VOL. 34 NO. 2 1971

lead

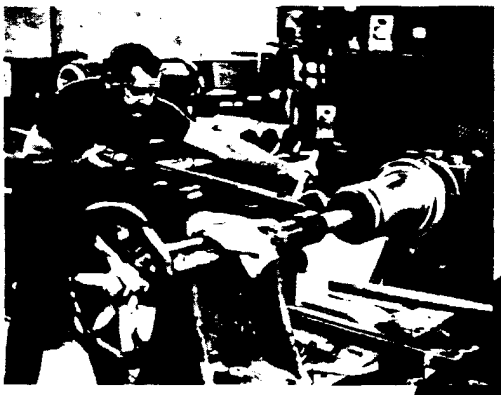
LEAD INDUSTRIES ASSOCIATION, INC.

LEAD
A FACTOR IN METALWORKING FIRM'S SUCCESS

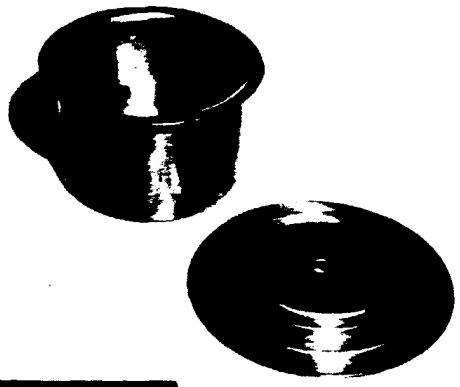
Solving complex production problems efficiently and at cost savings to the firm and its customers is a byword at Bomco, Inc., a Gloucester, Massachusetts metalworking firm. In eleven short years the firm has built a solid business with a solid reputation. Its customer list is impressive, including a number of well-known and prestigious companies.

Part of the company's success is attributable to its ability to solve the production challenges of new-design, high-precision parts. Another factor, maintains N.K. Banks, Jr., Bomco's President, is the company's extensive work with lead. Bomco started working with lead right at the outset, producing spun lead conforming anodes for General Electric chrome plating operations. Ease of production, lower production costs than with other methods, and product reliability prompted Bomco to seek out other orders that called for lead work.

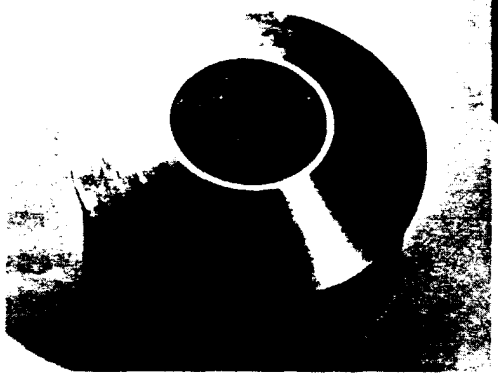
Over the years the company has perfected various old and new methods of spinning, stamping, deepdrawing and casting precision products that require lead. Spun or cast lead shielding for X-ray equipment and for the storage and handling of other radioactive materials is commonplace. The company's custom-made product list ranges all the way from lined metal shapes to a complex 163-hole medical scanner collimator.



Lead power tube components, some of them produced for the Raytheon Company, are spun in the Bomco plant.



As with other parts such as the spun lead conforming anodes made for General Electric, production and cost efficiencies were realized when working with lead.



This medical scanner collimator made for Baird-Atomic was the first of a now wide variety of collimators made by Bomco.

The lead-filled, stainless steel shell part has 163 tapered, hexagonal holes that must focus within .005-in. Septums between holes are as low as .040-in. What seemed to pose insurmountable production problems proved simple with Bomco's ingenuity and the easy workability of lead.

BANK RAILING ANCHORED WITH LEAD WOOL

The First National Bank of Chicago has added another architectural landmark to that city with the construction of its new 60-story headquarters building. The graceful up-swept sided building is the main feature in the First National complex, scheduled for completion in 1972.

The First's new headquarters is the tallest bank building in the world, and tied for sixth place among the world's tallest buildings. At 850-feet, it ties with the RCA building in New York City.

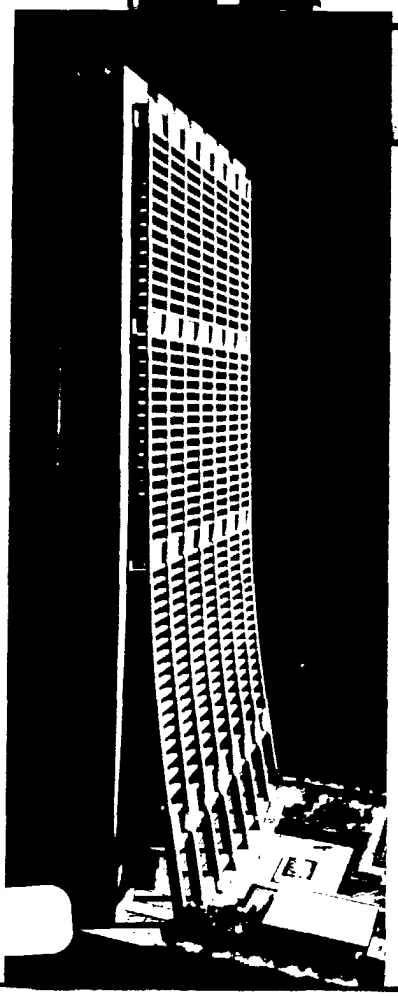
Inside the bank building and readily apparent to anyone doing business on the extensive main banking floor, is a glass railing around the entire perimeter of the bank quarters on the second floor above. The Solarbronze glass railing adds to the feeling of openness and spaciousness that characterize the interior design of the bank.

