VOL. 33 NO. 2 1970

lead

LEAD INDUSTRIES ASSOCIATION, INC.

NEW SAFETY SPECIFICATIONS FOR BRIDGES

Include Red Lead Primers

The new Silver Memorial Bridge spanning the Ohio River between West Virginia and Ohio is protected from the elements by a lead-based anti-corrosive primer paint coat. It shares this distinction with every other State-maintained bridge in the State of West Virginia.

Many factors make this new bridge both unusual and newsworthy. It was built under Federal order to replace the old Silver Bridge that collapsed into the river in 1967, with the tragic loss of 46 lives. Also, it was built under rigid new safety specifications that grew out of the tragedy. Among these specifications was the use of an anti-corrosive primer coat.

This particular specification, however, was not new to the West Virginia State Road Commission under whose supervision the new bridge was built. They had for a long period of time specified a red lead primer coat for bridges throughout the State. When queried as to the reason for selecting this particular type of anti-corrosive primer, a Commission spokesman reported that "It has been our experience that this type of paint performs satisfactorily when subjected to the varying conditions found throughout our State." The pigment specification adopted by the State of West Virginia in 1960, the last time paint specifications were updated, is as follows:

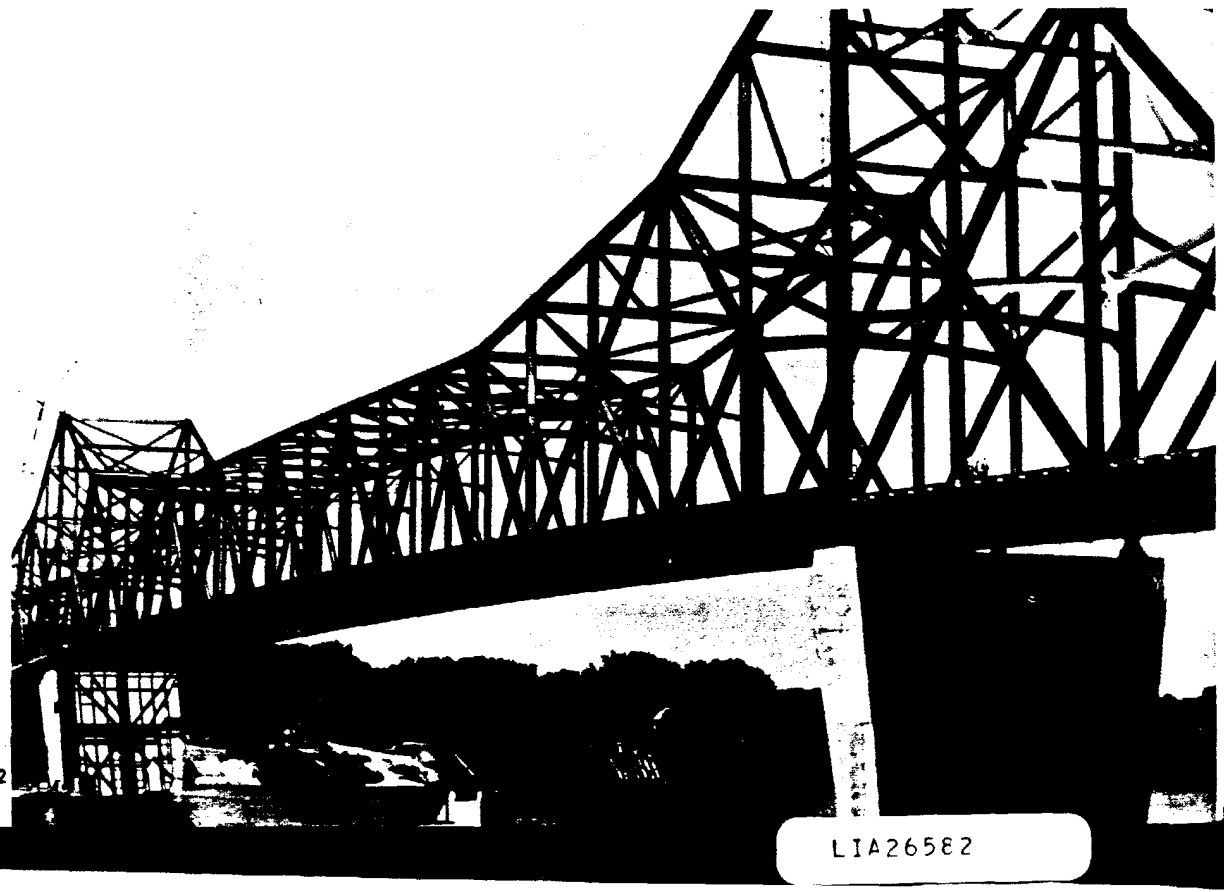
Red Lead (97% Pb_3O_4)	75% Minimum
Red Iron Oxide (85% Fe_2O_3)	24.7% Maximum
Aluminum Stearate	0.3% Maximum

