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LEAD INDUSTRIES ASSOCIATION

420 LEXINGTON AVENUE
NEW YORK 17, N. Y.

CONFIDENTIAL

SUBJECT TO REVISION

WHITE LEAD SECTION MEETING

WHITE LEAD RESEARCH COMMITTEE

New York, N. Y. May 15, 1946

A meeting of the White Lead Research Committee of the Lead Industries Association was held at the office of the Association on May 15, 1946. Present were:

REPRESENTATIVE	COMPANY
A. C. Coots	Eagle Picher Company
O. F. Shobe	Eustom Lead Company
L. E. Donaldson	International Smelting & Refining Co.
E. Peterson	National Lead Company
K. Vetterkind	National Lead Company
E. Saunders	Sherwin-Williams Company
M. Van Loo	Sherwin-Williams Company

F. E. Wormser, Secretary
R. L. Ziegfeld, Assistant Secretary

The meeting was called to order at 10:07 A.M. with Mr. Van Loo in the chair.

The chairman explained that meetings of this committee had not been held for some time, because the current demand for white lead so far exceeds the available supply that it was thought inadvisable to promote increased usage at this time. It was felt that the advantages of immediate publicity of the desirable qualities of white lead might be lost by the time adequate supplies again become available to paint formulators. There was no idea of tabling this work, rather the program is to be pursued actively, taking advantage of the supply situation to do additional research work in the interim to supplement data already available.

The Chairman then referred to the summary of papers to be prepared by various members of the Committee, as listed on page 5 of the minutes of the meeting of December 8, 1945. He took up these papers in order, as follows:

1. Single Pigment Exposures, Including The Functions of Reactive Pigments.

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Representatives of the National Lead Co. and the Eagle Picher Co. met in Pittsburgh on February 27 to discuss this paper. At that time some objection to the paper itself was expressed as it was felt that it would be of little value unless it was carried on to include multiple pigment formulations.

It was generally agreed that any discussion of the functions of single pigments leads logically to a presentation of their performance as components in conventional multiple pigment combinations. However, it would appear that it might not be possible to cover both points in a single paper and keep within necessary limits of time and space. Since a new generation of paint formulators have come along since much information on white lead has been published, it was considered worthwhile first to present basic information on the functions of the individual pigments, indicating that a presentation of their functions in multiple combinations would be forthcoming. It was agreed that the cooperating laboratories should proceed with setting up the paper in a tentative form, so that it could be determined whether the discussion would have to be confined to single pigments alone, or whether time and space would permit expansion into phases of multiple pigmentations.

2. Physical Properties of Single Pigment Paint Films. (Tensile strength, elongation, extensibility, water permeability, abrasion resistance, hardness, impact.)

The chairman summarized a letter received from Mr. Dunn, of the National Lead Company, describing the status of this work. The evaluation of the various physical characteristics enumerated is proceeding satisfactorily. Single coat films were exposed at Sayville in August, 1945. It is assumed that by the time the paper is presented the results will probably represent a correlation with 18 months' exposure performance.

The Sherwin-Williams Company has done some further work on the mixing and grinding properties of single pigments as well as a few simple combinations. The data collected to date include measurements on pastes at equal consistency before milling; at equal oil/pigment volume ratios, and at equal consistency after milling. Measurements were made on the Brabender Plastograph and the Brookfield viscosimeter. The data were too complex for presentation, and interpretation of the accumulated data is still uncertain. The chairman stated that considerable further work is indicated, and while the topic is still far from being ready for presentation as a paper, it appears worth pursuing.

It appears that because of the apparent complexity of this subject it would merit presentation as a paper separate from the phases under investigation by Mr. Dunn. It was suggested that the Sherwin-Williams Company should pass the data they have collected to the National Lead Company for review and comment.

3. Chemical Properties of Reactive Pigments and the Functions of the Reaction Products.

The work on this subject is being held in abeyance until further progress has been made on other projects now under active consideration.

