

LEAD INDUSTRIES ASSOCIATION, INC.

222 MADISON AVENUE

NEW YORK, N. Y. 10017

TELEPHONE - AREA CODE 212

OR 9-6622

February 2, 1967

SUBJECT: "WORKING WITH LEAD
... AND ADHESIVES"

To the Members of the Lead Industries Association, Inc.:

A copy of "Working with Lead ...and Adhesives" is attached. This booklet contains practical information based on the project done for ILZRO by American Smelting and Refining Company. We emphasize that this booklet does not pretend to be full coverage of the research. Rather, it is aimed at the acoustical contractor, other building people with a special or one-time interest, and inquiries ranging from research and development people to do-it-yourselfers.

While it has been checked and approved for technical accuracy, its real aim is to provide an easy-to-follow set of instructions to the workman on the job and a guide to the designer.

The booklet has been printed in limited quantity and will not be given broadcast distribution. It will be sent to selected people whose interest or specific inquiry show that they have a use for it. We have printed 5,000 of these. Up to 25 copies are available without charge and more are available at a cost of 20¢ each.

Sincerely,

Bruce Fader
Bruce Fader

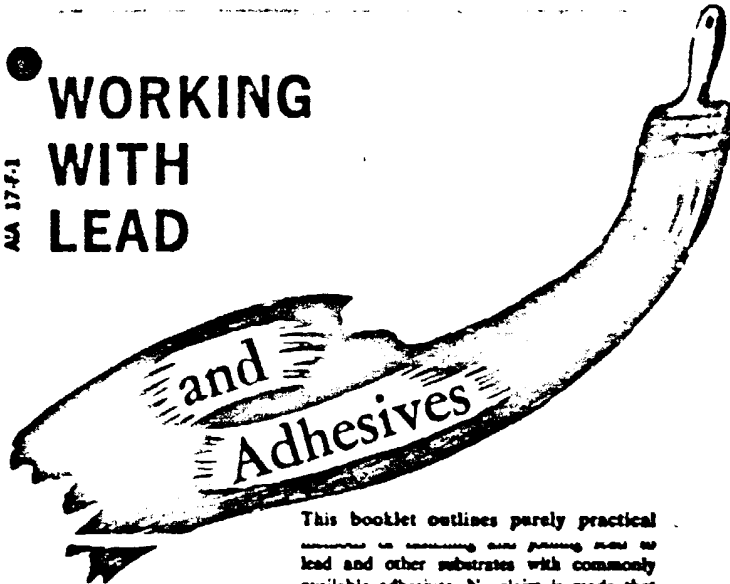
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Look Ahead with Lead

WORKING WITH LEAD

AA 17-F-1



This booklet outlines purely practical methods for joining and painting lead and other substrates with commonly available adhesives. No claim is made that the adhesives or the methods described represent the best possible practice — the whole technology of adhesives remains in ferment and today's performance limits may be routine tomorrow. Nor is the information given here intended to supplant the time-tested techniques of joining roofing sheets, for example, or lead burned (welded) joints which have become the traditional standards of performance in their areas of application. Some of the technical data contained herein was derived by research conducted by the International Lead Zinc Research Organization. A detailed study is available through ILZRO, 292 Madison Avenue, New York, N.Y. 10017.

AA 17-F-1

LEAD INDUSTRIES ASSOCIATION, INC.
292 MADISON AVENUE, NEW YORK, N.Y. 10017



Look Ahead with Lead

WORKING WITH LEAD... ●

MEET LEAD — a metal with character

For one of many reasons you are interested in using lead. It may be that you need permanence in exposure to all sorts of weather, or long service life in the presence of a virulent corrosive like battery acid. Sheet lead handles these assignments with ease and it is also a superlative material for soundproofing, X-ray and radiation shielding, as a spark-free and anti-static work surface, and in other special roles.



STOPS RATS

But in the same way that lead is unique among metals in *these* ways, it has its own peculiarities of personality or character. If you want to get the best from lead, you'll need to know something about these traits — especially as they apply to the immediate problem of working and fastening lead with adhesives.

You already know that lead is relatively soft. Of all common metals it is the most easily bent and formed. ~~Even when up to 16 mils thick and in sheets of many and~~ even antimonial or "hard" lead of this thickness is readily formed with simple tools like wooden blocks and mallets. Lead's tensile strength is low, too: about 3000 psi compared with 70,000 psi for a typical steel. But this low strength is not as important in sensible designing as the creep behavior of lead. Its tendency to stretch out, under tension, limits the useful room temperature stresses to about 250-400 psi for a "permanent" job. At higher temperatures, even lower limits must be accepted.



One curious outcome of this fact is that nearly all adhesives which will wet lead's surface are acceptably strong for well-thought-out adhesive applications. This is so because the designer always tries to distribute the load when working with lead and he usually arrives at a practical design which brings the stresses into the range comfortably handled by adhesives of quite modest strength.

