LEAD INDUSTRIES ASSOCIATION
420 LEXINGTON AVENUE
NEW YORK 17, N. Y.

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SUBJECT: "PAINT GALVANIZED SURFACES?" REPRINT

To Members of the Lead Industries Association:

Attached is a copy of an article dealing with the painting of galvanized surfaces and incorporating material developed by the Red Lead Technical Committee of the Pigments and Chemicals Division of the Association. The article is reprinted from the April, 1956 issue of "Factory Management and Maintenance."

Additional copies are available and we shall be glad to supply them on request.

Very truly yours,

Secretary

# Paint Galvanized Surfaces?

**Some plants do. Some don't; they're satisfied just to let galvanized roofs and sidings weather. But here are three good reasons to paint—plus a lot of how.**

PEELING is big problem when you paint galvanized surfaces. To prevent, you can let the surface weather for a few months. Or etch it with a mild acid. But newer way is phosphate or chromate pre-treatment, followed by a new kind of paint.

**PEELING PAINT** on galvanized steel surfaces is a common headache to maintenance men. Roofs and sidings so affected not only are unsightly, but also go to pot more quickly.

Why do these surfaces peel? Is there any way to avoid it? Why bother to paint a galvanized surface at all? Let's dispose of this last question first:

It really isn't necessary to paint the galvanized exteriors of ordinary plant buildings for protective purposes when new. Nor even after the span clean appearance is dulled by 6 months' weathering. This weathering is normal, acts further as a protective film for the rest of the life of the galvanized coating. One authority says bare zinc coatings of 2 ounces per square foot of surface will last 14 to 31 years in urban atmospheres, and 40 to 80 years in purer country air.

**Three big why's**—There are three main reasons for painting galvanized surfaces:

. . . *For appearance*—A weathered surface admittedly is not attractive, and may mar the appearance of an otherwise well-painted plant. And if the plant pursues a definite color scheme, the need for painting is obvious. On the other hand, transmission towers for utility power lines—which are usually galvanized—are rarely painted.

. . . *For protection*—Sometimes severe atmospheric conditions justify a protective coat of paint, even for transmission towers. Such conditions will exist mostly in plant interiors or in the vicinity of process plants that make the local air highly corrosive.

You may ask: Why galvanize at all if you're going to add a protective coating? Answer: It multiplies the protection. Under equal conditions a galvanized covering usually

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gives longer rust-resistant protection to steel than a normal coat of paint. But a coat of paint added over galvanized steel will greatly increase the protection.

Here's another kind of paint protection that's needed. Galvanized surfaces should be painted (when new) whenever there's a threat of galvanic corrosion. This can occur wherever surfaces overlap or come in contact with supporting steel framework. Sometimes, as in the case of bolts or straps, such surfaces are kept apart by dielectric washers or insulating gaskets.

... *For upkeep*—This could be the case of an unpainted galvanized roof or siding—or even a transmission tower—that had reached the point in years of service where a coat of paint would save it for continued useful service.

**Why does paint peel?** One reason only—on any kind of surface: lack of adhesion. Adhesion is obtained in two ways: by molecular attraction to the metal, and by mechanical anchor. Chief culprit in destroying the bond is moisture.

It's the same with painted galvanized surfaces. Without special measures of surface preparation, moisture and air (oxygen and carbon dioxide) will penetrate the coat of paint to the galvanized surface. Here the moisture will react chemically with the zinc to produce the normal products of corrosion, such as zinc oxides and carbonates. This also describes the weathering process on bare galvanized surfaces.

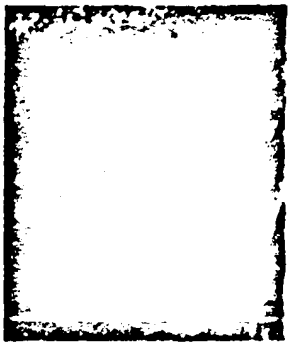
But when coated with paint, the zinc oxides and carbonates combine with the fatty acids in the paint oils. Result is a chemical soap film that loosens the paint bond. This reaction progressively weakens the zinc coating. So instead of protecting the surface, the paint hastens its destruction.

