

## LEAD INDUSTRIES ASSOCIATION

480 LEXINGTON AVENUE  
NEW YORK 17, N. Y.

RED LEAD DIVISION

CONFIDENTIAL - FOR COMMITTEE USE ONLY

SUBJECT TO REVISION

### RED LEAD TECHNICAL COMMITTEE

New York, N. Y.

May 4, 1948

A meeting of the members of the Red Lead Technical Committee of the Lead Industries Association was held in the Association's office on Friday, May 4, 1948. The following were present:

Committee  
A.C. Coets  
O.F. Shobe  
J.O. Johnstone  
S. Dickman

E. McMullen  
A.J. Eickhoff  
A. Stewart

Representing  
Eagle-Picher Lead Co.  
Glidden Co.  
Hammond Lead Products, Inc.  
National Lead Co.

Eagle-Picher Lead Co.  
National Lead Co.  
National Lead Co.

F.E. Kormser, Secretary-Treasurer of the Lead Industries Association  
L.L. Carrick, Director of Red Lead Research  
J.L. Benson, Acting Secretary of Meeting

The meeting was called to order at 10:00 A.M. with Dr. L. L. Carrick presiding.

### GALVANIZED IRON PRIMER TESTS

Eight panels for the galvanized iron primers should have been placed on outside exposure so that they could weather from March 1 to September 1. On June 1, eight additional panels of the galvanized iron should be placed on exposure so that they can weather for three months, that is, until September 1.

On September 1 the paints should be applied to all of the galvanized iron panels namely, 1. those that have weathered six months; 2. those that have weathered 3 months; and 3. those that have not weathered at all but have the paints applied according to Pages 2, 3 and 4 of the Red Lead Technical Committee Meeting Minutes of January 28, 1948.

### Rail Car Paints

It was decided that Dr. Carrick was to contact the railroad companies and find out their exact requirements, as follows:

1. The price they desire to pay for the primers.
2. The temperature range which it must withstand.



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3. The method of application of the primer.
4. Drying time.
5. The number of coats of primer.
6. The painting schedule.
7. The paint system.
8. The possibility of securing steel box cars as test sites for the paint.

No formulations have been submitted to date but the committee will consider this information at its July meeting. It is requested that each member of the committee bring to the meeting in July his best recommendations for steel box car paints.

#### ADDITIONAL FLORIDA EXPOSURE TESTS

It was decided at the meeting that the paints prepared by Mr. Shobe dealing with the following should be exposed at Daytona Beach, Fla.:

1. the variation of the alkyl resin solution combined with LV-257 varnish in L.I.A. Vehicle 18 should be varied from 40 to 60% with the corresponding variation in LV-257 varnish, and

2. vehicles which have formulas in which the alkyl fraction is held constant and the LV-257 vehicle fraction has a composition so that the oil length varies as follows 6, 12, 18 and 24 gallons, and

3. vehicles in which the linseed oil fraction in the LV-257 varnish is to be replaced by dehydrated castor oil and the BR9432 resin is to be replaced with RZ254 resin.

It is hoped that this series of tests will show the effect of varying the alkyl fraction of Vehicle 18. Pigmentation to be used with these vehicles is Pigmentation 75, a modified pigmentation J, as follows:

|                       |     |
|-----------------------|-----|
| Red Lead 97% grade    | 50% |
| Zinc Chromate         | 10% |
| Iron Oxide            | 4%  |
| Asbestos (M.C. Spec.) | 18% |
| Colite or Dicalite    | 8%  |
| Micalith-6            | 10% |

(See Exhibit A, L.I.A. Paints Nos. 184 to 188, inclusive.)

