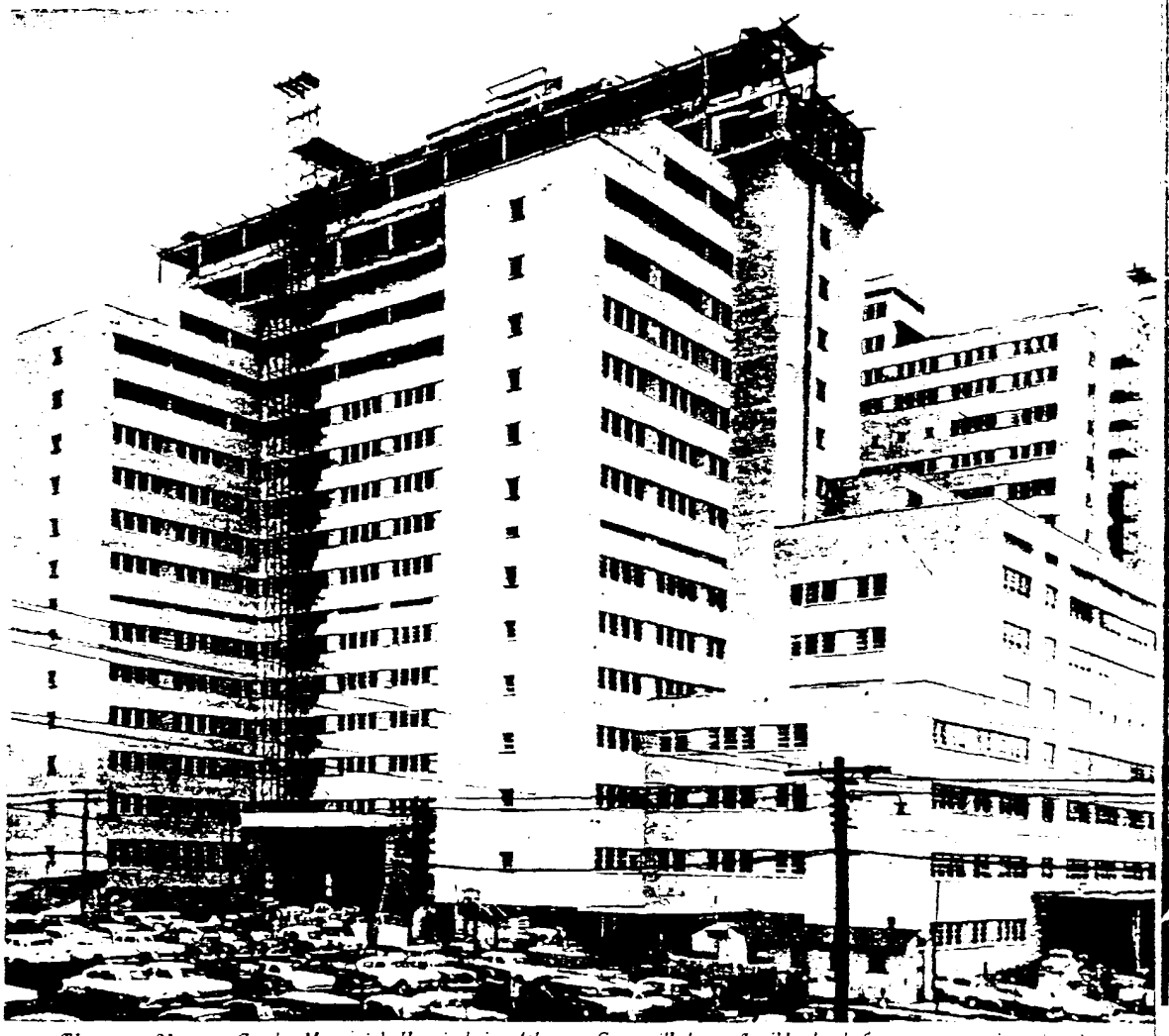
Lead

VOLUME TWENTY 1956 NUMBER FOUR



The new 21-story Grady Memorial Hospital in Atlanta, Ga., will have flexible lead fixture connections in the extensive waste plumbing system being installed. Robert and Company Associates are the architects. *See story page 4.*

LEAD INDUSTRIES ASSOCIATION

New Technique Solders "Impossible" Materials

Photos by Los Alamos Scientific Laboratories

Materials soldered by Los Alamos Scientific Laboratory's new technique include, left to right, Pyrex glass, titanium, molybdenum, aluminum, tantalum, stainless steel, tungsten, ceramic and cobalt.

