

LEAD INDUSTRIES ASSOCIATION

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NEW YORK 17, N. Y.

Pigments and Chemicals Division

July 2, 1957

**SUBJECT: RED LEAD TECHNICAL
LETTER NO. 12**

To Members of the Red Lead Technical Committee:

For your information, I am enclosing a copy of the Red Lead Technical Letter No. 12 - Painting Highway Structural Steel.

This has been sent to the members of our Association, as well as to all publicity media.

If you would like additional copies, please advise.

Sincerely yours,

David M. Borcina

David M. Borcina
Secretary, Red Lead Technical Committee



N2756

PAINTING HIGHWAY STRUCTURAL STEEL

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Red Lead Technical Committee
LEAD INDUSTRIES ASSOCIATION
60 EAST 42nd STREET
New York 17, N. Y.

Foreword

THIS Technical Letter offers highway engineers and others, specifications for complete systems to be used in painting highway structural steel. The material contained herein was prepared by the Red Lead Technical Committee and is based on an extensive study of current practice of state highway departments and such authoritative sources as the American Association of State Highway Officials. Experience has shown that the practices and paints recommended will produce highly satisfactory results.

Red lead primers have proved to be the overwhelming favorite for highway structural steel. Forty-seven of the 48 state highway departments have specifications for red lead primers, and out of a total of 88 primer specifications in all states, approximately 75 percent are for red lead primers. Of these red lead primer specifications, nearly 75 percent require that the pigment portion be 100 percent red lead and over 85 percent that it be over 80 percent.

The preference for lead paints for the first field coat is almost as universal as the use of red lead in the prime coat. In many instances when a light colored finish coat is to be specified, white lead field coats are used. Forty-one states have specifications for either red lead or white lead field coats. Out of a total of 88 first field coat specifications in all states, nearly 75 percent are for red lead or white lead base paints.

Thus the choice of highway engineers who are constantly faced with painting problems is a strong endorsement of the recommendations made on the following pages. Inquiries on these formulations or on specific painting problems of all kinds are welcome and should be addressed to the Lead Industries Association or to the designated individuals in the member companies listed below.

THE BURNER HILL COMPANY..... 648 Market Street, San Francisco 4, California
1336 - 14th Street, Oakland 7, California
2151 Yates Avenue, Los Angeles 22, California
2700 - 14th Avenue Southwest, Seattle 4, Washington
For technical information write H. E. Burner, Chemical Products Division,
1220 - 14th Street, Oakland 7, California.

THE EAGLE-PICHER COMPANY..... American Building, Cincinnati 1, Ohio
For technical information write Paul Winkler at above address.
Chicago, Cleveland, Dallas 24, Detroit, Kansas City 4, (Mo.), New Orleans,
New York 17, Philadelphia 4, Pittsburgh 22.

W. F. FULLER & COMPANY..... 3471 Mission Street, San Francisco 18, California
For technical information write W. F. Fuller at above address.
Boise, Butte, Fresno, Los Angeles, Oakland, Phoenix, Portland (Ore.), Sacramento, Salt Lake City, San Diego, Seattle, Spokane, Tacoma, Yakima (Wash.)

THE GLIDDEN COMPANY..... 1794 Union Commerce Building, Cleveland 14, Ohio
For technical information write G. F. Glidden at above address.
Atlanta, Boston, Minneapolis, New York, South Hackensack (N. J.), San Francisco; Adams & Kitting Division, Chicago; American Paint Works Division, New Orleans; Campbell Paint & Varnish Division, St. Louis; Nukon Paint & Varnish Division, Chicago; A. Wilhelm Company Division, Reading; Canadian Division, Toronto; Chemicals, Pigments & Metals Division, Baltimore, Collinsville (Ill.), Hammond, (Ind.); Keston Lead Company, Barreton.

HANMOR'S LEAD PRODUCTS, INC...... 8321 Madison Avenue, Hammond, Ind.
420 Lexington Avenue, New York 17, N. Y.
1663 Oliver Building, Pittsburgh 22, Pa.
For technical information write A. G. Johnson at Hammond, Ind.