A second group of paints, which have been prepared by Mr. Shobe and ground in Pigmentation 75 above, deal with the substitution of soya bean oil or dehydrated castor oil for the linseed oil in the alkyl vehicles. The vehicles prepared are L.I.A. paints 190 to 206, inclusive. (Exhibit A attached)

Briefly, the phthalic anhydride content varies from 20 to 35% and the pigment volume varies from 30-35%. Standards to be included with these tests are 62-P-18, 62-MC-28, 62-MC-23 and TT-P-86 in linseed oil and TT-P-86, Amendment 1, covering replacement oil, and the formulation submitted to the Navy by the National Lead Co. It was further decided that the pigmentation recommended to the Navy should be ground in

- (1) the vehicle used in 62-P-18,
- (2) 62-MC-21 vehicle,
- (3) L.I.A. vehicle No. 63 or Engle-Picher JV96, and
- (4) the vehicle submitted to the Navy for test on the P.C. boats by the National Lead Co. which is a modification of Vehicle 18.

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These tests are to be conducted in a manner which will be in accordance with that used by the Navy under similar conditions. The committee recommended that the four paints above be presented to the Navy for their experimental tests. It was also requested that these be presented to the Maritime Commission for inclusion in their test program. The formulations of these paints are given in Exhibit B attached.

#### BATTILLE MEMORIAL INSTITUTE RESEARCH PROGRAM

In accordance with the report to the Committee that steel could be secured the latter part of June or the first of July the order for the steel has been placed. It amounts to 8.88 tons. The steel will be supplied by the Bethlehem Company through the Lukens Steel Co. It was agreed by the Committee that the work should proceed as rapidly as possible. Mr. Wormser has made arrangements, for the studying of the health hazards encountered in the arc welding of steel, with the Industrial Hygiene Foundation in Pittsburgh. It is understood that the Industrial Hygiene Foundation will send a representative to the Battelle Memorial Institute and collect the samples which result from arc welding and flame cutting under the supervision of the Battelle Memorial Institute.

Mr. Goets thought that it would be advisable to have a written agreement from the Navy and Maritime Commission that the proposed arc welding of painted steel meets with their approval. Mr. Stewart thought that it was justifiable to authorize the procedure as set up making the Battelle Memorial Institute responsible for the acceptance of the program by the Government departments. This acceptance is predicated upon the consultation between a representative of the Battelle Memorial Institute and the Government officials of interested bureaus who have examined the proposed research plan. It was suggested that the welding program which has been submitted to the L.I.C. should be shown to the interested government officials by Dr. Carriek in the near future. This to be done if possible during the week beginning May 14. As to the signing of the contract it was moved by Mr. Stewart and seconded by Mr. Goets as follows "that the contract be signed on June 1 contingent on the date of the delivery of the steel and that Dr. Carriek submit the program to interested government agencies and steel companies." The motion was approved without a dissenting voice.

#### RED LEAD MULTIPLE PIGMENTATION RECOMMENDATION TO THE MARITIME COMMISSION FOR PIGMENT SPECIFICATION

Dr. Carriek reported that while in Washington recently he was told by Mr. Pearson of the Maritime Commission that they were willing to entertain a red lead multiple pigmentation providing it carried:

1. the backing of all the lead interests, and
2. it had experimental data to back the recommendation.

Exhibit C (attached) was recommended to the Red Lead Technical Committee for its approval. After reviewing the proposed specification (Exhibit C) it was decided without a dissenting voice to recommend this proposed specification to the Maritime Commission.

The pigmentation in this specification is a modification of Pigmentation J which has consistently proved to be better than any other pigmentation which we have tried. The vehicle chosen, B2-MC-21, seems desirable as the Maritime Commission has considerable experience and confidence in it. Our experience with B2-MC-21 in the modified Pigmentation J has been very satisfactory.

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Mr. Goets observed that after the war paints will be purchased by the operators and that not so much attention will be paid to government specifications. Hence, any specification material which we recommend to the Navy and Maritime Commission should be brought to the attention of the marine paint manufacturers.

It was recommended that Dr. Carrick contact the manufacturers of marine paints such as the Socony Products, Marine Division of Devco & Reynolds Co., the Baltimore Copper Paint Co. (Oliver River), the Red Hand Paint Co. and the Patterson-Margent Paint Co. The object is to interest the manufacturers in comparing existing marine paints with those in use at present and in use prior to the opening of World War No. 2. The formulations that Dr. Carrick is to use in interesting the manufacturers of marine paints in red lead pigmentations are those shown in Exhibit B (attached).