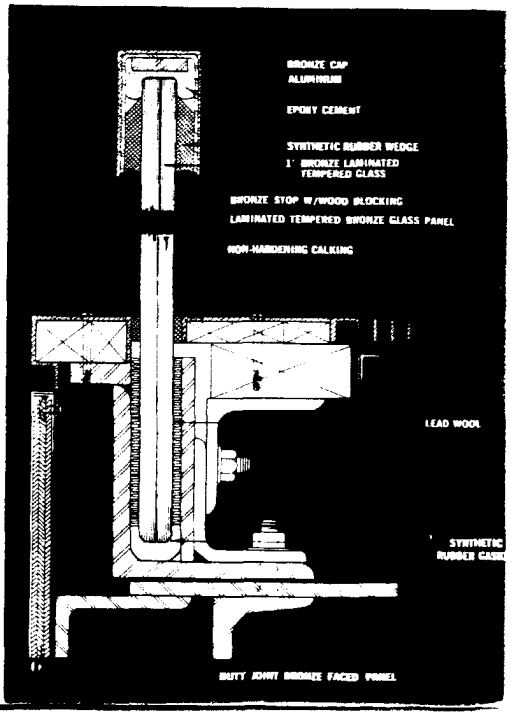
Critical to the railing design, of course, is an anchoring system that insures complete safety. Architects for the building, C. F. Murphy & Associates and the Perkins & Will Partnership, were unwilling to rely on standard setting wedges to do the necessary job. They relied instead on lead wool calking, a foolproof material that has stood up under the most rigorous testing for a wide variety of calking installations.

In all, 15,000 pounds of lead wool, a loose, ropelike strand made up of fine threads of lead metal, were used to calk the First National railing to a depth of 6-inches in its setting channel. The lead wool application is an unusual one, much as the size of the glass railing is in itself unusual.

Under the tremendous pressure generated beneath the point of the calking iron, the tiny filaments of lead wool actually "cold weld" or fuse into a single piece of lead. This lead "anchor" forms a tight and impervious seal that will insure the stability of the glass railing at First National.

The handsome Solarbronze glass railing at First National overlooks the main banking floor. Architects specified lead wool calking to assure an absolutely safe anchoring system for the railing. The diagram shows the details of the anchor system.





Credits:

Architects: C. F. Murphy & Associates
The Perkins & Will Partnership
General Contractors: Gust K. Newberg Construction Co.
Installers: Pittsburgh Plate Glass Ind., Inc
Lead Wool: Gardiner Metal Company

BATTERIES POWER A BIG MOVE

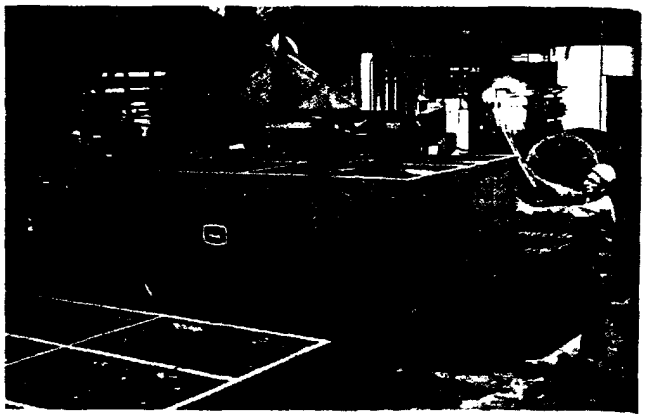
Hauling 75 tons of steel from one plant site to another is as simple as flicking an electric switch at the Middletown, Ohio mill of Armco Steel Company. Armco uses lead acid battery-powered locomotives to haul as many as five fully-loaded buggies at a time . . . a potential total capacity of 150,000 pounds. Each of the five locomotives in Armco's fleet has a complement of two batteries, the largest motive-power batteries made. While one battery is in service, the other is on charge, so that the two batteries power three full shifts.

Armco reports that their use of lead acid batteries has resulted in significantly low operating and maintenance costs.

Also, the battery-powered locomotives go about their business without creating any bothersome fumes.

Each of the locomotive batteries measures approximately 4′ x 6′ x 12′ and weighs 20,000 pounds. Too large to be shipped assembled, the battery cells are shipped individually and then installed at the mill in large Armco-made steel trays. Battery interconnections are made by the battery manufacturer.

Carefully planned battery maintenance at Armco insures ample power at all times for the locomotives. This essential interplant handling system operates reliably three shifts each seven days a week.



Giant locomotive battery is lowered into place for charging. The battery is made up of 84 cells and is rated at 168 volts.

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Pb Lead Power 71

Hamburg, Germany, will be the host city for the 4th International Lead Conference scheduled for September 21 through 24, 1971. Under the overall sponsorship of the European Lead Development Committee, the conference program is being organized by the Lead Development Association of London. A committee representing German lead producers has made all meeting arrangements in Hamburg.

The conference program will include technical sessions on the manufacture and use of lead acid batteries; the production, properties and performance of lead cable sheaths; the role of electric vehicles in public and private transport; and new developments in lead metallurgy and technology. Also part of the program are plant visits to German lead production and fabrication facilities, a reactor station, and the largest research establishment in Germany concerned with fundamental research into elementary particles.

The 1971 Wilhelm Hoffmann Memorial Awards for original lead research will be presented at the September conference. The awards were originated and first presented at the 3rd International Lead Conference held in Venice in 1968. In addition, the Association has started a new international lead acid battery competition, for which awards will be given during the Hamburg meeting.

