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LIA26693

I am happy to have this opportunity to extend my congratulations to the Lead Industries Association for your sponsorship of a production model of a battery powered electric delivery van.

At this time, the development of viable alternatives to gas consuming, air polluting motor vehicles is of vital importance to the well-being of our nation and the entire world.

Because of our great population density, the City of New York is deeply interested in any advances made in this direction.

I join with concerned citizens everywhere in awaiting new ways of meeting the energy and pollution crisis. I am expecting a report on this innovation from Transportation Administrator Michael Lazar, who is representing me at the demonstration of your project.

I wish everyone involved in the sponsorship of this new concept continued success in your efforts to encourage and support the realization of new energy-saving ideas.

Sincerely,
Abraham D. Beame
Mayor, City of New York

Lead first among recycled metal

Recycled scrap battery lead is poured into pigs, most of which are used to produce new lead batteries.

On a percentage basis, lead is first among all metals in recycling. Recycled lead produced by the secondary industry accounted for at least 610,000 tons in 1972, according to the U.S. Bureau of Mines. Total U.S. production of pig lead during 1972 was reported to be about 1,577,000 tons. In previous years, before U.S. mining operations were expanded, secondary lead production exceeded domestic production of primary lead.

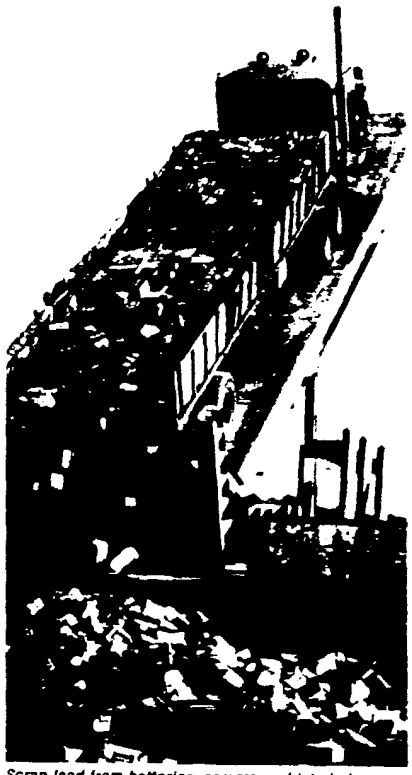
Lead scrap is unique in that most of it comes from batteries, which require more lead than any other end-use application for the metal. Approximately 65% of the lead produced by the secondary lead industry in 1972 came from scrapped batteries and this percentage is expected to increase.

It is estimated that at present, well over a million tons of lead—which can be compared to a huge, above-ground mine—is in the recycled lead inventory. A million ton lead inventory seems like a huge amount until one considers the millions of batteries being produced for new cars each year, and the fact that automotive batteries are replaced about every three to four years. This insures a continued availability of the major source of supply for the secondary lead industry and it helps conserve ore reserves.

Added to the number of passenger car batteries are the nearly 6.6 million nonhighway vehicle batteries produced during the same period. Such batteries are used in (1) materials handling equipment such as forklift trucks and similar types of vehicles, and (2) in farming and construction equipment, lawn and garden tools, boats and ships, recreational vehicles such as golf carts and snowmobiles.

Adding to lead's advantages as far as availability is concerned, is the fact that it can be continuously recycled. In fact, most of the lead that is recycled comes from "old," or previously recycled scrap. According to the U. S. Bureau of Mines, the ratio of old scrap vs. new scrap during a recent 10-year period was 80% old and 20% new.

The continuing growth of the secondary lead industry can be seen by examining production figures spanning the 10-year period beginning in 1958 when 402,000 tons of secondary lead were recovered. By 1968, the figure had reached 550,000 tons—148,000 more than ten years earlier. An even more dramatic growth rate was achieved from 1968 to 1972 when secondary tonnage increased 145,000 tons. Each year of increased secondary lead production has been marked by a corresponding increase in battery production and increased use of scrap batteries.



Scrap lead from batteries, compressed into bales, are dumped into an open storage pit to await recycling.

Some secondary lead producers obtain as much as 80% of their scrap from batteries. They usually arrive in 40,000 lb. truck loads which consist of about a thousand average-size batteries. After unloading, the tops of the batteries are cut off by a guillotine and the lead plates are removed and stored in huge piles to await refining.

Refined lead is assayed to determine its exact alloy content. The lead is usually molded into pigs and, more often than not, the pigs are shipped directly to a nearby battery manufacturer who depends on recycled lead for most of his supply. Thus the lead once again enters the recycle market.

In addition to use for batteries, recycled lead and lead alloys are refined for use in tetraethyl lead gasoline additives, and for ammunition, caulking lead, cable covering, foil, die castings and lead type. Some of these end uses, particularly foil, lead type and cable covering, also are sources of lead scrap.

Refinery solves major noise problems with lead sheets

Complying with Occupational Safety and Health Act (OSHA) noise control regulations can be a major problem for large installations such as chemical plants and oil refineries. Modifying huge, complex plant equipment for such installations often involves sizable expense and considerable downtime for the equipment and a subsequent decrease in overall plant production.

However, one major East Coast refinery has demonstrated that the huge task of modifying process and industrial equipment can be accomplished without disturbing the normal plant schedule. The refinery installed a combination of sheet lead, glass fiber and aluminum on equipment. The result: noise levels were reduced to well within OSHA limits, and plant operations continued undisturbed.

The acoustical consulting firm of Donley, Miller and Nowikas, Upper Montclair, N.J., was engaged to pinpoint plant equipment noise problem areas and to design solutions. Their study revealed that gearboxes, blowers, steam chests and some sections of the giant pipe network within the plant were the primary sources of noise. Corrective action called for shrouding the noisy equipment in thick layers of glass fiber and thin layers of sheet lead, and then jacketing the noise shroud in heavy-gauge aluminum.

In order to modify the gearboxes, anchor pegs were bonded to gearbox casings to support the 1.5—2-in. thick fiberglass layer. Bonding was chosen over welding since the latter might have created a spark hazard in an area where large volumes of flammable materials are processed.

Parkway Insulation Company, Hackensack, N.J., installed the 3 and 6 lb. per cubic foot (pcf) fiberglass and then covered it with sheet lead. Generally, 2 lb. per sq. ft. (psf) (.0312-in. thick) of the sheet lead was used although some 1 psf (.0156-in. thick) sheet lead was also utilized on other parts of the equipment.

Sound attenuation of such parts as valve handles and gages was accomplished by adding silicone rubber and aluminum sliding doors. Silicone rubber added to the valve handles and sliding aluminum doors covering them eliminated potential sources of noise. Similar doors combined with clear plastic were installed around gages.

Enclosures for the blowers were of a different construction from the gearboxes and steam chest housings. Blowers were first layered with glass fiber and sheet lead, then encased in sound-insulated outer panels of aluminum, lead and glass fiber. Movable panels permit easy access to the equipment when required.