If we are able to interest the marine paint manufacturers in the design of the four paints submitted to the Navy and Maritime Commission (Exhibit B) then we are to secure samples of marine paints made by the manufacturers listed above and test them along with the four Navy and Maritime recommended paints in Florida.

The topcoat to be used on tide-range exposures is to be S2-MC-C. This paint is considered the best topcoat by members of the Technical Committee.

If total submersion tests are conducted then it is proposed to employ the painting system used by the Navy along with the Navy anti-fouling topcoat paint.

#### REVISION OF INDUSTRIAL CODE RULE NO. 28

The L.I.A. has been invited to become an advisory member of the Committee which has as its purpose the revision of Industrial Code Rule No. 28 in New York State dealing with the health hazards of painters. Dr. Carrick has already met with the Committee once and reports that satisfactory progress is being made with members of the Committee and that the deletion of any terms which show partiality and which are discriminatory is being made. Three sections of the proposed code have already been revised and such terms have been deleted and more general terms inserted. In future meetings, the balance of the code will be up for consideration.

#### PRIMER PAINTS FOR THE UPPER MISSISSIPPI RIVER VALLEY TEST PROGRAM

The recommendations for primer paints for this project approved under date of January 26, 1948, were reviewed and the seven primer paint formulations shown in Exhibit D are to be made and delivered to Mr. Sol Glaser in charge of the testing program before June 15, 1948 (Exhibit D attached).

#### ATMOSPHERIC EXPOSURES

Messrs. Goets and Diehlman suggested that the Committee should review the existing atmospheric exposures at the Eagle-Picher Test Farm at Joplin, Mo. and at the National Lead Test Farm at Sayville, L.I. and after consideration of the data and tests reviewed, that the L.I.A. should inaugurate an atmospheric exposure test program.

The meeting adjourned at 6:30 P.M.

It was decided that the next meeting date of the Red Lead Technical Committee should be in the latter part of July, the date to be arranged.

