ALLIED RESEARCH BULLETIN

Number RC-37

SUBJECT

EXPOSURE STUDIES RELATING TO THE EFFECT OF DIFFERENT INERT PIGMENTS IN HOUSE PAINT FORMULATIONS ON DURABILITY

pared by: C. D. Holley

November 24, 1937

ALLIED RESEARCH LABORATORIES

CHICAGO, ILLINOIS

EXPOSURE STUDIES RELATING TO THE EFFECT OF DIFFERENT INERT PIGMENTS IN HOUSE PAINT FORMULATIONS ON DURABILITY

mary Statement:

In the attempt to develop mixed paints, based on Zinc Sulphide as incipal opaque pigment having a performance equal to the better class of Oxide paints, results have been obtained of definite interest.

Experience with the conventional types of White Lead and Zinc Oxide paints has shown that the character of the Inert Pigment present has a minor influence on the wearing value of the paint. The introduction of titanium pigments along with White Lead and Zinc Oxide, has shown that the acter of the Inert Pigment in such combinations can be of great importance. of the poor durability of paints made with Titanox B can be attributed to Blanc Fixe and the present improved results, to its replacement with Asbes-

The same line of reasoning has been applied to the Zinc Sulphide ments. The poor durability of Lithopone paints can in the main be attributed to their high Blanc Fixe contents. This report deals with replacements of anc Fixe with other Inert Pigments as to improving durability.

posure Procedure:

The various paints were applied 3 coats on Western Red Cedar, a side coat being employed in each instance. The exposures were vertical, in he latitude of Chicago and in the main extended over a period of 4 summers (3-1/3 years).

It is generally recognized that vertical test fence exposures are more severe than actual house tests. The rate of acceleration usually being not

than 20% or more than 30%. Therefore, a test fence exposure extending through 4 summers, approximates the normal durability of the better white house paints of today, i.e., 4 to 5 years, at which time the paint enters the "neglect" period, during which satisfactory repainting becomes increasingly difficult.

General Nature of Results:

Zinc Sulphide pigments show improved durability in proportion to the replacement of finely precipitated Inert Pigments, such as Blanc Fixe with Inert Pigments having flaky or plate shaped particles. Mica being the best and much superior to Asbestine, plate Talc occupying an intermediate position. Typical Zinc Sulphide formulations containing Mica have shown a durability and appearance equal to SWP White.

Types of Inert Pigments and Formulations Selected:

The following Inert Pigments were selected:

Asbestine	-	Standard 20 Dry Int. Pulp Co.
Flaky Talc	-	Innes Speiden
Mica	-	Standard 1779 Dry
Silica	-	Standard 3 Dry

The first type of pigment formula selected was based on previous exposure experience based on:

30% Zinc Sulphide
46% Leaded Zinc 35/65
24% Inert Pigment

The pigments were ground to a Semi-Paste of about 20 lbs. net per gallon in the following oil mixture:

30% Alkali-Refined Lin. Oil
40% Raw Linseed Oil
10% Bodied Linseed Oil - "Q" Body
10% Driers and Volatile Thinners

For application the Semi-Paste was reduced as follows:

	Semi-Paste	Linseed Oil	Turpentine
Coat	1 Gal.	1-1/4 Gal.	1/4 Gal.
Coat	1 "	1/2 "	3/8 "
Coat	1 "	7/8 "	1/8 "

Series No. 1:

Two Zinc Sulphides were selected on the basis of previous expo ure rience, one designated as "F" having a considerably higher inherent durabil- than the one designated as "K."

Two groups of paints were made and exposed, based on these two Sulphides with the following replacements of the 24% Inert Pigment content:

Paint No. 1	Zinc Sulphide	X,	Inert Pigment		Asbestine
" " 2	"	"	"	"	Talc
" " 3	"	"	"	"	Mica
" " 4	"	"	"	"	2/3 Asbestine, 1/3 Silica
" " 5	"	"	N	"	Asbestine
" " 6	"	"	"	"	Talc
" " 7	"	"	"	"	Mica
" " 8	SWP White (present formula)				

Paint No. 4 was used as the guide paint on each panel of this ies.

At the end of 4 summers, paint No. 4 - Asbestine-Silica has failed ly through cracking and flaking with considerable areas of bare wood.