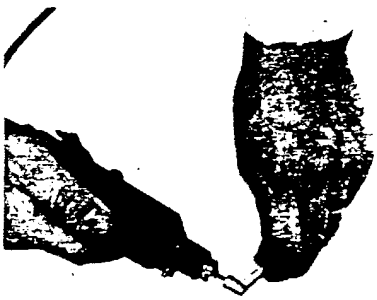
AN unusual new technique which permits soldering such materials as aluminum, stainless steel, glass, and ceramics without special equipment has been developed by the University of California's Los Alamos Scientific Laboratory. The method is expected to effect great savings over the ultrasonic method the Laboratory had been using, and to be of particular interest to the aircraft and electronics industries, home-workshop hobbyists, and laboratory equipment makers.

The new method of joining materials hitherto believed impossible to solder was developed by Joseph C. McGuire of the Laboratory's Chemistry and Metallurgy Division. It requires, in addition to the usual soldering materials, only a hand grinder with an abrasive wheel. The technique was discovered by McGuire during a research project on the use of ultra-high-frequency sound waves in soldering, and ironically involves doing something that apprentice mechanics are taught not to do.

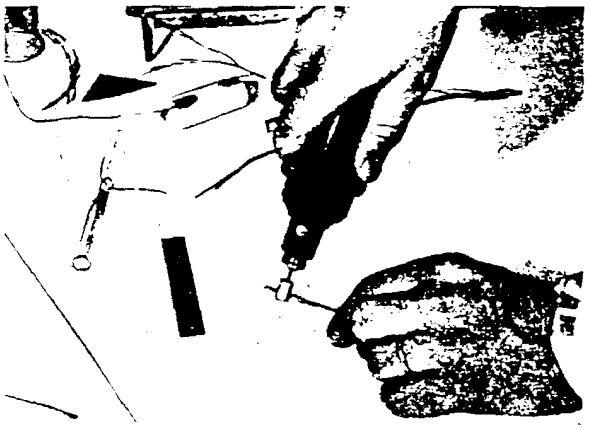
To solder these previously unsolderable materials, the grinder is turned on and the abrasive wheel (preferably preheated by grinding metal or the use of heat) is brought to bear on a soft solder such as Wood's metal or 40-60 tin-lead. The soft solder melts and flows onto the surface of the wheel, "loading" it and incidentally making it useless for its customary purpose until it has been trimmed down. The solder-loaded wheel is then applied to the surface to be soldered until a slight amount of abrasion has taken place, using the pressure one would ordinarily use in grinding. The heat of friction again melts the soft solder, which flows onto the freshly abraded surface and forms an intimate contact.

After this tinning operation, soldering is done in the usual manner with standard 50-50 tin-lead solder. The other surface is also given the new treatment if it is a material not ordinarily "wetted" by solder. No soldering flux, surface cleaning, or pretreatment is used.

When working with such materials as soft glass, Pyrex, and ceramics, the best tinning is accomplished with a mixture of Wood's metal and 50-50 indium-tin. However, when soldering glass to glass or ceramic to ceramic, it is necessary to use flame or furnace heating to get enough heat to the surfaces to be joined. The two surfaces need not be of the same material; metals, soft glass, Pyrex, and ceramics may be soldered in any combination. A satisfactory grinding wheel has been found to be a medium grit, 1-in. diameter by 1/8-in. long, although the type and size are not critical.



At left and below, loading the grinding wheel with solder, tinning the material to be soldered, and soldering to the previously tinned surface by conventional methods.



Spark Plug Ceramic Insulators Are Lead Glazed

The lead glaze on this AC spark plug is physically and chemically durable throughout its life.

THE exposed ceramic insulator on automotive, commercial and marine type spark plugs is another of the many industrial applications of ceramic materials on which lead glazes are used to advantage.

In this particular application, lead is used as a component so as to produce a glaze that can be applied to the ceramic base at a comparatively low temperature and still have the desired properties. That is, the glaze must be physically and chemically durable throughout its life under the most severe operating conditions.