*L. L. Carrick*

L. L. Carrick

## ADDITIONAL FLORIDA EXPOSURE TESTS

## EXHIBIT A

| Panel No. | LIA Paint No. | LIA Pig. No. | LIA Vehicle No. | Mfg. Paint No. | Vehicle Composition                                                                      |
|-----------|---------------|--------------|-----------------|----------------|------------------------------------------------------------------------------------------|
| 154       |               | P-75         | V-19            | Standard       | Alkyd sol. 40% LV257, 60% (8 gal. length linseed oil)                                    |
| 155       |               | "            | V-19a           | GL51624        | Alkyd sol. 40% LV257, 60% (12 gal. length linseed oil)                                   |
| 156       |               | "            | V-19b           | GL51625        | Alkyd sol. 40% LV257, 60% (18 gal. length linseed oil)                                   |
| 157       |               | "            | V-19c           | GL51626        | Alkyd sol. 40% LV257, 60% (24 gal. length linseed oil)                                   |
| 158       |               | "            | V-19d           | GL51627        | Alkyd sol. 60% LV257, 40% (8 gal. length linseed oil)                                    |
| 161       |               | "            | V-19e           | GL51628        | Alkyd sol. 60% LV257, 40% (12 gal. length linseed oil)                                   |
| 162       |               | "            | V-19f           | GL51629        | Alkyd sol. 40% LV257, 60% (8 gal. length linseed oil and R254 in place of R2432)         |
| 163       |               | "            | V-19g           | GL51630        | Alkyd sol. 40% LV257, 60% (16 gal. length (80% C.O. 80 L.O.) and R254 in place of R2432) |
|           |               |              |                 |                | Vehicle Composition      Primer data                                                     |
| 190       |               | P-75         | V-69            | GL51334        | Soya oil, P.A. 25      PV 30      KU 74      Wt/Gal. 12.2                                |
| 191       |               | "            | V-70            | GL51335        | Soya oil, P.A. 25      PV 35      KU 72      "      12.9                                 |
| 192       |               | "            | V-71            | GL51336        | Linseed Oil, P.A. 20      PV 30      KU 72      "      12.7                              |
| 193       |               | "            | V-72            | GL51337        | Linseed Oil, P.A. 20      PV 35      KU 72      "      13.4                              |
| 194       |               | "            | V-73            | GL51338        | Soya oil, P.A. 20      PV 30      KU 75      "      12.7                                 |
| 195       |               | "            | V-74            | GL51339        | Soya oil, P.A. 20      PV 35      KU 75      "      13.4                                 |
| 196       |               | "            | V-75            | GL51340        | Soya oil, P.A. 25      PV 30      KU 72      "      12.8                                 |
| 197       |               | "            | V-76            | GL51341        | Soya oil, P.A. 25      PV 35      KU 72      "      13.5                                 |
| 198       |               | "            | V-77            | GL51342        | Dehydrated Castor Oil, P.A. 25      PV 30      KU 75      "      12.55                   |
| 199       |               | "            | V-78            | GL51343        | "      P.A. 25      PV 35      KU 75      "      12.75                                   |
| 200       |               | "            | V-79            | GL51344        | Linseed Oil, P.A. 20      PV 30      KU 73      "      12.6                              |
| 201       |               | "            | V-80            | GL51345        | Linseed Oil, P.A. 25      PV 35      KU 74      "      13.55                             |
| 202       |               | "            | V-81            | GL51346        | Linseed Oil, P.A. 20      PV 30      KU 74      "      13.55                             |
| 203       |               | "            | V-82            | GL51347        | Linseed Oil, P.A. 20      PV 35      KU 75      "      14.7                              |
| 204       |               | "            | V-83            | GL51348        | Linseed Oil, P.A. 20      PV 30      KU 75      "      13.5                              |
| 205       |               | "            | V-84            | GL51349        | Linseed Oil, P.A. 20      PV 35      KU 75      "      14.5                              |
| Standard- |               | "            | "               | GL50441        | 52-MC-29      KU 70      "      14.8                                                     |
| "         |               | "            | "               | GL49253        | TT-P-86 in linseed oil      KU 80      "      24.5                                       |
| "         |               | "            | "               | GL51162        | TT-P-86 in replacement oil      KU 84      "      25.5                                   |
|           |               |              |                 |                | 52-MC-25                                                                                 |
|           |               |              |                 |                | 52-P-18                                                                                  |

FORMULATIONS FOR THE NAVYEXHIBIT BTest Sample No. 1

| <u>Pigment 53.40%</u>           | <u>Percent</u> | <u>Pounds</u> | <u>Gallons</u> |
|---------------------------------|----------------|---------------|----------------|
| Red Lead (97% grade)            | 55.0           | 398.0         | 5.38           |
| Zinc Yellow (77-2-418)          | 10.0           | 72.0          | 2.51           |
| Mica (52-M-3)                   | 9.0            | 64.0          | 2.78           |
| Indian Red (52-R-3)             | 3.0            | 21.7          | .81            |
| Magnesium Silicate (52-M-2, 2x) | 22.75          | 164.5         | 6.99           |
| Aluminum Stearate               | 0.25           | 1.7           | .80            |
|                                 | <u>100.00</u>  |               |                |

Vehicle 46.60%

|                                                  |               |               |               |
|--------------------------------------------------|---------------|---------------|---------------|
| Alkyd Resin Solution (52-A-1 Class XXII)         | 34.60         | 218.0         | 28.75         |
| LV-257 Varnish (data attached)                   | 51.50         | 325.0         | 40.68         |
| Aromatic Petroleum Spirits (Am-VV-B-96, Type II) | 13.40         | 85.0          | 11.92         |
| Cobalt Naphthenate (6%), (52-D-7, Type II)       | 0.18          | 0.9           | 0.12          |
| Lead Naphthenate (24%), (52-D-7, Type I)         | 0.35          | 2.2           | 0.24          |
|                                                  | <u>100.00</u> | <u>1354.5</u> | <u>100.00</u> |

Wt./per/gallon = 13.5 lbs.

PV = 30%

Consistency 75 KU

To be prepared by National Lead Co.