As with the previous three conferences, attendance will include interested parties and experts in the lead industry from all over the world. To facilitate the immediate flow of information through this multi-language group, full simultaneous translations of all proceedings will be made in English, French, German and Spanish. Copies of the provisional program together with hotel reservations and conference registration forms are available on request from Lead Industries Association, Inc., 292 Madison Avenue, New York, New York 10017.

RARE JEWELS SPARKLE BRILLIANTLY IN LEAD SETTING

Starting with a lead exterior finish on the rebars that extended from the ceiling down to the counters and the floor of the store, the use of lead expanded into the design and construction of counter and display spaces and even the front door of the shop.

Lovers and collectors of beautiful jewels come to an abrupt stop the first time they enter the dazzling interior of the Arthur King Jewelry Store on New York's prestigious Madison Avenue. It's dazzle with a difference. Instead of the conventional, almost pedestrian, rectangular jewelry shop interior with glass showcases and implicit "don't touch" signs that connoisseurs of jewels are accustomed to, Mr. King's store is a one-of-a-kind custom-designed lead showcase.

It required both experience and imagination for Mr. King to select one of the world's most common materials to set off his exquisite jewelry. And it works to perfection. The monochromatic gray color of lead is a perfect foil for the brilliance of the jewelry. The lead has a richness and beauty all its own without being obtrusive—a potential danger when one decides to completely change the "look" of normally so unchanging an institution as a jewelry store.

Sound practical considerations also governed the choice of lead as the major material to be used for the display and renovated areas. Architectural details offensive to Mr. King's highly developed esthetic taste included a ceiling too high in relation to the area's other dimensions and an extensive fire sprinkling system that either had to be lowered or disguised.

It was Mr. King's inspiration to create a false ceiling with a free-form lattice work of steel reinforcing bars with a lead finish. The airiness, strength and masculine look of the rebars appealed to Mr. King. The lead finish provided the proper color and patina.

Display counters were made with a plywood and asbestos dam into which lead was poured and then worked by Mr. King himself with a welding torch to create the proper texture and tone. Display cases were literally custom-fitted into spaces between rebars. The cases also were made of steel with a lead exterior finish.

The major work done, Mr. King's keen eye focused on other details of the shop's interior. Ultimately the lead was used in several places to tie the interior design together: the framing of wall mirrors to obliterate the rigidly geometric vertical and horizontal lines that "fought" with the now almost "organic" design forms of the interior; at the foot of the ceiling-to-floor rebars to soften the bar-to-floor union and to match the freer form of the bar-to-ceiling design.

The lead finish was ground and polished with soft wire brushes, steel brushes, and sanding discs. The end result is a textured, soft-looking surface of considerable elegance. Lacquer and wax were applied to the lead surfaces at the last to prevent oxidation.

Since Mr. King is primarily in the jewelry business and a designer, architect and metalworker only by avocation, his first concern, naturally, is how does the lead work in relation to the sale of jewels. The answer is positive. The lead is an ideal surface for showing gems. A stone dropped on lead will not bounce or break as it might on glass. Nor will the stone harm the counter surface as it would if dropped on a wooden counter. The soft richness of the lead sets off the jewels beautifully without ostentation or in any way competing for attention in the eye of the customer.

A great deal of knowledge, insight and hard work went into the interior design of the Arthur King Jewelry Store. Also a lot of lead . . . an estimated two-and-a-half tons. Nothing like it exists anywhere in the world; but in it are the nuclei of a hundred different ideas for the practical and esthetic use of lead as a versatile material for both display and structural changes.

LEAD... A MAJOR FACTOR IN NEW MACHINERY NOISE SUPPRESSION SYSTEMS

The costly effects of machinery noise can be fought with new techniques using lead as a noise barrier

Uncontrolled machinery noise has always been costly to human health, and as a result, to production efficiency. Growing awareness and concern with the problem has led to the development of new techniques to reduce machinery noise to safe, liveable limits. Lead and leaded composites play an important part in this accomplishment.

Lead, in a variety of forms (see box), offers excellent sound insulation properties and can be tailored to meet very specific demands for noise controls.

One can easily measure the noise levels in his plant and base their acceptability or nonacceptability on the Federal Government's Walsh-Healey Public Contracts Act. The Act limits industrial noise to 90 db "A" scale in any plant having government contracts exceeding $10,000 or any manufacturer involved in interstate commerce. The Act specifies that an increase of 5 db in the noise level over the 90 db limit requires that worker exposure be halved. Since the allowable worker exposure time to 90 db is 8 hours, a level of 95 db means the worker can be exposed for only 4 hours.

Pin Down the Noise Sources

In an industrial complex the noise level will vary from section to section depending on the equipment used. The table below lists the most common plant machines used for which average noise levels exceed 90 db. Any standard sound level meter set to "A" mode will determine the noise levels for any given plant or machine.

The type of machine involved determines the design of the sound insulating system. Fully automatic machines may be completely enclosed in a sound insulating structure with doors built into the enclosure to permit necescary adjustments and tooling changes. Manually fed equipment, however, must provide for operator access so it is not possible to cover the machine completely. In such cases, partial enclosures, efficiently constructed, are capable of reducing noise levels to safe limits. Some manually operated machines can be retrofitted with automatic feed devices. This approach is economically sound if production increases are also desired.