A glaze is applied to spark plug insulators for essentially the same reasons it is used for fine dinnerware and wall tile; it is decorative and more important where spark plugs are concerned, easily cleaned.

One of the most frequent causes of spark plugs missing according to the AC Spark Plugs Shop Manual is the dirt accumulation on the outside of the insulator top. When combined with moisture, the dirt shunts the high tension current across the insulator top from terminal to shell and away from the gap at the firing end inside the combustion chamber. This is generally referred to as "flash-over" and is easily avoided by keeping the insulator top clean.

The glaze used at the AC Spark Plug Division, General Motors Corp. is essentially an alumina-silicate to which alkalis, alkaline earths and lead oxides are added.

Lead Shielded Syringe For Radioactive Isotope Injections

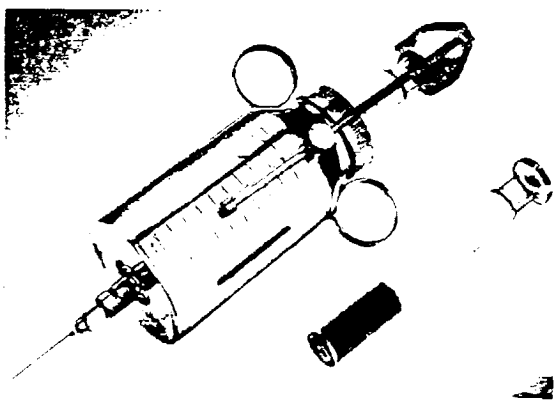
THE use of radioactive isotopes in the treatment and diagnosis of human ailments is one of the important peacetime developments of atomic energy. As is often true of advances in medicine, there is an element of risk to the doctors, nurses and technicians using the newer methods of treatment and such is the case with radioactive isotopes. Fortunately this element of risk was known beforehand and the development of proper precautionary measures have gone hand in hand with the increasing use of this important medical and diagnostic tool.

Radioactive isotopes give off gamma rays that, in controlled amounts such as are given patients undergoing treatment, can be curative. However, in repeated and continuous doses such as doctors and nurses would be subjected to, they are harmful. Generally, lead is the means by which such control is possible. Lead, being the densest of the common metals and one of the most effective means of confining gamma rays, is used as a barrier wherever radioactive isotopes are used, particularly when space and weight requirements are critical.

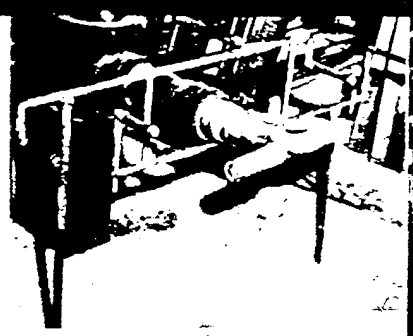
One of the most unusual of lead's applications for this purpose is as a shield around a syringe, shown in the accompanying photograph, for giving injections of gamma emitting isotopes. These syringes, manufactured by The Hamilton Company, Whittier, Calif., have a half inch of lead enclosed in a hard chrome plated brass case completely encircling the glass syringe itself.

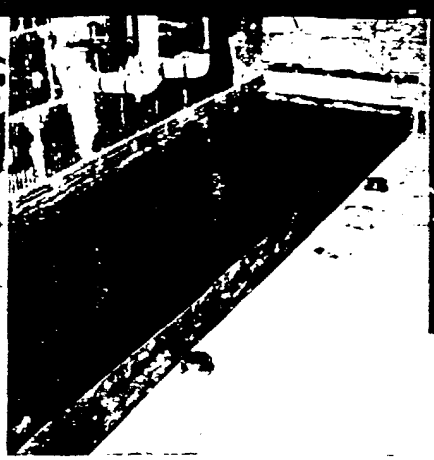
The glass syringe plunger, also shown in the accompanying photograph, has lead wool packed within it to the equivalent of a half inch of solid lead. This latter development eliminated the previously used heavy thumb shielding, and at the same time shortened the unit considerably. It has also made it possible to use the 10 c.c. syringe with one hand though it is comparatively heavy, weighing $3\frac{3}{4}$ lb. Smaller capacity lead shielded syringes, down to 2 c.c. capacity, weighing $1\frac{1}{2}$ lb. and easily manipulated with one hand are also available.