Test Sample No. 2

| <u>Pigment 53.2%</u>            | <u>Percent</u> | <u>Pounds</u> | <u>Gallons</u> |
|---------------------------------|----------------|---------------|----------------|
| Red Lead (97% grade)            | 55             | 418.0         | 5.61           |
| Zinc Yellow (77-2-418)          | 10             | 75.2          | 2.62           |
| Mica (52-M-3)                   | 9              | 68.0          | 2.88           |
| Indian Red (52-R-3)             | 3              | 22.7          | .88            |
| Magnesium Silicate (52-M-2, 2x) | 22.75          | 174.0         | 7.30           |
| Aluminum Stearate               | 0.25           | 1.77          | .81            |
|                                 | <u>100.00</u>  |               |                |

Vehicle 44.8%

|                                         |              |                |               |
|-----------------------------------------|--------------|----------------|---------------|
| Alkyd resin solution (52-MC-21)         | 72.4         | 444.0          | 56.62         |
| Mineral Spirits (52-T-8 (Int.) Grade I) | 20.8         | 128.0          | 19.27         |
| Mi-Flash Naphthm                        | 6.6          | 42.1           | 5.83          |
| Cobalt Naphthenate 52-D7, Type II       | 0.3          | 1.67           | 0.23          |
|                                         | <u>100.0</u> | <u>1375.44</u> | <u>100.10</u> |

Wt./per/gallon = 13.9 lbs.

PV = 34%

Consistency KU (to be determined when made)

To be prepared by National Lead Co.

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EXHIBIT B

Test Sample No. 3Pigment 55.82%

|                                     | <u>Percent</u> | <u>Pounds</u> | <u>Gallons</u> |
|-------------------------------------|----------------|---------------|----------------|
| Red Lead (97% grade)                | 80%            | 377.08        | 5.06           |
| Zinc Yellow (77-2-418)              | 10%            | 75.42         | 2.40           |
| Zinc Oxide (52-M-8)                 | 10%            | 75.42         | 1.61           |
| Magnesium Silicate (52-M-2, 2x)     | 20%            | 150.83        | 6.34           |
| Diatomaceous Silica (as Dicalite L) | 10%            | 75.42         | 3.90           |
|                                     | <u>100%</u>    |               |                |

Vehicle 44.38%

|                                              |                |                |        |
|----------------------------------------------|----------------|----------------|--------|
| Dehydrated Castor Oil (as Isoline)           | 32.75          | 196.92         | 80.70  |
| Oiticila                                     | 3.34           | 20.23          |        |
| Bakelite B22963                              | 13.92          | 85.72          |        |
| Mineral Spirits 52-T-8, Int, Grade I         | 40.00          | 240.71         |        |
| Hi-Flash Naphtha                             | 4.82           | 29.00          |        |
| Dipentene (52-D-8)                           | 2.37           | 20.30          |        |
| Lead Naphthenate, 24% (52-D-7, Type I)       | 0.90           | 5.45           | 100.00 |
| Manganese Naphthenate, 6% (52-D-7, Type III) | 0.60           | 3.62           |        |
| Cobalt Naphthenate, 6% (52-D-7, Type II)     | 0.20           | 1.81           |        |
|                                              | <u>100.00%</u> | <u>1355.91</u> |        |

Wt./per/gal. = 13.56 lbs.

PV = 30%

Consistency KH

To be prepared by Anglo-Fisher Lead Co.

Test Sample No. 4Pigment 45.0%

|                                 | <u>Percent</u> |
|---------------------------------|----------------|
| Red Lead (97% grade)            | 55.0           |
| Zinc Yellow (77-2-418)          | 10.0           |
| Mica (52-M-3)                   | 9.0            |
| Indian Red (52-R-3)             | 3.0            |
| Magnesium Silicate (52-M-2, 2x) | 22.75          |
| Aluminum Stearate               | 0.25           |
|                                 | <u>100.00%</u> |

Vehicle 55.0%

|                                                       |               |
|-------------------------------------------------------|---------------|
| Linseed oil alkyl - phenolic resin (ND Spec. 52-V-21) | 36.3          |
| Alkyl solution (Grade I of ND Spec. 52-R-13)          | 30.6          |
| Paint thinner (Grade I of ND Spec. 52-T-8)            | 14.67         |
| Paint thinner (Grade I of ND Spec. 52-T-9)            | 14.67         |
| Lead Naphthenate drier (Type I of ND Spec. 52-D-7)    | 4.24          |
| Lead Naphthenate drier (Type II of ND Spec. 52-D-7)   | 0.21          |
| Lead Naphthenate drier (Type III of ND Spec. 52-D-7)  | 0.21          |
|                                                       | <u>100.00</u> |

LEAD INDUSTRIES ASSOCIATION  
New York, N. Y.

