JOHN HANCOCK BUILDING, CHICAGO LANDMARK, PUTS LEAD TO WORK IN CONSTRUCTIVE WAYS. SEE STORY ON PAGE 3.

lead

...ON, INC.

...Y. 10017

LEAD PIPE JOINTS MEET TALL BUILDING PRESSURES

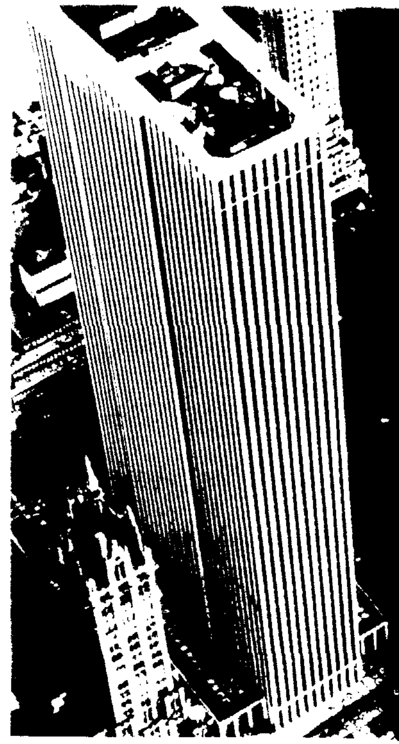
Until recently, a basic question of the design of high rise buildings was whether a storm drain would leak if a stoppage occurred at the base. At 62-lb. cu. ft., a head of water can rapidly build to exert enormous pressures on the drain pipe and its joints.

In order to lay the question to rest, a research project was commissioned by the International Lead Zinc Research Organization to test pressure limits for lead/oakum calked cast iron pipe joints. These tests showed that the joints held an average of 300 psi, sufficient to meet the requirements of a 50 to 70 story building, depending on construction.

The three-stage test program covered conventional lead/oakum calked joints in plain 4-in. cast iron coated soil pipe, with and without a spigot bead end, and uncoated with a beaded end. Test joints were made by joining two 2½-ft. lengths of pipe with lead/oakum joint, welding steel plate to the open ends, and then providing a pump connection on one of the end plates.

THE TEST PROCEDURE

Using a high-capacity, high-pressure pump connected to a measuring gage, speciment joints were hydrostatically pressurized at 100 psi for 15 minutes. Pressure was then increased at the rate of 50 psi per minute with a hold of one minute at each 100 psi increment. At the appearance of a trace leak (very slight moisture seepage) the pressure was recorded. Pressure was continued until two or three drops of water appeared simultaneously on a joint. At this point increased pressure was applied until the joint failed or the pump failed to keep up with the leak.



In most instances when pressure on pipe having a spigot head was reduced to about 150 psi, the joint would continue to hold the pressure for as long as two hours with very slight leakage (5 to 10 psi pressure drop per hour).

To keep individual skill from influencing the test results, a journeyman plumber with no knowledge of the tests to be performed, was asked to calk two joints. Both joints were tested under the identical procedure as outlined above. The values of the joints calked by the journeyman plumber were consistent with similar gage pressures on the other joints tested. Various tests on specimens were witnessed by building inspectors, a professional engineer, and a retired plumbing inspector. At the end of the test, the joints were broken open so that the witnesses could see and verify the fact that the joint was of conventional lead/oakum type with a 1″ring.

The results of the tests show that lead/oakum calked cast iron pipe joints can be successfully applied to storm drain applications. A breakdown of the test results show that the average effective pressure to be withstood by a coated pipe without a bead is over 200 psi; that of a coated pipe with a bead to be over 300 psi and that of an uncoated pipe with a bead to be almost 400 psi. To equate pressure to height, 300 psi is equal to a static column of water over 692 ft. This, in turn, relates to a building height of between 50 and 70 stories depending upon the construction.

TABLE OF TEST RESULTS

Specimen Number	Pre-test Pressure & time	Pressure first leak	Pressure leak excessive	Pressure joint failure	Comments
1	100 psi-10 min	300 psi	375 psi	450 psi	lead raised ¼″
2	100 psi-10 min	275 psi	300 psi	450 psi	lead raised ¼″
3	100 psi-10 min	200 psi	275 psi	350 psi	bad leak separation
4	100 psi-15 min	150 psi	300 psi	450 psi	joint separated ¼″ witnessed sample
5	100 psi-15 min	240 psi	300 psi	400 psi	joint separated ¼″ witnessed sample
6	150 psi-15 min	400 psi	450 psi	460 psi	joint separated ¼″
7	150 psi-15 min	275 psi	325 psi	425 psi	joint separated ⅛″ beaded pipe
8	150 psi-15 min	300 psi	350 psi	690 psi	joint separated ¼″ beaded pipe
9	150 psi-15 min	350 psi	420 psi	715 psi	joint separated ½″ beaded pipe held 150 psi pressure after lift
10	150 psi-15 min	300 psi	420 psi	700 psi	held 150 psi after lift beaded pipe
11	150 psi-15 min	375 psi	420 psi	675 psi	separated ⅛″ held 150 psi after lift beaded pipe
12	150 psi-15 min	400 psi	490 psi	650 psi	separated 3/16″ held 150 psi after lift
13	150 psi-15 min	390 psi	450 psi	650 psi	separated 3/16″ held 150 psi after lift witnessed sample

JOHN HANCOCK INSURES SILENCE WITH LEAD

Dominating Chicago's exciting skyline these days is the new 1.107 foot tall John Hancock Center Building, an architectural trend setter with its combination of offices, retail stores, restaurants, apartments and parking garages. The building is located on North Michigan Avenue, Chicago's "Magnificent Mile."

Noise control is a vital factor in planning the use of such a multi-purpose structure. Two aspects of noise control at John Hancock required particularly careful planning: containment of noise in the machinery rooms located throughout the building; and noise insulation between residential apartments.