NATIONAL LEAD COMPANY..... 111 Broadway, New York 4, N. Y.
For technical information write E. P. Bates at above address.
Atlanta, Buffalo 2, Chicago 2, Cincinnati 3, Cleveland 12, Dallas 2, Philadelphia 22, Pittsburgh 12, St. Louis 1, San Francisco 18, Boston 4, Charleston 24 (W. Va.), Seattle 4, Los Angeles 22.

WESTERN LEAD PRODUCTS COMPANY..... 4436 E. Pacific Way, Los Angeles 22, California
1238 Pearl Street, Berkeley 2, California
For technical information write Thomas G. Hale at Los Angeles, California.

PAINTING HIGHWAY STRUCTURAL STEEL

Surface Preparation

THE importance of surface preparation for proper performance of any metal protective paint cannot be over-emphasized. The method of surface preparation selected will depend upon many factors, the more important being:

1. Condition of the surface to be painted.
2. Type of exposure to which the painted structure will be subjected.
3. Practicality of using a particular method as limited by environment, and
4. The type of paint which is to be applied.

In general, more careful surface preparation is needed for fast drying (poorer wetting) paints and for severe exposure conditions.

For maximum service with paints containing synthetic type vehicles, blasting to white metal is preferred. However, this is usually economically impractical, and commercial sandblasting is most often employed. Where it is impractical to sandblast, power tool or hand wire brushing is often employed. Under such conditions, high oil content primers are preferred because of their superior wetting properties.

A discussion of surface preparation will be found in Red Lead Technical Letter No. 11, a copy of which will be supplied on request. More detailed surface preparation specifications are to be found in Volume II of Steel Structures Painting Manual, obtainable from Steel Structures Painting Council, 4400 Fifth Avenue, Pittsburgh 12, Pa.

Shop Costs of Primers

FORMULA 124

(A.A.S.P.O. DESIGNATION: M78-61, TYPE I)

This paint has excellent wetting and performance characteristics. It is particularly suitable for use where surface preparation is restricted to power tool or hand wire brushing.

	Coverage	Primer	Primer	Primer
PIGMENT: Red Lead (97% Pb ₃ O ₄)	94.0 min.	1875.0	25.20	
Aluminum Stearate	9.5-10.4	7.5	0.30	
	100.0			
VEHICLE: Raw Linseed Oil	94.0 min.	507.1	65.00	
Vealite Thinner and Drier	10.0 max.	14.4	2.20	
	100.0	546.6	100.00	

Pigment by weight 77.50%
Vehicle by weight 22.50%
Wt./Gal. 24.5 lb. min.

DRYING TIME: Red to Touch 6 hr. max.
Dry Through 24 hr. max.

FORMULA 12-2*

(A.A.S.H.O. DESIGNATION: M78-61, TYPE II)

This paint is similar to Formula 12-1 with replacement of some of the raw linseed oil by bodied oil and additional thinner to provide similar viscosity. This formulation offers wetting characteristics almost as good as 12-1, provides better leveling and develops lower gloss, thus offering an improved surface for recoating.

	Composition	Pigment	Resin	Solvent
PIGMENT:	Red Lead (77% PbO ₂)	95.4 min.	1344.5	34.57
	Aluminum Stearate	0.5-0.4	7.4	0.39
		100.0		
VEHICLE:	Raw Linseed Oil	54.5-54.0	573.0	35.75
	Pale Heat-Bodied Linseed Oil (2-3 viscosity) ..	11.0-30.0	62.0	13.26
	Volatile Thinner and Drier	54.5 max.	190.2	38.14
		100.0	2400.0	100.00
	Pigment by weight	77.00%		
	Vehicle by weight	23.00%		
	Wt./Gal.	34 lb. min.		
DRYING TIME:	Set to Touch	6 hr. max.		
	Dry Through	26 hr. max.		

*Also conforms to the requirements of Federal Specification TT-P-40a, Type 2.

FORMULA 12-3*

(A.A.S.H.O. DESIGNATION: M78-61, TYPE III)

Where painting schedules require faster drying than is afforded by the foregoing formulations, paints formulated with alkyd resin are generally used. Formula 12-3 is a paint of this type and will not wet the surface as well as Formula 12-1 or 12-2. Greater care must be employed in preparation of the surface and sandblasting is desirable.

