LEAD INDUSTRIES ASSOCIATION

420 LEXINGTON AVENUE
NEW YORK 17, N. Y.

Pigments and Chemicals Division

February 9, 1956

SUBJECT: RED LEAD TECHNICAL LETTER NO. 11

To Members of the Red Lead Technical Committee:

Attached is a first draft of proposed Red Lead Technical Letter No. 11, "Surface Preparation of Steel for Red Lead Primers." Please review this and make whatever suggestions, corrections or revisions you see fit.

You will note that this letter is not in the form originally decided upon by the committee. In attempting to do that it was found that the letter, in summarizing all the common methods of surface preparation, not only became too long (some thirty script pages) but also, because it was a summary, did not do justice to any one preparation method. To do the job properly, of course, would entail the preparation of a formidable booklet, much beyond the scope of a Red Lead Technical Letter and of doubtful promotional value in proportion to cost.

The present approach was therefore taken, in which I have attempted to set down, in a useful tabular form, specific surface preparation recommendations in relation to the most common classes of steel painting jobs. In turn I have tried to select the red lead paints, of varying types, we most widely recommend. The last part of the Letter will be an appendix containing all the red lead formulations mentioned.

By no means am I satisfied that the letter is now in its best possible form and it is in this more than anything else that suggestions are sought. Also, among the specific points on which your careful attention is requested are the following:

1. Accuracy. In one place, at least, I have attempted no recommendation, in others I have made only an educated guess.

2. Completeness. I have tried to stick to general classes. Perhaps a wider range of specific cases is preferable. (But watch out for excessive length that will make the letter a hodge-podge!)

3. Scope. Many preparation methods such as flame cleaning, alkali-cleaning and acid cleaning have been neglected. (My thinking was that where numerous alternatives are given the recommendations are no longer very enlightening. Also, I attempted to keep the table simple. On the other hand, there are substantial deficiencies in the table.

4. A number of blank spaces have been left in the table for your additional recommendations.

An early review by each of you will be appreciated.

Very truly yours,

Charles E. Cherry Jr.

Secretary to the Committee

MARCH, 1956

SURFACE PREPARATION OF STEEL FOR RED LEAD PAINTS

Red Lead Technical Committee
LEAD INDUSTRIES ASSOCIATION
420 Lexington Avenue
New York 17, N. Y.

RED LEAD
TECHNICAL LETTER
No. 11

Foreword

In past Red Lead Technical Letters, the Red Lead Technical Committee of the Lead Industries Association has confined itself to the recommendation of red lead paints and has left other considerations involved in painting to be discovered by the user from other sources. The extreme importance, however, of surface preparation for the proper performance of paints, has now led the Committee to prepare the recommendations contained in this Technical Letter to aid the industrial user in getting the most out of his paint. The success or failure of a paint system, after all, very often depends upon the adequacy of the surface conditions. An excellent paint will fail quickly over a dirty, ill-prepared surface while a lesser paint may do well over a scrupulously clean surface. The stringency of preparation requirements, then, varies with the type of paint used. The recommendations contained here are intended to aid in the proper determination of need and selection of method. Simply, they are a listing of surface preparation requirements in reference to a number of painting conditions for which red lead primers are suggested. Formulas for all the paints listed are contained in the appendix and most of them have appeared, often in more detailed form, in previous Red Lead Technical Letters (these are available, at no charge, upon request to the offices of the Association).

Inquiries on the contents of this letter or on specific painting problems are welcome and should be addressed to the Lead Industries Association or to the designated individuals in the cooperating companies listed below.

Cooperating Companies

SURFACE PREPARATION OF STEEL
FOR RED LEAD PAINTS

Why Surface Preparation?

The reason for surface preparation may be stated simply and wholly in terms of adherence of the paint film. This phenomenon consists of molecular attraction of paint and surface, properly called adhesion, and mechanical anchoring to a relatively rough surface, called bonding. Paint will fail in direct proportion to the lack of adhesion and bonding. Any dirt, oil, grease, salts, rust and other foreign matter will hinder adhesion up to the point of making painting impossible. Except for rust, the contaminants prevent wetting of the metal which is the essential of adhesion. Rust, while it can be painted over, forms scale which eventually lifts off the surface taking the paint with it. Likewise a completely smooth surface is extremely difficult to paint. Surfaces to be painted, therefore, must be free of adhesion retarding substances and the surfaces themselves must provide at least some degree of mechanical anchor.

What to Consider in Selecting a Method of Surface Preparation

Presuming a decision has been made on the matter of economy, which, in relation to surface preparation must be considered in terms of the total extension of paint film life, the question of selecting a method depends on three factors:

1. Condition of surface before preparation.
2. Practicality, because of physical condition, of using a particular method.
3. The type of paint which is to be applied.

The first two considerations are easily understood. The third may perhaps be amplified.

Most essentially the adherence of a paint, as indicated above, is a matter

of its wetting ability. The requirements for surface preparation, therefore, are more severe as the wetting ability of paints decreases. One reason why the straight red lead in linseed oil paint, L.I.A. Formula 6-1 (the same as Fed. Spec. TT-P-86a, Type I, or SSPC Paint 1-55T) or its near equivalent, has achieved an eminent position in the painting of steel is that its superior wetting characteristics make it possible to be used over steel where small amounts of rust and tightly adherent mill scale are present. Such a surface condition is often the best that can practically be obtained in the field. The corrosion inhibitive red lead pigment, of course, contributes to this advantageous characteristic.