Tools in Lead's Noise Reduction Arsenal

A good sound barrier should be dense, limp, and impermeable. Lead and lead composites easily fulfill these requirements. Additionally, they are usually unaffected by coolants, cutting oils, drawing compounds and similar industrial materials. Sheet lead is readily obtained in weights ranging from ½-lb. (1/128"-thick) to 8-lb. (⅛"-thick) per square foot. Weights normally used for noise reduction applications are ½-lb. and 1-lb. An outstanding advantage in the use of sheet lead is its easy workability. It can be cut with an ordinary pair of scissors, formed by hand and applied to most any surface with elastic type adhesives. Lead can be readily laminated to many substrates including steel and aluminum sheet. These lead laminates can be formed, drawn or otherwise shaped using the same tools as employed for the substrates themselves.

Leaded vinyl sheet is another useful material for sound attenuation. One adaptation of this product comprises two sheets of lead loaded vinyl laminated to a core of glass fiber cloth to give the material more supporting strength. This material is often hung around noise producing sources with excellent results or used in conjunction with acoustical wool for reducing noise from machinery. In addition to reducing noise, leaded vinyl sheet is also used to damp vibration in resonating structures.

Sheet lead and polyurethane sandwich material is ideal for sound conditioning areas such as the inside of existing machine shrouds or guards. The material is easy to work. It can be cut with a pair of scissors or simple steel rule dies when repetitive parts are needed. It can be shaped readily to contours and held in position with adhesives. Types are available with a sealed surface that will not absorb oils or coolants.

For structure-borne noise, lead loaded epoxies make ideal damping compounds. The compounds are made by mixing powdered lead into epoxies. The material is usually applied with a trowel and can be used on resonating structures such as machinery guards to reduce vibration and the resultant noise.

Deadening Vibrations from High Impact Machines

High tonnage presses, drop hammers and other high impact machines create vibrations in addition to air borne noise. These vibrations, unless short circuited, can be transmitted throughout an entire plant even into office areas where they may be translated into audible noise. To prevent this from occurring, machines must be isolated from their foundations. One highly efficient method of accomplishing this isolation

Lead Materials for Noise Insulation

Material	*Description*	*Uses*
Sheet lead	Usual weight ¼-lb to 4-lb	Used alone or laminated to substrates of various types
Lead/Foam	½-lb and 1-lb sheet lead sandwiched between layers of polyurethane foam	Laminated to enclosures
Leaded plastic sheets	Lead loaded sheet vinyl or *neoprene with or without* fabric reinforcement	As a curtain or to line *enclosures*
Damping tile	Lead loaded epoxy or urethane tiles	Damping heavy machinery
Casting compounds	Lead loaded epoxy	Potting, filling complex voids
Trowelling and damping compounds	Lead loaded epoxy, neoprene and urethane	Damping enclosures, surfaces, resonant members and rattling panels

is through the use of lead antivibration pads installed between the vibration producing machine and the foundation of the building.

The pads are made of a sheet of steel sandwiched between two layers of asbestos within a sealed envelope of sheet lead. Lead anti-vibration pads are fabricated to order for specific applications.

Mechanical Power Presses

An automatic power press is most effectively sound controlled by enclosing it fully in a sound insulating structure made of sheet lead or lead composites. Only recently a manufacturer of die sets for mechanical power presses used this method to quiet the presses in their own shop. A straightside, 600 spm 20-ton press with a slide feed was enclosed in a lead/foam laminate structure that reduced noise levels from 96 db to 86 db six feet in front of the press, 98 db to 85 db six feet from the rear.

The enclosure was easily constructed of a wooden frame covered with plywood. It was then lined with sheet lead/polyurethane laminate. Cut-outs were provided for the slide feed, finished parts and scrap. Louvers were cut into the top of the structure and flat panels covered with the same lead material located underneath as baffles, to prevent excessive heat build-up.

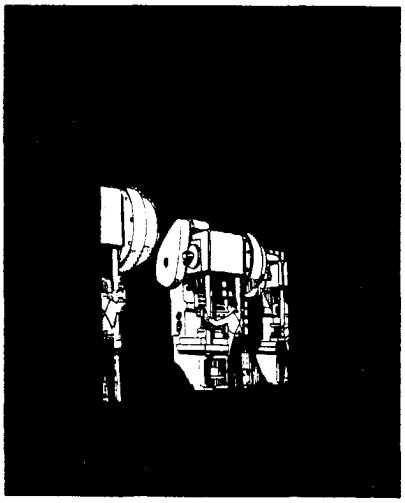
Possible techniques for noise insulation systems for other types of power presses include:

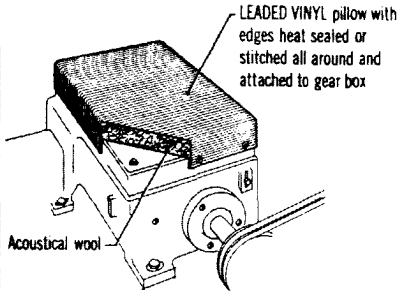
Presses with automatic feed devices—floor to ceiling leaded vinyl curtains that will enclose single presses or banks of units.

Presses that require operators—retrofit the press with an automatic feed device so that the press can be fully enclosed with a lead noise attenuation system; or failing that, build a partial

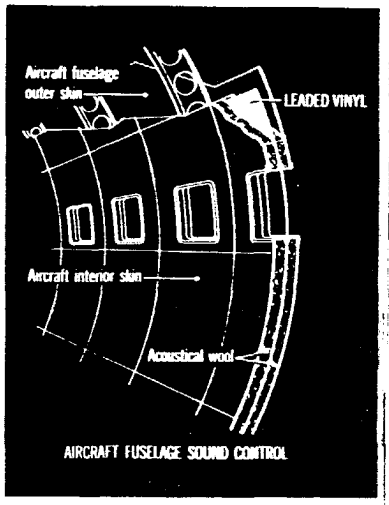
vels of Typical Machines That Range Above 90 db.