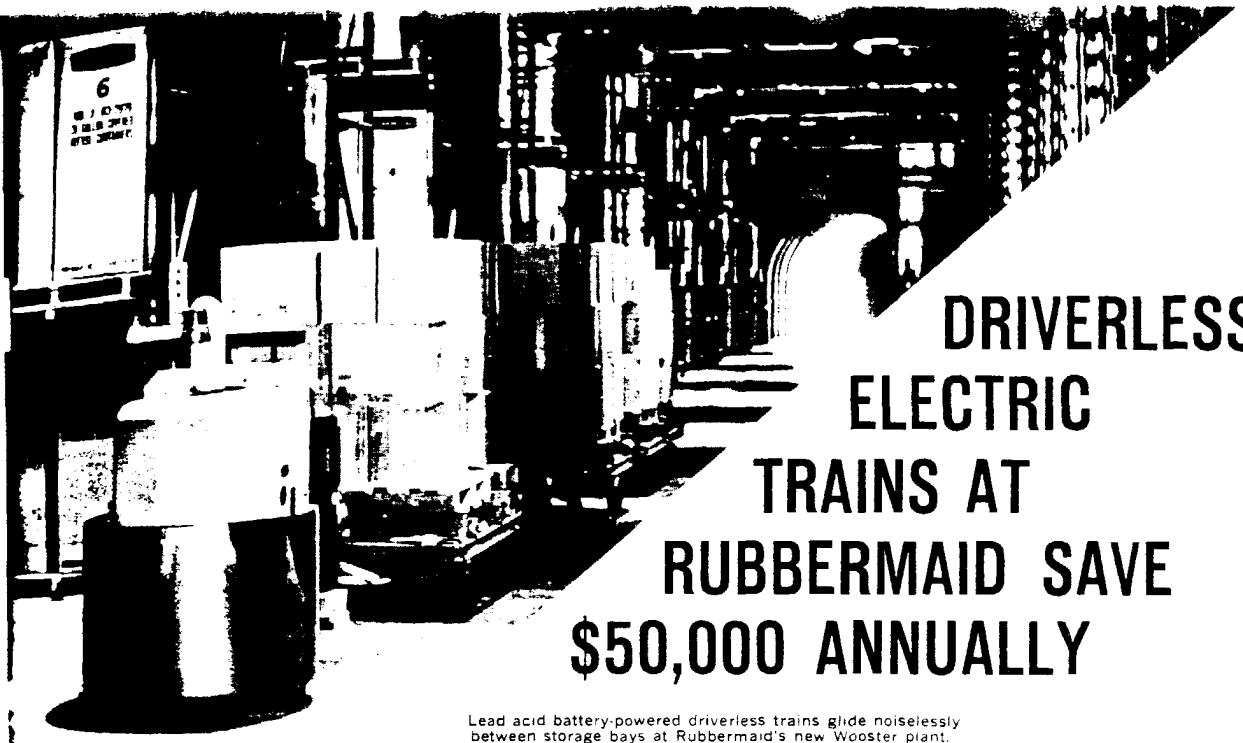
E. Lionel Pavlo Consulting Engineers, New York City, were awarded the job of designing the superstructure of the new $10.1 million bridge. Approaches, design foundations and substructures were designed by various other firms. The superstructure erector was Allied Structural Steel Company of Hammond, Indiana.

The new structure, about ½ mile downstream from the old bridge, is an 1,800-ft., four-lane, three-span, cantilevered through truss, with a 75-ft., I-beam approach span at either end. The truss section comprises a 900-ft. mainspan of which 150 ft. is suspended and two 450-ft. sidespans. The truss is 68½-ft. wide between chord centers. Over the channel the bottom chords clear normal water level by 70-ft. The top steel over the piers rises 200-ft. above the river.

The designers, engineers and builders of Silver Memorial Bridge have hopefully insured that history will not repeat itself. Lead makes a small but essential contribution to that objective.

The new $10.1 million Silver Memorial Bridge is dependably protected from the elements by a red lead anti-corrosive primer coat.





DRIVERLESS ELECTRIC TRAINS AT RUBBERMAID SAVE $50,000 ANNUALLY

Lead acid battery-powered driverless trains glide noiselessly between storage bays at Rubbermaid's new Wooster plant.

Rubbermaid, Inc., one of the country's leading manufacturers of rubber and plastic housewares products —some 5,000 of them, turned to a "total electric concept" in designing its new 146,000 square foot plant in Wooster, Ohio. Everything from the machinery, light, heat and materials handling equipment is operated electrically.

An exciting and major innovation in the new plant is the use of two completely automated lead acid battery-powered driverless trains to transport merchandise from each of two manufacturing areas, in the middle of which is a high bay holding warehouse.

A study of various material handling systems for this area persuaded Rubbermaid that the electrics were the easiest and least expensive to install and maintain. Actual operational results indicate an annual saving of $50,000 according to Ray Slabaugh, Project Engineer for the plant.

The trains travel over pre-established tracks consisting of a wire imbedded in the plant floor. When the wire is energized by 24 volts, a magnetic field is set up, forming an electrical path that the guidance system of the train's tractor follows.

Various safety checks have been designed into the no-hands material handling system at Rubbermaid. Any obstruction in the path of a train will cause it to stop immediately and remain stopped until the obstruction is removed. A flashing red light on the top of the tractor and a ringing bell warn of the train's approach.

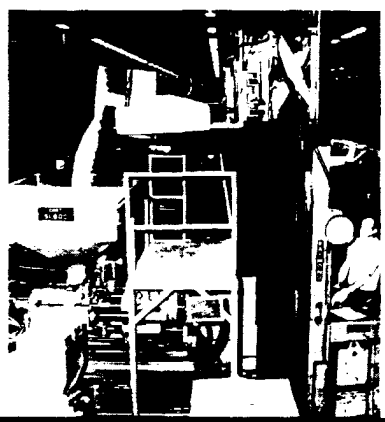
Each trailer in the train has an electric eye circuit that triggers an automatic stop at the appropriate work station. In turn, the weight of the pallets on a loaded train automatically closes a limit switch that defeats the electric eye circuit. The next empty train then gets the signal to stop. All current for the electrical system on the trailers is provided by the lead acid battery on the train's tractor.

Other electric vehicles in use at Rubbermaid include lead acid battery-powered lift trucks of various designs and serving purposes, as well as personnel carriers serving both the maintenance crew and management personnel.

The plant has three battery charging stations. Each train has two batteries—one in operation, one on charge during Rubbermaid's 24-hour plant operation. Fork lift trucks have four batteries: two for operation and two on charge. The use of roller conveyors at charging stations has reduced battery changing time to just under two minutes. The power cost for battery charging is approximated by management at 75 cents per battery per shift.

Rubbermaid considers the use of electrics as having two important side benefits in addition to their economy and efficiency. Their quiet operation helps keep the noise level down in the 1,200 personnel plant. They minimize housekeeping because of their clean operation.

A variety of electric fork lifts are in use at Rubbermaid. This one feeds molding powder into an extrusion machine hopper.



Battery-powered personnel carriers speed maintenance crews through the 146,000 square foot plant.

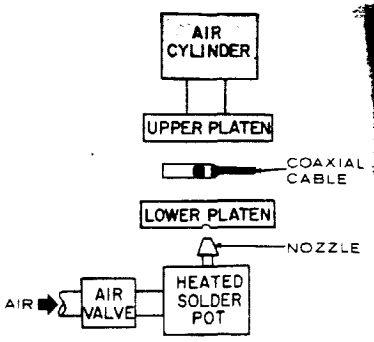


Figure 1

Two joining techniques, Low Pressure Solder Die Casting and Mechanical Thermal Pulse bonding, have been introduced to industry as solutions to difficult bonding operations.