Additional work is to be acoustically treated by wrapping equipment piping in glass fiber, sheet lead and aluminum jacketing.

According to the refinery, the cost of the job was "under $10,000 for the large blower housing, and under $6,000 for the gearboxes". Sound attenuating materials were installed by Bulldog Drummond Insulation Accessories, Inc., Bellmore, N.Y.

Sheet lead, glass fiber and aluminum reduced sound levels near this blower by more than eight decibels.

Gearbox noise was reduced to levels permitted by OSHA.

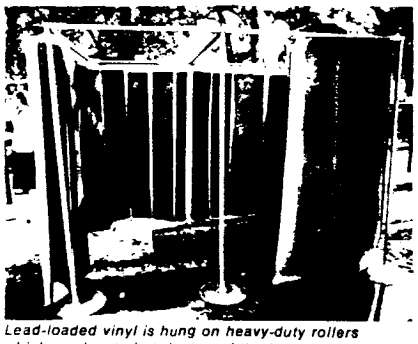
Noise problem areas such as this large steam chest were pinpointed by the acoustical consulting firm.

Street construction sites silenced by sound enclosure

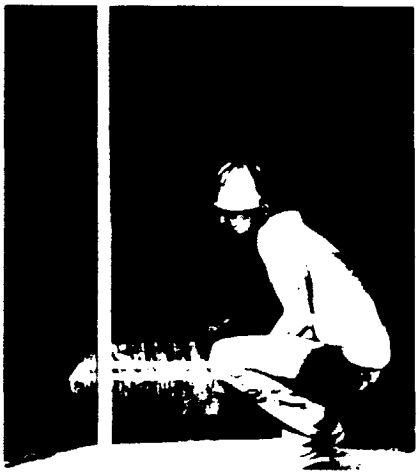
Ever walk down a city street and wish you had ear plugs to block out the high-pitched noise coming from a street-level construction site where a utility was installing water, gas or telephone lines?

Such an incident may soon be a thing of the past if experiments conducted by noise control engineers of the Department of Environmental Control of the City of Chicago continue to prove successful. The engineers collaborated with Singer Partitions, Inc., Chicago, one of the nation's leading manufacturers of noise control products, to test a prototype noise control enclosure for utility installation and maintenance sites. The approach taken was to surround street-level construction operations with sound reducing curtains so that noise could not annoy people in the area. Such installations also permit construction and maintenance work to be undertaken without having to worry about violating municipal noise codes that almost every city has in effect.

According to Singer Partitions, the utility construction site noise enclosure was designed to combine portability with simplicity of erection and maximum noise abatement. A key element of the noise control system was a lead-loaded vinyl curtain wall suspended from a four-sided framework of heavy duty track that surrounds the construction site. Free-standing columns support the overhead track containing steel ball bearing rollers which allow the curtain to move freely. The curtains are segmented so that they can be easily stored for transporting from one site to another. Men and equipment can move through the front, back or side openings as desired. A roof section, also comprised of lead-loaded vinyl, was placed over the top of the enclosure to insure a tight, noise-reducing system.



Lead-loaded vinyl is hung on heavy-duty rollers which are located at the top of the framework.



Workmen inside the noise enclosure cut a 12-in. diam. ductile water pipe.

Engineer from Chicago's Department of Environmental Control checks noise level outside the enclosure while workmen cut water pipe.

The Chicago noise control experiment was carried out at a site on the city's well-known North Clark Street. A several-mile-long section of the street was being excavated to install a water main to service the numerous high-rise apartments that have been built in the area. Noise was so bad that the city was receiving numerous complaints and the decision was made to experiment with the noise control enclosure.

Lead-loaded vinyl selected for the prototype enclosure was $\frac{3}{4}$ lb. psf density backed on the inside face with acoustical foam. The enclosure, 9 ft. long, 7 ft. high and 6 ft. wide, was produced at a cost of approximately $2,000. According to Singer, it was installed by two men in 45 minutes.

To test the enclosure, workmen from the city's water department cut through a 12-in. dia., $\frac{1}{2}$-in. thick ductile iron water main using a gasoline-powered cutting saw. Engineers measured sound pressure levels at various distances from the site during the test. They determined that at 10 ft. from the site, the cutting operation resulted in a 97 dB(A) reading without the enclosure. A 12-decibel reduction, to 85 dB(A) was realized with the leaded vinyl curtain in place.

City engineers expressed satisfaction with the test and added that the enclosure system is an effective means of reducing construction noise for operations such as pavement breaking and repairing and installing metal pipe. They also commented that the 12-decibel reduction could also be expected in similar situations.

PLZT: From transparent to opaque in a split second

Enlarged view of a lab prototype PLZT wafer used as a computer input information device shows electrodes (black areas) which are used to activate the array of small light gates in the ceramic.

PLZT may one day become a household word as familiar as the initials of International Business Machines — IBM. PLZT stands for lanthanum-modified lead zirconate, lead titanate and when this combination is baked it forms a transparent ceramic. When charged with electricity, the ceramic makes a split second change from its original transparency to an almost jet black opaqueness.

The PLZT concept has been used at Sandia Laboratories, Albuquerque, New Mexico, to develop three devices—nuclear flashblindness protective goggles, protective windows for aircraft and a computer input information device that can transmit up to 5 million bits of data per second. These devices are being developed under various military contracts, but their spin-off into commercial applications shows promise for a wide variety of uses. They include safety goggles, optical shutters for high-speed cameras, and protective systems for light-sensitive equipment. Research is also underway to use the PLZT concept to develop high-resolution image storage devices for slow scan and possibly television scan rate displays.

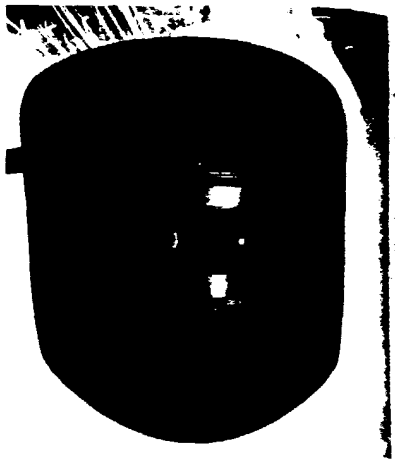
PLZT ceramics are generally made by starting with the individual raw material oxides, which are as small as 3 microns in size. Depending on the applications concerned, PLZT's typically contain from 55 to 70 per cent lead. The oxides are hot pressed at elevated temperatures in a furnace. The raw slug is then cut into thin slices, which are polished and annealed. The addition of lanthanum, a rare earth metal, to lead zirconate titanate, provides the ceramic with its transparency.