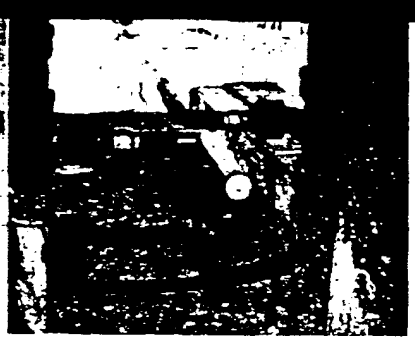
Lead is also the generally accepted material for use in shipping containers used to transport radioactive isotopes from various AEC installations to hospitals and other users. LEAD, Vol. 20, No. 3, describes this use of lead in greater detail.



The ½-in. lead shielded syringe for giving injections of gamma emitting isotopes and the syringe plunger in which lead wool is packed.







Atlanta's new Grady Memorial Hospital's plumbing system has the unique space-saving "diaper" joint in lead pipe for connecting two lavatories to a 3-in. hub, as above. Other examples of how lead has been used include sheet lead pans for batteries of showers, manufactured 2-in. lead bends for sink connections and 4-in. lead stubs connecting the water closets to the rigid piping.

Lead Plumbing Connections In Atlanta's Two New Hospitals

HOSPITALS are among the many building types in which lead connections in the plumbing waste system are used to definite advantage. Hospital plumbing is as unique and extensive as any plumbing installation could be, and the flexibility provided by lead in connecting fixtures to the rigid pipe system can mean important savings in space and in time in installing fixtures, not to mention the long life and low maintenance costs that can be expected of lead.

Atlanta, Ga., is undoubtedly one of the most fortunate of cities in that two new hospitals are currently being built there.

The largest of these is the new Grady Memorial Hospital which will have, when ready for occupancy in the spring or summer of 1957, an estimated 1,085 beds and will cost about $24,000,000. Robert and Company Associates are the architects and engineers for this 21-story hospital, a project of the Fulton DeKalb Hospital Authority, and financed by Fulton and DeKalb counties. Construction was started in March, 1954 by Robert E. McNee, general contractors with headquarters in Dallas, Texas.

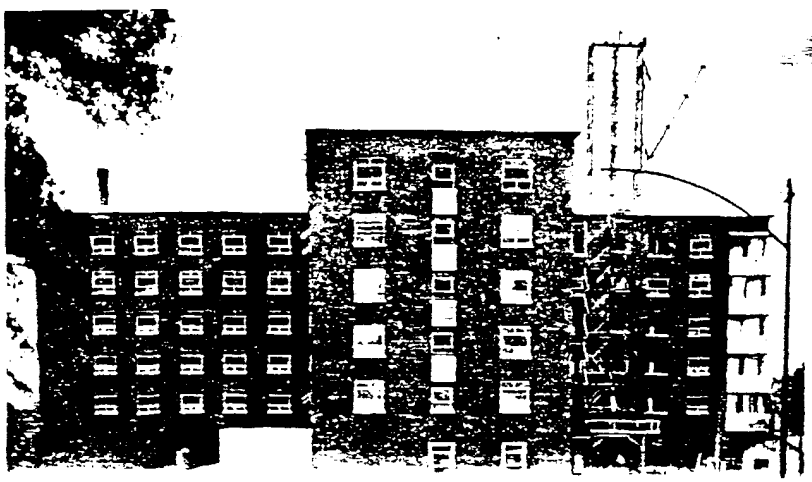
The plumbing, as can be imagined, is extensive and is being installed by J. S. Brown and E. F. Olds Plumbing & Heating Co. The accompanying photographs illustrate the various ways in which lead is being used. 1¼-in. lead pipe in some cases and in others 1½-in. manufactured lead bends for the connections for sinks and lavatories, 4-in. lead stubs for water closets and similar fixtures, and 6-lb. sheet lead for shower plans and vent stack flashings. Also shown is an unusual "diaper" joint for connecting the lead wastes from two sinks into a single 3-in. cast-iron soil pipe hub. This particular application of lead indicates graphically the unlimited possibilities of making space-saving connections without recourse to special and usually expensive cast or machined fittings.

