) both test pigments are fully as good as the regular 412 dry. In Cream, both specials show noticeably more dirt but less fading than the regular.
2. Series 8126-35 C, Cof. (4-1/2 years at Chicago and also at Coffeyville) tested the use of Economizer (15% leaded) as (a) a replacement for 40% of the 412 dry, and (b) as 100% replacement in SWP White and Cream, on cedar beveled siding with Rex 450 Undercoater. One Rex 471 formula is high in TiO_2 , low in basic carbonate white lead, another vice-versa, as we were interested in using a minimum of white lead at the time. With fairly uniform exposure results at both locations, slight inferiority due to the special pigments is shown, but since the higher quantities of Economizer (and lowered BCWL) are not particularly poorer than the others there is little to say against the use of the special pigment. However, this slight inferiority carries over into the tints, especially at Chicago.

0007-SWP-043996

0007-SWP-000113366

#86 - Cont.

3. Series 6192-9 C, Cof. (4-1/2 years Chicago, 6 years Coffeyville) tests, in SWP Gloss White, only 25% 414 in the relatively high TiO_2 formula of 10-27-41, plus a reduction of oil content in the vehicle. Neither location shows any appreciable difference due to the 414 or vehicle change. In the Cream shade, 50% and 100% 414 are tested, with both regular and lower oil (increased p.v.c.) With quite advanced failure at both locations, the 100% 414 sample seems slightly best, but the 50/50 sample is not quite as good as the regular (1526 dry).
4. 414 dry is tested in series 6186-91 C, Cof., the purpose being to use the new pigment in a lead-zinc paint. Before general formulation details were finally worked out, "standard" 414 W was developed and this series represents its earliest test on our exposure fences. These tests were exposed on beveled cedar siding, with Rex 450 Undercoater, 4-1/2 years at Chicago and 6 years at Coffeyville, vertical south. Because of the current lack of interest in lead-zinc paint and the fact that the set-up is not suitable for testing 414 W as such, only a brief statement of results is presented. A 45/40/15% BCWL/414/magnesium silicate special and another with slightly higher ZnO (due to 414 W) and 7% mica gave mediocre results as compared to regulars. With still higher 414 W, 4-1/2% of mica and about 4% of TiO_2 , there was a considerable improvement. Poor clean-up was a more important shortcoming than general failure.

0007-SWP-043997

0007-SWP-000113367

Paint Research
May, 1948

-15-

#86 - Loaded Zinc Pigments

At the request of the P. C. and C. Department we prepared an itinerary and conducted a tour of our exposure farm for representatives of Montgomery Ward and Company. This was the third annual visit by this group. Considerable care was exercised to limit the panels inspected to exposures of conventional formulations.

Mr. H. F. Saunders and Mr. C. H. Adams, of the Auxiliaries Research Department, reviewed current exposures on basic silicate white lead. To date no failures have occurred which would advise against its use. From a paint application and appearance standpoint, basic silicate white lead seems to cause a puffy type consistency which leads to definite brush-marking.

0007-SWP-043998

0007-SWP-000113368

Paint Research
October, 1948

-19-

#86 - Leaded Zinc Pigments

Panels 11611-28 F, C were examined after 12 months' exposure at Florida and 17 months at Chicago, vertical south, cedar beveled siding. The purpose is to test the results obtained by using mechanical mixtures of lead and zinc pigments at three zinc oxide levels, the lower ones having been suggested as possibly more suitable in the case of finer particle size zinc oxides than the usual level of about 32%. All panels are primed with Rex 450 Undercoater. In the top coats, the following zinc oxides, and also 412 dry leaded zinc, are used at (a) 32% zinc oxide content, (b) 21% and (c) 10% using 108 dry, XX 582; 1707 dry, XX-50; 2059 dry, XX-503; 2295 dry, Azo ZZZ-33.

On the basis of orthodox estimates of the PbO , $Pb(OH)_2$ or "active" constituent contents, the mechanical mixtures should be higher in total reactivity than the corresponding co-fumed formulations. It would probably be considered normal that lead-free zinc oxides would be more reactive than the zinc oxide in co-fumed leaded zinc. B.C.W.L. "reactivity" may be expressed roughly as 35% $Pb(OH)_2$ or 30% PbO as against about 15 to 20% for the lead portion of lead sulfate, plus about 5% zinc oxide. 412 leaded zinc runs from 4 to 6% PbO . It was rather surprising, therefore, to find that in every part of the above test 412 samples were cleaner and better than the corresponding mechanical mixes, especially in the Florida series, which was most important because of mildew growth. There was an increase in mildew due to decreasing zinc oxide, as expected.

Though perhaps too early to be significant, there were signs of failure on the ZZZ-33 samples and in the 10% zinc oxide group. Mr. C. H. Adams has expressed great interest in these results, and plans to run actual reactivity tests by the fatty acid method on these various pigments. We should be able to report at some future time as to whether his results tend to uphold the orthodox conceptions or the data of these exposures, which certainly do not agree.

Two added zinc oxides, St. Joseph's #46 and #17, used at the 30% level only, showed up no better than the poorest of those listed above.