A significant point to these new bonding processes is their ability to cope with reasonably heavy layers of contamination. Manufacturers can now use lead coatings rather than the more costly lead-tin coatings normally used. The new bonding processes no longer need the wettability provided by the relatively more costly tin. On the other hand, the excellent environmental protection provided by lead alloys can still be used to strong advantage.

Low Pressure Solder Die Casting (Figure 1) simultaneously forms both an electrical and mechanical connection between two or more parts. In the typical process cycle, parts to be joined are placed in a die held between the upper and lower plattens of the casting machine. An air cylinder, when activated, brings the upper platten against the lower one and carries both of them down against the nozzle of a heated solder pot containing 60-40, lead-tin solder. When the nozzle is engaged in the die, a switch is triggered which in turn opens an air valve. This permits compressed air to flow to the solder pot forcing the solder within the die cavity where the metal freezes almost instantly. In a variation of the process, lead-tin solder alloys are only raised to the semi-molten state during the casting cycle.

This new process bonds parts together even with relatively fragile temperature-sensitive insulation. It bonds parts with non-uniform, hard-to-control geometries. Solder casting can create useful work parts such as terminal lugs, flanges, etc., as it bonds two or more pieces. The process can form mechanically strong joints of low electrical resistance between insulation-covered wires without extensive precleaning and fluxing. One simply removes the insulation at the joint. Under controlled conditions Low Pressure Solder Die Casting can even bond unstripped wire. And finally, the solder joint formed by this process provides an unusually high strain relief against flexing as well as tension, more so than higher temperature weld type connections that would rupture prematurely if subjected to an identical degree of abusive mechanical treatment.

An unusual application of this process is the low temperature die casting of a lead-tin alloy through the pores or interstices of a woven material such as cloth. (Figure 3) Tests show that it is possible to die cast solder alloys through low temperature materials such as cotton, forming a wetted, metallurgical bond to tinned surfaces on the reverse side of the cloth without damage to the cloth fibers themselves. Applications include the forming of decorative buttons or fasteners in a small fraction of a second.

Another variation of solder casting is the Mechanical Thermal Pulse process (Figures 2, 4). The process utilizes the thermal energy stored within a ram or other metallic structure that has been preheated to as low as 20% up to 80% of the lowest melting point alloy being used. The heated ram is brought down, hydraulically, against the work parts to be bonded, applying pressure. The thermal energy, stored in the ram, is transferred to the parts by thermal conduction. This allows the thermal energy required for bonding to be reduced to the lowest possible values.

There are relatively sophisticated advantages inherent in this particular process. The total quantum of thermal energy can be transferred to the work parts independent of the many variables that are inherent in other energy transfer processes. This capability makes it possible to form strong, reliable bonds through heavy layers of contaminants. Dirt, grease, and even insulations commonly used in electrical and electronic industries are no longer a major obstruction factor in the bonding process.

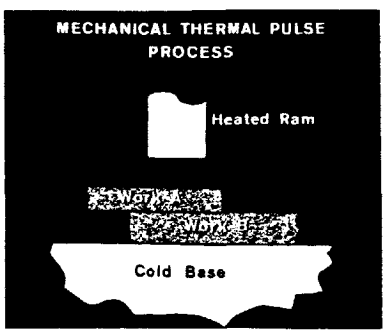


Figure 2

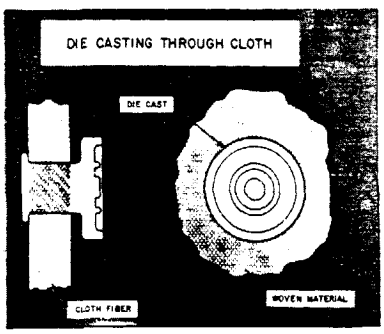


Figure 3

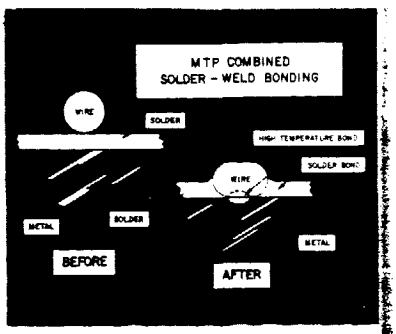


Figure 4

*Based upon a paper given before the 42nd Annual Meeting of Lead Industries Association, Inc. at St. Louis, Missouri, by R. H. Cushman, former staff member of the Special Studies Engineering Research Center, Western Electric Co., Inc. Princeton, New Jersey.

LEAD IN GASOLINE

By J. L. Kimberley
Executive Vice President
Lead Industries Association, Inc.

Lead additives for gasoline, which provide untold millions of inexpensive horsepower for American automobiles, have been caught in the wrangle of frantic efforts to reduce air polluting emissions from auto exhausts.

In the understandable and commendable drive to clean up our air, simple panaceas are frequently advanced where only complexity reigns.

That's why there has developed considerable momentum behind the catch-phrase "get the lead out" of gasoline, even though there is little evidence that such action would bring positive benefits and much evidence that the action could have boomerang effects.

Since their discovery in the 1920's lead additives in gasoline have provided anti-knock qualities that make fuels smoother burning, more efficient, and less damaging to engines. They make possible higher octane (more powerful) gasoline at lower refining costs and greater conservation of raw petroleum stocks than would otherwise be possible.

Lead Industries Association, Inc. has an obvious interest in getting the facts and in helping to resolve this complex problem. That's why I was authorized earlier this year to make an intensive investigation of all aspects of this subject and to represent the LIA before various legislative bodies considering the lead additives question. I am grateful for considerable help and guidance from members of our own and other industries concerned.

As a result, LIA has taken a strong stand against proposals for the arbitrary elimination of lead additives from gasoline, based on present knowledge and evidence. At the same time, we have taken the position that efforts to reduce noxious emissions from automobile engines should include intensified research for a means of reducing exhausted lead, which constitutes about one-third of 1 percent of auto exhaust emissions.

This position is fully supported by the following basic facts:

1. No data has been advanced to show that the amounts of lead exhausted from automobiles pose a health hazard or major pollution threat, now or foreseeably. The question of lead in the atmosphere has been intensively researched, in large part with assistance from the lead industry, for many years and continues to be closely studied.