4. Primers and Undercoats.

A preliminary paper on this subject was submitted, and a copy is attached as Exhibit "A." It was agreed that further work is necessary before a paper can

be presented on this subject.

While it was felt that special primers are generally superior to self-primers, it was pointed out that no systematic approach had yet been made to the subject from the standpoint of establishing performance as related to white lead content, and that in many cases, available data could not be satisfactorily correlated. The Sherwin-Williams Co. has laid out such a systematic program, but no results can be expected for several years.

However, tests started two years ago by the Eagle Picher Co. might show some results by the Fall of 1948 so that it may be possible to have something worth publishing by the end of this year. This could be followed later by reports based on the systematic study now being started, these results to be available some four years hence.

5. Blistering and Adhesion Studies.

The chairman explained that further work has been done on this topic but that results are still inconclusive. Efforts to reproduce natural blistering of sufficient uniformity and degree to permit comparisons of original and final adhesion have usually resulted in such curing of the blistered film that readhesion is quite negligible. It is entirely possible that the comparatively low adhesion after blistering is to be expected, in which case it would be interesting to determine the minimum readhesion required to give a margin of safety against peeling on repaint.

A number of suggestions were made as to methods of reproducing natural blistering and these were noted by the chairman. So far the measurement of adhesion seems to be fairly satisfactory.

6. Chemical Composition and Improvements of White Lead.

The data are available for this paper so that it can be prepared and ready for use at almost any time desired.

Col. William J. Knox of the International Smelting and Refining Co. had submitted some views on this subject to the Chairman and to Mr. Stewart of the National Lead Co. A copy of his letter to the Chairman is attached as Exhibit "B."

7. Tint Retention.

This subject had been tabled for review of available evidence and further study. It was felt, however, that if something could be developed on the contribution of white lead towards tint retention, it would be valuable and appealing to paint formulators.

It was suggested that the Chairman write to W. P. Fuller & Co., South San Francisco, Calo, for suggestions on all of the subjects discussed, and particularly as to what they might contribute towards a paper on tint retention.

SUMMARY

The Chairman then summed up the above discussion as follows:

1. Single Pigment Exposure, Including The Functions of Reactive Pigments.

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It was decided that a preliminary paper be set up to be used in determining whether this subject can stand alone or whether multiple pigments must be included.

The authors of this paper were requested to get together on their own and work it out for submission to the Committee as soon as possible.

2. Physical Properties of Single Pigment Paint Films.

This work is proceeding, with results and a paper on this subject about a year away.

3. Chemical Properties of Reactive Pigments and the Functions of the Reaction Products.

This work is being held in abeyance for the time being.

4. Primers and Undercoats.

The Eagle Pisher Co. exposures are expected to show some results by the year end, which might be combined with the preliminary paper submitted at this meeting, together with any data which the Glidden Co. and Sherwin-Williams Co. might have to add.

In the meantime, the systematic program laid out by Sherwin-Williams Co. will proceed and will probably have some results in about four years.

5. Blistering and Adhesion Studies.

Sherwin-Williams Co. will continue its work along these lines and would like to have advice from any members of the Committee or their assistance on the technique of duplicating natural blistering.

6. Chemical Composition and Improvements of White Lead.

This paper is to be prepared now, in order that it be ready for release when propitious.

7. Tint Retention.

The Chairman will write W. P. Fuller & Co. for what they can contribute to this subject specifically, as well as anything they can contribute to any of the other subjects discussed.

DEMONSTRATION HOUSES

It was brought out that when the panel tests have shown sufficient results for the Committee to arrive at definite conclusions, it would probably be necessary and desirable to have demonstration houses painted in different parts of the country. It was emphasized, however, that such a program needs close technical supervision and follow up.

Therefore, as soon as the panel tests show house tests to be expedient, they should be conducted at locations where technical supervision is available. As the Committee is well distributed throughout the country, this would permit adequate geographical distribution.

The meeting adjourned at 3:10 P.M.