The second of the hospitals under construction in Atlanta, Ga., is the 6-story Piedmont Hospital that will have facilities for 250 beds when completed some time this summer or fall at a cost of over $4,000,000. The original plans called for a 5-story structure, but upon the advice of the architects, P. Y. Shutze, J. W. Armistead, Jr. and M. O. Saggus, and the contractors, Beers Construction Co., the hospital authorities approved an additional floor when it was determined that it could be included now at half the cost of adding it later, allowing 20 percent more space for only 10 percent more cost.

Here again the versatility of lead in the plumbing system is aptly shown by the use of 1½-in. lead pipe connections with two 90 deg. offsets for the sinks and lavatories. These are made by simply bending the lead pipe as can be seen in the accompanying

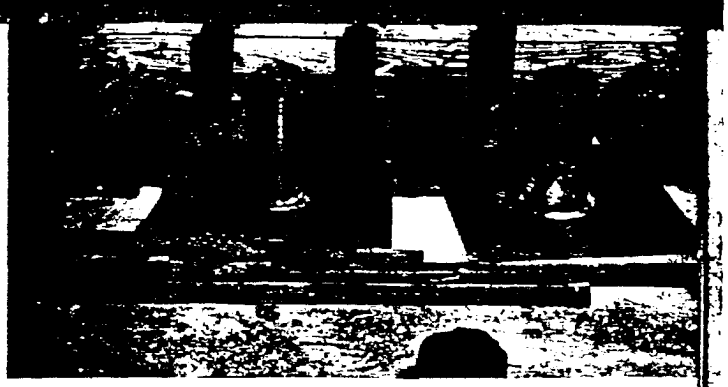
The second of Atlanta's two new hospitals is the Piedmont Hospital, a six-story, 250 bed hospital, designed by architects, P. Y. Shutze, J. W. Armistead, Jr. and M. O. Saggus, of Atlanta.

The plumber is connecting the lead sink waste to the stack. Note the two space-saving 90 deg. offsets in the lead pipe.



photograph. thus avoiding expensive and space consuming fittings that would have been necessary had rigid piping been used.

In addition to the lead sink and lavatory connections. the Stepenson Company, Atlanta. Ga., plumbing contractors. are installing 4-in. lead stubs for water closets and similar fixtures and using 6-lb. sheet lead pans under shower baths and for flashing vent stacks passing through the roof.



Lead vent stack flashings ready for installation on the new Grady Memorial Hospital in Atlanta, Ga.

Present plans include extensive use of sheet lead for lining walls, floors and ceilings of X-ray rooms when installation is made in both hospitals.

Sheet Lead Floors Are Shock Absorbent And Non-Sparking

IN plants manufacturing nitroglycerin. two of the important but lesser known properties of lead, its ability to absorb shock and its non-sparking characteristics, contribute to make lead the preferred material for use as a floor covering in specific areas of such plants.

Converting glycerin into a high explosive involves in general the slow addition of a high purity glycerin to an acid mixture containing approximately equal parts of sulphuric and nitric acid. The mix is agitated from 60 to 90 minutes in nitrator vessels equipped with cooling coils carrying brine at about 20 deg. F. to maintain a temperature below 60 deg. F. After nitration. the nitroglycerin and spent acid flows through troughs into separating and settling tanks located at some distance from the reactor vessels. The nitroglycerin being lighter than the spent acid rises to the top and is carefully separated and washed with warm water to remove most of the remaining acid. It is then treated with an alkali to insure complete removal of acid and washed repeatedly to remove all traces of alkalinity.

One of the foremost producers of explosives, Atlas Powder Company of Wilmington. Del.. uses lead extensively as a floor covering in its nitroglycerin manufacturing and storage buildings primarily because the lead floor provides a shock absorbant and non-sparking working surface. Atlas. which operates several high explosives plants as well as an experimental dynamite-manufacturing facility at its explosives research laboratory, uses lead floor coverings in strategic areas throughout these operations. In locations where particularly sensitive materials are handled. lead floor coverings properly grounded also provide satisfactory protection against the possible generation of hazardous static energy levels.

Experience in these plants has also indicated that lead floor coverings protect normal structural materials such as wood and steel from acids used in the process and prevents contamination of these structural materials with the explosive products.

The lead floor coverings also provide an incidental but highly important quality in that they are easily cleaned by hosing down and have a relatively low yearly maintenance cost. In this particular company's operation. some installations have been in service up to twenty-five years.