The machinery rooms house such potential noise-makers as water pump boosters, elevator motors and other mechanical equipment. During the day office machine and street noises are usually at high enough levels to mask any noise problem. However, in the quiet of the evening the noise level would have been potentially disturbing to tenants of the building's apartments, so sound attenuation measures were designed into the machinery room construction.

SOUND BARRIER BLOCKS MACHINERY NOISE

Joint planning on the part of the architect, acoustical consultant and acoustical contractor produced a relatively easy solution to the machinery room noise problem. Machinery room walls were made of standard concrete block and then an acoustical barrier was constructed on the inside wall surfaces.

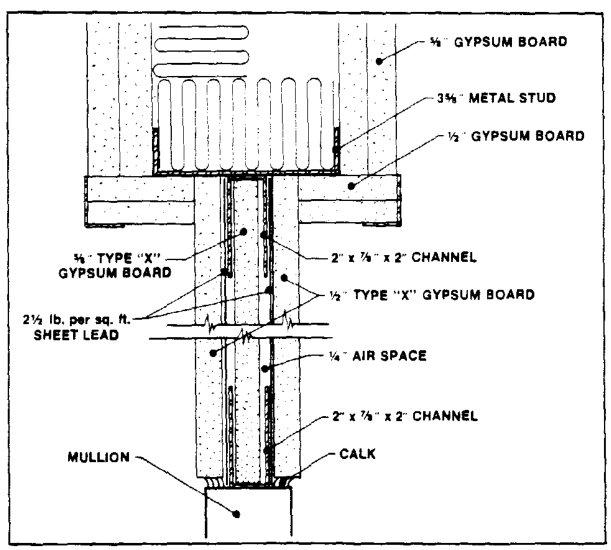
The barrier consists of an underlayer made of furring strips with acoustical wool in between followed by an overlayer composed of a three layer system of 2½-lb. per sq. ft. sheet lead sandwiched between two layers of gypsum board. Tests made since completion show that the sound barrier thus constructed has effectively reduced noise transmission to acceptable levels.

SOUND BARRIERS BETWEEN APARTMENTS

The movement of the tall John Hancock Building in the brisk winds common to that Lake Michigan area, and the narrow width of the building's mullions influenced the design of the sound barrier system used between apartment areas. Interior apartment walls were constructed of two pieces of ⅝-in. gypsum board attached to opposing sides of 3⅝-in. metal studs. The void between the boards was filled with acoustical wool and the resulting 4⅞-in. thick walls provide a Sound Transmission Class* of 45. Building mullions, however, were only 1⅞-in. wide so an accommodation had to be made to match interior walls to mullions. Interior walls were carried to within 28-in. of mullions. Then a special-design channel was constructed along the mullion, floor, overhead spandrel, and interior wall. The latter has a slip joint to compensate for building movement. Gypsum board ⅝-in. thick was fitted inside the channel with a ¼-in. air space. Sheet lead (2½-lb.) was screwed on either side of the channel and the channel walls finished off with ½-in. gypsum board. The STC of the stub wall matches that of the interior wall.

Altogether the sound attenuation systems at the John Hancock Center systems are highly successful. To date the building management has received no complaints about noise.

**A measurement of the relative efficiency of acoustical sound barriers established by the ASTM.*



Credits: Architect: Skidmore, Owings, & Merrill, General Contractor: Tishman Construction Company, Acoustical Consultant: Bolt, Beranek & Newman, Cambridge, Mass. Dry Wall Contractor: McNulty Bros. Co., Chicago.

ORGANOLEAD PAINT... ASPIRIN FOR SHIPOWNERS' HEADACHE

Test patch of experimental black antifouling paint (without organolead toxicant) showing 40% fouling with tubeworms after 11 months of service on oceangoing tugboat at Pearl Harbor Naval Shipyard. (Photograph VSJ-737-7-71 taken July 22, 1971.)

For as long as there have been ships, fouling by marine organisms has been a serious and costly problem. Fouling causes ship drag, excessive fuel consumption and heavy maintenance costs due to the drydock time involved in removing the growths and repainting.

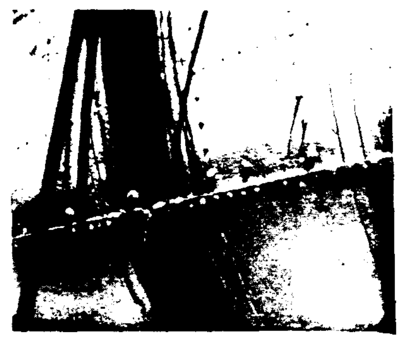
A 10-year research program on marine paints formulated to solve the fouling problem has been conducted under the sponsorship of the International Lead Zinc Research Organization, Inc. (ILZRO) with highly satisfactory results.

The paints tested contained organolead compounds, toxicants that can be released from the paint in minute quantities at a controlled rate. The organolead compounds prevent the attachment and growth of marine organisms for as long as two years—and impede same for much longer periods.

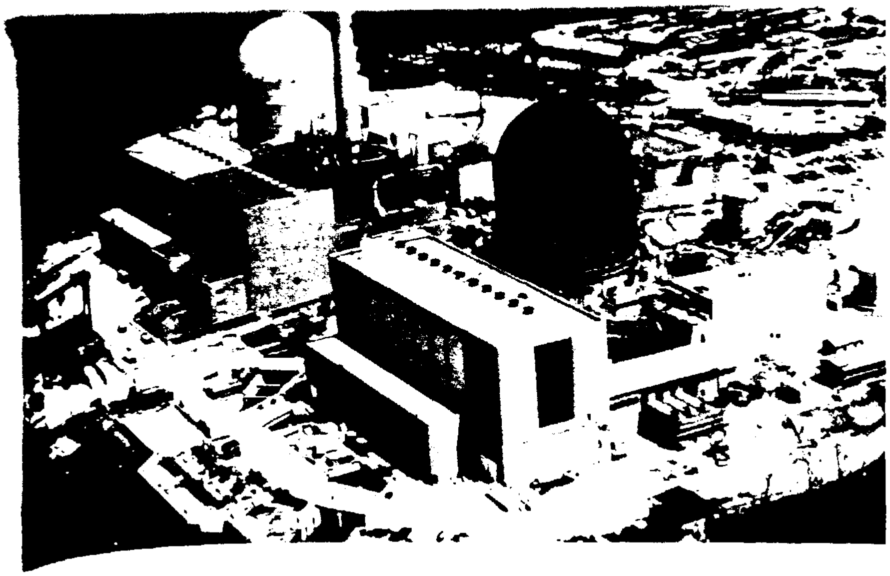
ILZRO Paint Formula 1, a mixture of cuprous oxide plus triphenyllead acetate, produced eye-opening results in tests conducted in seawater at Pearl Harbor (tropical), Miami Beach (subtropical), and Long Island (temperate). Test panels with Formula 1 coatings retained a fouling resistance of up to 60% after 91 months (almost 8 years) immersion in Pearl Harbor water—a normally bad fouling area. Corresponding panels painted with a mixture containing cuprous oxide but no organolead were completely fouled after 18 to 24 months.