	Composition	Pigment	Resin	Solvent
PIGMENT:	Red Lead (77% PbO ₂)	95.0 min.	744.5	9.56
	Red Iron Oxide (85% Fe ₂ O ₃)	15.0 min.	100.0	4.56
	Magnesium Silicate	14.7 max.	104.2	0.99
	Mica, E25 wash	4.0-4.0	54.5	2.22
	Aluminum Stearate	0.5-0.4	8.4	0.41
		100.0		
VEHICLE:	Raw Linseed Oil	25.0 min.	100.1	21.12
	Alkyd Resin Solids	25.0 min.	103.1	17.44
	Volatile Thinner and Drier	44.0 max.	264.2	57.14
		100.0	1713.0	100.00
	Pigment by weight	64.00%		
	Vehicle by weight	31.34%		
	Wt./Gal.	16.7 lb. min.		
DRYING TIME:	Set to Touch	4 hr. max.		
	Dry Through	16 hr. max.		

*Also conforms to the requirements of Federal Specification TT-P-40a, Type 2.

FORMULA 12-4

(A.A.H.O. DESIGNATION: M72-41, TYPE IV)

Formula 12-4 is a pure red lead paint offering fast drying characteristics and outstanding performance. This paint, like Formula 12-3, requires careful surface preparation and sandblasting is desirable.

	<u>Ingredients</u>	<u>Pounds</u>	<u>Pints</u>	<u>Gallons</u>
PIGMENT:	Red Lead (97% Pb_3O_4)	90.0 min.	1004.0	21.00
	Aluminum Stearate	0.3-0.4	0.4	0.70
		100.0		
VEHICLE:	Raw Linseed Oil	27.0 min.	100.0	30.00
	Alkyd Resin Solids	24.0 min.	114.0	14.12
	Volatile Thinner and Drier	47.0 max.	230.0	60.61
		100.0	1204.0	100.00

Pigment by weight 72-70%
Vehicle by weight 24-27%
Wt./Gal. 21.6 lb. min.

DRYING TIME: Set to Touch 4 hr. max.
Dry Through 16 hr. max.

Touch Up

A shop coat may become damaged during transit or erection of structural steel. The damaged areas as well as field rivets, bolts, welds, etc. should be thoroughly cleaned and touched up to provide a continuous primer coat. For touch up purposes, the same paint that was used for the shop coat should be applied.

First Field Coat

The formulations 12-1 to 12-4 inclusive are intended generally for shop coat application or for use in priming structures in the field that were erected with unpainted steel.

These same primers, tinted with lamp black in oil for contrast, are generally used for the first field coat when multiple coat systems are specified.

It is often found desirable to use a paint like Formula 12-3 as a field coat over primers 12-1, 12-3 or 12-4. There are three reasons for this:

1. It has a contrasting color,
2. It is a fast-drying paint permitting earlier finishing, and
3. It is more economical.

If in a multiple coat system, a light finish coat is specified, a white lead base paint is generally used for the first and/or second field coat. Formulas 12-5 and 12-6 are typical for this application.

First Field Coat (cont.)

The following paints are intended for use as first field coats over primer Formulas 12-1 to 12-4 inclusive in three coat systems and for the third coat in four coat systems where a light color is desired. They may be used tinted.

FORMULA 12-3

(A.A.S.H.O. DESIGNATION: M70-32, TYPE I, CLASS B)

	Constituent	Pounds	Pounds	Gallons
PIGMENT:	White Lead	21.0 min. ¹	222.5	5.00
	Zinc Oxide	25.0-27.0 ²	237.5	5.00
	Titanium Dioxide, Rutile Type ³	11.0-11.5	100.0	2.37
	Magnesium Silicate ³	22.0 max.	200.0	4.50
		100.0		
VEHICLE:	Raw or Refined Linseed Oil	60.0 min.	552.7	12.50
	Bodied Linseed Oil	10.0-20.0	90.9	2.00
	Thinner and Drier	20.0 max.	112.1	2.50
		100.0	1075.0	24.00

Pigment by weight 63% min.

Vehicle by weight 36% max.

Wt./Gal. 14% lb. min.