In making a joint in a free-hanging 1/4" lead sheet, for example, a 1" lap will develop only 10 psi in the adhesive for 15 feet of vertical lead. By the same token, a good design would never call for point attachment or nailing only at the top of such a sheet because the high



BLOCKS WORK

● and Adhesives

stresses thus developed exceed lead's long-term performance and tearing would result.

Sheet lead is made in two ways. The traditional method, still standard for most weights of lead, is by rolling the metal out in a rolling mill. These sheets (starting at about $\frac{1}{32}$ " or $\frac{1}{16}$ " — 2 pound and 3 pound per square foot, respectively) are covered by a thin film of rolling oil which must be removed to get good adhesive bonds. Solvent degreasing or, much more usual on small jobs, heavy-duty cleaners like trisodium phosphate and hot water, remove it quickly. (Where alkali cleaners such as TSP are used they should not be allowed to stand on the lead for protracted periods but flushed away to prevent corrosion and oxide formation.) Thinner lead sheet, typically $\frac{1}{64}$ " or one pound per square foot, is usually made by continuous casting and, if so, the metal surface, as supplied, readily accepts adhesive.



EASILY FORMED

If any lead surface is actually dirty, use a mild abrasive — fine sandpaper, scouring powder, etc. — or scrape it. Be careful, though, not to gouge or make the surface deep or joint strength will be lowered.

WHICH ADHESIVE TO USE?

An exact count of the number of adhesive types, brands, and packages available today will disclose that there are far too many to choose between. To the bewildering array already in existence there is a steady stream of newcomers. And, if this weren't enough, all too often a familiar old product that has proven itself suddenly appears in a package with the faintly disquieting "NEW! — IMPROVED!" sticker on the label.



WHICH ADHESIVE TO USE

This little booklet recommends only three types of adhesive — not because they are better than the others, but because they work and among them they can handle nearly every job that comes along. Moreover, they are types which are easily recognized and are stocked by most hardware and paint stores.

CONTACT CEMENTS

These are rubber-based or viscoelastic cements to which various modifying plastics have been added. Generally they are fairly low in cost, require only

a short cure period to be strong enough to handle and work with, and are quite convenient to use. They are the preferred cements for laminating lead for acoustical work and for any field job where large surfaces (doors, table tops, etc.) have to be covered. On the debit side, their strength is generally lower than that of other adhesives. It is adequate, however, where the major portion of the surface is cemented.

TO USE CONTACT CEMENTS:

1. MAKE SURE THE SURFACES ARE CLEAN AND OIL-FREE.
2. Apply the adhesive to both surfaces as directed by the manufacturer's recommendations.
3. Allow to air dry until the surface is tack free. (Optional) Lightly cover with building paper or Kraft paper as a slip sheet.
4. Carefully mate with the adhesive covered surface of the lead — either directly or by carefully removing the slip sheet.
5. Press or roll to force out air bubbles.

PRACTICAL TIPS ABOUT USING CONTACT CEMENTS:

- Several grades with "drying" times from less than a minute to about half an hour are available from many manufacturers.
- In difficult places or on vertical surfaces, consider using several small pieces of lead rather than one large one because . . .
- These cements "grab" and hold tenaciously wherever the first contact is made . . . attempts to separate the surfaces usually leads to irreparable damage.
- It is often easier to lay out the limper sheet (lead) on the floor or worktable and position the stiffer sheet (plywood, gypsum board, etc.) over it than it is to work "right side up."
- Not much pressure is required to get a perfect mating and the bubbles, if any, can usually be stroked out by hand . . . a roller

(lawn roller, for example) can speed up the work if high production rates are needed.

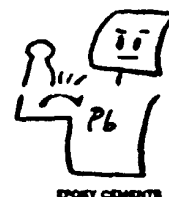
- Give the cement adequate time for solvent evaporation during the initial drying period before mating the sheets, especially when working with large sheets, because lead is impermeable to the solvent vapor and cure to final strength will be very slow if too much solvent is trapped.

EMULSION CEMENTS

These are quite similar to the contact cements except that they are thicker and they tend to be slower in drying and curing. They are quite useful in laminating lead to porous surfaces like masonry. The comments on contacts, generally, apply.

EPOXY CEMENTS

This is quite a large family of two-part chemical adhesives. While a wide range of properties is available within the family, epoxies tend to be quite strong, resistant to most corrosives, and capable of withstanding moderately high temperatures. Some epoxies cure to quite hard, even brittle states. While these may have special applications, it is generally better to use a softer material which cures to the hardness of your thumbnail since the added compliance helps make up for differences between the thermal expansion of lead and the adhesive. On the debit side, epoxies range from moderately expensive to very expensive. Their pot life is limited — once mixed, they have to be applied within a few minutes or hours and there is no way of usefully saving the remainder of a batch.



TO USE EPOXY CEMENTS

1. MAKE SURE THE SURFACES ARE CLEAN AND OIL-FREE.
2. Mix the two (or more) parts carefully and thoroughly according to the manufacturer's directions.
3. Apply as thinly as is recommended or needed (good joints do not require much epoxy).