Test patch of organolead (TPLA)-modified Type 121 Vinyl-Rosin antifouling paint (containing 8 lb/gal Cu.O), showing 95% fouling resistance after 11 months of service on U.S.S. TAWAKONI at Pearl Harbor Naval Shipyard. Rated "Excellent." (Fouled rectangle not painted—under supporting block.) (Photograph VSJ-738-7-71 taken July 22, 1971.)

Standard vinyl-high rosin antifouling paint, Type 121/63 (containing 14.4 lb/gal Cu O) showing 35% fouling resistance after 11 months of service on U.S.S. TAWAKONI at Pearl Harbor Naval Shipyard. Rated "Excellent." (Photograph VSJ-739-7-71 taken July 22, 1971.)



These test results impressed the U. S. Navy sufficiently so that it embarked on its own testing program to compare organolead paint formulations with its own Standard vinyl-high rosin formulation paint. The testing area was again Pearl Harbor. The bottoms of oceangoing tugs, salvage ships and submarines were patch painted (usually 100-150 square feet in area) with the two paint formulations. To date the ILZRO organolead paint is as free of fouling as the Navy's own standard anti-fouling paint.



GROWING USE OF ATOMIC ENERGY BUILDS DEMAND FOR LEAD SHIELDING

All signs point to burgeoning demand for atomic energy. Already 23 nuclear power plants are in operation in the U.S. Another 100 are scheduled for the next decade. By the end of the century it is anticipated almost 100 huge atomic plants will be generating half the electricity required in the United States.

The harnessing of atomic energy has brought with it the problem of controlling the powerful rays emitted during the atomic disintegration. Basically the problem of protection from these rays is the same as from x-rays and radium. Lead as a shielding agent has played an historical role in this area since the discovery of x-rays in 1895.

HIGH DENSITY A MAJOR FACTOR

Lead offers substantial advantages over other shielding materials. Its low cost, density and the ease with which it can be cast, extruded, rolled, machined or otherwise formed, combine to make it one of the most efficient of shielding materials.

Lead's high density means a saving in space since less material is needed for a given shielding requirement. There is also a weight saving when the shield is in the shape of a hollow sphere or thick walled cylinder because the shield volume is related to the cube or square of its thickness while the density increase is only linear.

Economies in space and weight of lead shields lead to further, less obvious, cost savings. A lead shielded transport container, being smaller and possibly lighter, is easier and cheaper to ship. The need for special cranes or outsized doors is minimized. And should the shielding involve a complex mechanism such as a reactor refuelling machine, the use of lead reduces the size of components around the shield or of controls passing through it.

Lead itself is extremely stable and does not become radioactive under bombardment by neutrons. An additional favorable factor in using lead shielding, therefore, is its reuse or scrap value.

PURITY OF COMMERCIAL LEAD

When lead, brick or sheet is used for shielding x-rays or gamma rays, its density is all that counts. The slight lowering of density by alloying or by impurities is of little consequence. Readily available commercial lead is suitable since it can be obtained in purities of up to 99.99% whereas a 99.5% purity is considered acceptable for this application.

When neturons are also present, such as with a reactor, the purest lead available is used in conjunction with an effective neutron shield such as boron or a hydrogenous material. The absence of impurities in the lead is essential since neutrons can make the impurities radioactive.

Where lead is used as an unsupported shield in the absence of neutrons, greater hardness and rigidity than can be obtained with pure lead are needed for protection from potential damage. In such circumstances a 4% antimony-lead alloy, a calcium lead or a dispersion strengthened lead alloy, serves the purpose.

Another circumstance in which pure lead will not suffice occurs when shielding a radioactive source that emits thermal as well as gamma energy. In such a case the heat being generated at the center of the unit must be conducted away to avoid a dangerous thermal build-up. The combination gamma shield and necessary thermal conduction may be constructed in one way by using lead-clad steel—bonding of the lead shield bonded to a steel container.

OTHER LEAD COMBINATIONS FOR SHIELDING

The rapid increase in the use of isotopic tracing for analysis and medical diagnosis, both in hospitals and factories in recent years has necessitated the adaption of existing buildings for use for radiography or radiotherapy. Fixing lead sheet to the walls sometimes provides the necessary shielding.

At other times the bare metal won't suffice and a lead cored plywood is used. Other laminates, combining lead and aluminum, mild steel or plastics are also available. They all are convenient to handle, self-supporting, hygenic and protect the lead from damage.