A thin slice of the PLZT is sandwiched between two crossed polarizers of material similar to that used for polarized sunglasses. Virtually no light will pass through this sandwich until an electrical voltage is applied to metallic electrodes on the surface of the ceramic.

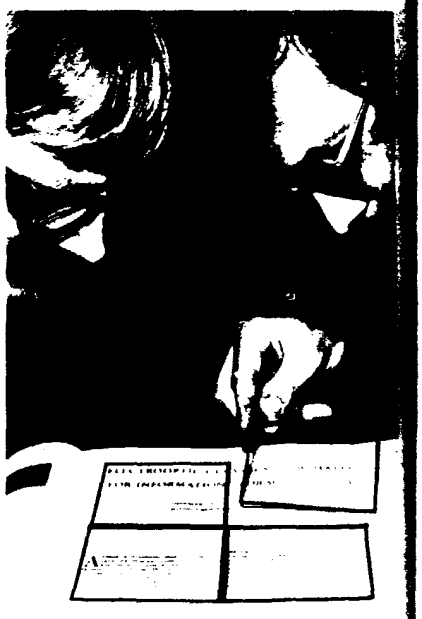
The electrodes are thin, parallel strips about two one-thousandths of an inch wide and separated by gaps of about 40 one-thousandths of an inch. A voltage applied to the electrodes switches microscopic areas in the ceramic, altering the light and enabling it to pass through the second of the crossed polarizers. When the voltage is removed, the ceramic returns to its normal unswitched state and the second polarizer again blocks the passage of light.

Using the nuclear flashblindness protective goggles as an example, it is easy to see how the PLZT ceramic is used for various applications. For military use the goggles are designed to furnish the wearer with an "electronic blink" which cuts off the peak brilliance of eye-damaging nuclear flashes. The PLZT in the glasses permits them to switch from transparent to opaque (with a transmission of 0.01 per cent) within 50 microseconds. The glasses return to the transparent state when the light levels drop to a non-hazardous level. When the battery system being developed for the glasses is fully miniaturized, it will displace less than 2-cu. in. and weigh about 2 oz. The industrial spin-off version of the goggles, which can be used in welding and other metalworking applications, incorporates a "dial-a-shade" circuit that permits the wearer to preselect the level of light transmitted through the lens. These goggles have about the same size of power supply as the nuclear flashblindness version.

PLZT was invented by Dr. Gene H. Haertling while at Sandia Laboratories, Albuquerque, New Mexico. Sandia is a prime contractor to the Atomic Energy Commission, and is engaged in research and development on nuclear weapon ordnance. Dr. Haertling left Sandia last year to form Optoceram, Inc., a company which produces and sells the PLZT ceramic.



PLZT section of welder's mask at left shows lens activated in "on" (transparent) position, while right view shows "off" (nearly opaque) condition.



3 x 4-in. wafers of PLZT will be used for flashblindness and thermal burn protection in aircraft window segments.

Grand old lady of bridges gets a new coat of paint

Dramatic view of upper level of bridge before painting.

There are countless jokes about the big-time operator who sold the Brooklyn Bridge, but when it comes to painting John Augustus Roebling's historic structure, it's not a joking matter. Fact is, it takes a 20-man crew two years to do just that.

Roebling's "grand old lady" has just turned 90 and, as a birthday present, the Transportation Administration of the City of New York is now giving the old gal a new multiple coat of paint . . . some 10,000 gallons of it in fact. To insure that corrosion resistance requirements for the bridge's multiple-coat paint system were met, a basic lead silico chromate pigment whose low tinting strength makes just about any color possible was used. The pigment, which meets ASTM designation D-1648, also provides the required durability and weather-ability required for the bridge's paint system. It must be able to withstand aggressive attacks from the salt-laden marine environment — the bridge crosses New York's famed East River, which connects both with Long Island Sound and New York Bay; and the bridge is subjected to corrosive attacks that are common to all urban industrial environments.

Brooklyn Bridge is being painted with a specially formulated, multi-coated system that was developed for use on bridges that span water and are located in industrial areas. Amsterdam Color Works, Inc., The Bronx, N.Y., is supplying the paint for the bridge. The key element that gives the paint system its corrosion resistance, long life and ability to retain its "just painted" good looks for many years is its high lead content.

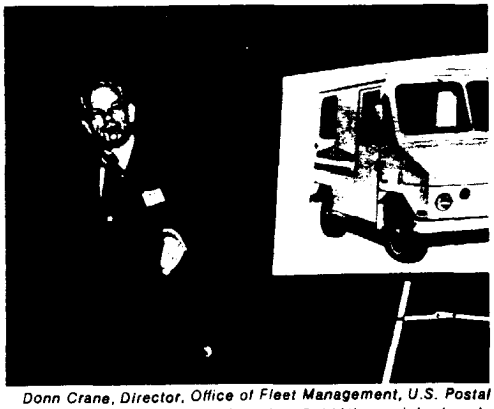
Vertical cabling of Brooklyn Bridge was painted silver.

The first step in painting the bridge was to remove as much as possible of the old, peeling paint from the structure. To accomplish this, the vertical posts of the truss system were sand blasted while the remainder of the bridge—the cables, etc., were hand-cleaned.

One unusual aspect of the paint system for the Brooklyn Bridge is the fact that it was selected by the New York Landmark Preservation Committee. The bridge has been designated an official landmark of the City of New York and, for that reason, the New York City Transportation Administration specified that the same colors be used as those specified by John Roebling when he designed the bridge 90 years ago—medium brown for the steel undergirdings, tan for the main catenary cables, and silver for the vertical cabling. Thanks to lead, the bridge will look just the way it did when it opened on May 24, 1883.

GOLIATH program accelerates acceptance of electric vehicles

(L) Senator Hubert Humphrey discusses GoLIAth with (C) Paul R. Hafer, Chairman of Battronic Truck Corp., manufacturer of the vehicle and, (R) Michael Kielar, representative from LIA, during electric vehicle demonstration in Washington, D.C.



Donn Crane, Director, Office of Fleet Management, U.S. Postal Service, was principal speaker when GoLIAth was introduced at the Plaza Hotel, New York City.

(L) Connel Baker, LIA representative in charge of GoLIAth project, (C) Donn Crane, Director, Office of Fleet Management, U.S. Postal Service, and (R) Philip E. Robinson, Executive Vice President LIA, discuss the vehicle at LIA's exhibit at the Third International Electric Vehicle Symposium held in late February in Washington, D.C.

Lead Industries Association has launched a major promotional campaign to demonstrate the capabilities and economics of lead acid batteries to power multi-stop, short-range work vehicles. A key element in the program is GoLIAth, a battery powered delivery van LIA introduced earlier this year in New York City.