In installing the lead floors. the lead is extended up the side walls for varying distances and all vessels in the area or piping passing through the floor are provided with lead boots or aprons. All joints are lead welded.

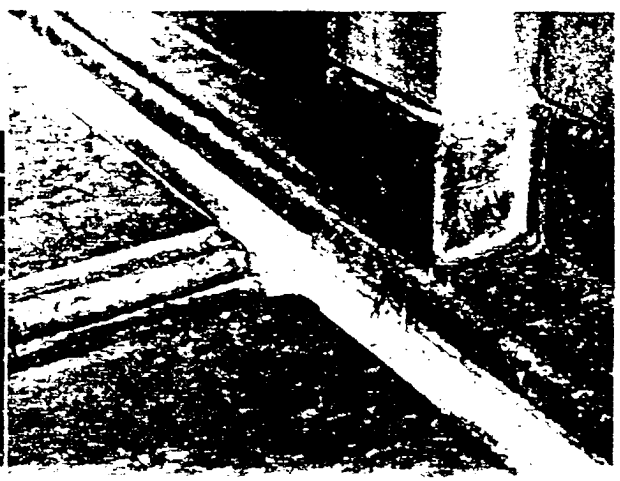
At Atlas the usual practice is to use 6-lb. sheet lead for floor coverings and up to 16 lb. for some special applications.

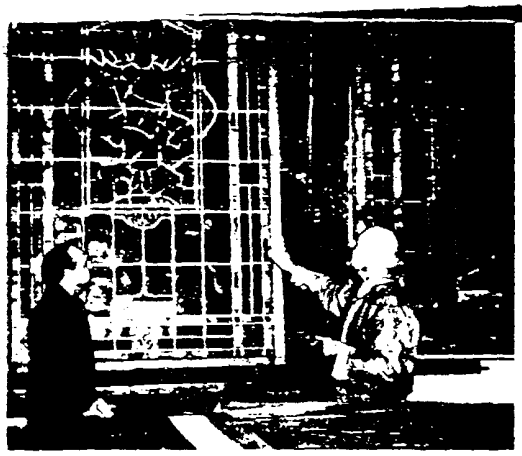
LIA26079

Sheet lead floor around nitrator has been in use for years and is still in excellent condition.

Detail of lead boots for pipes passing through new lead floor.

Part of the new lead floor installed at Atlas Powder Company explosive plant showing T gutter.





Leaded Glass Windows

At left, the Messrs. Llorens, father and son, view a completed work and at right, the glass is fitted together and held by the lead cames.

FOR centuries lead has contributed to the awe-inspiring beauty of the stained glass windows of great cathedrals the world over. Few who have viewed these magnificent works of art realize that such windows are being produced today in a number of studios in the United States.

An example is the Llorens Stained Glass Studios of Joseph Llorens, Sr., in Atlanta, Ga. Mr. Llorens is assisted by his son, Joseph, Jr., and a daughter, Rosalind Benatar. According to Mr. Llorens, art or stained glass craftsmanship is divided into two schools, the antique and the American.

"In the old days," explains Mr. Llorens, "the color came from real jewels—crushed emeralds and rubies and sapphires. The old monks gave years to the work in the famous cathedrals. Now we use mineral colors, ground and put on the glass and fired at high temperatures, which change the drab mineral colors into intense emerald green, deep ruby, glowing sapphire and soft amethyst."

In the American style opalescent glass developed under the leadership of Tiffany, the glass itself is colored, the design being obtained by matching small fragments in a came or glazier's lead frame.

Whether antique or American, each piece of glass is fitted together and held by the lead cames soldered at the joints on both sides, pressed against the glass to encase each piece, and cemented to make the window watertight. Cames of different width are used to emphasize the artist's conception of lines necessary in his creation. The color of aged lead blends perfectly with the glass and age serves only to beautify the windows with the permanence and pliability of lead contributing to this art.