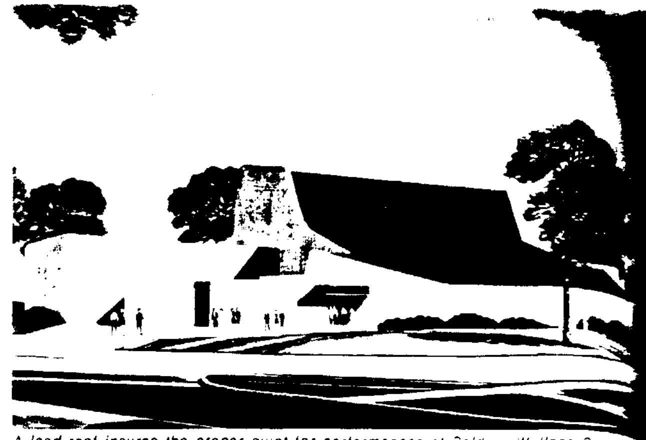
Where a combined neutron-gamma shield is required, a solid material made up of finely divided lead dispersed in polythene is available. Proportions of components vary to meet different job limitations. This material can be accurately machined and individual components can be welded together using filler rods of the same material.

To meet the constantly evolving need for protective shielding, other materials have been experimentally lead loaded. Asbestos cement, building bricks, rubber, and concrete have all been filled with lead shot, powder and oxides. A new form of dense concrete, a combination of high alumina cement and galena (lead ore) has been produced giving densities up to one-half of metallic lead and yet still having the mechanical properties of an excellent structural concrete.

Radiation shielding is a complex business that leaves no margin for error. Detailed information on lead shielding materials, techniques and construction are readily available. Whatever the shielding need may be, stationary shield, transport container, space shield, movable local shield, or whatever, lead may prove to be the least expensive and most efficient shielding method available.

Credits
Architect: Heine-Crider-Williamson, Inc., Berea, Ohio
General Contractor: Thomas D. Rabie Construction Co., Brunswick, Ohio
Acoustical Consultant: Bolt, Beranek & Newman, Inc., Cambridge, Mass.
Roofing Contractor: Korner Roofing & Sheet Metal Co., Independence, Ohio

LEAD ROOF ON CULTURAL CENTER UPSTAGES AIRPORT NOISE



A lead roof insures the proper quiet for performances at Baldwin-Wallace College's new Arts and Drama Center even though the theatre is located directly under a major air corridor.

All of the drama associated with Baldwin-Wallace College's new Art and Drama Center isn't necessarily inside. The outside has a new lead roof that plays three essential roles. First, it plays the heroic role of the esthetically-pleasing beautiful patina roof associated with monumental buildings. It is a stalwart because of its renowned durability. And here at Berea, Ohio, it acts as a sound barrier between the jet noise from the nearby airport and the theatres inside the building.

NEED FOR NOISE CONTROL

The new campus cultural center at Baldwin-Wallace houses two theatres: one seating 550 designed for regular stage productions, the other a small experimental theatre seating between 250 and 300 depending on how flexible interior partitions are arranged.

The most feasible location for the Center, adjacent to the school's football stadium where a 1000-car paved parking lot could be shared, as it happened, was also directly under a major air corridor used by jet planes at the nearby Cleveland Hopkins Airport. To keep the roar of planes offstage, the firm of Bolt, Beranek & Newman, acoustical consultants, recommended a sound attenuation system that included brick cavity walls and a roof of sheet lead.

The main theatre in the Center has a fly loft, the conformation of which gives the building its singular appearance. The loft roof slopes almost vertically up from the rest of the building. Loft and other roof areas are covered with 3-lb. per sq. ft. sheet lead (3/64-in. thick).

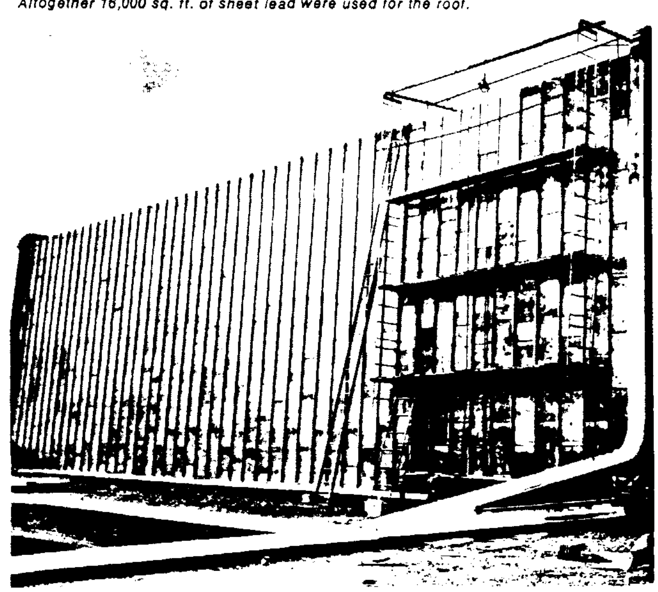
BATTEN PRINCIPLE USED FOR INSTALLATION

Underlayment for the roof consists of 15-lb. building felt over a wood deck. This underlayment is covered with 3/4-in. rigid insulation, 3/8-in. plywood, 30-lb. building felt, rosin paper, and finally the sheet lead. Lead is secured to battens with 16-oz. copper cleats. Edges of sheets are joined with loose locks and filled with non-hardening calking compound to prevent moisture from entering the joints.

All told, 16,000 sq. ft. of sheet lead were used on the Center's roof. And the lead is playing its role well. It looks strikingly handsome. It will last indefinitely. It is keeping the noise of low-flying jets out of the theatre. Even when planes are roaring overhead, a stage whisper inside the theatre can be heard without difficulty in the last row.

Workmen put the first fold in the lead at the sheet metal "shop" assembled on the roof by the roofing contractor.

The dramatic fly loft roof of the Center makes the building a standout on campus. Altogether 16,000 sq. ft. of sheet lead were used for the roof.