GoLIAth will be used in an extensive, multi-city program, in the United States and Canada, to demonstrate the effectiveness of battery powered delivery vans for a wide variety of multiple-stop, short range services. The vehicle is featured at the Association's annual meeting in early April at the Drake Hotel in Chicago. It already has completed two successful demonstration programs in the New York City metropolitan area and it is slated for additional projects in major U.S. and Canadian cities. Future uses will be similar to the two already completed.

Mr. Donn Crane, Director of Fleet Management, U.S. Postal Service, was the featured speaker at the GoLIAth introduction and he stressed his organization's keen interest in electric vehicles. The U.S. Postal Service is conducting continuing tests of battery powered mail and parcel delivery vehicles in five U.S. cities to determine their effectiveness in a variety of terrain and weather conditions. Mr. Crane specifies what this interest could mean if the tests continued to be successful. Based on data from tests at Cupertino, Calif., one of the cities where electrics are being tested, the U.S. Postal Service has ordered 350 vehicles. Providing these vehicles and those still under test continue to operate successfully, Mr. Crane says, "Our next purchase could be sizable indeed . . . perhaps 1,000 this year and as many as 5,000 in 1975." He also added that the U.S. Postal Service alone represents a potential market for 93,000 additional electric vehicles. Still another target for electrics would be the nearly 100,000 vehicles the U.S. Postal Service leases from private industry as well as the operators of fleets of pick-up and delivery vehicles such as telephone, gas, electric and water utilities.

In his address at the introduction of GoLIAth, LIA Executive Vice President, Philip Robinson, said, "Our goal is to further demonstrate the economic, environmental and energy conservation advantages of lead acid batteries to power short haul vehicles used for a wide variety of purposes. Lead acid battery powered vehicles are more economical to operate than vehicles powered by other sources; they use no

energy while standing or waiting at traffic signals, and they significantly reduce noise levels in city streets." He added that such vehicles also have the advantage of being recharged during off-peak or nighttime hours when electric energy demand is at its lowest. Just as important, electric vehicles that provide services for which they are best suited—multiple-stop, short-haul deliveries—can play an important role in helping to solve the current shortage of fuel needed for internal combustion powered vehicles.

GoLIAth is the first of a series of production line electric work vehicles being produced by Battronic Truck Corporation, Boyertown, Pa. The company is one of four electric vehicle manufacturers that have produced delivery vans for the U.S. Postal Service's tests. Battronic also is producing more than 100 electric work vehicles for use in a nationwide battery vehicle demonstration program sponsored by the Electric Vehicle Council and 55 electric utilities. They will use the vehicles for the same purpose as their conventionally powered vehicles—for meter reading, to transport maintenance and repair crews, and to carry personnel and cargo.

GoLIAth is powered by 112-volt lead acid batteries that can operate the vehicle for 20 miles at a minimum of 50 mph or for 50 miles at a minimum speed of 20 mph. Such speeds and ranges are well within the requirements for a typical multiple-stop, short-range vehicle performing tasks such as intra-city delivery services. An auxiliary 12-volt battery provides power for windshield wipers, lights, etc., and it is continuously charged from the main lead acid batteries. The vehicle is 145-in. long, 78-in. wide, 92-in. high and can carry 160-cu. ft. of cargo.

If programs GoLIAth has been involved in thus far are any indication of what can be expected to happen during the rest of the year when the exceptionally busy schedule for the vehicle is being implemented, it won't be too long before virtually every major segment of American industry, commerce and government are aware of the capabilities of lead acid batteries to power short-haul, multiple-stop delivery vans. For example, shortly after GoLIAth's introduction, the vehicle was evaluated by N.Y. Telephone for determining the effectiveness of electrics for carrying a variety of personnel involved in installing and maintaining the city's vast telephone network.

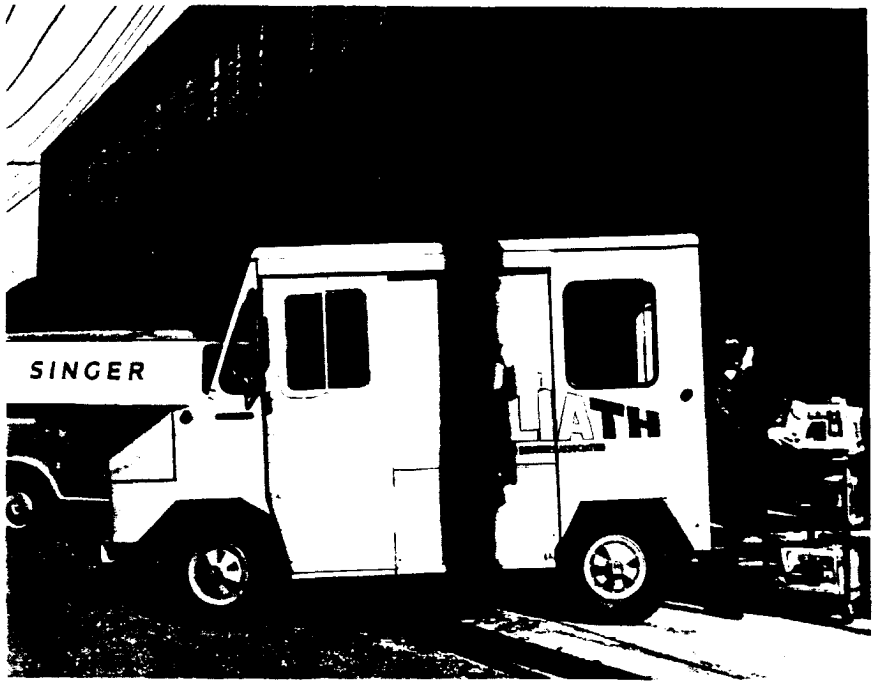
GoLIAth participated in the Third Electric Vehicle Symposium in Washington, D.C. from Feb. 19-21. The vehicle was one of the highlights of electrics on display. During the three-day event, hundreds of industry and government officials discussed the vehicle's potential with LIA representatives and many had their first ride in an electric. Government officials who took an active interest in GoLIAth included Mr. Donn Crane of the U.S. Postal Service, who was principal speaker when the vehicle was introduced in New York; and a large number of utility industry spokesmen as well as officials from many commercial and industrial companies who are interested in the possibilities of electrics.

A major event of the Symposium was an electric vehicle cavalcade to famed "Capitol Hill" where a number of commuter cars, a bus, a miniature "police car", and other examples of battery powered vehicles now available, joined GoLIAth in an open air exhibit at the foot of the U.S. Capitol stairs. Among those who viewed the vehicles and took a close, personal interest in GoLIAth, were Senators Muskie, Humphrey and McClure. Senator McClure was principal speaker when the Symposium opened on Feb. 19 and he rode an electric vehicle from the U.S. Capitol Building to the Sheraton Park Hotel, where the event was held.