2. Scientific evidence indicates that pollution hazards could actually be increased if lead were to be eliminated from gasoline under current conditions. This is partly because of the likelihood of increased emissions of so-called aromatic compounds which are known to contribute to smog and eye irritation and some of which are considered carcinogenic.

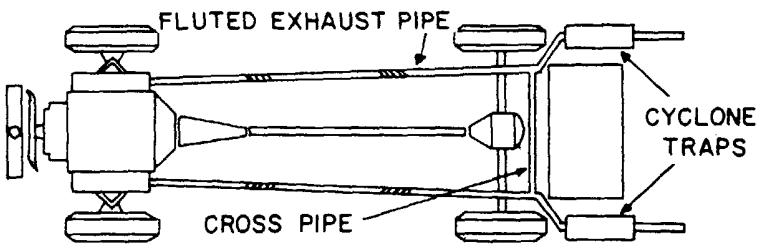
3. Elimination of lead from gasoline would involve massive expenditures by oil companies, auto companies, and the public—with no clear assurance at this time that there would be commensurate benefits in eliminating the carbon monoxides, hydrocarbons, and nitrogen oxides that constitute the major noxious automobile exhaust pollutants.

4. Pollution control systems for automobiles that work with leaded gasolines have been developed and demonstrated. The drive for non-leaded gasoline is premised primarily on the automotive industry's assumption that control systems (involving catalysts) are to be preferred and would work better and be longer-lasting with non-leaded gasolines. However, at this point there has been no assurance that this assumption is correct or that systems to work with non-leaded gasoline are anywhere near ready to be put on new model cars in the foreseeable future.

These points are a distillation from the great volume of information collected for LIA since about the first of the year. They come from study of past and current scientific and technical literature, from personal interviews I have had with top executives of automobile, petroleum and lead additive producers, from discussions with knowledgeable government officials, testimony either heard by me personally or read from transcripts of federal and state hearings on the question, and from reports of experts currently studying the question.

On the basis of these facts, I was authorized to appear before, or submit statements to, several state bodies considering legislative restrictions on leaded gasoline, appropriate Congressional committees in Washington, and a special Presidential Commerce Department panel considering automobile fuel composition.

Cover photo courtesy of The Research Corporation of New England.



Gaseous and particulate emission standards for automobiles proposed by the Federal government for 1975 can now be met by the use of existing automotive systems, such as the 3-part one developed by DuPont. The cyclone trap portion of the system shown here traps and stores particulate emissions, including lead.

LIA also prepared a succinct position paper for the information of members of the federal Congress considering proposals affecting gasoline additives. One proposal would give the Department of Health, Education and Welfare broad powers to regulate the composition of automobile fuels, including the use of lead and other additives. Another would place a punitive tax on leaded gasoline in an effort to drive it off the market. Neither of these proposals is justified by evidence showing that a ban on leaded gasoline would bring the desired results—drastic reduction or elimination of auto pollutants.

In view of current technical developments for systems to control exhausts from leaded gasoline, LIA believes that a ban or similar legislative restriction on gasoline composition would result in restricting the range of efforts to develop workable systems to alleviate automobile pollution. For example, in mid-summer 1970 one of the largest oil companies announced development of a lead filter for autos that would capture a substantial amount of the lead resulting from combustion of leaded gasoline. This is only one of recent developments indicating that there is much progress being made in developing control systems that work effectively with leaded gasoline and that would also be capable of reducing lead emissions, too.

The California Air Resources Board earlier this year verified that one such system cut escaping hydrocarbons and nitrogen oxides to a level more than 50 percent below the state's proposed standards for 1975. The same device was shown to reduce carbon monoxide emissions more than 33 percent below these standards. Nitrogen oxides were reduced to less than 50 percent of California's 1975 standards. And this was with leaded gasoline.

In fact, the Commerce Department's Technical Advisory Board Panel on Automotive Fuels and Air Pollution recognized the possibility of efficient emission control systems which operate on leaded gasolines being developed in the near future, and did not recommend the elimination of lead additives although the Panel also recommended the availability of an unleaded fuel.

Aside from technical aspects, there is the very real possibility that the changed composition of gasoline that would result from the elimination of lead would pose both known and unknown problems.

A U.S. Bureau of Mines study published in May reported on tests comparing leaded regular and premium gasolines with comparable non-leaded fuels. The conclusion was that the unleaded fuels increased eye-irritating, smog-producing emissions by as much as 25 percent over the leaded fuels.

These very serious considerations were succinctly put by Dr. Richard D. Cadle of the National Center for Atmospheric Research. An article on Dr. Cadle's position appeared in the April 20, 1970 issue of *Chemical & Engineering News* and said in part:

"In connection with any possible health hazard from the lead compounds that automobiles send into the atmosphere, Dr. Cadle believes that there is reason for alarm, but warns that quick solutions could build into problems of an entirely different stripe. He suggests, for example, that gasoline manufacturers who hope to replace leaded alkane gasoline with high-aromatic fuels should look at least twice before they leap.

"It's conceivable that some of these aromatics could lead to the formation of carcinogenic by-products in the combustion process, although I don't know of any hard evidence to support that idea. Nevertheless, aromatic compounds generally are toxic, irrespective of whether or not they're carcinogenic.

"Also, certain aromatic compounds have been found to be more severe in magnitude, more severe as eye irritants, than the peroxyalkyl nitrates formed from conventional gasolines. What I'm really saying here is that in the whole area of air pollution control, we shouldn't rush ahead with one solution before trying to anticipate the larger problems it may create."

Dr. Cadle's fears may have already been demonstrated to have real substance. This occurred this summer in Japan. Because of a "lead scare" that was subsequently proved false, the Japanese government hurriedly last spring set a limit on lead in gasoline at about one-half of what it had been. This lower-level lead fuel went on sale in Tokyo the first of July and in subsequent weeks the gasoline sold for cars in that large oriental city was of the greatly reduced lead content. Nevertheless, about four weeks later, Tokyo was experiencing the worst smog crisis in its history—attributed not to lead but to the reactive emissions that created the citywide photochemical smog when the spring rain clouds passed and let the sun hit the gaseous automobile emissions. As suggested by the Bureau of Mines study and by Dr. Cadle, the reduced lead content of gasoline may well have resulted in higher aromatic emissions.