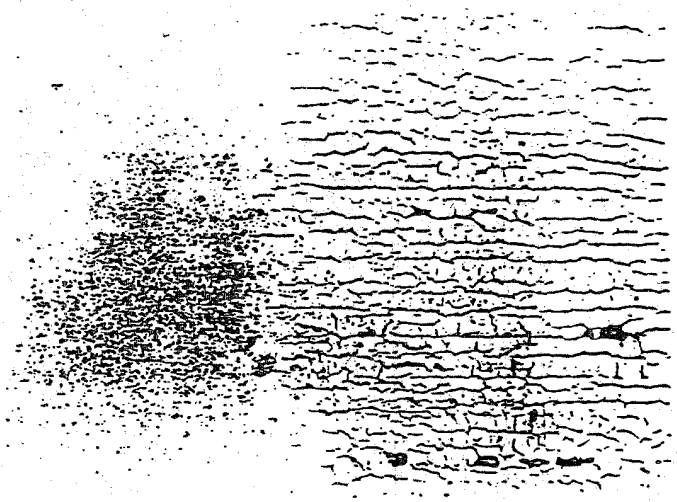
Paints No. 1 and No. 5 both made with Asbestine but different Zinc hides, have shown similar durability performance. In both, the failure has ressed through severe cracking to definite flaking.

Paints No. 2 and No. 6 both made with Talc show a wide difference urability. With the "N" Zinc Sulphide, the durability was appreciably better

ith Asbestine, the checking being definite with only slight cracking, as the panel with the "K" Zinc Sulphide shows bad cracking and flaking.

Paints No. 3 and No. 7 both containing 24% Mica show definite im- ment over the Asbestine and Talc. The "N" Zinc Sulphide showing marked riority over the "K" Zinc Sulphide.

Paint No. 7 made with the "N" or the more durable grade of Zinc ide and with Mica, is free from checking and compares favorably as to ness, general appearance and integrity of film with the panel of SWP White me length of exposure. Chalking on the Mica panel is moderate, with no nness of the surface or evidence of erosion. It has shown exceptional dirt ding qualities throughout its exposure period.



Magnification x 2
Adjoining Sections On Same Panel
Left - Paint No. 7 Zinc Sulphide-Mica
Right- Paint No. 4 Zinc Sul.-Asbestine-Silica

Paint No. 3 shows a definite improvement over the corresponding tine and Mica "K" Zinc Sulphide formulations.

Paint No. 8, present formula SWP White shows slight general check- good whiteness and fairly heavy chalking.

Series No. 2:

Montgomery Ward's Zincite paint was taken as the basic type of lation, because of general customer acceptance as to usable performance in second grade price range.

Paint No. 9 represents the pigment formula.

55% Lithopone
35% Leaded Zinc 35/65
10% Asbestine

Paint No. 10 represents a modification adopted in 1934 in which reased durability was sought by replacing one-third, or 18% of the Lithopone th Barium Base Double Strength Lithopone.

Paint No. 11. Same composition as No. 9, but with complete re- cement of normal Lithopone with Barium Base D. S. Lithopone.

Paint No. 12. Same composition as No. 9, but with replacement of thopone with M.S. 130 (55% Zinc Sulphide, 35% Asbestine, 10% Mica).

This series therefore represents a transition from high Blanc Fixe tent through lesser contents to complete replacement with a silicate type of rt pigment containing an appreciable percentage of Mica. Exposures were pre- ed and conducted in a similar manner to the preceding.

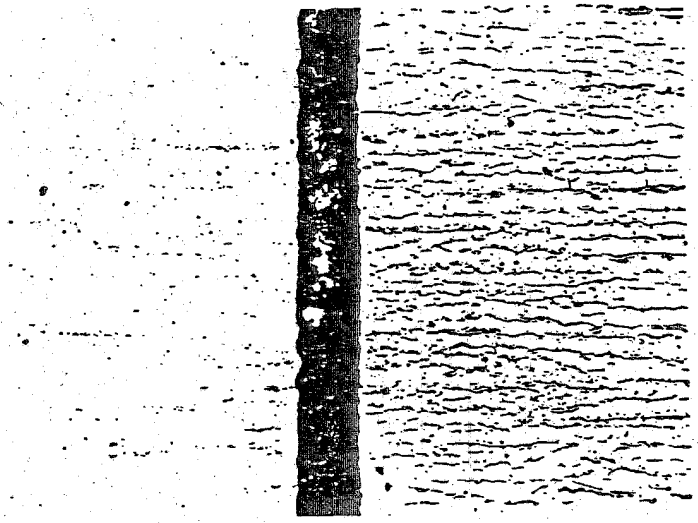
After an exposure period of approximately 4 summers, the follow- results were noted:

Paint No. 9 - Lithopone - bad checking and cracking with slight ing, moderate chalking, some erosion, fair whiteness. These results check ious observations as representing average performance of this type of paint.