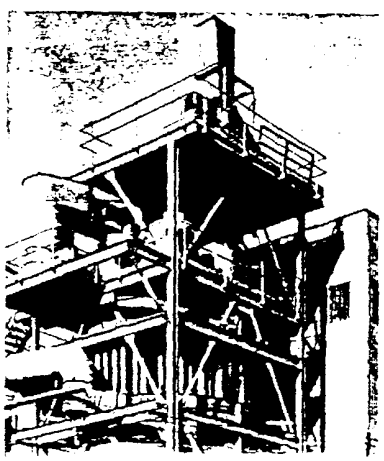
Each window starts with a water color sketch which is then blown up to full size and broken down with studied zig-zag lines for cutting into templates. For an American window each section is marked for the color of glass to be used. The paper templates are then placed on a bench over the original drawing. The colored glass is then selected and cut by an expert and placed into the lead frame which is finally soldered together.

Air Pollution Control

IN many ways lead is making a big contribution to control of air pollution, a problem which is receiving a great deal of attention in many communities and which, if not controlled, can be vexing and costly to many industrial companies. A good example is in the Baltimore, Md., plant of The Glidden Company at which titanium dioxide is manufactured. Huge quantities of sulphuric acid are used in this process and mists of this acid generated in the process must be prevented from contaminating the atmosphere.

To suppress the sulphuric acid mists, an electrostatic precipitator, boasting the largest number of tubes in any such single unit, has been installed. It is based on a conventional Cottrell design and is constructed of lead to resist attack by the corrosive gases passing through it.

"Cage" or "basket" design was employed in which a steel framework supports the lead. This has the advantage of easy and economical field erection, eliminates the need for difficult shop forming of a steel supporting vessel, and permits easy accessibility for inspection and servicing. The circumferential steel supporting straps are covered with lead, and the precipitator shell and tubes are lead. More than 50 tons of lead went into the construction of the precipitator which is made of 10-lb. chemical sheet lead. The tubes are extruded.



Lead is the standard material for constructing precipitators for handling sulphuric acid mists because of its great resistance to corrosion. It is also adaptable and readily fabricated, and has high scrap value.

Lead constructed precipitator at the Baltimore plant of The Glidden Co.

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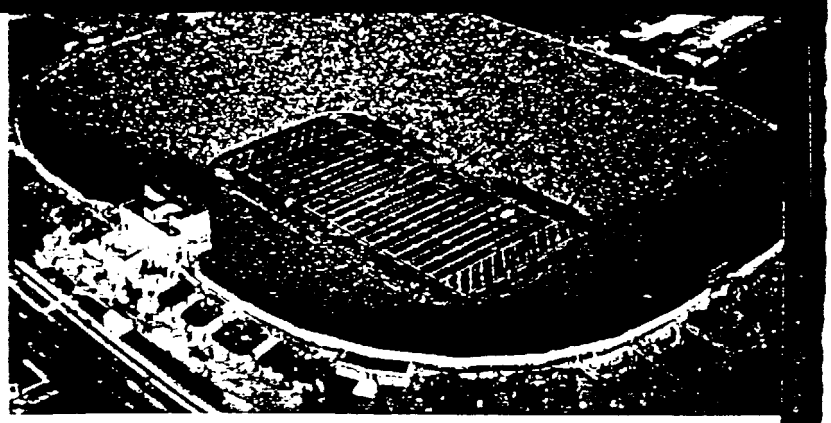
Red Lead-Lead Chromate Primer Protects Steel Against Corrosion



The University of Michigan's stadium, the upper part of which is steel construction that had been primed with red lead-lead chromate paint four years ago shows no signs of rusting.

THE original University of Michigan football stadium oval erected in 1927 was a reinforced concrete structure with a seating capacity of 75,000. Due to the popularity of college football among the student body and the university alumni, and as a result of the great succession of excellent football teams coached by F. H. Yost and H. O. Crisler, it became necessary to enlarge the seating capacity of the stadium oval. This was accomplished in 1949 by topping the existing concrete oval with steel sections which increased the seating capacity to 97,239.

The fabricated steel sections were shop primed, erected and given an intermediate field paint coat and then a finish top coat in which sand was embedded to produce a nonskid surface.

After one year's service, in 1950, the paint system was approximately 50 percent eroded. Because of the unsightly appearance, the combined objective of painting for protection and aesthetic value was born and it was decided in 1952 to repaint the steel seating sections.