In order to demonstrate the effectiveness of GoLIAth in wintertime conditions, the vehicle was placed in test service with the Singer Company for a three-week period beginning in late February. The vehicle operated out of the company's Mt. Vernon, N.Y. Service Center, which provides sewing machine pickup and delivery repair service for the company's list of nearly 1,200 schools and penal institutions, and 48 retail stores carrying Singer Sewing Machines in areas of Westchester County, Long Island and New York City.

The Singer Service Center in Mt. Vernon is typical of the hundreds the company has all around the country, and it is also typical of home appliance repair centers established by many other companies. The Mt. Vernon Singer Service Center maintains a total of seven delivery-type vans that might well be battery powered electric vehicles. During the experimental winter-time pickup and delivery demonstration in cooperation with Singer, GoLIAth made as many as 12 pickup and delivery trips a day and averaged about 50 miles per day.

A wide variety of other test and demonstration projects are planned for GoLIAth during the rest of 1974. These include delivering newspapers, flowers, bakery products, laundry and similar products, as well as transporting maintenance and repair crews. In addition, GoLIAth will be exhibited at the joint Lead Industries Association/Zinc Institute Annual Meeting at Chicago's Drake Hotel on April 3-4, and at Booths 556-558 during Fleet Week 74, June 17-21 at McCormack Place in Chicago.



Singer Company, which used GoLIAth for sewing machine repair pickup and delivery service between its repair facility in Mt. Vernon, N.Y. and the company's institutional customers and retail stores in the New York City metropolitan area, is typical of the electric delivery van demonstration projects that will be undertaken this year by LIA.

Terne-coated stainless gaining acceptance by architects

Stainless steel, terne-coated or covered on both sides by an 80% lead, 20% tin alloy, is rapidly gaining favor among architects and construction material specifiers. A 304 nickel-chrome "dead soft" stainless steel, the material is known by its initials—TCS—and it is particularly suitable for a wide variety of exposed architectural applications.

While the terne can be used for most flashing and fascia applications, it is being increasingly specified for roofing applications designed to provide a bold, contemporary look in modern architecture. Because the material is easy to form and bend in the dead soft condition, it can quickly and economically be formed into a wide variety of roofing designs—such as standing, batten, Bermuda and flat locked seams that are among the most popular patterns.

Produced by Follansbee Steel Company, TCS has been specified for and installed on such significant structures as the State Hospital in Buffalo, N.Y.; the Andrew Jackson Hermitage House in Nashville, S.C.; LaSalle College in Philadelphia; the Chicago Circle Campus of the University of Illinois; and a number of outstanding private residences.

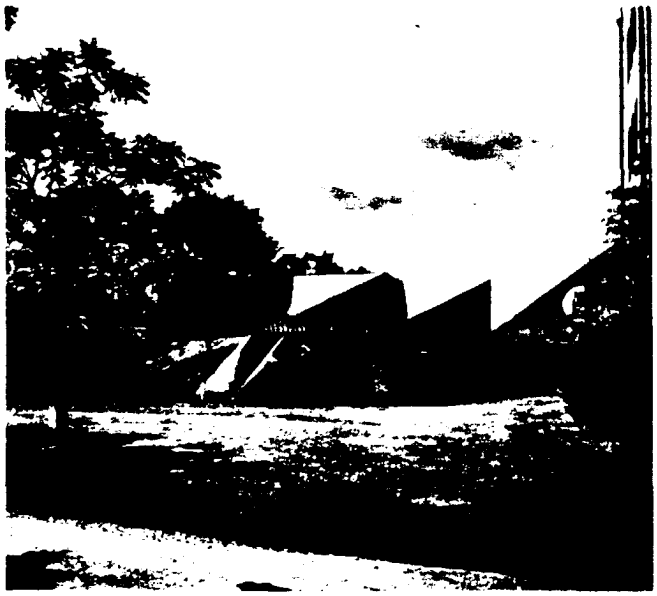
Although introduced only five years ago, the technique of coating steel with terne to protect it from corrosion has been in use for several hundred years. For example, the roof of the Yale Faculty Club in New Haven, Conn., has been in use for nearly 200 years without a major repair and some of the nation's most historic buildings—among them Monticello and the original Smithsonian Institute—have terne roofs.

One particular advantage of terne-coated stainless steel is that it does not have to be painted. The material has the ability to "paint itself" as it weathers in the atmosphere without danger of unsightly discoloration or staining of surrounding surfaces. This is possible because the high lead content in the terne coating helps turn it a soft, gray color that is both predictable and architecturally attractive.

Another advantage of coating stainless steel with terne is that it permits a solder-joining of roofing components without the need of pretinning or special preparation that is required to avoid post-soldering corrosion problems that can occur when stainless steel is solder-joined. Only a rosin flux is required for soldering, thus the need for subsequent neutralization of the highly corrosive flux ordinarily used to solder stainless is thereby eliminated.

The terne coated stainless is manufactured by a unique process which creates a tin-iron alloy at the surface of the stainless steel with the tin actually penetrating the basic metal. As a result, the lead-tin terne coating cannot peel, flake or be completely removed by any scraping process.

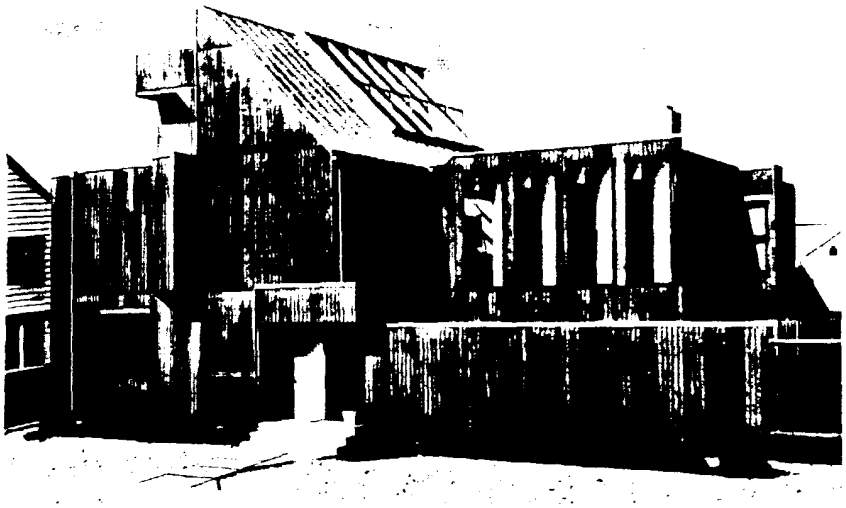
It is also anodic to the stainless, protecting the latter by galvanic sacrificial action. This is extremely important in areas close to salt water or where high atmospheric corrosion is present. Furthermore, when the coating is entirely removed at certain points that have been spot-welded, independently conducted laboratory tests show that there is no deterioration of the metal even after exposure for a thousand hours in a salt-spray cabinet.