Average db level
130
130
128
108-118
98-112
98-110
101-105
99-101
93-100
100
99
80-95





GEAR BOX DAMPING PILLOW



AIRCRAFT FUSELAGE SOUND CONTROL

enclosure that will lower the noise but to a lesser degree than the full enclosure.

Large Industrial Gears

On a larger scale, heavy gears such as those on hoists and crane equipment, generate high noise levels. The meshing of teeth on these "industrial giants," some of them up to 40" or more in diameter, results in a painful, high pitched ringing. The resonance of these huge gears can be substantially reduced by applying to the gear face damping materials such as lead loaded epoxies or lead loaded vinyl sheets.

Machinery Guards

In some instances, large machinery guards of sheet metal have a tendency to set up a high pitched ringing noise if stiffening ribs have not been added. The solution to this problem is to laminate pieces of sheet lead to the guard by trial and error method until the ringing is reduced or eliminated. Self adhesive leaded vinyl sheet may also be used to line the guard with the same result.

Air Compressors

Air compressors, a source of irritating noise within the industrial complex, can be silenced by enclosing them completely within a shroud consisting of sheet lead, lead/foam or leaded vinyl laminated to any material intended for drywall construction. Louvered openings with baffles should be provided for the dissipation of heat build-up.

Vibratory Feeds

A source of highly distracting noise on production machines devoted to automatic assembly of spark plugs was created by air-vibrated feeds on each of the units. The noise, caused when the steel spark plug shells were vibrated into position on the metal feed track, was reminiscent of machine gun fire. This unavoidable, metal-on-metal noise was a distraction to workers. Because of the feed's construction, it was impossible to completely enclose them. Plant maintenance engineers surrounded the 2-foot by 4-foot area around each vibrating feeder with curtains made from reinforced, lead loaded vinyl. Even though the curtained area was left open at top and bottom, the noise at the individual feeds was reduced from 93 db to 86 db.

Automatic Riveters

Another shop tool where most of the noise produced is impact noise is a pneumatic riveter. By enclosing the barrel of the tool in leaded vinyl sheet and rock wool some quieting can be achieved. The enclosure muffles the exhaust noises.

TENNESSEE SPECIFIES LEAD PAINT SYSTEM

The new bridge taking shape over the Mississippi between Shelby County, Tennessee, and Crittenden County, Arkansas, is a vital link in one of the country's major highway systems.

As yet unnamed, the bridge is part of Route 40, an across-continent highway that provides millions of people with convenient access from the southeastern United States all the way to the west coast.

Scheduled for completion in 1972, the new bridge is jointly owned by the Tennessee Department of Highways and the Arkansas Highway Commission. It was designed by Hazelet & Erdal, Louisville, with Bethlehem Steel Corporation as prime contractor for the main river span.

In all 14,450 tons of steel will go into the superstructure of the bridge . . . an investment of $25,000,000. Maintenance and preservation are major factors in insuring the safety of the bridge as well as the investment.

For this important bridge a time-tested lead paint system is being used for protection against the corrosive effects of the atmosphere and the river. Paint specifications for the bridge are taken from the State of Tennessee's Department of Highways specifications for steel structures. To add still further protection and to extend the life of the paint system, a third field coat was added to the basic specifications.

Upon completion the bridge will have a total of five coats of protective paint, four of them containing basic lead silico chromate. The structural steel is delivered to the site with a wash primer and a shop-applied primer coat of orange silico chromate/alkyd resin paint formulated as follows:

Orange

Pigment	*% by weight*
Lead silico chromate	99.33 min.
Organo montmorillonite	.07 max.
Vehicle	
Linseed Oil	59.0 min.
Alkyd/resin solution	21.0 min.
Non-volatile in vehicle	73.5 min.
Volatile thinner & drier	26.5 max.
Paint	
Pigment	65.5 min.
Vehicle	34.5 max.

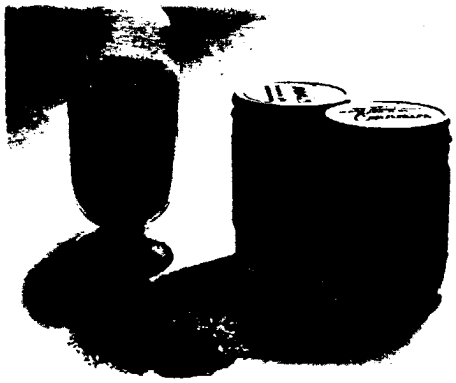
Two field coats of red silico chromate/alkyd resin paint will be applied, followed by the final coat of bright green. Formulations for these coats are:

Red

Pigment	*% by weight*
Lead silico chromate	64.0. min.
Siliceous red iron oxide (85% Fe_2O_3)	35.5 max.
Organo montmorillonite	0.5 min.
Vehicle	
Linseed Oil	18.0 min.
Alkyd resin solution	31.0 min.
Non-volatile in vehicle	71.5 min.
Volatile thinner & drier	28.5 max.
Paint	
Pigment	62.0 min.
Vehicle	38.0 max.

Green

Pigment	*% by weight*
Lead silico chromate	85.0 min.
Phthalocyanine green	2.9 max.
Phthalocyanine blue	1.0 max.
C.P. med. chrome yellow	2.6 max.
Titanium dioxide	8.0 max.
Organo montmorillonite	1.0 max.
Vehicle	
Linseed Oil	5.0 min.
Alkyd resin solution	73.0 min.
Non-volatile in vehicle	55.5 min.
Volatile thinner & drier	44.5 max.
Paint	
Pigment	39.0 min.
Vehicle	61.0 max.