0007-SWP-043999

0007-SWP-000113369

Paint Research
November, 1948

-24-

#88 - Leaded Zinc Pigments

Exposures 11319-47 F, C were examined after 18 months at Florida, vertical south, and Chicago north and south, regular cedar siding. The purpose was to test what was considered in early 1946 to be the formulations most likely to be used by National Lead in their forthcoming ready-mixed outside white. The basic assumption was that it would be 20% each of ZnO, BSWL, BCWL, anatase (for the white) titanium and extenders, the lead and zinc being a mechanical mixture. On this basis several lead-zinc combinations were tested as follows, using (517) "Z" bodied linseed and formulating at both 30.4% and 34% p.v.c.:

XX-503 ZnO, National HTS BCWL and National Acicular BSWL.

ZZZ-33 ZnO, National HTS BCWL and National Acicular BSWL.

ZZZ-33 ZnO, National #111 BCWL and National Acicular BSWL.

ZZZ-33 ZnO, National HTS BCWL and 9 dry Sublimed BSWL.

412 dry (co-fumed), with National HTS BCWL.

The Florida tests are two coats self-primed only, but the Chicago tests included self-priming, and the use of Rex 450 and Titanium Pigment's MW-401 (zincless) as primers.

Differences at present are slight, but the following tentative inferences are possible:

1. Co-fumed formulas have at least a slight margin in durability.
2. No particular choice as to p.v.c. level.
3. Slightly greater failure using National HTS-acicular BSWL with XX-503 and ZZZ-33 than when using #111 or 9 dry.
4. ZZZ-33 with #111 possibly poorest of all. (Chicago results contradict this, showing ZZZ-33 with National HTS poorest.)
5. Practically all special tests show more mildew and dirt than co-fumed regulars.

Exposures 11611-28 F, C were examined after 12 months at Florida, vertical south, and 17 months at Chicago. The purpose is to determine whether certain zinc oxides of varying particle sizes could be used more successfully in Rex 471 SWP Gloss White by reducing the amounts used. Regular Rex 471, bodied oil type, all anatase TiO_2 is the basic formula and guide. Mechanical mix formulas at 32%, 21% and 10% zinc oxide make

0007-SWP-044000

0007-SWP-000113370

Paint Research
November, 1948

-25-

#86 - Cont.

up the main tests, using at each level the following zinc oxides: 108 dry (XX-592), 1707 (XX-50), 2059 (XX-505), 2295 (Azo ZZZ-33), also 412 (Ozlo 35/65). A second portion of the test covers #46 and #17 zinc oxides from St. Joseph Lead Company at the 32% level only.

Very sharp differences in mildew (Florida) and dirt (Chicago) showed up, due to both the type and quantity of pigment. Greater mildew on the lower ZnO samples is obvious. 412 is much cleaner than the mechanical mixes at each ZnO level. There is no serious failure, but the two lower-ZnO groups show signs of early erosion, with ZZZ-33 tending to check slightly on Florida exposure. The two St. Joseph samples seem even more dirty than the other zinc oxides, and are the only ones to show really significant checking and cracking.

0007-SWP-044001

0007-SWP-000113371

Paint Research
January, 1949

-19-

#86 - Leaded Zinc Pigments

1410 dry, a new co-fumed 20% leaded zinc oxide, has been introduced by the Auxiliaries Department. This material is produced in a like manner to 412 dry and has texture and color properties similar to that material. Incorporated into Rex 471 SWP Gloss White the initial properties of the paint are standard. Arrangements have been made for experimental factory production of the paint and the batch will be completed in the near future. Exposure tests will also be started immediately.

0007-SWP-044002

0007-SWP-000113372

Paint Research
February, 1949

-24-

#86 - Leaded Zinc Pigments

Laboratory production of house paints has been disturbed by the variable nature of the magnesium silicate supply. Viscosities have been running as high as 60 seconds on materials which should be in the 25 - 30 second range. Plant experience is similar. Test batches made using 1410 dry ran consistently high at 50 - 55 seconds. At the time this was attributed to the moisture content of the 1410 dry, but since that time high consistencies have been experienced repeatedly with 20 dry so that it may have been responsible.

A further shipment of 1410 dry will be tested in factory production when received.

0007-SWP-044003

0007-SWP-000113373

Paint Research
March, 1949

-18-

#86 - Leaded Zinc Pigments

The Chicago plant has put into production a formula for SWP making use of 1410 dry. This production will have a blend of 1989 dry and 2201 dry for the extender portion. The body effects associated with 20 dry mentioned in the February report are under investigation. A separate report will be made when the work reaches a positive stage.

0007-SWP-044004

0007-SWP-000113374

Paint Research
April, 1949

-26-

#86 - Leaded Zinc Pigments

Exposures 8139-86 C, F, Gof. were discontinued and reported after 4 years at Florida and Chicago, 56 months at Coffeyville, all vertical south. All are cedar bevel siding, primed with Rex 450 Undercoater shaded gray. The series tests 414 leaded zinc against regular leaded zincs and mechanical blends, using a conventional pigmentation of 50% lead, 30% zinc, 15% titanium as rutile/anatase and 25% extender. The vehicle uses 10 gallons of bodied oil, and the p.v.c. is 51%.