The St. Benedict Abbey Chapel in Benet Lake, Wisc., shows how TCS can be used to achieve a dramatic effect for the roofing and siding of religious architecture.

The use of TCS provided one of the architectural highlights for the three-tier roof of a group of buildings designed for the New York Bar Association Center, Albany, N.Y.

Photo courtesy of Conde-Nast Publications, Inc.



Sheet lead was selected for the steeply-pitched roof of this house in Atlantic County, N.J.

The Gloucester Hotel, West London, where lead adhesively bonded to hardboard is used for roof fascia and to cover a rooftop mechanical penthouse.

New architectural applications for sheet lead

Current developments in the United States and England indicate the increasing variety of uses being made in architectural applications involving sheet lead for exterior roofing, siding and fascia of hotels, apartment blocks and private residences. The sheet lead is being used both as the primary architectural material and as the exterior of combined material panel systems.

One of the most dramatic uses of sheet lead was specified by Philadelphia architects Louis Sauer Associates. The sheet lead was used for the steeply pitched roof of a boldly contemporary house near the shore in Atlantic County, N.J. that soars above its neighbors to provide a third-story view of the ocean. Sheet lead was selected because it provides the combined corrosion resistance needed near the ocean with the aesthetic need for a clean plane for the steeply-pitched, skylighted roof. In addition, the standing seam of the roof design echoes the vertical lines of the textured plywood siding of the house. Approximately 300 sq. ft. of 24-gauge (1 psf) sheet lead was used for the roof.

Meanwhile, in England, a recently introduced technique of adhesively bonding sheet lead to hardboard is gaining quick acceptance for the roof fascia of hotels, apartment buildings and offices. Developed as the result of a research project conducted by the International Lead Zinc Research Organization in England, the concept also has potentially wide application in the United States since a wide variety of sheet lead fabrication specialists are capable of producing the panels.

The primary objective of using sheet lead bonded to a substrate is to decrease the total weight of material required to cover a given area and to eliminate "oil canning"—wavy lines that almost always can be seen in installations involving sheet metal that is not supported by being bonded to a rigid material. An added advantage is that in many cases, sheet lead bonded to substrate material can be installed at prices that are competitive with such materials as copper, stainless steel and other exterior materials frequently specified for roofing, siding and fascia.

While copper and other materials have been successfully bonded for use in exterior applications, it was only recently that techniques were developed to successfully bond thin sheet lead to a substrate such as hardboard. A key to the success of the bonding technique is the use of a special neoprene-base adhesive bonding agent that will perform satisfactorily in a variety of weather and temperature conditions that are typically found in exterior architectural applications.

A typical exterior face panel utilizing the adhesive bonding technique consists of ¾ in. hardboard bonded to 2 or 3 psf sheet lead (1/32-in. or 3/64-in. thick) with either a textured or rolled finish. The panels are factory faced and are supplied with projecting flanges for on-site joining. A vapor barrier is provided on the interior face of the panels, which can be joined end-to-end to make up greater lengths than the 5′ 4″ standard lengths now available.

Current examples of lead adhesively bonded to hardboard include the Gloucester Hotel in West London, where they are used for roof fascia and to cover a rooftop mechanical penthouse; the Runneymede Hotel, located near the site where the Magna Charta was signed; and for the roof fascia, and adjoining top floor window overhangs and mechanical penthouse sheathing of a new office block on Baltic Street in London.

Sun and wind

Energy from the sun or wind, stored in lead acid batteries, may soon be providing electricity to light and heat homes and to run major and small appliances.

A system to convert sunlight into electric energy for residential dwellings is in use and plans are underway to install a wind-generated electrical power source in another home.

These prototype homes are a direct result of the energy crisis which has prompted a search for new alternatives to fossil fuels as a source of electricity and heat. Solar energy—converting the sun's rays into usable energy—appears to be one of the leading candidates at this time to augment fossil fuels and there are estimates that such systems could be widely used by 1980. Solar energy is abundantly available and can be converted directly into electricity and heat.

According to some projections, solar energy could supply up to approximately 15 per cent of the country's national energy needs—more than is currently supplied by hydro-electric and nuclear power plants combined. Just as important is the fact that solar power also can produce more energy than that provided by current oil imports from all foreign countries. The use of solar energy for residential dwellings is only a small part of the proposed use of this natural resource. Solar scientists indicate that approximately 20 to 60 per cent of the energy now used for homes could be saved if most of the housing in the United States were heated wholly or in part by solar energy.

The basis for converting solar energy into heat and electricity is the installation of solar conversion systems. These systems vary. One involves circulating water to be heated by the sun's rays and then stored for later use in insulation. Another exposes inexpensive salt hydrates to air warmed by the sunlight, which melt by the action of the sun's heat and then condense at night and give off the stored heat. These systems would provide supplemental electrical and thermal energy from solar inputs in amounts varying up to 80 per cent of the total power demand, depending upon geographical location. They would operate in conjunction with local power utilities which would supply the balance of power when needed. Solar conversion systems would alleviate a sizable amount of the power drainage during hours of peak demand. They would also offer the possibility of power-on-demand during power emergencies by overriding the internal system, disconnecting the house from the utility, and work from a reserve of energy stored for that specific purpose.

SOLAR ONE house at Newark, Delaware. Small shed to right of house contains batteries for energy storage.

Energy reserves can be stored in a number of ways. Lead acid batteries constitute one of the simplest, most dependable and readily available means of storing energy for future uses. They also possess the unique ability of being able to deliver large amounts of energy quickly in a short period of time, or small amounts of energy over long periods of time.

Lead acid batteries are currently being utilized for energy storage in SOLAR ONE, an experimental solar home built by the University of Delaware's Institute of Energy Conversion (IEC), in Newark, Delaware. This house is the first such structure that incorporates a system for directly converting sunlight to both heat and electricity for domestic use. Dr. K. W. Boer, Director of the Institute, is responsible for both the concept of solar conversion systems developed for the house and for the construction of SOLAR ONE. It incorporates the use of 20, 12-volt, 80-ampere hour lead acid batteries.

SOLAR ONE was built to collect data on the use of solar energy in solar conversion systems as a supplement to conventional energy sources. Such data will also provide a basis for further study of solar conversion systems for future residential dwellings.

The 1500 sq. ft., two-level structure has been designed to obtain a substan-

Interior view of shed containing batteries. A total of 20 lead acid batteries are used to store energy.

tial proportion of its heat and electricity from sunlight. The remaining energy needs, which are expected to be required on very cloudy or overcast days when solar energy cannot be used, will be obtained from the Delmarva Power and Light Company, Delaware's public utility which is cooperating in the experiment.

SOLAR ONE's roofline is set at a 45° angle to the horizon. A skylight set into the roof protects the solar cells, which are installed in 4-ft. x 8-ft. panel sections.