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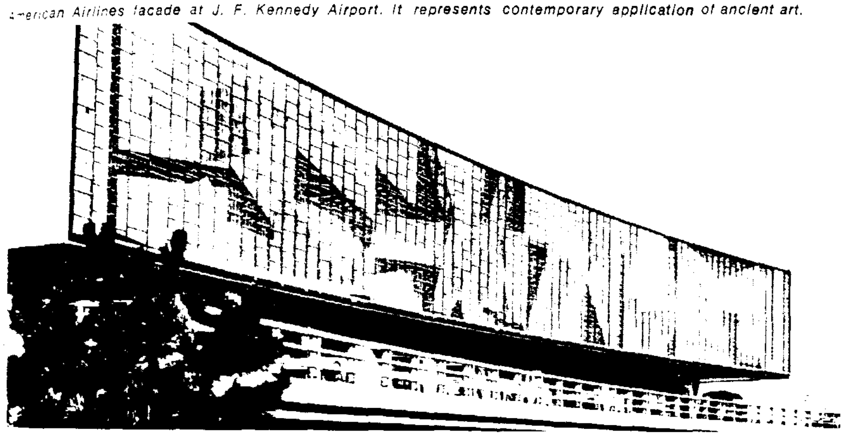
STAINED GLASS—THE ART FORM THAT GOES ON

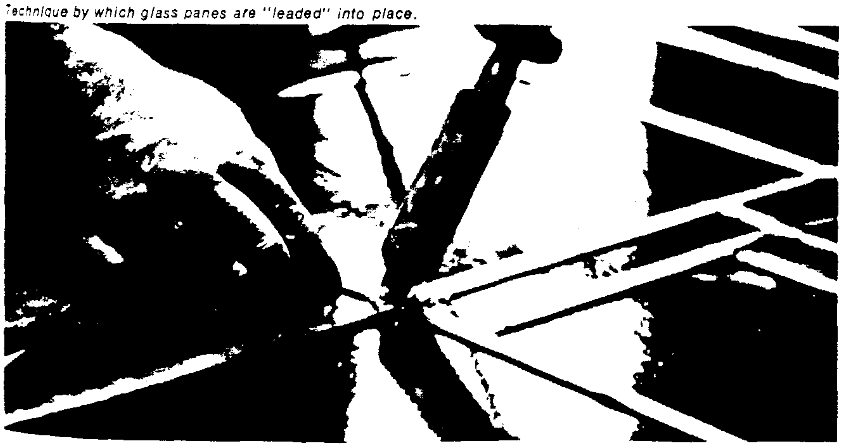
If anyone has any doubts about the present vitality of the stained glass market, he may be surprised to learn that the manufacture of stained glass is estimated to exceed $25 million annually. So an old art form that began as an architectural adjunct in the Middle Ages, all its own with its perfection by the designers of religious institutions, is still very much with us.

By now, of course, stained glass has broadened its scope. Private homes, commercial buildings, retail stores, schools, and subsequently was elevated to a plane and a wide variety of other establishments can be found with stained glass today. It's important to add that the glass is being used as a significant decorative item and not just as a stairwell window decor.

Lead, of course, is synonymous with stained glass. Besides being the carrier for the glass itself and the shaper of the design in question, the lead is used in various thicknesses and proportions to the glass to give added definition, shape, and depth to the design.



American Airlines facade at J. F. Kennedy Airport. It represents contemporary application of ancient art.

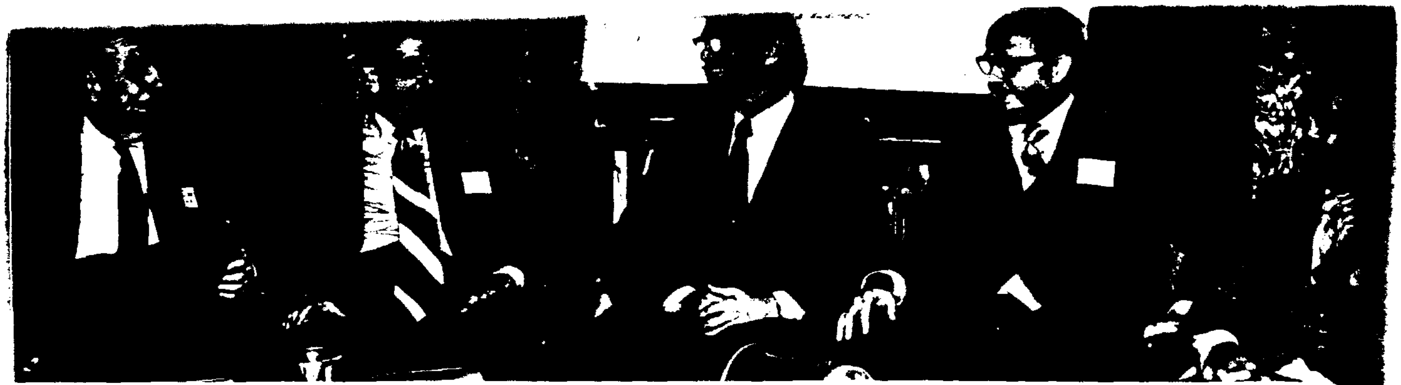


Technique by which glass panes are "leaded" into place.

The actual process of putting together a stained glass window has varied little since the 13th century when the windows of the great European cathedrals were made. A life size black and white "cartoon" of the design is made. The cartoon is cut in pieces, each one representing a different piece of stained glass. The glass itself is cut using the cartoon as a pattern and a glazer puts the window together.

The glass is put in place and bound with pliable leading called cames. Finally each leading joint is soldered for strength. The lead cames are normally H-shaped to accommodate the insertion of the glass. The lead's pliability is a key factor in its use for stained glass—as well as its solderability and the beautiful patina it acquires with time.

A spectacular new technique, developed at a relatively recent date, involves soldering sculptured 3 lb. sheet lead overlays to the basic lead cames which ordinarily hold the stained glass in place. These overlays, formed in relief, are incised with carefully formed and located slits of varying widths which allow the light to shine through the richly colored glass during the day. The "halation" of light through first the glass and then through these slits allows none of the beauty of the glass to be lost. At the same time the sculptured lead, covered with gold leaf, fulfills the representational function of the window in silhouette. It is at night therefore, when the glass is normally dark, that the interior light reflects the golden design with startling intensity. Thus the window functions as well by night as by day.