- (a) In a group testing 9 dry basic sulfate white lead versus 18 dry basic carbonate as supplementary lead, with 4 "pairs" of paints tested, there is essentially no choice.
- (b) Due to factors too complex to set forth in detail, only the following highlights of the leaded zinc comparisons can be presented here:
 - (1) All except 412 and certain samples with Azo 35 L show serious failure at Florida. More explicitly, 414, Eagle-Picher 50/50, Lehigh 635 and especially Lehigh 6 are unsatisfactory in durability.
 - (2) At Chicago, erosion being predominant, Lehigh 635 and Azo 35 L seem least satisfactory, with all others acceptable, none outstandingly good.
 - (3) At Coffeyville, with the longest exposure and the most severe failure, E. P. 50/50 stands out as poor and 412 as good, all others at least fair.
- (c) The blend of Lowe Brothers V-10 and V-35 leaded oils seems definitely inferior to (48), which in turn is slightly inferior to (315).
- (d) Regular 412 against a 414 called "Tad-Nac" in tints shows no difference and "Tad-Nac" in the one white test seems good.
- (e) The basic formula ("modified vehicle," 31% p.v.c.) seems generally somewhat inferior to regular bodied oil type at 36% p.v.c., which is used as a guide.

0007-SWP-044005

0007-SWP-000113375

Paint Research
June, 1948

-20-

#86 - Leaded Zinc Pigments

Panels 15740-58 CS and F were prepared for exposure south vertical Chicago and Florida. The purpose of this series is to compare the tint retention of SWP formulas containing basic carbonate white lead against no basic carbonate and substituting basic silicate white lead plus 414 leaded zinc for the 412 leaded zinc and basic carbonate contained in the base formula. In the last group 414 is substituted on an equal zinc oxide poundage and the basic silicate on an equal volume basis.

The following tints were prepared, with tinting colors shown:

Rex 459 Berkley Yellow - BY 40, BY 10, CB 7063

Rex 465 Colonial Yellow - BY 40, BO 1, CB 7063

Rex 474 Chelsea Gray - CB 7063, BY 40

Rex 478 Geneva Cream - BY 40, BY 10, BO 4

Rex 496 Ivory - BY 20, BY 1, BO 4, BY 40

One SWP with no basic carbonate has been shaded to each of the above tints using the shading bases which are shown on the formula cards. These are the A series. The regular bases used include several chrome colors and are included for a comparison between chrome and ferrite tinting colors.

0007-SWP-044006

0007-SWP-000113376

Paint Research
February, 1950

-54-

#86 - Leaded Zinc Pigments

A sample of 412 dry Leaded Zinc Oxide which had been treated for color improvement was tested in Rex 471 SWP Gloss White. No color improvement could be noted.

- . -

0007-SWP-044007

0007-SWP-000113377

Paint Research
March, 1950

-17-

#86 - Leaded Zinc Pigments

1. Panels 7380-7 F, Cof. were examined after approximately five years' exposure, vertical south, at Florida and Coffeyville. The series tests the SWP Tint Base of 7-21-43, regular using 1528 dry leaded zinc against a stock sample of 414 W from Coffeyville and a special composite sample of "Canadian fume 414" representing batches made at Coffeyville from July 7 to September 13, 1943. As indicated in earlier progress reports, all these materials have shown good durability although there is some evidence against the two 414 samples in the form of microscopic checking at Florida. In appearance, the differences are a little more readily noticeable but not outstanding. 1528 is favored because of less white chalk-mask, although the 414's in some cases seem slightly less dirty. No choice is apparent between the regular and composite 414.

2. Exposures 10518-39 F, C were examined after 36 months' exposure at Florida, vertical south, and 40 months at Chicago, north and south. These are cedar bevel siding primed with regular Rex 450 Undercoater, except for a part of the group in which special undercoaters are tested. The plan of these tests cannot be presented fully in this limited space but essentially the tests cover:

- (a) White lead comparisons, in Rex 471 SWP Gloss White, both on a regular co-fumed leaded zinc basis using a 25% and a 30% zinc oxide level, and also on a mechanical-mix basis at 24% zinc oxide. The white leads are:
 - 1. 9 dry basic sulfate
 - 2. 18 dry basic carbonate
 - 3. National Lead's 45 X basic silicate.
 - 4. Eagle-Picher's #202 basic silicate.
- (b) Rex 450 Undercoater versus MW-401 zincless type primer with the special pigments, using Rex 471 top coat both as regular and with the silicate pigments.

Results can be presented here only in general terms: satisfactory or "average" performance may be assumed for all tests not specifically mentioned, although there are minor variations throughout.

Eagle-Picher's #202 shows the least failure of the four white leads in most cases. However, this material has been found to gel badly on storage in 1/2 pint cans for four years at 85° F. average. The others were not all perfect on the storage test, but showed no serious gelation.

0007-SWP-044008

0007-SWP-000113378

Paint Research
March, 1950

-18-

#26 - Cont.