IMPORTANT GUIDELINES FOR THE AMATEUR POTTER

As the public interest in art and hobby pottery grows, so does the danger of improper handling and use of some essential, but potentially toxic materials. The danger exists for the amateur potter himself and for the eventual user of any improperly glazed ceramic piece used for food or beverage service.

Since there can be little control over the use to which the increasing volumes of art and hobby pottery are put, it is essential to spell out the correct procedures for using the potter's materials.

Our concern is lead, one of the most valuable materials used by the ceramist but a material that poses certain hazards if used incorrectly. The primary danger is lead leaching out of the ceramic glaze when exposed to acids contained in some foods and beverages. However, properly formulated, applied and fired, lead fluxed glazes are among the safest and most acid resistant of all.

Why use lead in the first place? Because no element, alone or in combination, will impart all of the desirable properties to a ceramic glaze that lead will. Centuries of experimentation with substitutes have proved this conclusively.

The presence of lead oxide in a properly formulated glaze offers:

- A highly acid-resistant glaze that matures in a lower melting range than leadless glazes.
- A more foolproof glaze. Lead oxide increases the glaze's fluidity during firing and maintains it over a wider firing temperature.
- A low surface tension that allows the glaze to heal over defects in the whiteware more effectively.
- Brilliant glaze surfaces because of the high index of refraction.
- High resistance of divitrification, the process by which the surface crystalizes and makes the ceramic piece porous.
- Color compatibility with most coloring oxides used in art glazes.

Glazed ceramics normally have an exceptional permanency and durability. No glaze made, however, is totally insoluble; so it is possible, given the right conditions, for heavy metals such as lead, cadmium, copper, barium and others used in glazes, to leach. If the glaze has been properly formulated, applied and fired, the quantity that will leach out is so small as to be almost unmeasurable—in the case of lead, less than seven parts per million parts of solution, when tested according to industry and government standards.

Factors that determine the amount of lead that can be extracted from any given glaze include chemical composition of the glaze, ratio of ingredients to one another, glaze thickness, temperature and length of time fired, and kiln atmosphere.

Potters Using Commercial Glazes

Any hobbyist producing ware that may be used with food should use low lead release glazes only. A safe procedure is to make certain that the glaze manufacturer specifies that the glaze can be used for food contact surfaces when fired according to instructions.

Copper oxide must never be added to a lead glaze. The combination results in a reaction that markedly increases lead release. Firing by time alone poses uncertainties that can be avoided. The hobbyist should use standard pyrometric cones when firing; they will insure correct firing time and temperature for a reliable glaze. With low fire glazing normally used by the hobbyist, a thin glaze is usually better. During firing the glaze will react with and dissolve body constituents; they, in turn, strengthen the glaze and make it more acid resistant.

Potters Formulating Their Own Glazes

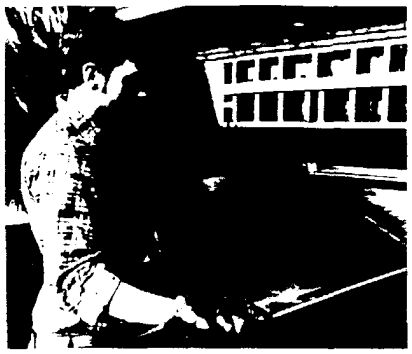
So many glaze formulations have been published for the use of the studio potter that it is impossible to comment on them individually. The Lead Industries Association has available a list of glazes that consistently give a lead release of less than seven parts per million, when fired to the proper cone level.

If any glazes other than these are to be used, they should be tested before they are considered safe for food and beverage applications.

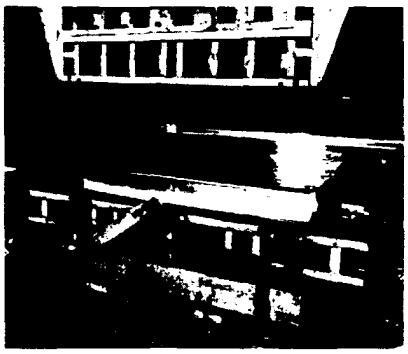
Good Housekeeping

The value of careful housekeeping for the amateur potter cannot be overstated. The handling of materials, dust controls, proper spraying procedures, ventilation controls, personal hygiene . . . all must be considered by the potter. Specific cautions are included in the Lead Industries Association booklet, "Facts About Lead Glazes For Art Potters and Hobbyists" which will be sent to anyone on request.

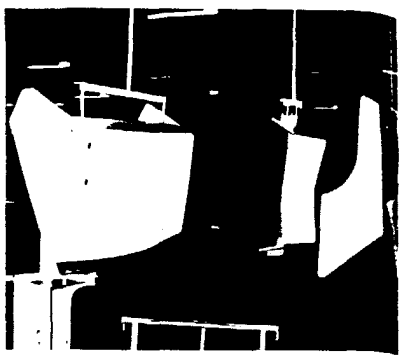
Award-winning Cushman Motors golf cars get their corrosion resistance from terne.



Terne ready to be inserted in press.



Terne part at conclusion of pressing operation.



Terne parts emerging from painting area.

As more and more people flock to the world's golf courses, the need for reliable and attractive golf cars to transport them around the course rises correspondingly. One major manufacturer of golf cars, Cushman Motors, a division of Outboard Marine Corporation, conducted extensive material tests before selecting lead-alloy coated steel (terne) as the most effective corrosion-resistant material for their car bodies.