On the economic ramifications and other consequences of a quick switch to non-leaded gasoline, without good reason, the April 8 issue of *The Wall Street Journal* went into considerable detail, and can be summed up as follows:

1. The oil industry will have to make a major investment in new refining facilities, variously estimated from $6 billion to $10 billion, as well as an additional 6 to 8 percent drawdown in petroleum reserves.

2. Small petroleum refineries may have to shut down because they do

not have the capital resources to make the new investment.

3. Asphalt, the backbone of road building, would be curtailed since this product is made largely by the small refineries.

4. The hundreds of thousands of retail outlets for gasoline would have to install new gasoline pumps and gasoline storage tanks. The availability of pumps is strictly limited; the labor required to install them and the tanks will add to the inflation of construction costs.

5. Without lead in gasoline, oil companies would have to make greater use of benzene, toluene and xylene, thereby diminishing the supply of these materials to the petrochemical industry, with sharp inflationary consequences.

6. Sellers of bromine and sodium would lose a major market since these are the elements used in combination with lead for gasoline additives.

7. The lead industry would lose 20 percent of its total market. A replacement market cannot be found overnight. The problem is complicated by the fact that many lead producers have already made major capital outlays for recent plant expansions.

The Lead Industries Association, Inc. maintains an extensive file of reference material relating to lead additives. Material available upon request includes:

LIA statements to:

The Commerce Department Technical Advisory Board Panel on Automotive Fuels and Air Pollution.

The California Assembly Transportation Committee.

The Pennsylvania House Committee on Health and Welfare.

The U.S. Senate Subcommittee on Air and Water Pollution.

The U.S. House Subcommittee on Public Health and Welfare.

Informative material:

"Facts About Lead and the Atmosphere."

The LIA Position Paper on Removal of Lead Additives from Gasoline.

"Gettin' the Lead Out," **Motor Trend**, May 1970.

"Comparative Emissions From Some Leaded and Prototype Lead-Free Automobile Fuels," U.S. Bureau of Mines Report 7390, May 1970.

The Unknowns of Hasty Substitution

All these dislocations and difficulties might be justified if there had been demonstrated the availability of devices to deal with emissions from unleaded gasoline that would materially reduce air pollution. However, this has yet to be proven.

These then are the major reasons why the Lead Industries Association maintains that it is poor public policy to compel the abandonment of an existing proved source of efficient automotive power without a clear, accepted proof that the alternative represents a clear and demonstrated improvement.

Six Facts Related to the Proposed Removal of Lead in Gasoline

Fact Number 1:

No proven benefits in auto emission have been demonstrated to result from lead-free gasoline, despite speculation and assurances.

Fact Number 2:

Significant reduction in auto emissions has already been accomplished with systems that work with present automobiles and present gasoline.

Fact Number 3:

The knowns and unknowns about non-leaded gasoline do not at this point support the supposition that auto emission problems will be solved by the removal of lead.

Fact Number 4:

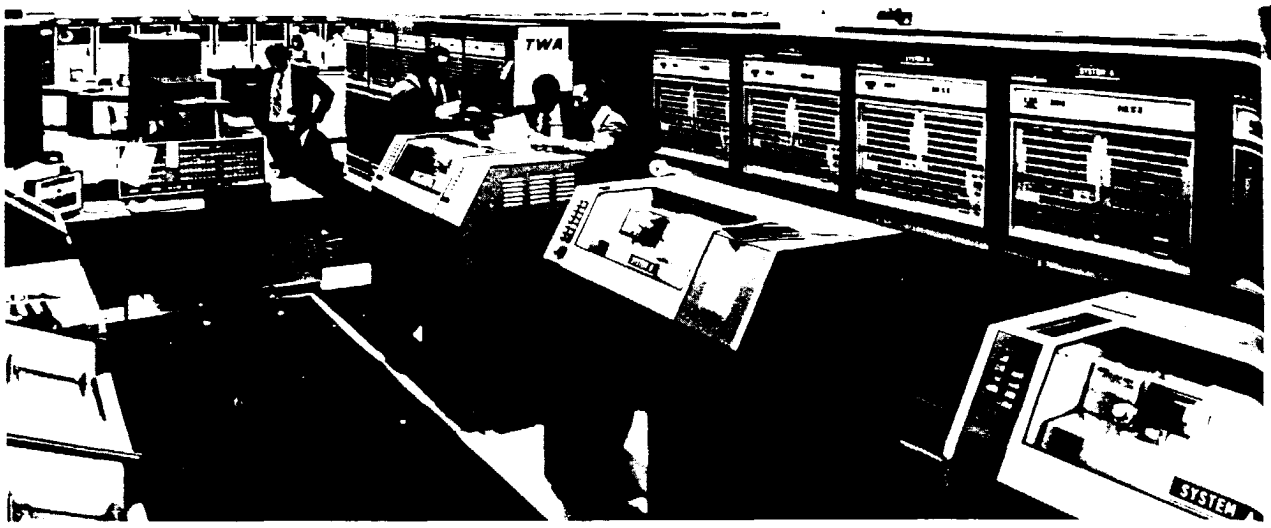
The uncertainties about results of using non-leaded gasoline emphasize the need not to ban leaded gasoline now for the future.

Fact Number 5:

Lead does not contribute to formation of photochemical smog—one objectionable result of auto emissions.

Fact Number 6:

Lead in the atmosphere—whether from auto exhausts or other sources—does not represent a health hazard to the public. Lead traps for automobile exhausts are being developed and demonstrated.