Both 18 and 9 dry samples rate as somewhat more durable in these exposures than National's 45 X, but all three are on the same general level slightly below #202.

Both the silicate leads have a better clean-up record than 9 or 18 dry, but the differences are comparatively minor.

In the primer tests, MW-401 types are slightly inferior, and there is no choice as to the type of white lead, the silicates being fully satisfactory.

0007-SWP-044009

0007-SWP-000113379

Paint Research
May, 1950

-25-

#86 - Leaded Zinc Pigments

Panels 11611-28 F, C were examined after 2 years' exposure vertical south in Florida, and 2-1/2 years in Chicago. The paints were designed to study the use of zinc oxides and to determine whether amount used and particle size or reactive surface area could be balanced to give equivalent performance. SWP Gloss White was used as the base formula, increasing lead contents as zinc oxide contents were reduced. Zinc oxide was introduced at 32%, 21% and 10% levels using Dalo 35/65 leaded zinc, XX 582 New Jersey zinc oxide 108 dry, XX 50 1707 dry, XX 503 2059 dry, or Azo 222-33 2295 dry. St. Joseph Lead Company's zinc oxides #17 and #46 were used at the 32% level only.

Only the Florida panels show significant film failures, with the co-fumed samples showing slightly to definitely less failure than any of the mechanical mixtures. Failure is very slight at the 32% level, somewhat more advanced at the 21% and 10% level. St. Joe's #17 and #46 oxides at the 32% level show advanced failure, thus the former cannot be considered as an alternate for XX 503, 2059 dry, and the St. Joe oxides should not be used in exterior formulas.

Although mildew growth has not progressed much during the second year of exposure, the co-fumed leaded zincs continue to show an advantage over mechanical mixes in mildew control.

0007-SWP-044010

0007-SWP-000113380

Paint Research
June, 1950

-19-

#86 - Leaded Zinc Pigments

A sample of 1424 12/88 Leaded Zinc was submitted to the National Lead Company for work with their Basic Silicate White Lead. This has been made up in SWP Undercoater and Gloss White replacing the zinc oxide on an equal chemical basis and the lead on an equal volume basis with National's 45 X Basic Silicate White Lead. The paints had normal characteristics of body and color and will be compared further by exterior exposure.

0007-SWP-044011

0007-SWP-000113381

Paint Research
December, 1950

-21-

#86 - Leaded Zinc Pigments

Exposures 11656-61 F were retired after 36 months at Florida vertical south, cedar bevel siding panels. The tests involved two samples of 414 dry co-fumed leaded zinc submitted by Auxiliaries Research in 1946. One purpose was to determine the general suitability of these materials, AURL-597 "minimum standard" and AURL-598 "average standard," the terms having reference to color of the pigments. Otherwise, they are essentially alike at approximately 90/10% zinc oxide/BSWL. Another purpose was stated at the outset -- "how much lead ... is needed to exhibit co-fumed durability characteristics?" However, this question could be answered only in a very limited way by this series, as the only comparison was with regular 412 55/65 leaded zinc used in the guide formulas. The special samples were used in Rex 450 SWP Undercoater, Rex 471 SWP Gloss White and Rex 496 SWP Ivory, prime coat and top coat using the same sample in each case.

There was little failure at Florida on the whites, but the "average" sample showed a little slower flaking-off of surface dirt. The 412 looked noticeably cleaner and whiter than the other two, and it was possible to distinguish slightly more grayness on the "minimum" than on the "average" sample. The tints showed fairly serious microscopic checking, with the "average" sample having a greater number of checks but smaller in size. Our general conclusions were: (a) the "minimum" is not satisfactory in color, (b) the "average" is none too good and (c) the durability with 10% lead is possibly slightly inferior to that of 35/65, but quite satisfactory as far as can be judged from these few tests. It should be remembered that the 414 used is not typical of present day quality, which is considerably better.

0007-SWP-044012

0007-SWP-000113382

Paint Research
March, 1951

-25-

#86 - Leaded Zinc Pigments

Exposures 12510-44 C, F were examined after two years' exposure at Florida, vertical south and at Chicago south and north. The panels are primed with regular Rex 450 Undercoater except for a few cases in which one of the test variations is made in the undercoater as well as in the top coat. The series was put out in cooperation with the National Lead Company, to the extent that they received samples of our paints and exposed them in their regular manner at Sayville, Long Island. We have received no recent information from them except as observed on our last annual inspection trip to their farm.

The broad purpose was to evaluate various replacements of 412 dry 35/65 leaded zinc with 414 dry 12/88 leaded zinc and National's 45 X basic silicate white lead in Rex 471 SWP Gloss White and in SWP tint base. The substitution, less extensive in the tints than in the whites, involved three methods:

- A. Zinc oxide replacement by equal poundage, lead by equal volume.
- B. Maintain 35/65 lead/zinc ratio, replace on total volume.
- C. Same, but replace on total weight, adjust volume with extender.

(In certain cases involving only Method A, (1) the zinc oxide level was lowered from the normal 52% to 25% and 20%, and (2) zinc oxide was introduced as Azo ZZZ-33 instead of leaded zinc.)