Paint No. 10 - Lithopone and D. S. Lithopone - definite checking cracking, much less severe than preceding, moderate chalking, no erosion, whiteness. A definite improvement over the preceding.

Paint No. 11 - D. S. Lithopone - slight to definite checking. rwise similar to No. 10. A definite improvement over preceding. Should rep- nt fair customer acceptance in the second grade price field.

Paint No. 12 - Asbestine - Mica - checkin very slight (localized one very small area), chalking slight to moderate, w teness excellent. uld represent a good paint in the moderate price range.



Magnification x 2

Series No. 3:

This series represents another approach to an acceptable paint in moderate price field based on modifications of S.W. Family Paint White, Rex increasing the pigment from 750 lbs. to 885 lbs. Length of exposure and eration of panels similar to preceding series.

The Family Paint pigment percentage composition is represented by:

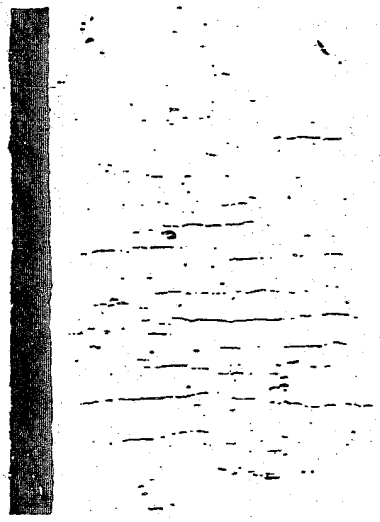
54% Barium Base D. S. Lithopone
14% Leaded Zinc 35/65
32% Asbestine

The type formula selected was:

33-1/3% Barium Base D. S. Litho. (Cryptone)
33-1/3% Leaded Zinc 35/65
33-1/3% Inert Pigment

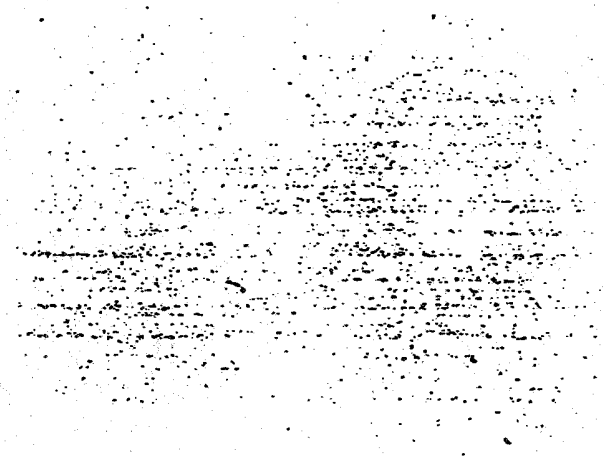
Paint No. 13 Added Inert Pigment, half Asbestine, half Silica. ere cracking, initial flaking, moderate chalking, fair whiteness.

Paint No. 14 Added Inert Pigment Talc. Slight checking and cking, some erosion, fair whiteness. A marked improvement over Paint No. 13.

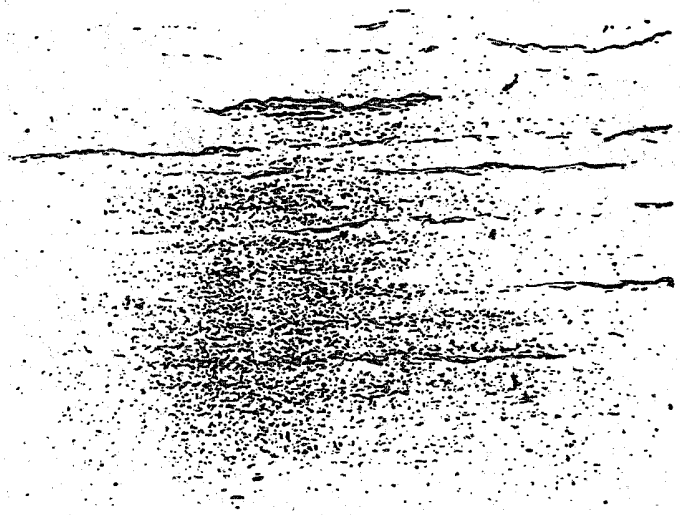


Magnification x 2
Adjoining Sections Same Panel. Black Line Showing Division
Left - Barium Cryptone