The linseed-oil vehicle, however, is slow drying and it is necessary to use a faster drying oil-resin vehicle primer, such as L.I.A. Formula 6-7 (TT-P-86a, Type II). Such a paint is limited in its wetting ability by the presence of synthetic resins. Therefore, surfaces receiving paints of this type must be carefully cleared of all corrosion products and contaminants.

Going still further, painting requirements may require the use of the very rapid drying synthetic vehicle type paints, such as L.I.A. Formulas 3-7, or 6-13 (TT-P-86a, Type III) or 6-16 (Bu Ships Paint Formula No. 116). These paints are useful and excellent but only on the most carefully prepared surfaces so that they may only be used where a high degree of cleaning is practical or on factory-fabricated equipment.

With these considerations in mind, the recommendations following, for surface preparation of steel work to be primed with red lead paints, are presented.

IF YOU HAVE TO PAINT:	FOR THIS TYPE OF EXPOSURE:	AND THE DRYING TIME REQUIREMENT IS:	THEN THE INDICATED RED LEAD PRIMER IS:	AND THE FOLLOWING SURFACE PREPARATION IS RECOMMENDED:	BUT THESE STEPS MAY ALSO BE REQUIRED:
Structural Steel	Atmospheric	36 Hrs.	L.I.-.. 6-1	Hand Cleaning Or Power Tool Cleaning	Solvent Cleaning
Structural Steel, Oil Storage Tanks	Chemically Contaminated Atmospheres and Marine Environments	24 Hrs.	L.I.-.. 3-7	Blast Cleaning Or Pickling	
Structural Steel	Atmospheric	16 Hrs.	L.I.-.. 6-7		Solvent Cleaning Or Steam Cleaning
Structural Steel	Atmospheric	24 Hrs.	L.I.-.. 6-3	Hand Cleaning Or Power Tool Cleaning	Solvent Cleaning
Structural Steel	Atmospheric	4 Hrs.	L.I.-.. 6-13	Blast Cleaning Or Pickling	
Structural Steel, Especially Building Frames	Atmospheric, Temporary (6 Mos.)	8 Hrs.	L.I.-.. 11-1 (SSPC 13-55T)	Solvent Cleaning and Wire Brushing	
Railroad Rolling Stock	Atmospheric	18 Hrs.	L.I.-.. 8-8 Or 8-9	Hand Cleaning Or Power Tool Cleaning	Solvent Cleaning
Hydraulic Structures, e.g. crest gates, sluice gates, tainter gates, exposed structural steel at pumping stations	Partial Or Continuous Immersion in Fresh Water	6 Hrs.	L.I.-.. 7-4	Blast Cleaning Plus Chemical Conditioner (e.g. MIL-P-15328)	

IF YOU HAVE TO PAINT:	FOR THIS TYPE OF EXPOSURE:	AND THE DRYING TIME REQUIREMENT IS:	THEN THE INDICATED RED LEAD PRIMER IS:	AND THE FOLLOWING SURFACE PREPARATION IS RECOMMENDED:	BUT THESE STEPS MAY ALSO BE REQUIRED:
Hydraulic Structures, e.g. crest gates sluice gates, tainter gates, exposed structural steel at pumping stations	Partial Or Continuous Immersion in Fresh Water	1 Hr.	L.I.-. 7-5	Blast Cleaning Plus Chemical Conditioner (e.g. MIL-P-15328)	
Ships (Topsides, Interiors, Boot-Topping), Bridges Over Tidewater, Docks	Marine, Intermittent Immersion in Sea Water	6 Hrs.	L.I.-. 6-16	Blast Cleaning Or Pickling	
Ships (Topsides, Interiors, Boot-Topping), Oil Storage Tanks	Marine, Intermittent Immersion In Sea Water, Chemically Contaminated Atmospheres	1 Hr.	L.I.-. 6-26	Blast Cleaning Or Pickling	
Ship Bottoms, Buoys	Immersion In Sea Water	4 Hrs.	L.I.-. 6-24	Blast Cleaning Or Pickling	
Galvanized Steel, One Coat	Atmospheric		L.I.-. 9-1, 9-2, Or 9-3	Solvent Cleaning Plus Phosphate Pretreatment	
Weathered Or Rusted Galvanized Steel, One Coat	Atmospheric		L.I.-. 9-1, 9-2, Or 9-3	Wire Brushing Plus Solvent Cleaning	
New Galvanized Steel, Top Coat To Be Applied	Atmospheric		L.I.-. 9-4 Or 9-5	Solvent Cleaning Plus Phosphate Pretreatment	

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IF YOU HAVE TO PAINT:	FOR THIS TYPE OF EXPOSURE:	AND THE DRYING TIME REQUIREMENT IS:	THEN THE INDICATED ZINC RICH PRIMER IS:	AND THE FOLLOWING SURFACE PREPARATION IS RECOMMENDED:	BUT THESE STEPS MAY ALSO BE REQUIRED:
Weathered Or Rusted Galvanized Steel, Top Coat To Be Applied	Atmospheric		L.I.A. 9-4, or 9-5	Wire Brushing Flue Solvent Cleaning	

IF YOU HAVE TO PAINT:	FOR THIS TYPE OF EXPOSURE:	AND THE DRYING TIME REQUIREMENT IS:	THEN THE INDICATED LEAD FREE IS:	AND THE FOLLOWING SURFACE PREPARATION IS RECOMMENDED:	BUT THESE STEPS MAY ALSO BE REQUIRED:

ANNEX

RED LEAD FORMULATIONS

(All formulas recommended in letter)