A previous report at approximately one year showed no significant differences in performance, at least none which were confirmed at all locations. The present routine study of Florida and Chicago tests indicates that no new differences of consequence have developed in the second year. The main tendency on dirt collection seems to be that the regular guides are cleaner than the specials, except that those the same as the regular but lower in zinc oxide seem cleaner.

The SWP tint base tests, buff and gray, are all well within a satisfactory range of dirt collection and fading. The special formulas run about the same as the regulars in both respects. One sample carrying 414 dry and 45 X at a 25% ZnO level is definitely cleaner than the average, and one similar but at 20% ZnO is somewhat cleaner and noticeably better in color. This is based on Florida results, which also show some incipient checking. Chicago tests show no noticeable differences. In general, the use of 45 X and 414 dry seems fully satisfactory through two years' exposure, and essentially the same can be said of the reductions of zinc oxide level, which would have advantages from the standpoint of cost and supply. (The behavior at lower zinc oxide levels is rather unexpected and no ready explanation suggests itself.)

0007-SWP-044013

0007-SWP-000113383

Paint Research
May, 1952

-20-

#88 - Leaded Zinc Pigments

Panels 15148-9 F, C were examined after approximately 3 years' exposure at Florida vertical south and at Chicago north and south, all cedar bevel siding primed with Rex 450 Undercoater. (a) Regular SWP Tint Base of early 1948, 400 lbs. of 412 dry co-fused leaded zinc was compared with (b) our batch of National Lead Company's Dutch Boy Buff, a formula using a mechanical blend of lead and zinc, with all lead as 18 dry basic carbonate white lead and a somewhat lower inert content than our formula. An added formula (c) was one pigmented the same as (a) but a mechanical blend using 9 dry basic sulfate white lead and 18 dry to match the composition of the 412 dry.

The results on these tests had varied considerably in the past, but no serious failure had shown up. At present there is serious microscopic checking at Florida on both mechanical-mix formulas, none on (a). During most of the first year, Dutch Boy looked good due to superior color-retention; at 2 years it looked poor due to chalk-masking and dirt (as did the (c) formula); and at 3 years it is back to a better appearance than the others due to more satisfactory elimination of chalk-mask and dirt. The panels are being continued on test because of these past variations.

0007-SWP-044014

0007-SWP-000113384

Paint Research
December, 1952

-15-

#86 - Leaded Zinc Pigments

Laboratory produced samples of yellow leaded zinc pigments have been placed on exposure at the Chicago farm as well as in Miami, Florida. For these exposures the pigments were dispersed in the SWP tint base vehicle substituting the yellow leaded zinc pigments for the entire pigment volume normally contained in Rex 475 Tinting White. In comparison with this series of leaded zinc paints two control paints were used. Control paint A was standard Rex 475. Control paint B was made using O slo 412 leaded zinc oxide in the same manner as used on the experimental pigments. Portions of these control paints were shaded to match the lightest of the leaded zinc yellows while other portions were shaded to match the deepest of the leaded zinc yellows.

Carbon arc exposures on this series of paints have completed 535 hours. At this stage chalking is just beginning on the control leaded zinc paints. This chalking is only slight but there is evidence of some chalk face. The mixed pigment tint base is not chalking but it has flatted almost completely. The colored leaded zinc paints are quite chalk resistant at this stage of exposure. This chalk resistance would be of considerable importance if it carries through on exterior exposure and in more practical formulating approaches. Panels 18148-59 C, F were prepared for exposure in Chicago and Florida south vertical of the initial experimental paints. Work is under way on the more complete evaluation of pilot plant batches of similar pigments.

0007-SWP-044015

0007-SWP-000113385

Paint Research
January, 1955

-18-

#86 - Leaded Zinc Pigments

Continued carbon arc exposures on this series of yellow leaded zinc pigments have now reached 620 hours. At this stage the panels are showing chalking and are rated as follows:

<u>Panel</u>	<u>Pigment</u>	<u>White Chalk Mask</u>	<u>Degree of Chalk</u>
A	AURL 2298 Light Yellow	5	7
B	AURL 2265 " "	7	6
C	AURL 2267 " "	7	5
D	AURL 2297 Dark Yellow	7	9
E	412 Shaded to match D	4	5
F	SWP Tint Base Shaded to match D	8	7
G	AURL 2264 Dark Yellow	9	8
H	412 Shaded to match G	6	4
I	SWP Tint base shaded to match G	8	7

The above data indicate that the darker yellow leaded zinc pigments are more chalk resistant and produce a chalk that is more nearly self-colored than the other leaded zincs of this series. The poor performance of 412 dry shaded would indicate that there probably is a good possibility of formulating an even more permanent tint base by using colored leaded zinc pigments. Work is under way on this problem and will be reported on at a later date.

0007-SWP-044016

0007-SWP-000113386

Paint Research
April, 1953

-17-

#86 - Leaded Zinc Pigments

Series 18380 - 7 F, G were exposed during the month, testing tinted leaded zinc paints RB 4141 - 4144. The special leaded zincs involved are AURL 2519 - 2522. SWP Tint Base is shaded to match the four special shades, as RB 4256 - 4259.