Paint No. 15 - Added Inert Pigment all Mica, no checking, no observable erosion, moderate chalking, excellent whiteness throughout exposure, performance equal to that of SWP White.



Magnification x 2
Barium Base D. S. Lithopone Plus Mica



Magnification x 2
Barium Base D. S. Lithopone Plus Asbestine and Silica

Series No. 4:

This brief series is related to the No. 1 series being based on following pigment composition, but exposed on White Pine:

30% Zinc Sulphide
46% Leaded Zinc
24% Inert Pigment

Paint No. 16 - "K" Zinc Sulphide, Inert Pigment 2/3 Asbestine, 1/3 Silica. Bad checking and cracking, considerable to bad flaking, moderate chalking.

Paint No. 17 - "N" Zinc Sulphide, Inert Pigment 3/4 Asbestine, 1/4 or 6% Mica. Very slight checking, no cracking, chalking moderately, slight erosion. Performance nearly comparable to that of SWP White.

Paint No. 18 - "Z" Zinc Sulphide, Inert Pigment 3/4 Asbestine, 1/4 Mica. Bad cracking and flaking. Indicating that 6% Mica is not sufficient to counterbalance the lack of durability inherent in the "Z" Zinc Sulphide, whereas the higher Mica percentage - 24% - in Paint No. 3 partially overcame that weakness.

Discussion of Results:

While these paints represent modification of established types, merchandized at the time these exposure tests were begun, and therefore do not cover the experimental field in a thorough manner, the results strongly indicate that the micaceous types of Inert Pigments can greatly increase durability of mixed paints, especially those made with the Zinc Sulphide pigments.

1. The use of substantial percentages of a Talc, the particles of which show a definite plate or flake formation give considerable improvement in durability over Asbestine or admixtures of Asbestine and ordinary Silica.

The use of Mica in substantial percentages, 24% to 33% in paints Nos. 7 and 15, exhibit a durability, whiteness and general appearance equal to S.P White. The dirt shedding qualities are excellent.

The use of Mica in small percentages, 6%, along with substantial percentages of Asbestine, Paints Nos. 12 and 17, increases the durability to a marked extent over Asbestine alone or Talc alone, but does not raise the durability to that of S.P White.

The indications are that very satisfactory results can be obtained within the limits of a Mica content of 10% to 20%, both as to durability and dirt shedding qualities.

An examination of the films during and at the close of this exposure period indicates that 46% of Leaded Zinc is slightly high as the rate of chalking and wearing away of the film should be increased so as to prevent ultimate excessive cracking. The 33-1/3% Leaded Zinc content appears to be a desirable figure. Indicated acceptable limits are 30% to 40%.

These exposure results confirm previous findings to the effect that as the Blanc Fixe contents of the Lithopone pigments are progressively replaced with micaceous Silicate pigments, the durability progressively increases. It is interesting to note that with Paint No. 15, the presence of 33% Mica counteracted the 16% of Blanc Fixe, this paint comparing favorably with S.P White in all respects.

The repainting characteristics of the Mica paints remain to be determined. Indications based on the present characteristics of the film are regarded as favorable.

The possibilities of developing a Zinc Sulphide - Leaded Zinc - Mica formula, for the tints and light colors of a first grade paint line and at a lower cost, are considered good. This subject will be given especial consideration during the coming year.

Availability of Mica:

Experience indicates that Mica for mixed paint purposes should be wet ground, not dry ground, in order to produce a maximum surface area with minimum thickness of the particles.

Ample raw material stocks are available at low costs. The expense to date of water grinding is high, which with relatively small consumption, has resulted in an undesirably high price. It is understood that a large mill is now being built near Asheville, North Carolina, which is expected to produce a suitable grade of Mica at a considerably lower cost.

CDH:NLK

C. D. Holley