EXHIBIT C

SPECIFICATION FORMULATION  
For  
RED LEAD MULTIPLE PIGMENT  
PRIMER FOR U.S.N.C. STEEL SHIPS

| <u>Pigment - 55.2%</u>           | <u>% Wt.</u> | <u>Pounds</u> | <u>Gallons</u> |
|----------------------------------|--------------|---------------|----------------|
| 97% grade, Red Lead              | 55.00%       | 416.0         | 5.61           |
| Zinc Yellow                      | 10.00%       | 76.0          | 2.54           |
| Micaeous Material                | 9.00%        | 69.0          | 2.88           |
| Indian Red                       | 2.00%        | 22.7          | .63            |
| Magnesium Silicate               | 23.00%       | 175.0         | 7.38           |
|                                  | 100.00%      | 757.7         | 18.81          |
| <u>Vehicle - 44.8%</u>           |              |               |                |
| Alkyd Resin Solution<br>62-MC-21 | 72.4%        | 446.00        | 56.48          |
| High Flash Naphtha               | 6.8%         | 42.10         | 5.83           |
| Mineral Spirits                  | 20.8%        | 126.80        | 19.27          |
| Cobalt Naphthenate (8%)          | 0.3%         | 1.67          | .21            |
|                                  | 100.00%      | 616.27        | 81.77          |
|                                  |              |               | 100.88         |

Wt./Gallon 18.7 lb.  
PV 25%  
Consistency - Krebs Units  
Pigment per gallon 7.67 lb.  
Volatile in Drier & Thinner 49.81%

SPECIFICATION MATERIALS FOR PROPOSED PRIMER

Red Lead, (TT-2-191) (a) Type I grade C)  
Zinc Yellow (TT-2-418)  
Mica (82-M-8)  
Indian Red (TT-1-811a (7/24/44)  
Magnesium Silicate (82-MC-11 Type I)  
Aluminum Stearate  
Alkyd Resin Solution (82-MC-21)  
Mineral Spirits (82-F-9) (INT) Grade I)  
High Flash Naphtha (Barrett L.P. 200 Hi-Flash Naphtha or Neville 2-20-W  
Hi-Flash Naphtha  
Cobalt Naphthenate (82-D-7 Type II)

UPPER MISSISSIPPI RIVER VALLEY DAM PRIMER PROJECTEXHIBIT D

This project constitutes seven primer paints.

There are two paint systems recommended.

The paints are to be prepared in amounts of  $2\frac{1}{2}$  gallons for each primer paint.

The area to be covered on the lock gate is to be 300 sq. ft.

The paints must be in the possession of Mr. Sol Glaser, Upper Mississippi River Valley Division, Rm. 1124 Syndicate Trust Bldg., 315 Olive St., St. Louis, Mo. on or before June 15, 1948.

The National Lead Co. has agreed to make primer paints Nos. 1, 3, 4, 6. Eagle-Picher Lead Co. has agreed to prepare Primer No. 2 and the Glidden Co. has agreed to prepare Primers 5 and 7. The National Lead Co. has agreed to prepare the white top coat paint given on this page, approximately 3 gallons required.

The two paint systems recommended below are to cover surfaces which are prepared in the standard way which is in use at the present time by the Upper Mississippi River Valley engineers.

Paint System No. 1 is as follows -- apply one coat of primer paint, allow this to dry, follow with a second coat of primer paint and dust the second coat of primer paint with sand before it is thoroughly dry, apply a third coat of primer paint, cover with one topcoat of white paint, whose formula is as follows:

Pigment 67.4%

84.3% basic carbonate white lead  
14.9% zinc oxide  
0.3% aluminum stearate  
0.5% raw sienna

Vehicle 32.6%

82.4% Bakelite varnish XV10248  
17.6% thinner

TV - not given

Wt/per/gallon 17.5 lbs.