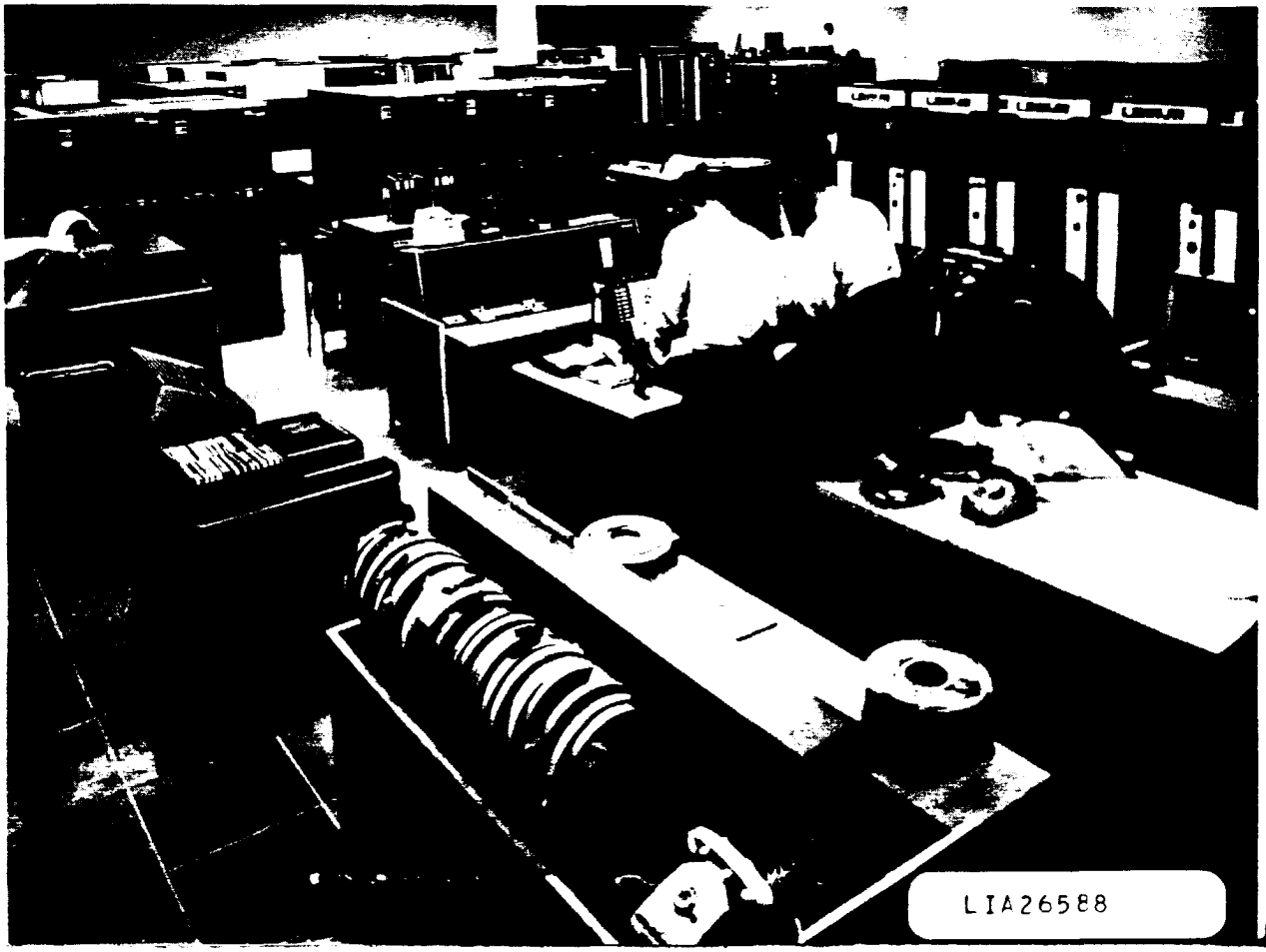


View of the computer room at TWA's Rockleigh Communication Center. TWA uses a Burroughs B5500 Data Processing System at this complex.

LEAD BATTERIES ASSURE UNINTERRUPTED POWER SERVICE FOR AIRLINE COMPUTER CENTERS

Today the air lines are perhaps one segment of our economy most dependent on real time computers that are in operation up to 24 hours a day. Almost every line has installed or is in the process of installing complex computerized centers to assist them in serving their passengers. Prime functions of the centers are to instantaneously record passenger information, flight data, flight progress, rental car and hotel reservations, special meals and other important intelligence from a broad network of airport and city reservation offices.

American's computer room showing its IBM 7090 Data Processing System. In the far background the IBM 1301 Disc Storage units are located.



American Airlines pioneered the development of the computerized passenger reservation system. Their engineers working with IBM computer experts planned the system from which evolved American's Sabre Reservation Center at Briarcliff Manor, New York. The Sabre center is accessible to 2,000 terminal devices and can handle as many as 2,000 inputs a minute. Leased phone lines tie the remote locations to the center.

Originally intended for passenger reservations, the computer use has been broadened to include other fields. The system controls minor maintenance at points where the planes have overnight layovers, freight waybilling, and supplies marketing information to management.

To make sure this computer complex is always operable, American engineers, together with consultants devised a power backup for the center. This is a solid state Uninterruptible Power Supply (UPS) that consists of an AC to DC rectifier, a 177-cell lead acid battery, rated at 2,400 ampere hours, and DC to AC inverters.

The lead acid battery is constantly on the line and is capable of taking over the load of the system immediately, during an outage, until the auxiliary diesel generators are started up. At American, two diesel generator sets are on standby to power the computer if a prolonged power outage should occur. These generators would be automatically started by lead acid batteries if such an outage occurs. A second set of two diesel-generators are installed to power the air conditioning system necessary to maintain the proper temperature levels of the computers. If for any reason, during a lengthy power interruption, the auxiliary power plant could not be started, the lead acid battery of the Uninterruptible Power Supply could sustain the computer complex for 57 minutes. This would give the computer room personnel ample time to complete an orderly shutdown of the facility. Under normal operating conditions, however, when the auxiliary power plant takes over the load, the lead acid batteries are automatically recharged by the rectifier, keeping them ready for any other emergency.

According to Arthur G. King, Manager Facilities Engineering for American, the system was installed to carry the computer load long enough to start auxiliary generators during an extended outage, to take over during short power interruptions and to assure constancy of power.

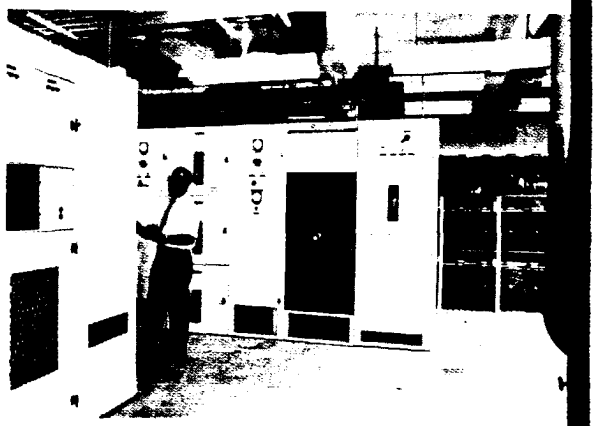
Maintenance of the system is a relatively easy matter. Once a month the UPS is tested by purposely interrupting the utility power supply and allowing the lead acid batteries to take over. The diesel generators are also tested about once a month. To assure maximum battery efficiency at all times, about once a month 10% of the battery's cells are checked for voltage, temperature and specific gravity.