H. E. Thomas
Secretary.

White Lead Research
Committee Meeting

Exhibit "1"
May 18, 1948

HOUSE PAINT PRIMER AND UNDERCOAT

The gradual decrease in the availability of high quality lumber during the past twenty to thirty years has made the problem of exterior wood painting increasingly difficult. Several other factors have contributed to this condition. The widespread use of insulating materials where construction details were not perfect have added greatly to peeling and blistering troubles due to increased moisture in walls. The introduction of mixed paints of high zinc sulphide content with a relatively low white lead percentage have generally given poor weathering results especially where such paints were thinned in the conventional manner and used for priming.

Many paint manufacturers began widespread distribution of relatively high zinc sulphide and low white lead bearing paints in the ten year period following World War I. These paints were of course used in the same general way for house priming as had been the practice with high white lead, zinc oxide and inert types of material. The vehicle used in these two types of paint were substantially the same and the expectation from incomplete exposure tests was that no difficulty would be experienced on exposure of jobs done in this manner. Contrary to expectations troubles did crop up everywhere on paint jobs done in this manner. Longitudinal slitting of the film between spring and summer wood developed and curling of the film, scaling, and flaking followed on a high percentage of houses. This failure was particularly bad over yellow pine and other woods difficult to paint. Many of these high zinc sulphide paints popularly known as 40-40-20 paints were at first formulated and put on the market using lead free zinc oxide, lithopone and inert. When the above mentioned peeling and scaling troubles were experienced, efforts made to correct the condition brought out the fact that the substitution of leaded for the lead free zinc oxide showed a distinct improvement in the weathering characteristics of jobs done. However, this improvement in formulation did not cut down failure to a point where this type of outside paint was considered a thoroughly safe product for general distribution as a combination primer and finish coat product.

It has always been a practice on the part of many reliable painters who use ready mixed paints as finishing coats on houses to do their priming with paste white lead reduced in the conventional manner for priming coat work. Obviously, many jobs finished with high zinc sulphide ready mixed paints of the 40-40-20 type were automatically primed with reduced white lead in oil. It was soon discovered that these jobs were relatively much less likely to give trouble from longitudinal cracking, scaling and peeling.

The serious difficulties experienced with lead free or low white lead content paints led to the development of an idea on the part of paint technologists that a special priming undercoat should be developed for exterior wood painting. Special primers were used for painting automobiles, railway cars, structural steel and for wood where enamel finishes were to be applied. It seemed only logical that a special primer could be made that would go a long way toward curing exterior paint failures. It was noted that certain types of paints such as iron oxide paints where a good vehicle was used rarely gave peeling or scaling trouble. Most

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iron oxide paints carry a quantity of varnish along with linseed oil as the makeup of the vehicle. The sharp toothlike structure of iron oxide pigments was thought to contribute to adhesion of such paints over the surface to which they were applied The activity of aluminum powder producers in the late twenties added to the need for special house paint undercoats to meet this new competition. Aluminum powder producers were flooding the country with advertising material showing the merits of aluminum paints as primers both front and back. True enough, it was found that aluminum paints of certain types did a fairly good priming job but it was also found that two succeeding coats of the highest hiding paints then on the market were required to produce a white job and after a period of exposure dark patches of the metallic aluminum background again presented its unsightly appearance. In spite of its shortcomings aluminum priming was used on many house paint jobs and was strongly backed by some prominent paint technologists.

A paper on "Special Primers for House Paints" by Schmutz, Palmer, and Kittelberger of the New Jersey Zinc Co. given before the Division of Paint and Varnish Chemistry at the 79th meeting of the American Chemical Society, Atlanta, Ga., April 7 to 11, 1930 and printed in Volume 22, Page 855, August, 1930 of Industrial and Engineering Chemistry effectively pointed out that the vehicle used in aluminum primers was the important factor which contributed to their priming efficiency. This article clearly showed the need for controlled penetration and the adhesion characteristics of bodied oils and long oil varnishes in a properly formulated primer for house painting. Some formulators working on priming undercoats for house paints soon found that special vehicles pigmented with white lead, gritty siliceous inerts and stepped up in hiding with a small percentage of titanium dioxide pigment for all practical purposes cured their exterior house paint complaints. Such properly formulated primers possessed the qualities necessary in wood priming which may be summarized as follows:

1. Its moisture proofing efficiency should be maintained high enough to prevent rapid moisture changes for a long period of time.