The golfer's comfort and pleasure are only one consideration in the design and manufacture of a golf car. The economics of running a golf or country club or even a golf course in this time of high service costs mandate among other things, the purchase of equipment that will give maximum service for maximum life. A recent survey by experts in the field indicates that while club revenues are up 4.4% in the 1970-71 period, costs are up 6%.

Traditionally, clubs lease golf cars, usually from a manufacturer's distributor, for a 3 to 4 year period. During that time, the distributor is responsible for any necessary repairs. Upon completion of the lease period, the golf cars are refurbished and leased to a second club for a corresponding period. In all, a golf car should be able to withstand almost 8 years in all kinds of potentially destructive weather.

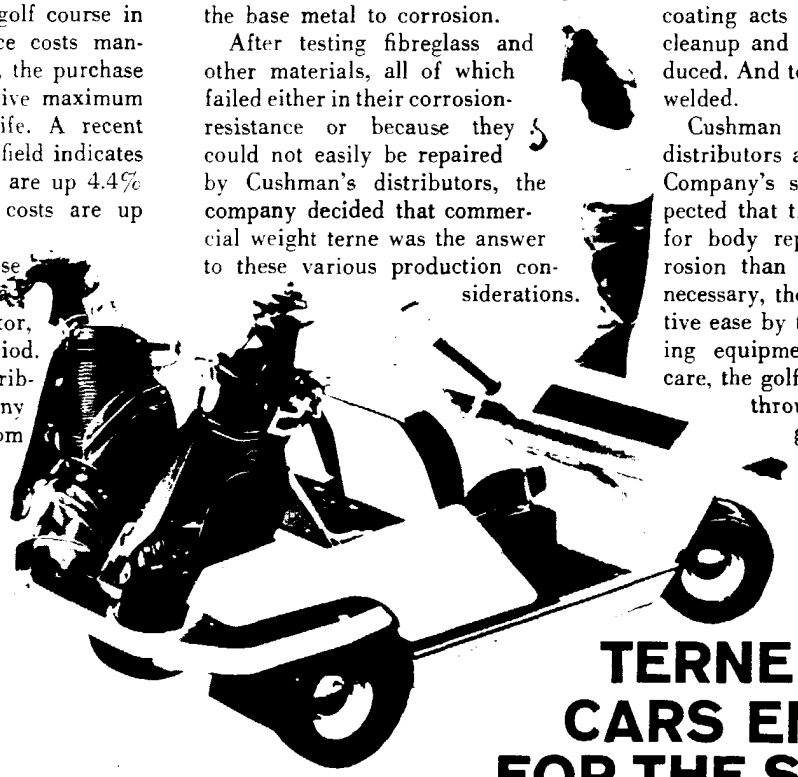
Certain areas of the golf car body are particularly susceptible to corrosion. One of the worst such areas is the coach joint, an inaccessible blind where moisture collects and causes conventional steels to rust. The overall exterior surface of the body is also vulnerable since it is exposed at all times to the elements and the most minor scratch or other abrasion could expose the base metal to corrosion.

After testing fibreglass and other materials, all of which failed either in their corrosion-resistance or because they could not easily be repaired by Cushman's distributors, the company decided that commercial weight terne was the answer to these various production considerations.

Cushman now uses terne for the critical body areas of its complete line of golf cars. In addition to the factors of corrosion-resistance and ease of repair now built into the Cushman golf car line, an important third factor also resulted. The special properties of terne make it able to take and keep a beautiful exterior finish that will hold up even under the duress under which a golf car is normally operated.

Other benefits accruing to Cushman with their use of terne are the ease with which it is formed or deepdrawn. Die life is extended since the terne coating acts as a lubricant. Lubricant cleanup and die dressing costs are reduced. And terne is easily soldered and welded.

Cushman golf car customers and distributors alike will benefit from the Company's switch to terne. It is expected that there will be far less need for body repairs resulting from corrosion than usual. When repairs are necessary, they can be made with relative ease by the distributor, with existing equipment. And with minimum care, the golf car will shine like "new" throughout its career on the greens.



TERNE GOLF CARS EMERGE FOR THE SWINGING 70's

LIA26614

ODDS "N" ENDS ABOUT LEAD

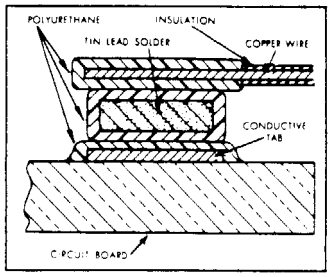
THE CABLE THAT WON'T QUIT

Originally installed under Puget Sound in 1940, this 2-conductor No. 6 cable is still in excellent condition and ready for line service although currently enjoying its second retirement. The cable is insulated with Okonite rubber and protected with a lead sheath and steel armor wire. In its initial service it carried 6600 volts and was raised to 7200 after a period of years. It was retired in 1952 and put on standby by its owner, Peninsula Light Company, Gig Harbor, Washington. In 1968 the installation was converted to three-phase, 13 kv. Pending the arrival and installation of new cable, this veteran cable's two conductors were connected as the neutral and the cable was once again in operation. Thanks in part to lead's resistance to corrosion, this underwater cable may find that life indeed begins again at forty.

NEW FLUXLESS SOLDERING PROCESS

A new fluxless soldering technique that employs a polyurethane coating has been developed by International Business Machines Corporation. The coating which is sprayed or brushed on, or dipped, protects the metallic surfaces from contaminants. The process was developed initially for use in high-density electronic environments where flux residue can trigger corrosion.

Solder and parts to be joined are cleaned, rinsed in deionized water, dried and coated with polyurethane. Once coated, the parts can be stored indefinitely until ready for soldering. Since the polyurethane melts below the melting point of a 60/40 tin-lead solder, it is easily displaced by the heavier alloy at joining temperatures. Rather than decompose, the polyurethane redistributes itself at the joint surface. When the solder solidifies, a metallurgically sound connection is achieved.