Once a year a 100% check of the battery is made. As the individual cell containers are of clear plastic, a visual inspection of the electrolyte level is all that is necessary to indicate the need for adding water.

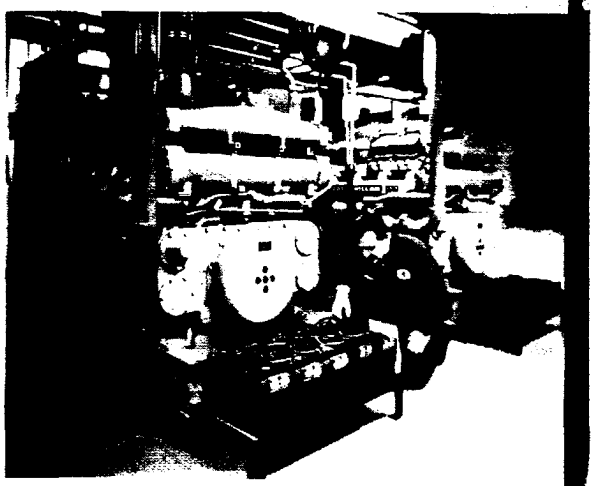
Trans World Airlines maintains a similar communications center at Rockleigh, New Jersey. It differs from the American Airlines center in that the computers were supplied by Burroughs Corporation and it employs gas-turbine generators for auxiliary power. The real time computers are on the line 24 hours a day.

Presently TWA is expanding its UPS system through the addition of a second 177-cell lead acid battery to accommodate additional computer systems. When completely installed the UPS will be capable of sustaining the computers for a half hour without any outside power. As for the two auxiliary generators, one is lead acid battery start and the other is air start. The system is checked out once a month when it is run for a period of between four to six hours.

Because of the critical nature of the stored information, all airlines reservations computer centers rely on lead acid batteries to maintain the load until auxiliary power can take over. These UPS systems also insure against current and voltage variations that would cause the computers either to file data erratically or completely miss information bits.

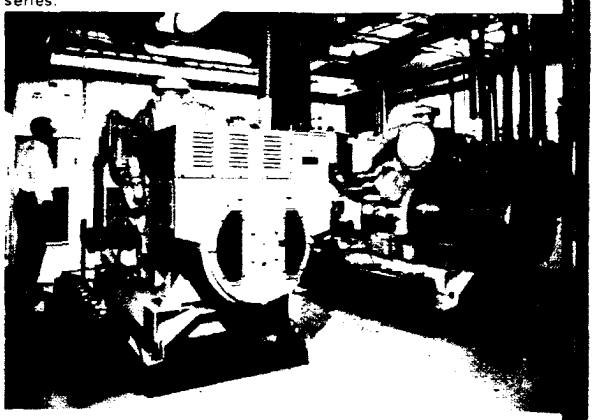


At the right of the static inverter and rectifier banks are located the 177-cell lead acid battery of the Sabre Center. To give some idea of the battery's size, it contains about 80 tons of lead whereas an automobile battery contains 20 pounds of lead.



The two diesel drive generators, used to power American's computer room in the event of a power outage are automatically started by five 6-volt lead acid batteries connected in series.

To power the air-conditioning for the computer room in the event of a power outage, American maintains two diesel generator sets. These units are started automatically by three 6-volt lead acid batteries wired in series.



LEAD

Still First for Waterproofing

Client: Missouri State Board of Public Buildings: Governor Warren E. Hearnes, Chairman; Lieutenant Governor William S. Morris, Secretary; Attorney General John C. Danforth, Member; under the direction of the Division of Planning and Construction, John D. Paulus, Jr., AIA, Director.

Architect: Richard P. Schneider, St. Louis.

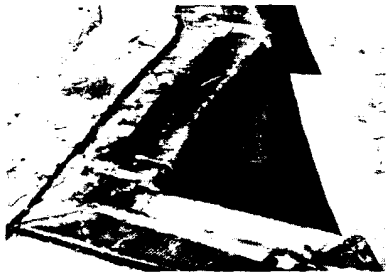
General Contractor: E. G. Linhardt, Jefferson City, Mo.

Lead Work: Larry Goad & Co., St. Louis.

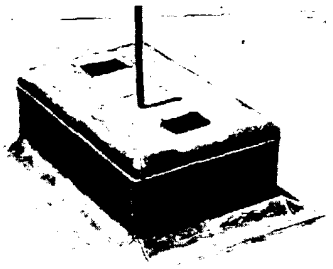
The sheets on the sides are formed at the bottom of the pool to follow the cant profile.

Workman is forming the 8-lb. sheet lead to the sides of the pool with a wood dressing tool. The sheets that form the sides are first tack burned and then finish burned to the sheets that are flashed into reglet that was cut around the pool.

View of the finish corner of the pool shows how easily the sheet lead can be made to conform to intricate shapes and still maintain complete waterproofing integrity.



The bases for the fountain statues are covered with lead to insure the continuity of the membrane.



The State of Missouri is currently engaged in a program of restoration of the Capitol Building and surrounding grounds. The badly worn steps of the Capitol are now being replaced and waterproofed with sheet lead.

So successful was the waterproofing installation on the Capitol steps, sheet lead was selected by architect Richard P. Schneider of St. Louis to line the north patio pool on the Capitol grounds.