0007-SWP-044017

0007-SWP-000113387

Paint Research
May, 1955

-24-

#86 - Leaded Zinc Pigments

Exposures 18625-33 CS, CN, F, K were prepared during the month, all cedar bevel siding exposed vertical south at Florida, Coffeyville and Chicago and also north at Chicago. These tests evaluate Ozlo 18 M leaded zinc in B78 W 9 Painter Craft Exterior Semi-Paste Paint #684. The paints may be described as follows:

<u>OJ No.</u>	<u>Pigment Cost</u>	<u>Leaded Zinc</u>	<u>Zinc Oxide</u>	<u>Available Lead</u>
485 R	\$111.00	1424 Dry	352 lb.	20.8 lb.
486 R	112.70	Ozlo 18 M	352 "	51.
487 R	110.44	" "	355 "	23.4
488 R	110.25	" "	352 "	24.6

A regular Rex 450 SWP Undercoater - Rex 471 SWP Gloss White is used as control. The paints are applied as 5-coat work with reductions as per the B78 W 9 label, and also as 5-coat work starting with Rex 450 and following with two coats as per label.

0007-SWP-044018

0007-SWP-000113388

Paint Research
January, 1954

-35-

#86 - Leaded Zinc Pigments

Paints were prepared to compare regular leaded zincs such as 412 dry and 1424 dry with high basicity leaded zinc 18 M 88 C 6. Exposures were made in the Weather-Ometer and at Chicago, Coffeyville and Miami. The paints include SWP Gloss White Cards 7L, 75 and specials, One Coat White and tints. Panel numbers are 20404-23 CS, CN, K and F.

Panels 18148-59 F, C were examined during the month. The purpose of this series is to make an exploratory evaluation of special yellow leaded zincs prepared by the Auxiliaries Research Department. These pigments are used alone and are compared with (a) 412 dry regular co-fumed leaded zinc shaded to match the deepest of the yellow pigments and (b) regular SWP tint base shaded likewise. The special materials are identified briefly by Auxiliaries as:

- AURL 2297 - Yellow basic sulfate white lead.
Light; slightly basic.
- AURL 2298 - Same, but no basicity.
- AURL 2263 - Co-fumed, with basicity; 12% leaded.
- AURL 2267 - Same, slightly higher basicity.
- AURL 2263 - 55/65 lead-zinc as 412 dry; the treatment was carried through to a considerably deeper color than the preceding four.

The panels are cedar bevel siding, primed with Rex 450 Undercoater. Florida panels have been exposed 12 months, vertical south, and Chicago panels the same, north and south.

On the Florida panels, the contrasts are very striking. The two special pigments containing no zinc, AURL 2297 and 2298 show extreme mildew; 2297 looks somewhat better than 2298 because the latter shows an extreme color change as well as the mildew. By contrast, the AURL 2263 and 2267, containing zinc, show practically no mildew. The panels look very clean and bright, although the actual fading, partly chemical and partly chalk-masking, is quite advanced. AURL 2264 is quite good in color-retention, but looks bad because of mildew. The straight 412 leaded zinc is clean but seriously faded; the tint base (guide) shows both dirt and fading.

0007-SWP-044019

0007-SWP-000113389

Paint Research
January, 1954

-54-

#88 - Cont.

The Chicago panels show about the same general trends, with less extreme mildew and fading. There is no film failure and the chalking is no heavier on any of the specials than on the tint base.

The Florida panels are being retired. Obviously, the leaded zincs have possibilities in certain shades, but it is doubtful whether versatility can be developed.

0007-SWP-044020

0007-SWP-000113390

Paint Research
May, 1954

-5-

#86 - Leaded Zinc Pigments

Work has been continued on the reformulation of SWP to replace the regular combination of 412 dry and 1424 dry leaded zincs with 68 C 6 18 M leaded zinc in the easier brushing vehicle. The hiding of the Rex 471 based on 18 M leaded zinc was also increased to 19,820 Holley units in opacity in line with the hiding of Rex 471 Card 75, which was 19,800 units. Formula 471 S made with 68 C 6 dry and the new vehicle is approximately 10% lower in raw material cost than the formula being made at Chicago with 412 dry and 1424 dry in the easier brushing vehicle. The Chicago plant has been requested to manufacture sufficient SWP on the proposed formula 471 S using the present stock of 20,000 pounds of 68 C 6 dry on hand at the Kensington plant.