Panelists J. L. Kimberley, E. Cantwell, W. E. Adams, O. Fremd and R. Sugimoto report on developments in automotive emission control devices.

LEAD INDUSTRY EXAMINES ITS ROLE IN ENVIRONMENT

The 44th annual meeting of the Lead Industries Association in Montreal, April 6-7, was unique in its departure from many, old established patterns. The focus of the meeting itself was distinctive. Unlike earlier meetings where the major concern was research, product development and marketing, in Montreal the dominant issue was "lead in the environment." The industry's concern with its "social contract" was expressed in many ways. Richard D. Mushlitz speaking on the statistics-oriented subject of "World Lead Demand and Supply" commented, "Environmental problems may well have a drastic effect on the lead industry in the next decade."

Dr. Jerome F. Cole, manager of the environmental health department of the International Lead/Zinc Organization reported on the implications of the 1970 Williams-Steiger Occupational Safety and Health Act for the lead industry. This far reaching legislation affects all industry. It is estimated that compliance on a national scale could increase operational costs of affected industries by 5 to 10%. The OSHA standards for lead are the same as those set originally by the American National Standards Institute: "200 ug/m³ on an eight hour day, 40 hour week time weighted average exposure." To the objectives of the OSHA program: "assuring so far as possible every working man and woman in the nation safe and healthful working conditions and to preserve our human resources" Dr. Cole gave unqualified support. He recommended in fact that the OSHA air monitoring program be augmented with a program of blood analyses as being a more sophisticated technique for determining actual metabolic lead imbalance.

Another group of speakers briefed the members on "auto emission control devices that work with leaded fuel." They addressed themselves to the problem posed by the decision of the automotive industry to meet federal air cleanliness standards by employing catalytic converter emission control systems. Since lead fouls the catalyst the decision, in Detroit at least, is that lead must go. Not so said the panelists. They reported on alternative thermal reactor systems that work successfully with lead.

These include different high-temperature approaches called thermal reactors, a catalytic muffler, and several systems to trap lead and other particles before they can be emitted into the atmosphere.

J. L. Kimberley, senior environmental advisor for LIA, charged "the auto industry has yet to develop one of these catalytic devices which will operate effectively on lead-free fuel."

William E. Adams, of the Ethyl Corp., described a Danish catalytic system which his company is presently evaluating. This device was reported by the Danish developers to be able to remove about 90 per cent of the carbon monoxide and unburned hydrocarbons, 80 per cent of the nitrogen oxides and 50 per cent of the lead compounds in exhaust gases. And these levels are accomplished with today's leaded gasoline. This catalyst does not contain expensive noble metals such as platinum.

Both the Du Pont Company and Ethyl Corporation continue to report improvements of systems incorporating thermal reactors which replace conventional auto exhaust manifolds. These reactors serve as high temperature zones where the noxious gases are converted to harmless carbon dioxide and water vapor.

Dr. E. N. Cantwell, of E. I. Du Pont De Nemours & Company said, "We have developed trapping systems which reduce the emission of lead by more than 75 per cent that work in conjunction with the thermal reactors."

Osborn Fremd and Roy Sugimoto of PPG, Inc., reported on a sophisticated particulate trapping system developed by their company that captures about 98 per cent of the lead emissions at a manufacturing cost of only about $11 more than present day mufflers.

Speaking on the subject of health aspects of lead in gasoline, Dr. Cole summarized the position of the Lead Industries Association:

"There is no health hazard now or foreseeably from lead in the atmosphere.

"There is no relationship between lead in the air and lead in the blood at concentrations found in major cities.

"Aromatics, which will be added to auto fuels in increased amounts if anything near today's octane levels in lead-free gasoline are to be maintained, are suspected of promoting cancer.

"The increased aromatics are likely to increase eye-irritating photochemical smog.

"Unleaded fuels increase soiling and decrease visibility.

"It is strange how many of those persons who are unwilling to accept even the slightest risk to health or welfare are yet ready to advocate crash programs with unknown consequences to remedy some imaginary threat. In view of this there is no justification for further restrictions on the lead content of gasoline."

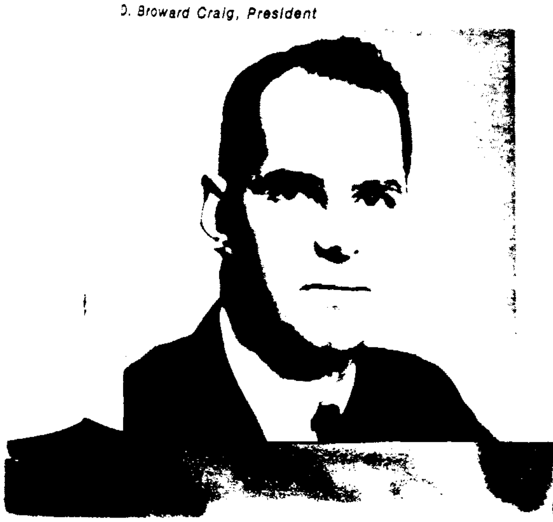
The problem of lead poisoning in children is particularly harrowing, Dr. Cole reported, because both the causes and treatment are known. "Urban renewal," he said, "is an answer to the pediatric lead poisoning problem." He pointed out the long history of the lead association in efforts to bring about standards of lead use in interior paints.

Similarly in the matter of lead poisoning due to lead release from glazed food and beverage items, Jerome F. Smith reported that such cases almost invariably involved folk crafted or imported ceramic utensils. The lead industry has taken a position of leadership in research, surveillance programs and public information in this area. This work is providing background for U.S. legislation now pending. Smith concluded: "It is gratifying to note that the information used in drawing up the legislation is necessarily drawn from work originally conceived and carried out by USPA, LIA and ILZRO. We are hopeful that the bill can be modified somewhat to provide better control over the imports of ceramics by individuals and the manufacture and sale of hobby and art craft pottery intended for food service. We are working with the sponsors of these bills and are optimistic that our input will be utilized."