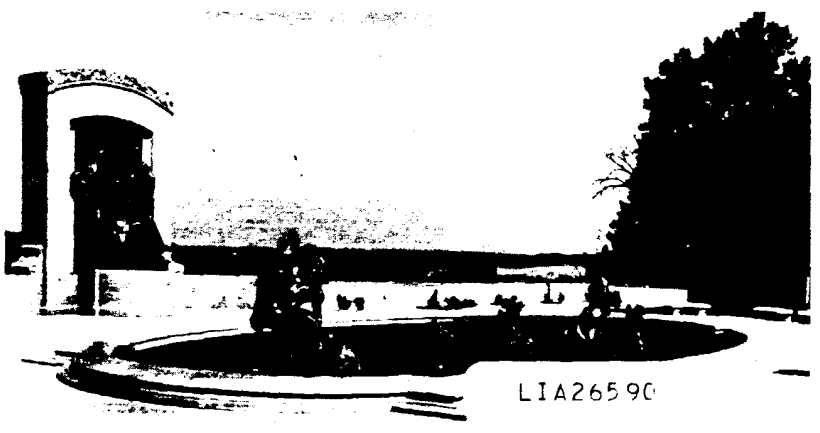
This oval shaped pool, the "Fountain of the Centaurs," has leaked ever since it was first filled with water some 40 years ago. Over this period, many attempts had been made to seal the leaks with tar and paint without success.

To prepare the pool for lining, all loose material was removed and a new concrete slab, four inches thick, was poured. New concrete was also added around the edge of the pool. Into this, a reglet was cut to completely encircle the pool. Before the lead lining was installed, the area was covered with asphalt impregnated felt. This was used to protect the sheet lead from the temporary corrosive attack of the free lime found in all cementitious materials.

In the construction of the lining, a membrane of 8-lb. sheet lead (⅛" thick), was laid across the bottom of the pool and the joints burned (welded). The sheets were overlapped slightly and then beveled with a shave hook prior to burning to present a smooth, even appearance. This technique was used because the lead lining acts as an exposed membrane. The lead sheets were carried up over the statue bases and around drains, overflows and pipe penetrations. Narrow lead sheets were next flashed into the reglet around the top of the pool's edge with lead wool and lead wedges. Enough lead was furnished to provide for the sheets that formed the sides of the pool to be burned to it. The sides of the pool were formed in a "Z" shape to make it possible to burn the sheets to the lead along the top of the pool and bottom linings in a horizontal position. Sheets on the side of the pool were then burned together to complete the waterproofing operation.

To provide night illumination six light fixtures have been shimmed into place with lead wedges and sealed. These lights are also recessed into Carthage stone housings using lead wedges and a sealant.

General view of the "Fountain of the Centaurs" on the Capitol grounds at Jefferson City.



LIA26590

INTERESTING ODDS AND ENDS ABOUT LEAD

LEAD LOWERS CURTAIN ON INDUSTRIAL NOISE

The use of a glass fiber fabric sandwich between two layers of lead loaded vinyl as an effective sound barrier is not new. This type of material has been used for some time to insulate the cabins of jet airplanes from the roar of the engines.

A new composite combines this glass fiber lined leadloaded vinyl with one-inch thick sound-absorbent polyurethane foam to form a sound insulating and absorbing curtain. The foam is applied to the leaded vinyl in 10-inch wide vertical strips to permit the curtain to fold in accordian style when it is opened. The sound absorption property of the foam helps reduce noise in the exposed areas and the leaded vinyl permits a marked reduction in transmitted sound outside the high noise area.

LEAD WALLED ROOM AIDS CANCER RESEARCH

With solid lead walls and doors almost a foot thick, this radiation-free chamber at the University of Utah Medical Center in Salt Lake City assists doctors conducting cancer research. The doors, as shown in the photo, look almost like those on a bank vault. Over 377,000 pounds of lead were used in the construction of the room.

The project treats and studies small animals. The animals are placed in the lead chamber and examined with a "body counter," a radiation detection device that measures the level of radioactivity in the animal's body. The equipment is being used to determine the relationship of radioactivity to bone cancer.

SILENT SAM . . . THE SWINGER OF THE '70's

A revolutionary new approach to traffic control is represented by Silent Sam™, a lead acid battery-powered robot designed and produced by Queens Devices, Inc., Long Island City, New York.

Sam is a natural for the construction industry, public utilities, road builders and others who create traffic control problems in the normal course of their business. With pedestal, Sam looms overall at 7'6". The unit with battery weighs more than 200 pounds —a dependable, tip-proof, always on the job control for traffic.

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LIA26591

NEW LISTINGS

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

ARCHITECTURAL

Lead armor soundproofs new arts center

Chicago's new Center for the Performing Arts is sheathed entirely in lead. A general description is given of the job and how the lead was handled. Four pages, illustrated. A-7.

The effects of waste line effluents on synthetic rubber gaskets for cast iron soilpipe

Synthetic rubber of a type similar to that used as gaskets in waste line joints was exposed to many effluents found in the plumbing waste system. Twelve pages, charts, tables and illustrations. D-5

CERAMICS

Microstructures and Magnetic Properties of Lead Ferrites

Investigation of isotropic high lead ferrites shows they can be prepared with energy products greater than 1.4×10^6 G Oe. Eight page reprint. B-9

CABLE SHEATHING

Lead sheathing for power cable

Design guide for use of lead sheathed power cable. Factors governing cable selection are also reviewed. Twenty-four pages, illustrated. C-1

PLUMBING

Will calked lead joints withstand high temperatures?

Describes tests on uncoated cast iron soil pipe with lead and oakum joints. Such joints were found to withstand temperatures to 170° F without leakage. Four pages, reprint. D-4

ANODES FOR CATHODIC PROTECTION

Lead-silver alloy anodes in cathodic protection of ships

Operating efficiency and behavior of lead-silver anodes for corrosion protection of ships. Other anodes are compared. Details of operation, costs and other important factors are discussed. Eight page reprint, tables and illustrations. E-1

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

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

CHEMICAL CONSTRUCTION & CORROSION PROTECTION

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

SOLDERING AND WELDING

Soldering alloys

Describes numerous alloys used as solders and discusses advantages and drawbacks of many. Flux requirements for soldering most metals, both ferrous and non-ferrous are listed. Four pages, tables and charts. I-3

SOUND BARRIERS

Practical application of sheet lead for sound barriers

Twelve page manual gives specific wall construction and performances. Tables, charts and illustrations. J-1

BATTERIES

Lift trucks: Accent on muscle, and talent too

Report discusses latest developments in the lift truck field together with future forecasts. Contains concise details on the economy of electrics. L-8

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

GENERAL

The U.S. Lead Industry—1969

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

Publications and films

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

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

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