Experimental results were as follows

Characteristics	465 S Rex 471 Card 75	466 S Easy Brushing Formula 412-1424	467 S Easy Brushing Formula 68 C 6	468 S As 467 S With Increased Hiding
Theoretical Weight	14.62	14.24	15.90	-
Actual Weight	14.70	14.58	15.96	15.97
Viscosity - #5				
Fresh	22"	29"	29.4"	24.2"
5 days	27.2	42.6	44.4	48.8
Brushing	7	8	8	9
Flow	9	8	8	8
Hiding on				
(a) Normal brush-out	Fair	Good	Good -	Good
(b) Draw-down (.005 film)	Good	Good -	Good -	Good
Leaded Zinc 68 C 6 dry			545#	545#
" " 412 dry	300#	300#	-	-
" " 1424 dry	100#	100#	-	-
1405 dry	50#	50#	50#	50#
2030 dry	50#	50#	50#	50#
2132 dry	175#	150#	150#	175#
Holley Hiding Units	19,375	18,450	18,895	19,820

0007-SWP-044021

0007-SWP-000113391

Paint Research
February, 1956

-12-

#86 - Leaded Zinc Pigments

Exposures 18625-33 C, F, K were studied recently. These were prepared to check the performance of Ozlo 18 M, with certain variations in basicity, in Paintercraft #684 Exterior White B78 W 9. The data regarding the paints and active pigments are as follows:

<u>Paint</u>	<u>Leaded Zinc</u>	<u>Zinc Oxide</u>	<u>Available Lead</u>
OJ 485 R*	1424 dry	352 lb.	20.8 lb.
OJ 486 R	Ozlo 18 M	352 lb.	31.0 lb.
OJ 487 R	Ozlo 18 M	355 lb.	25.4 lb.
OJ 488 R	Ozlo 18 M	352 lb.	24.6 lb.

*Basic formula - B78 W 9, Card 1. Date of formulation of tests - Feb., 1953.

The guide on all panels is regular Rx 450 - Rx 471 SWP 2-coat system. The tests are all 3-coat work: (a) as per label, reductions with linseed oil and turpentine, and (b) primer test starting with Rx 450 Undercoater and following with B78 W 9, second and third coats as per label. Florida tests have been retired at 24 months, vertical south. For the Chicago tests, north and south, we have very recent readings at 30 months. Latest ratings from Coffeyville cover only 17 months' exposure.

Mildew growth has not been heavy at Florida, but there has been consistently a little more mildew on the tests than on the guides. Considering also dirt collection, which followed a similar pattern, the Florida tests have shown somewhat poorer general appearance than the SWP guides. However, there has been no film failure, and no choice is possible among the test variations cited. At Chicago, the picture is a little different, but only because gray Rx 450 was used, and the guides, having only one top coat, look poor due to show-through. Otherwise, there is no choice whatever at Chicago through 2-1/2 years. Coffeyville reports the entire series as clean and good, no differences.

0007-SWP-044022

0007-SWP-000113392

Paint Research
February, 1956

-13-

#86 - Cont.

Exposures 18580-5 F, C were studied during the month. The purpose of this series was to evaluate four colored leaded zinc oxides made as pilot plant batches at Coffeyville by the antimony process. These are varying shades of yellow and are tested as single-pigment paints, compared directly with SWP Tint Base shaded to match. The samples are:

<u>AURL No.</u>	<u>Based on</u>	<u>ZnO</u>	<u>PbO</u>	<u>PbSO₄</u>	<u>Sb*</u>
2519	Ozlo 12	72.5%	2.2%	6.15%	17.5%
2520	Ozlo 12	72.2	5.3	5.3	17.5
2521	Ozlo 35	51.2	5.4	25.0	17.5
2522	Ozlo 35 plus litharge	42.7	17.4	21.1	17.5

*Antimony as lead antimonate.

Note: An earlier series, 18148-59 F, C (report of January 15, 1954) showed some very desirable characteristics in this type of material, but also demonstrated the danger of susceptibility to mildew growth when the zinc content is low.

All panels are cedar bevel siding primed with Rx 450 Undercoater, one top coat only. Florida exposures, south vertical, have been held for exhibit purposes for some time but are now examined as of 24 months and back on test. Recent Chicago readings cover 32 months.

This series shows most of the advantages and few of the disadvantages of the earlier series. At both locations, all tests are far ahead of the controls in color retention. Slight differences among the four tests in this respect are not parallel at the two locations, so we must consider all as equally good in color retention. If the Florida results on mildew (at 12 months as well as at 24) are taken as valid, which the clear cut distinctions seem to justify, all tests are far better in mildew control than SWP Tint Base. These formulations chalk quite freely, with a highly self-colored chalk. There is no film failure of consequence on any of these panels, guide or test. These materials, if practical from other standpoints, certainly deserve further study.

0007-SWP-044023

0007-SWP-000113393

Paint Research
March, 1956

-15-

#86 - Leaded Zinc Pigments

Exposures 18886 - 18912 C were examined after 30 months at Chicago, vertical south; Florida readings at 24 months were also studied. Throughout the series, self-priming is compared with Rx 450 priming on the same panel. The major comparisons are:

1. New Jersey Zinc Company's XI-601 zinc oxide (the series being done in cooperation with New Jersey Zinc) versus their XX-503 and American Zinc's Azo ZZZ-33. This was done in mechanical-mix versions of Rx 471 SWP Gloss White and Rx 456 Fume Resisting White and in paints submitted by New Jersey Zinc, the latter being lead-free formulas. The only difference at Chicago seems to be slightly greater chalking with ZZZ-33 than the others, but not to the point of appreciably greater erosion. With a considerable amount of checking and some cracking as a basis for judgment, the Florida tests show XX-503 consistently best, the other two nearly equal, with a slight edge for ZZZ-33. This, however, is not a recognized type of checking, but a "furrowing" or surface flaking.
2. The two S-W special formulas mentioned above show more failure than Rx 471 with co-fumed leaded zinc (guide). New Jersey's paints seem a little better than the two S-W specials, but not approaching the regular.