The discharge of social responsibility is an industry concern. One index of the degree of success with which LIA has pursued this goal may be found in the comment of Senator Edward Kennedy to association executive vice president, Phil Robinson, at the conclusion of recent Senate hearing on lead in paints: "I just want to say that you deserve great credit and the Lead Industries Association deserves great credit for the help it has provided to Congress in this area. Many times industry associations have not been as cooperative in matters affecting their own industry, have not been nearly as positive or constructive as your industry has been, and I appreciate it."

LIA OFFICERS FOR 1972-73

D. Broward Craig, President



Philip E. Robinson, Executive Vice President

Jerome F. Smith, Secretary & Manager

FUME-FREE ELECTRICS CUT IN-PLANT AIR CONTROL COSTS

Industrial health experts, managers and union members agree that plant air quality must be effectively controlled to insure employee safety and well-being. Such is the consensus that these groups have cooperated with various concerned law bodies in establishing control legislation.

Lead acid battery-powered electric lift trucks are the immediate beneficiary of any move to control in-plant air. Technological advances and economics have favored electrics for this use over internal combustion (IC) engine lift trucks for some time. Now, with emphasis on controlled plant air, the elimination of eye and lung irritating exhaust fumes provides a potent new reason to choose electrics.

A 1970 study reported in *Electrical World*, estimated the emission content of 15.000 gas-powered outdoor vehicles at 106.8 tons per day (tpd) of carbon monoxide, 19.8 tpd of unburned hydrocarbons, and 5.1 tpd of nitrous oxides. This study concluded that if carbon monoxide is brought under control, the other elements become relatively minor.

Specific information on carbon monoxide control has been gathered by the Michigan State Health Department. Narrowing the focus to in-plant industrial vehicles, Irving H. Davis, Regional Chief of the Division of Occupational Health, conducted tests that led to the establishment of an allowable carbon monoxide level in typical enclosed industrial plants.

Among industries regarded as typical were auto assembly, appliance manufacturing, and auto parts fabrication. The allowable CO level for such industry in Michigan was established at 50 parts per million (ppm). This standard was subsequently adopted by the American Conference of Governmental Industrial Hygienists, and the Federal Occupational Safety and Health Act (OSHA) of 1970.

Mr. Davis' field investigations turned up interesting data supporting increased electric vehicle use. For one thing, contrary to popular opinion, propane-powered equipment may emit as much or more CO than gasoline-fueled equipment. Propane users, believing themselves free of CO hazard, may neglect preventive maintenance and find themselves with critical problems. Others have relied on catalytic devices installed on IC engine units to improve combustion and lower emissions. Mr. Davis' investigation found that the devices were totally inoperative on 85% of the vehicles tested by the Michigan State Health Department.

The Michigan experience concluded: *In an enclosed manufacturing plant using 6 gas or propane lift trucks, 20,000 cfm of additional ventilation is required to stay within the 50 ppm maximum CO level. Hardware to provide the additional air, including roof units, ductwork, fans, wiring, but not maintenance, would cost $13.000, or $2,166 per truck. Operating costs (electricity and air conditioning) would add another $1,300 per year, or $220 per truck.*

These investigations prompted Mr. Davis to conclude that electrics were the only logical means of complying with in-plant carbon monoxide regulations.

The regulations similar to those adopted by the Michigan State Health Department have also been endorsed by other states. Elliott Mason, head of field investigations for the State of New Jersey's Occupational Health Department, concurs with Michigan's findings. Sadamoto Iwashita, Chief of Occupational and Radiological Health, State of Hawaii, states without reservation that electric vehicles are the only realistic answer to CO control in in-plant materials handling. Regulatory CO levels following Federal guidelines are in the process of being established in both states.

In recent years there have been several dramatic incidents that illustrate the importance employees attach to having clean air on the job.

At London's Heathrow Airport, ground support employees stopped work to dramatize the need for action to clear the air in baggage terminals then served by IC tractors.

U. S. dock workers protested air conditions and won maritime union regulations that permit only electrics to be used for below-deck cargo handling.

An employee committee at a major parts manufacturer for the automotive industry demanded and won a crash program to replace IC fork lifts with electrics for in-plant use.

Grocery items for shipment are checked out by one of Lucky's tractor operators with a dispatch. Lucky Stores, California, typifies the trend in food warehousing toward battery-powered electrics. Lucky's plant manager attributes an added advantage for the electrics in noise abatement.

In this worked-out limestone mine, Butler County Mushroom Farm, Inc., grows over 24,000,000 pounds of mushrooms a year. Currently a fleet of about 60 lead acid battery vehicles of all types are in use. Electrics were chosen because of their versatility, their clean operation, and their adaptability to underground environmental conditions.

Alfred M. Lewis, Inc. of Riverdale, California, one of the world's largest wholesale grocery companies, credits its electric fleet with annual savings of over $25,000. Here maintenance crew runs the lead acid battery-powered tugs into position at Lewis' outdoor charging station. The station has 57 chargers arranged in two rows.

COMPLEX AIR CONDITIONING INSTALLATION CHEAPER WITH LEAD

Hoffman-LaRoche, a leading pharmaceutical and fine chemical manufacturer, is currently engaged in an extensive building program to house its expanding scientific staff and research laboratories. One such recently completed building is the company's 9-story Research and Quality Control Building in Nutley, New Jersey.

Two major requirements for the new laboratory building influenced its design and construction: exhaust hoods in each laboratory and a continuous supply of conditioned air.

In the final design the exhaust hoods were connected by ducts running up the side of the building to fan rooms on the penthouse. This design preserved internal laboratory space and incidentally, gave the building a distinctive appearance.

To provide the continuous change of air in laboratories the architects deemed it necessary to totally enclose laboratory spaces from floor to slab. The presence of numerous pipes, ducts, and electrical conduits in the ceiling area of each laboratory made the erection of a solid partition from floor to slab too costly.