WONDER WHERE THE YELLOW WENT?

They may have to rewrite the children's books that persist in identifying fire engines as being red. In fact, Junior may well have to get out a yellow crayon for his coloring book. Although fire engines remain predominantly red, largely because of tradition, recent studies have shown that red isn't necessarily the safest or even the most visible color for fire engines. Chrome yellow, long in use as a highly visible cautionary color for highway dividing lines, traffic warning signs, and school buses, to name only a few applications, has emerged the most desirable color for fire fighting equipment as well. Shown here is an engine belonging to one of two volunteer fire companies in Chesterfield County, Virginia. They have switched from red to chrome yellow because they consider the yellow more visible and therefore safer.

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lead

LIBRARY OF TECHNICAL INFORMATION

NEW LISTINGS

Lead as a modern design material

Design engineering catalog with specifics on lead characteristics, benefits, available forms. Details on lead use as coating, radiation control, sound control, and in soldering, ceramics, etc. Illustrations, tables, graphs. Eight pages. **M-15**

Use of lead in the automobile

Reprint of article from Metals Week discussing in detail the various applications of lead in the automobile. Four pages. **M-17**

Lead—The "Clydesdale" workhorse in space

Reprint from Space World detailing the applications of lead in space exploration. Illustrated. Four pages. **M-19.**

The U.S. Lead Industry—1970

An annual review of activity within the industry that contains a general summary for the year and a series of charts and tables giving current statistics on lead production and consumption. **M-20**

Facts about lead glazes for art potters and hobbyists

Detailed information on the proper formulation, firing techniques, handling, etc. of lead fluxed glazes used by art potters and hobby ceramists. Illustrated. Sixteen pages. **M-21**

ARCHITECTURAL

Waterproofing with sheet lead

A description of the use of lead as a membrane waterproofing material for lining pools, planters, fountains, shower stalls and floors where positive waterproofing is required. Architectural details and specifications are included. Eight pages. **A-2**

Lead roofing and flashing

Detailed instructions on the simplest and most usual methods for forming or joining lead for roofing and flashing applications. Complete specifications. Diagramatic drawings. Sixteen pages. **A-5**

Lead applications for building and construction

Reprint of article from Progressive Architecture reviewing the latest developments in the use of lead in architecture and construction. Twelve pages. **A-10**

PAINTS

Red lead based paint systems

Technical booklet lists properties and applications for twenty-four red lead paint systems. Specific uses, e.g. fresh water, marine, etc. suggested for a wide variety of formulations. Preparation of surfaces discussed in detail. Thirty-two pages, charts. **F-1**

Follow the safety line with chrome yellow

Formulations and suggested applications for chrome yellow safety paints. Illustrated. Eight pages. **M-5**

PLUMBING

Lead plumbing catalog and specifications

Specifications and details for the use of lead in plumbing. Waste connections, shower and safe pans and chemical laboratory drains are covered. Four pages. **D-2**

CHEMICAL CONSTRUCTION & CORROSION PROTECTION

Corrosion resistance of lead in chemical applications

A chart presentation of the corrosion resistance of lead and its alloys against 188 common chemicals from 0° to 300 0°F. Six pages. **H-3**

Lead in modern chemical construction

Reprint from *Encyclopedia of Chemical Process Equipment.* Describes installation, proper design application, and testing of lead linings. Twelve pages, illustrated. **H-1**

Cladding steel with lead by powder rolling

A description of the roll compacting process under investigation by the International Lead Zinc Research Organization. Four pages. **H-4**

BATTERIES

A primer on the lead-acid battery

A condensed story of the principles of the lead-acid battery and its chemistry, including some of the fundamentals and definitions of direct-current electric energy. Two pages. **L-6**

Industrial truck cost calculator

Three nomographs permit estimation of costs for gas vs. battery powered industrial trucks in two or three minutes. Twelve pages, charts and tables. **L-1**

CERAMICS

Classification of inorganic enamels

Description of glass enamels, where they are used, and their composition. Application and firing is also discussed. Six pages. **B-3**

SOUND BARRIERS

Director of acoustic specialties

Summary of available materials for sound insulation by barrier, damping and absorbtion methods. Sixteen page list of materials by brand name and manufacturer. Eighteen pages. **J-4**

Industrial noise—how to control it

Technical data on the causes of industrial noise and information on methods of controlling it. List of control materials available. Graphs. **J-8**

ANTI-VIBRATION PADS

Ways to reduce press vibration

Two installations of lead asbestos pads to reduce heavy machinery vibrations. Sectional drawings and loadings are given. Two pages, illustrated. **G-1**

Lead asbestos anti-vibration pads

Specifics on lead anti-vibration pads including design and sizing, specifications for the sub-contractor, and list of pad manufacturers. Three pages. **G-3**

CABLE SHEATHING

Lead-covered underground cable use increasing

Reprint outlining a major utility's recent experience with lead sheathed underground cable. Details on where this type cable is desirable. Graphs. Four pages. **C-2**

GENERAL

Primary lead production areas in the U.S.

For schools, libraries. 11"x14" map showing locations in U.S. of most lead smelters and refineries, and lead mines. **M-11**

The new lead belt

Reprint of article details operations at the new lead belt in Missouri. Booklet describes activities at four mines, four concentrators and three smelters. Twelve pages. **M-16.**

Publications and films

This booklet lists all the material currently available from Lead Industries Association, Inc. Sixteen pages. **M-13**

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