Paint System No. 2 -- It is recommended that the second paint system consist of two coats of primer paint and that before the second coat has dried that it be dusted with sand. The second coat of primer paint when dry is to be followed by two topcoats of aluminum paint which is used by the Upper Mississippi River Valley Division engineers for painting of lock gates.

The following seven formulas were approved at the May 4, 1948, Red Lead Technical Committee Meeting:

(Wherever a question mark appears in the following formulas, it is requested that the maker of the particular sample where the question marks appear, send the data to the Lead Industries Association so it may be supplied to the Upper Mississippi River Valley Division engineer's office before June 15, 1948.)

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EXHIBIT D

Test Sample No. 1

L.I.A. Paint No. 188  
 Pigmentation No. P-88  
 Vehicle No. V-68

| Pigment 53.40%                             | Percent | Pounds |
|--------------------------------------------|---------|--------|
| Red Lead, 97% grade                        | 55%     | 398.0  |
| Zinc Yellow (71-2-416)                     | 10      | 72.0   |
| Mica (52-M-3)                              | 9       | 65.0   |
| Indian Red (52-R-3)                        | 8       | 21.7   |
| Magnesium Silicate (52-M-2, 8x)            | 22.75   | 166.5  |
| Aluminum Stearate (Metasap Chem. Co. (XX)) | 0.25    | 1.7    |
|                                            | 100.00% |        |

|                                               |        |       |
|-----------------------------------------------|--------|-------|
| Vehicle 46.60%                                |        |       |
| Alkyd Resin Solution (USMC 52-A-1 Class XXII) | 34.80  | 218.0 |
| LV-257                                        | 81.50  | 325.0 |
| Aromatic Petroleum Spirits (An-VV-B-96)       | 13.40  | 85.0  |
| Cobalt Naphthenate (6%) (52-D-7, Type II)     | 0.18   | 0.9   |
| Lead Naphthenate (24%) 52-D-7 Type I)         | 0.35   | 2.2   |
|                                               | 100.00 |       |

Wt/per/gal. 13.5 lbs.  
 PV-35%  
 Consistency 75 K.U.

Test Sample No. 2

L.I.A. Paint No. 108  
 Pigmentation No. P-72  
 Vehicle No. V-68

| Pigment 55.62%                   | Percent | Pounds |
|----------------------------------|---------|--------|
| Red Lead, 97% grade              | 50%     | 377.08 |
| Zinc Yellow (KC-281C)            | 10      | 75.42  |
| Zinc Oxide (52-MC-8)             | 10      | 75.42  |
| Magnesium Silicate, 8x           | 20      | 150.83 |
| Diatomaceous Silica (Dicalite L) | 10      | 75.42  |
|                                  | 100%    |        |

|                                 |         |        |
|---------------------------------|---------|--------|
| Vehicle 44.38%                  |         |        |
| Dehydrated Castor Oil (Isoline) | 32.73   | 196.98 |
| Citric Acid                     | 3.36    | 20.23  |
| Dakelite BR2963                 | 13.82   | 83.72  |
| Mineral Spirits                 | 40.00   | 240.71 |
| Hi-Flash Naphtha                | 4.82    | 29.00  |
| Dipentene                       | 3.37    | 20.30  |
| Lead Naphthenate (24%)          | 0.80    | 4.43   |
| Manganese Naphthenate (6%)      | 0.80    | 4.43   |
| Cobalt Naphthenate (6%)         | 0.80    | 4.43   |
|                                 | 100.00% |        |

Wt/per/gallon = 13.54%  
 Consistency \_\_\_\_\_ K.U.  
 PV = 30%

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## EXHIBIT D

Test Sample No. 3

L.I.A. Paint No. 188  
 Pigmentation No. P-88  
 Vehicle No. V-26

| Pigment ?            | Percent | Pounds (?) |
|----------------------|---------|------------|
| Red Lead, 97% grade  | 55.0%   |            |
| Zinc Yellow          | 10.0    |            |
| Mica                 | 9.0     |            |
| Indian Red           | 8.0     |            |
| Magnesium Silicate   | 22.75   |            |
| Aluminum Stearate    | 0.25    |            |
|                      | 100.00% |            |
| <br>Vehicle ?        |         |            |
| Alkyd resin solution | 40.0%   |            |
| 62-A-1 Class XII     |         |            |
| IV-268               | 60.0    |            |
|                      | 100.0%  |            |