SOLAR ONE has 24 roof incorporated solar collectors. Six vertical south wall collectors are available for additional cool weather heat gathering capacity. All collectors are used to gather heat energy from the sun. Three of the roof collectors act as combination thermal/electrical generators through the use of Cadmium Sulfide cells mounted on top of the thermal collection plate.

Electricity generated by the cells is stored in the lead acid batteries and thermal energy used for heating and cooling, is stored in eutectic salts. During winter months, solar energy will liquify the 120°F eutectic salts, thus storing heat of energy fusion. During times when cooling is needed, a heat pump is run during night hours to freeze the 50°F salts, thus providing a reservoir for cooling.

The direct current generated by the solar cells will be used to power lights, clothes dryers and the kitchen stove. When an inverter is installed to convert the direct current to alternating current, most all of the motor-driven appliances in the house can be tied into the solar power system.

Future plans call for the house to be connected to the Delmarva Power and Light Company during the night and morning hours for charging depleted storage systems. During hours of peak power demand, the house may be disconnected from the utility grid and the energy stored in the lead acid batteries is used until a minimum charge of 40 per cent or the end of the power peak demand is reached (approximately 9:00 P.M.). At this time the house is reconnected to the utility grid.

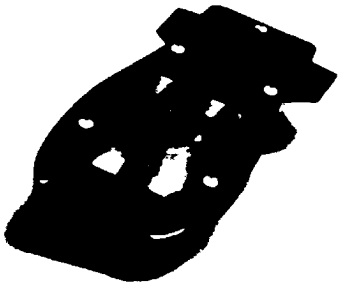
The Pittsburgh, Pa., architectural firm of Burt, Hill Associates, has designed a second prototype home that utilizes solar energy. Designed for Mrs. A. N. Wilson, Chief of Information Services for the National Parks Service, the home will be in Shanghai, W.Va. The demonstration house will be initially solar heated and then eventually solar cooled. Water will be used as a heat storage medium. Plans also provide for the inclusion of photovoltaic cells and a wind generator for producing electricity which will be stored in lead acid batteries.

According to Burt, Hill Associates, the house has been designed for maximum utilization of solar energy. Approximately 81 per cent of the required heat will be supplied by the sun, while the balance will be supplied by oil stored on site.

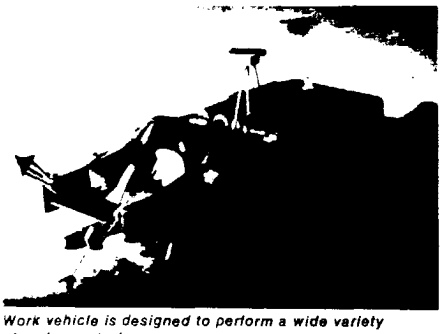
The thermal system operates from two storage tanks—one 2,400 gal., the other a 400 gal. tank. During cold weather the smaller tank is held between 135°F and 150°F—the large one, above the 90°F mark. Should the temperature of the large tank fall below 90°F, a pump draws hot water from the small tank. And should the temperature of the small tank fall below 135°F, a thermostat turns on an oil-fired auxiliary heater. During the cooling season and following the installation of air conditioning, the small tank will be held at 180°F.

The heat transfer medium consists of a mixture of ethylene glycol in water which is pumped to the roof where it gets heated and then flows into the tanks. This mixture is pumped through a coil where a fan moves cool house air across the coils to heat it and return it to the living areas. A variable speed motor drives the fan from 660 to 1600 cfm depending on the heat of the water. Hot water is obtained by circulating cold water through a coil submerged in the small, hot tank.

Shallow-depth submersibles designed for work and recreation uses



Recreational submersible vehicle can dive up to 60 ft. deep and has a maximum depth time of two hours.



Work vehicle is designed to perform a wide variety of undersea tasks.

Lead is playing a key role in the production of two new shallow-depth, dry submersibles; a two-seat commercial work boat and a four-seat recreational vehicle that is suitable for use by scuba divers, undersea photographers, etc.

Both submarines are powered by lead acid batteries and they use approximately 1,200 lbs. of lead as safety dropweights. The bottom working skids of the submersibles are aluminum tubes that are filled with lead bar stock to achieve stability while on the ocean floor.

The vehicles are being produced by Pierce Submersibles Inc. of Huntington, N. Y. The company says that production of the two submersibles, which share common parts, is an indication of the trend that is developing with regard to supplying dependable, highly efficient vehicles that can be equipped with various work tools to perform a number of undersea work functions or else can be equipped only for sport and recreation purposes.

Company president Robert H. Pierce reports that lead acid batteries were selected for the vehicles because of their dependability, ease of maintenance and performance characteristics and added that such batteries have already proven themselves in a wide variety of submarine uses. The use of lead acid battery power sources also decreases research and development time required to insure that all components for submersibles are of the high quality required.

Lead acid batteries for the two submarines are housed in a specially designed droppable pod that can be jettisoned in an emergency. This would permit the craft to rise to the surface even if both the normal electrical or back-up compressed air system should fail.

The two-seat commercial model the company is producing is called the PRV-II since it was developed from the company's first submarine design developed for recreational purposes. PRV-II, which also has been named the "Submobile," has a dry weight of 7,600 lbs. and works at depths up to 300 ft. Batteries in the droppable pod are used to power the craft's two 7.5-hp propulsion motors. They provide a cruising speed of 3 knots and a short duration maximum speed of 7.4 knots. The vehicle is equipped with a diver lock-out hatch, thus permitting exploration outside the vehicle. It can spend up to 5.5 hours at its maximum depth of 300 ft.

The PRV-II can be ordered with a variety of optional equipment. It includes one or two manipulator arms, a television camera and TV tape recorder, radar, sonar, and trenching tools. Designed for a variety of commercial uses, the boat has been ordered by the oceanography departments of two universities, an oil company that is exploring for offshore petroleum, and by a firm engaged in salvage and exploration.

PRV-I, the recreational model, carries passengers two-abreast. The vehicle can dive up to 60 ft. deep, and it has a top speed of 5 knots. The 5,400 lb. craft's lead acid batteries drive two 5-hp motors to provide a cruising speed of 2 knots. The vessel has a maximum depth time of two hours, and surfaces automatically when either the time or depth limit is exceeded.

Hydrodynamic control surfaces at the bow of each vessel adjust its pitch while stern surfaces regulate both pitch and roll. Yaw control and propulsion are provided by reversible dc motors in swiveling pods.

The stern and sides of each craft form a U-shaped structure containing the ballast tanks and air cylinders. All external equipment for the vehicles is mounted on spring-loaded sliding pins for quick release in case of fouling.

Large transmission gear, treated with anti-friction compound during laboratory tests, shows no sign of abrasion while untreated smaller gear displays severe wear

New lead/copper compound increases life of bearings

It's an established fact that moving metal parts that come in contact with one another—such as gears and bearings—abrade even when they are lubricated to help eliminate the metal-to-metal friction that results from such contact. The abrasion results in the slow removal of minute amounts of metal surface. In time, it can seriously decrease the ability of gears, bearings, etc. to properly function.