The steel was sandblasted to remove the remaining mill scale, rust and any of the original paint system, exposing the base metal for the new paint system. Once the base metal was exposed, it was bonderized and primed with a red lead-lead chromate mixed pigment primer (see the accompanying formula) containing a 25 gallon length ester gum modified pheno-

RED LEAD-LEAD CHROMATE MIXED PIGMENT PRIMER FOR STEEL

(Composition by Weight)

PIGMENT:	Percent
Red Lead, 97% Grade	27-28
Lead Chromate, Basic	37-38
Lead Sulphate	1.5 - 2
Magnesium Silicate	33-35
	100
VEHICLE:*	
Spar Varnish**	69-70
Mineral Spirits	31-30
	100
Pigment	57-58%
Vehicle	43-42%

Notes.

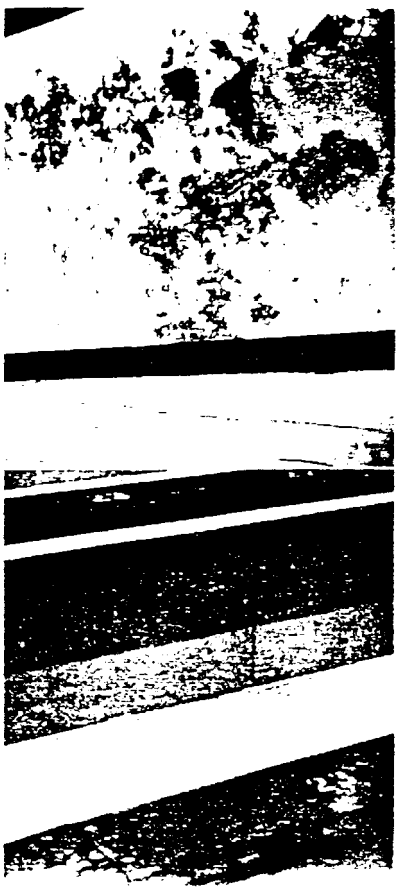
*The non-volatile in the vehicle should be about 40 percent.

**A 25 gallon length ester gum spar varnish of the following composition:

Ester Gum	70 lb.
Modified Phenolic Resin	30 lb.
Slacked Lime	1.5 lb.
Bodied Dehydrated Castor Oil (Z_2 Vis.)	25 gal.
Petroleum Naphtha	60 gal.
Cobalt Naphthenate (6%)	0.3 gal.
Lead Naphthenate (24%)	0.5 gal.

Processed to the following specification:

Viscosity	— C (Gardner-Holdt)
Nonvolatile	— 43% minimum
Acid Number	— Approx. 5 maximum
Color	— 4-5 (Gardner)



At left, the steel steps of the University of Michigan stadium as they appeared in 1952 after one year's service with another paint, and below, the same steps after four years of service with a rust inhibitive lead paint primer.

After one year's service with another steel primer, the steel at the feet of the fans appeared as at upper right and below the same area after four year's service with the red lead-lead chromate primer, the steel is still well protected against corrosion.

lic resin spar varnish vehicle. An intermediate coat of the primer containing a specially graded sand gave the desired film thickness and nonskid surface. The original gray color of the top coat was restored by a gray steel deck paint which was a 23 percent phthalic anhydride alkyd resin vehicle compatible with the primer. The new red lead-lead chromate mixed pigment paint system was applied during July and August of 1952. Today, four years later, the paint system on the stadium oval is as inviting as it was just after refinishing in 1952, in spite of four football seasons, winter frost, rain, snow, sleet, thaws and summer steel surface temperatures that often reach as high as 120 deg. F.

As shown in the accompanying photographs the condition of the painted surfaces today would indicate several more years of excellent protection.

As time marches on, press facilities and radio and television broadcasting have necessitated the enlargement of the old press and radio broadcasting unit into a three story structural steel and brick edifice. The record of lead primer on the seating sections prompted the use of red lead as the priming pigment of the new structure which will be ready in the fall of 1956 to accommodate all broadcasting and will, incidentally, increase the seating capacity from 97,000 to 100,000.

Gas Holders Protected By Red Lead

IT has been brought to the attention of the editors of this publication that the red lead multiple pigment formula paint used by Consolidated Edison Company is not similar to the formulations given in the article entitled "Gas Holders Protected by Red Lead," which appeared on page 5 of the last issue of this publication, Vol. 20, No. 3. The paint used is a red lead multiple pigment paint, but differs considerably from the formulas which were a part of the article in question.

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