DRYING TIME: 18 hr. max.

1. The white lead and zinc oxide may consist of any mixture of basic carbonate white lead, basic sulphate white lead, leaded zinc oxide, and zinc oxide that meets the composition requirements. At the option of the purchaser, the white lead may be required to be basic carbonate white lead.
2. Rutile (non-chalking).
3. The sum of tinting colors and magnesium silicate shall not exceed 22.0%.

FORMULA 12-4

(A.A.S.H.O. DESIGNATION: M70-32, TYPE II)

	Constituent	Pounds	Pounds	Gallons
PIGMENT:	White Lead	50.0 min. ⁴	1200.7	24.00
		100.0		
VEHICLE:	Raw Linseed Oil	70.0 min.	600.0	12.50
	Bodied Linseed Oil (2-2 viscosity)	15.0 max.	90.9	2.00
	Thinner and Drier	15.0 max.	90.9	2.00
		100.0	1075.0	24.00

Pigment by weight 71% min.

Vehicle by weight 28% max.

Wt./Gal. 12.7 lb. min.

DRYING TIME: 18 hr. max.

⁴ The pigment shall be basic carbonate white lead. In the tinted paints the pigment shall contain not less than 94.0 percent basic carbonate white lead, the remainder to be high strength tinting colors.

Top Coats

Any of the foregoing recommendations for primer or field coats provide excellent foundations for any good top or finish coat such as:

A.A.S.H.O. Designation M67-54 (Foliage Green)
M70-52 (White and Tints)
M68-52 (Black)
M69-54 (Aluminum)

The formula for M67-54 (Foliage Green) appears herein as Formula 12-7, and M70-52 as Formula 12-8, the latter to be used tinted to the desired color when used as a top coat.

FORMULA 12-7

(A.A.S.H.O. DESIGNATION: M67-54, TYPE II—FOLIAGE GREEN)

This paint is a typical foliage green finish coat of pleasing color and good durability.

	Composition		Percent		Pounds	Gallons
	By Vol.	By Wt.	By Vol.	By Wt.		
PIGMENT: White Lead	68.0	71.0*	68.0	71.0*	845.2	15.45
Zinc Oxide	14.5	15.5*	14.5	15.5*	185.5	3.94
Chrome Oxide Green	17.5	13.5	17.5	13.5	155.5	4.27
	100.0					
VEHICLE: Raw Linseed Oil	94.0	—	94.0	—	522.5	97.32
Vegetable Thinner and Drier	—	16.0	—	16.0	54.5	2.45
	100.0				1517.0	180.00

Pigment by weight 88% min.
Vehicle by weight 87% min.
Wt./Gal. 11.5 lb. min.

DRYING TIME: 24 hr. min.

* The white lead and zinc oxide may consist of any mixture trade carbonate white lead, both carbonate white lead, leaded zinc oxide and lead-free zinc oxide that meets the composition requirements.

A convenient ready referenced table for complete painting systems for three- and four-coat application on highway structural steel appears on the next page.

RECOMMENDED PAINT SYSTEMS FOR HIGHWAY STRUCTURAL STEEL

SURFACE PREPARATION	THREE-COAT SYSTEM				FOUR-COAT SYSTEM			
	HAND OR POWER TOOL		SANDBLAST		HAND OR POWER TOOL		SANDBLAST	
Primer	12-1	12-2	12-3°	12-4°	12-1	12-2	12-3°	12-4°
Second Coat	12-1 tinted	12-2 tinted	12-3° tinted	12-3°	12-1 tinted	12-2 tinted	12-3° tinted	12-3°
	12-3°	12-3°	12-5	12-4° tinted	12-3°	12-3°		12-4° tinted
	12-5	12-5	12-6	12-5				
	12-6	12-6		12-6				
Third Coat	12-5	12-5	12-5	12-5	12-5	12-5	12-5	12-5
	12-7	12-7	12-7	12-7	12-6	12-6	12-6	12-6
Fourth Coat					12-5	12-5	12-5	12-5
					12-7	12-7	12-7	12-7

* Paint-on Primer

NOTE: Black or aluminum top coats may be substituted for the white or light colored top coats where color is not considered important.