To help overcome this problem, a wide variety of products have been developed to decrease gear and bearing friction that can result in expensive parts replacement and machinery downtime.

However, most of these anti-friction compounds serve only as devices to somewhat lengthen the service life of mechanical parts.

A new type of lubrication that has recently been introduced is designed to provide greatly increased wear for both metal bearings and gears. The material consists of powdered lead and copper contained in a variety of mediums that can be applied to ball, roller and sleeve bearings; power transmission equipment such as gear reducers, open gearing, universal joints, splines, etc.; to hydraulic systems; to forming and stamping dies to increase die life; and for bearings, valves, pistons and cylinder walls in gas and diesel engines.

For normal usage, the anti-friction compound is supplied in a petroleum base carrier that is compatible with petroleum lubricants such as oil and grease. For applications where such products cannot be used, the material is available in vegetable, animal, water or synthetic base suspensions.

While the actual content of the compound is proprietary with the developer, Composite Metal Corp., Denver, Colo., it can be stated that the material is composed of a mix of 60 per cent copper and 40 per cent lead. The resulting composition, which has been patented, is not an alloy. It is a combination of both metals which takes advantage of the lubricity of lead, as well as the strength and heat dissipating properties of copper.

The lead and copper are dispersed in the composite in such a manner that they are burnished onto the metal surfaces in the form of a thin lead/copper coating. This is accomplished as the result of pressure from the metal-to-metal contact and the temperatures generated by friction during metal-to-metal contact. Unlike other anti-friction materials, the new lead/copper compound must be worn off.

According to Composite Metal Corporation, the new compound can effectively lubricate through temperature ranges of -450° F to 1500° F. The company says that use of the anti-friction compound reduces galling, friction, heat and noise while raising power transmission efficiency.

For bearings, the lead copper compound provides a low-friction coating on metal surfaces that are in rubbing or rolling contact. Use of the material closes tolerances of power transmission equipment, thus maintaining surface wear and prolonging service life. Use of the concentrate prolongs the working life of hydraulic systems and increases the production rate of forming and stamping operations. For gasoline and diesel engines, it provides protection against dust, dirt and severe operating conditions that would break down petroleum films.

The company has developed specific recommendations for each in-service use of the material. In some cases, the lubricant must be added to carriers while machinery is being operated; whereas in others, it can be applied directly to the metal surfaces to be protected from wear. The material is available in both liquid and paste forms, each of which was developed for a particular application. The company cautions that the new lead/copper compound should be used only in equipment which has metal-to-metal contact surfaces and it does not recommend its use in lubricants containing graphite or molybdenum disulphide.

LEAD

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A 12-page folder describing battery powered short-haul delivery vehicles and comparing their economics to internal combustion delivery trucks. L-19

Organolead Antifoulants

An 8-page reprint describing how organolead coatings have proven successful in preventing marine fouling. Tests were conducted in Connecticut and Maryland. F-6

Lead Proves A Heavy Favorite as Sound Control Material

A reprint of a feature from Product Engineering illustrating lead's usefulness in sound attenuation to help meet OSHA noise requirements in factories and also on planes and trains. J-17

Electrics Get Key Post Office Tests

Reprint of a feature from Electrical World describing tests on the suitability and economy of electric battery-powered delivery trucks for the Postal Service. L-18

ARCHITECTURAL

Lead In Building

A four-part data sheet containing information on waterproofing, sound barriers, roofing and flashing and anti-vibration applications. A-13

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. Diagrammatic drawings. Sixteen pages. A-5

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Follow the safety line with chrome yellow

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

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 chemicals from 0° to 3000°F. Six pages. H-3

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

Lift profits electrically

Provides performance data on electric battery powered vehicles for industrial use. Cost calculators are designed to help buyer estimate depreciation, operating and maintenance costs. Sixteen pages. L-14

A Crackling Market for Electric Forklifts

Business Week reprint details the upsurge in use of electric forklift trucks in compliance with stricter Federal and other antipollution regulations. L-16

CERAMICS

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. B-11

SOUND BARRIERS

Directory of acoustic specialties

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

Lead a major factor in new machinery noise suppression systems

Description of techniques used to lower machinery noise levels with lead and lead composites. Lists machines that normally exceed noise level allowed by Walsh-Healey Public Contracts Act. Two pages. J-9

Lead Keeps Classrooms Quiet

Reprint illustrates how sheet lead was installed as plenum barriers between rooms in a Greenlawn, N.Y. school. Lead-shielded audiometric room will provide accurate hearing tests. J-13

Sheet lead plenum barriers

Detailed description of acoustical plenum barriers and how to install them. Materials and installation procedures described and illustrated. Eight pages. J-10

Controlling sound with lead

Reprint cites three installations where lead is being used as a noise and vibration barrier: John Hancock Building; Baldwin-Wallace College; and New England Medical Center, Boston. Four pages. J-12

Practical Application Of Sheet Lead For Noise Barriers

Discusses how the use of various thicknesses of lead bonded to or used in conjunction with other construction materials determines the Sound Transmission Class (STC) rating of walls and partitions. J-15

SOLDERING AND WELDING

Lead Welding

Reprint from *American Welding Society Handbook*, covers methods of welding lead, joint design, torch manipulation and welding speeds. Other sections cover safety promotions and common applications. Bibliography. Fourteen pages. I-1

Soldering Preforms

Circuits Manufacturing reprint discusses how the use of lead solder preforms save time and simplify task of joining metals for automated production. I-3

GENERAL

Publications and Films

Twelve-page catalogue listing the publications and films available from The Lead Industries Association, Inc. M-13

The U.S. Lead Industry—1972

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-14

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

Lead—A Modern design material

Summary of properties and available forms of lead for radiation control, sound/vibration control, electrical energy sources, soldering and ceramics. 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 applications of lead in space exploration. Illustrated. Four pages. M-19.

Facts About Lead And Pediatrics

Presents data on prevention and control of lead absorption by both adults and children. Particular emphasis is placed on preventing lead intoxication in children from such sources as old leaded paint usually found in poor housing within poverty areas. M-20

Ecology in the new lead belt

Reprint describes cooperation of industry and environmentalists in developing southern Missouri lead mines. Four pages. M-23

Childhood Lead Poisoning

Highlights on Midwest and Eastern conferences where childhood lead poisoning were discussed. Prepared in cooperation with the American Academy of Pediatrics. M-27

FILMS

Lead Matrix

A 26-min., 16mm color film. Demonstrates that lead is one of the basic elements in the matrix that binds our civilization together. To order, specify desired show date and one alternate date. No charge to borrow; viewer pays only return postage. N-1

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