**How to avoid peeling**—All depends whether you have to paint new or old galvanized surfaces. Two methods of painting are possible. In one, the galvanized surface is allowed to weather for three to six months before painting. This works fairly well as far as good paint adhesion is concerned. Nobody seems to know for sure why paint will stick after weathering. Best answer is that weathering provides enough mechanical adhesion to counterbalance the bad effects of any oxide or carbonate reaction that may occur. But there's a question as to whether the maximum life of surface protection is obtained this way. Also, painting the structure later usually involves higher costs because the surface must be cleaned. And sometimes cost of rigging and covering is greater once the plant is operating.

The second method calls for special pre-treatment of the new galvanized surface to improve its adhesive qualities. Traditional ways have been to etch it with a mild acid, such as hydrochloric acid in toluol and alcohol, or soak it with solutions of acetic acid, nitric acid, sal soda, and similar chemicals.

How well have any of these etching pre-treatments worked? There are various shades of opinion—none too glowing. According to a leading authority, the Steel Structures Painting Council, results have been only fair at best. In fact, the Council claims that sometimes the treatments have destroyed the zinc coating altogether, thus accelerated the corrosion of the structure. In general, most everyone agrees there has never been complete satisfaction with the acid-washing technique.

Realizing this fact, LIA. (Lead Industries Association) devoted two years to study it. What was needed, it concluded, were both an effective method of pre-treatment and a new kind of paint. As a result of its research and tests, it has recently announced a series of five new paint formulations to suit the various problems of application. These formulations—LIA. 9-1 to 9-5—can be made up by any competent paint manufacturer. They all include red lead as a pigment because of its rust inhibiting properties.



**CORROSION.** *Underside of galvanized roof of warehouse shows how poorly applied paint didn't stop deterioration.*

In brief, here's how to use them on either old or new surfaces:

*LIA. 9-1*—for single coat on sheds or buildings where protection is important, appearance secondary. Has a linseed oil-alkyd vehicle, well suited for rusty surfaces because of its wetting qualities.

*LIA. 9-2*—for a single coat job, similar to No. 1, but using a faster drying straight alkyd vehicle. Good for new, pre-treated surfaces.

*LIA. 9-3*—similar to No. 1, but with green tint.

*LIA. 9-4*—for use as primary coat to be followed by a top coat. Same vehicle as No. 1.

*LIA. 9-5*—Similar to No. 4, except same vehicle as No. 2.

These new developments in paints do not eliminate the need for pre-treatment of new galvanized surfaces. But several authorities recommend a pre-treatment with a phosphate or chromate preparation, rather than by the dubious "etching" procedure. The Steel Structures Painting Council suggests nonflammable liquid zinc phosphate, applied by brushing, spraying, or in an industrial washer. In section 6.7 of its Specification MIL-Z-17871 the U.S. Navy says phosphate or chromate treatment will extend the life of zinc-coated articles, provide an excellent pre-treatment for painting.

The LIA. claims that treatments with copper sulphate, acetic acid, or hydrochloric acid are ineffective on *new galvanized* steel surfaces. But phosphate cleaning prevents the chemical reaction with fatty acids in paint oils by coating the galvanized surface with a fine, crystalline layer of inert zinc phosphate. If salts are formed, they don't come in contact with paint oils. LIA. further states that phosphate treatments effectively roughen the zinc surface, improve adhesion.

Steps in pre-treatment, LIA. points out, are simple:

... *Clean surface*—Remove all grease. Scrub lightly with steel wool to expose true metal surface.

... *Apply solution*—Brush or spray uniformly on cleaned surface. A protective coating will form in one to two minutes.

... *Wash the coating* with cold water, with sponge, rag, or hose. Allow to dry.

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