2. It should be unaffected by sunlight and air so as to maintain a high degree of elasticity indefinitely.

3. It should provide excellent adherence uniformly over both spring and summer growth so as to prevent longitudinal slitting flaking and peeling.

4. It should show good adherence over knots and resin pockets found in difficult to paint woods.

5. It should prevent the bleeding through of water soluble stains and resins found in certain woods.

6. It should have sufficient tooth to prevent crawling of finish coats when applied and to give and provide perfect adherence of finishing coats.

7. It should dry to a film that, while elastic enough to withstand swelling and shrinking of wood with changes of temperature and season, will not be so soft as to cause checking of top coats as they are progressively hardened by weathering.

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It is a significant thing that, the technicians of such paint manufacturers as the Sherwin-Williams Co. the Pittsburgh Plate Glass Co., the Glidden Co., the Patterson-Sargent Co., Devoe & Raynolds, John Lucas, and Pratt & Lambert, have placed on the market primers designed to have the above mentioned features carrying a percentage of white lead pigments ranging from 36% to 46.8% with only three of the above producers falling below 40% white lead content in their priming paints. Only two of the primers marketed by the above companies use zinc oxide pigment in their primer and those have relatively small percentages and in no instance has zinc sulphide been incorporated.

For the purpose of studying the effect of different woods on the behavior of house paints and to check up on competitive lines one of the above paint manufacturers prepared a series of panels for exposure in Florida, Louisiana and Northern Ohio. The exposure panels were built up of six kinds of lap siding-each panel carrying a board each of the following woods; white pine, cedar, spruce, yellow pine, red wood, and cypress. Galvanized nails were used to avoid rust streaks on the surface of the paint. The left hand third of each panel was primed with a primer made up along the lines of the above mentioned primers, the middle third of each panel was primed with the mixed paint used for the second and third coats on that particular panel and the right hand third of each panel was primed with lead in oil reduced as follows: 12½ white lead in oil, ½ gal. raw linseed oil, ½ gal. turpentine and 2 liq. oz of liquid drier per gallon. The paints were all reduced for priming, second and finishing coats according to label directions on the can. The backs of all panels were primed with the special primer used on the left hand third of the face of all panels. After exposure at 45° angle to the South for the equivalent of about four to five years vertical exposure, every house paint showed distinctly better durability over the special primer than it did over the self primed portion of the panel. In all but two or three instances out of a total of seventy two paints exposed the right hand third of each panel primed with white lead in oil showed distinctly better durability of the paint film than over the center self primed section but not as good as the section carrying a special primer based on white lead as the principal pigment.

Studies are now under way by a White Lead Technical Committee of the Lead Industries Association to determine just what the minimum and maximum percentages of white lead should be in House Paint Prizing Undercoaters to produce the highest possible quality and foolproof feature in this type of product.

White Lead Research
Committee Meeting

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Exhibit "P"
May 15, 1946

INTERNATIONAL SMELTING & REFINING CO.
East Chicago, Indiana

SPECIAL DELIVERY

May 7th, 1946

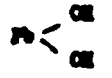
Dr. M. Van Lee
Sherwin-Williams Company
Allied Research Laboratories
115th Street and Cottage Grove Avenue
Chicago 28, Illinois

Dear Dr. Van Lee:

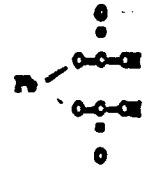
Pursuant to your request, I am recording below in greater detail the reactions mentioned in my letter of May 1st to Mr. Stewart, on which I based my proposal that the White Lead compounds are lineal and similar to organic compounds in structure and reactions.