Wt./Gallon lbs. ?  
 Consistency KU ?  
 PV 28.0%

Test Sample No. 4

L.I.A. Paint No. 186  
 Pigmentation No. P-87  
 Vehicle No. V-87

| Pigment 70.48%                   | Percent | Pounds (?) |
|----------------------------------|---------|------------|
| Red Lead (97% grade)             | 71.7    |            |
| Diatomaceous Silica (Celite 261) | 8.0     |            |
| Aluminum Stearate                | 0.3     |            |
|                                  | 100.0%  |            |
| <br>Vehicle 29.52%               |         |            |
| Bakelite Varnish XV10248         | 91.4%   |            |
| Thinner                          | 8.6%    |            |
|                                  | 100.0%  |            |
| <br>Wt./gallon 19.4%             |         |            |
| PV 40%                           |         |            |
| Consistency KU ?                 |         |            |

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## EXHIBIT D

Test Sample No. 5

L.I.A. Paint No. 185  
 Pigmentation No. P-86  
 Vehicle No. V-86

| Pigment              | Percent | Pounds (?) |
|----------------------|---------|------------|
| Red Lead (97% grade) | 58%     |            |
| Zinc Yellow          | 10      |            |
| Mica                 | 9       |            |
| Indian Red           | 3       |            |
| Magnesium Silicate   | 22.75   |            |
| Aluminum Stearate    | .35     |            |
|                      | 100.00% |            |

## Vehicle

A 30-gallon length varnish consisting of a cumar and Bakelite resin in dehydrated castor oil. (This vehicle is being supplied about May 25 by the Hilo Varnish Co.)

Wt./gal.        lb.    ?  
 PV = 35%  
 Consistency    KU    ?

Test Sample No. 6

L.I.A. Paint No. 187  
 Pigmentation P-87  
 Vehicle V-88

| Pigment 70.45%                    | Percent | Pounds (?) |
|-----------------------------------|---------|------------|
| Red Lead, 97% grade               | 31.7%   |            |
| Diatomaceous Silica (Celite #281) | 8.0     |            |
| Aluminum Stearate                 | 0.3     |            |
|                                   | 100.0   |            |

## Vehicle 29.55%

|                                               |         |
|-----------------------------------------------|---------|
| Alkyd resin solution (USMC 52-A-1 Class XXII) | 54.80   |
| IV-257 Varnish                                | 51.80   |
| Aromatic petroleum spirits                    | 13.60   |
| Cobalt Naphthenate (2%)                       | 0.15    |
| Lead Naphthenate (24%)                        | 0.35    |
|                                               | 100.00% |

Wt./Gal.        lbs ?  
 PV = 40  
 Consistency    KU ?

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EXHIBIT D

Test Sample No. V

L.I.A. Paint No. 184  
Pigmentation No. P-84  
Vehicle No. V-45

| Pigment                                   | Percent       | Pounds (1) |
|-------------------------------------------|---------------|------------|
| Red Lead, 97% grade                       | 25.0          |            |
| Line yellow (TY-2-415)                    | 10.0          |            |
| Mica (S2-M-3)                             | 9.0           |            |
| Indian Red (S2-R-3)                       | 2.0           |            |
| Magnesium Silicate (S2-M-2, 2x)           | 22.75         |            |
| Aluminum Stearate (Metnasep Chem. Co. 2x) | 0.25          |            |
|                                           | <u>100.00</u> |            |

Vehicle (chlorinated rubber)

1

Wt/Gallon lbs ?  
Consistency KU ?  
PV - 35?

The vehicle of L.I.A. Paint No. 184 is to be designed by Mr. Shobe after consultation with the chlorinated rubber manufacturer.