In general, the series does not show serious failure for 2 to 2-1/2 years, and the above indications are not final. In comparison with other series over the past several years, XX-601, though not best of these three zinc oxides, does give a more favorable impression.

Exposures 18939-54 F, C were studied after 24 months at Florida, also on the basis of very recent Chicago readings, north and south, at 30 months. The series covers several comparisons:

1. 7% water-ground mica versus dry-ground mica in Rx 471 SWP Gloss White, Card 70 but using the Rx 476 One Coat House Paint vehicle and the pigmentation of Card 70. No film failure, both look good.
2. Rx 471, Card 68 made with 412-6840 dry and 1424-6828 dry leaded zincs, as against the use of 68 C 6 leaded zinc of the 18 M type. No choice, both satisfactory.

0007-SWP-044024

0007-SWP-000113394

Paint Research
March, 1956

-16-

#86 - Cont.

3. Due to the use of Rx 471, Card 70, regular vehicle, as guide, we have the regular and Rx 476 type vehicles compared. Both are generally good, but there is a tendency toward slower chalking and less erosion with the latter. The difference in clean-up seems slight.
4. Rx 476 One Coat White, Card 5, versus same using 18 M leaded zinc, as one coat repaint work. These tend to look a little better than the Rx 471 tests because of less erosion, and there is no difference due to the use of 18 M.

0007-SWP-044025

0007-SWP-000113395

Paint Research
April, 1957

-7-

Project #86 - Leaded Zinc Pigments

Exposures 26043-80 CS, CN, F, K, consisting of 144 cedar bevel siding panels, were prepared for Chicago north and south, Florida and Coffeyville. This is a tint base study in SWP Colonial Yellow and Westchester Gray. The general set-up is as follows:

A. Ti-Pure R-610 as titanium

CaCO₃ as extender - zinc as Oslo 18 M.
Mg silicate as extender - same.
Mg silicate-CaCO₃ blend - same.
Repeat extenders - using zinc as Oxide.
Repeat extenders - using zinc as Azo Z22-33.

B. Titanox RC as titanium

CaCO₃ - Oslo 18 M, as above.
Mg silicate - Oslo 18 M, as above.
Mg silicate - CaCO₃ - Oslo 18 M, as above.
Repeat with Oxide, as above.
Repeat with Azo Z22-33, as above.

0007-SWP-044026

0007-SWP-000113396

Paint Research
July, 1966

-8-

Project #86 - Leaded Zinc Pigments

Exposure series 44184-44192 was prepared to study the effect of leaded zinc oxide 68 22 00 on the exterior durability of A2 W 8 SWP Trim and Tinting White. Past series of this type have placed the most emphasis on the effect on mold resistance. The specific purpose of this series is to study the effect of leaded zinc oxide on film erosion and bulk film properties. As the zinc oxide concentration goes down film failure is expected to increase. In order that the results are not affected by mold growth we have included 30 pounds of Vancide PA per 100 gallons formulation in all test paints. Films will also be prepared on tinfoil for Instron studies. The series includes a 68 22 00 ladder in 50 pound increments from 0 pounds to 350 pounds per 100 gallons. The exposure locations for this series are Chicago south and Florida south.

0007-SWP-044027

0007-SWP-000113397

Paint Research
September, 1966

-5-

Project #86 - Leaded Zinc Pigments

Exposure series 44610-44618 was designed to supplement series 44184-44192. These series are identical, except that the paints in series 44610 have been tinted blue, while those in the second series were exposed as whites.

Both series were constructed to study the effect of 68 22 00 leaded zinc oxide on cracking and film erosion of SWP Trim and Tinting White A2 W 8. The 68 22 00 was added in 50 pound increments ranging from a total of zero to 350 pounds per 100 gallons. 30 pounds of Vancide PA were added to inhibit mold growth. Panels were prepared as two coat work. The first coat was SWP Undercoater A2 W 2; the second was the test sample. The cedar test panels were exposed at Florida south and Chicago south.

In addition to the above, we are planning other work to aid in the film erosion study in which the amount of erosion will be determined gravimetrically by measuring weight loss as exposure time increases.

Exposure series 44690-44697 was prepared to study the effect of 68 22 00 leaded zinc oxide on the durability of SWP Trim and Tinting White A2 W 8. To exclude the effect of mold growth, 30 pounds of Vancide PA per 100 gallons has been included in all test samples. The formulation variable is a 68 22 00 ladder that goes from 0 to 350 pounds per 100 gallons in 50 pound steps.

Drawdowns were made over tinfoil covered aluminum panels for exposure at Chicago south. Instron data were obtained initially and will be obtained at six month intervals to determine the change in bulk film properties. Exposure procedure for these panels is described in the July Monthly Report.

0007-SWP-044028

0007-SWP-000113398