I. Intermediate Compounds

a. $Pb(OH)_2$

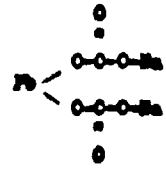


b. $Pb(CO_3H)_2$



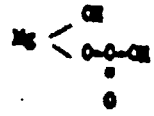
There are many other lead carbonates of varying basicity. About the only extensive studies of these compounds that I have seen in the literature was some work done in Russia on the sodium compound $Pb(CO_3Na)_2$:

i.e.



There has been quite a bit of work done on similar Mg and Cu compounds such as the following.

c. Magnesium Hydroxycarbonate



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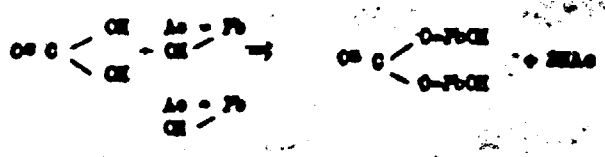
d. And Copper Basic Carbonate

$Cu_2CO_3(OH)_2$ or $O{=}C\begin{cases}O\text{-}CuOH\\O\text{-}CuOH\end{cases}$

II In more detail, the compounds I listed in my letter of May 1st can be shown graphically as follows.

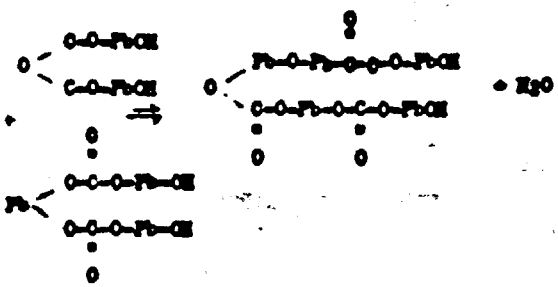
a. 8.65% CO_2 -- $2PbO \cdot CO_2 \cdot H_2O$

$PbCO_3 \cdot Pb(OH)_2$



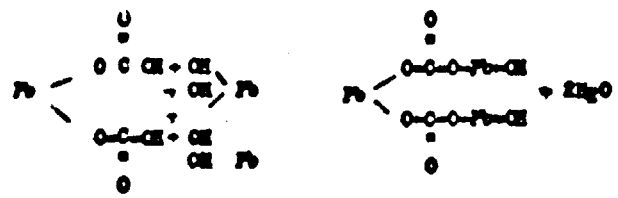
b. 10.42% $5PbO \cdot 3CO_2 \cdot H_2O$

$3PbCO_3 \cdot Pb(OH)_2\,PbO$



c. 11.58% $3PbO \cdot 2CO_2 \cdot H_2O$

$2PbCO_3 \cdot Pb(OH)_2$



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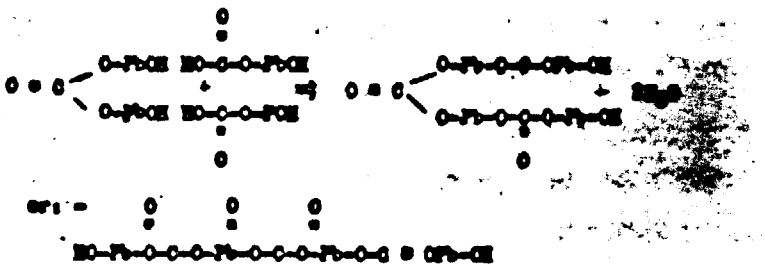
4. 12.86% CO_2 $4PbO \cdot 3CO_2 \cdot H_2O$

$2PbCO_3 \cdot Pb(OH)_2$



or:-

The foregoing compounds differ chemically. There are many examples of these differences. For example: Compound "A" forms a dispersed linseed oil-pigment system that in time will settle out "hard," while compound "D" forms a flocculated structure that stands up well and does not have the "hard" settling characteristics.

The foregoing, while brief, should be sufficient to indicate the possibilities of this approach to a better understanding of the unique properties of White Lead that are most valued in paint formulations.

Sincerely yours,

(SIGNED) William J. Rhea,
Superintendent Pigment Division

WJR/ha