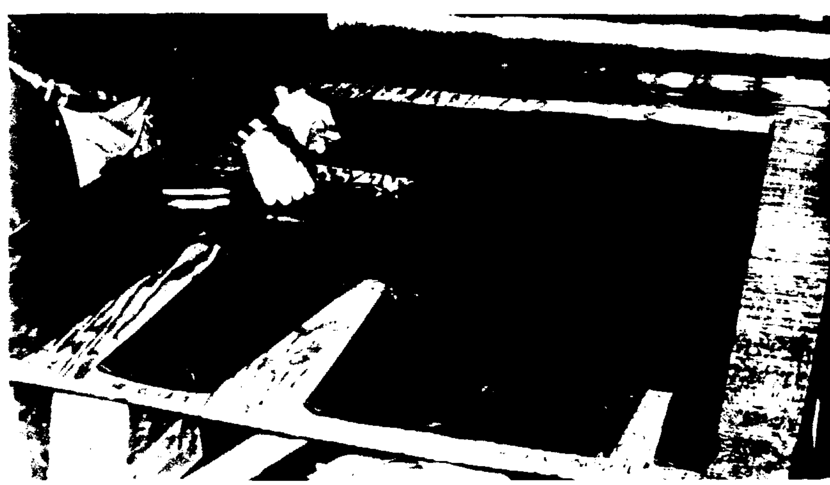
Instead, the partition contractor recommended the use of a 1-lb., (1/64-in. thick) sheet lead plenum barrier hung from the soffit of the floor slab to the top of a ceiling-high partition construction below.

Building architects approved the proposal because it had several benefits. It would tightly enclose the plenum space, thereby making the space an effective air chamber. It would seal off noise from the adjacent laboratory. It would be the least expensive and most effective method in terms of construction, since sheet lead is easily cut, fitted, and formed tightly around penetrations.

Sheet lead was supplied in rolls measuring 4-ft. by 25-ft. long. Each roll was cut into sheets of required length, and as it was hung, slits were made to permit the passage of piping. After the sheets were in place, the slits were folded back around the piping and sealed to maintain an airtight membrane. Because installation was made after piping was already in place, it was far easier and cheaper to install the sheet lead than to measure, cut and fit a rigid partition to the slab.

The new Research and Quality Control Building of Hoffman-LaRoche. Sheet lead plenums are utilized in its air conditioning system.

Air conditioning ducts run above the dropped ceiling in the corridors, carry conditioned air to each laboratory on the nine-floor building. Air flows into the laboratory through a perforated ceiling and is exhausted through a floor-level hood.

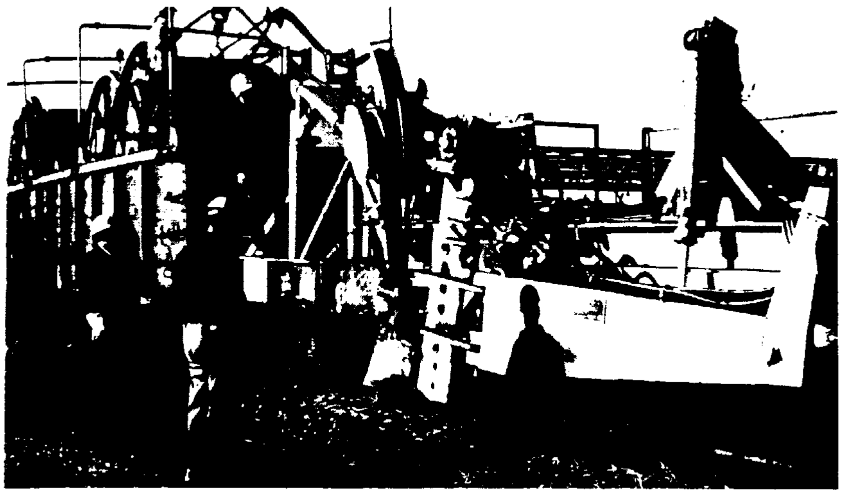


To install the plenums at Hoffman-LaRoche, sheet lead was cut to required size, slit and folded back to permit intrusion of the piping. When put into position around pipes, the slits were pushed down around the protrusion and sealed.

Credits: Architect: Haines, Lundberg and Waehler; General Contractor: Conforti & Eisele; Partition Contractor: E. F. Hauserman Co., NYC; Lead Work: Jacobsen & Company, Elizabeth, N.J.

LEAD LENDS A HAND IN RURAL BEAUTIFICATION

Three, 33kv, 2.3" diameter lead sheathed cables are plowed-in as the rail car mounted vibratory plow moves along the railroad right-of-way between Con Edison's Fresh Kill substation and the Travis section of Staten Island. Unique direct cable burial equipment greatly accelerates speed at which cable can be laid.



The three lead sheathed cables are lifted above the ground for creek crossings. They are later letted into the trench dug by a clamshell.

Close-up of the plow and the cable chute, inside which three cables are placed in a trench and then backfilled immediately. The cables are spaced 2½" apart.

New York's Staten Island is typical of the many U.S. suburban areas wishing to grow but at the same time insisting that some of the eyesores that accompany urbanization, like overhead power transmission lines and poles be eliminated or minimized. Responsive to this preference the island utility company, Consolidated Edison, is committed to a policy of installing power cable underground; in fact 90% of all new installations are underground. In these direct burial installations lead has positive advantages.

LEAD SHEATHED CABLE SELECTED FOR THE JOB

The 33kv cable selected for recent installation on Staten Island has an aluminum conductor of 757 MCM and is insulated with ethylene propylene rubber. A lead sheath that is about 7/64" thick is used to protect the cable. Each of the cables measured about 2.3" in diameter. According to James A. Sheppard, Jr., General Manager of Con Edison's Staten Island Division, lead sheathed cable was selected for two reasons . . . reliability and safety. Utmost reliability is required of any direct buried cable and the imperviousness of lead gives the needed protection even on underwater crossings. Sheppard stated that the lead sheath also provided a safety factor in the event of an accidental penetration of the cable. Any metal object that would go through the lead sheath and strike the conductor could cause a ground through the lead sheath, protecting the workman using the intruding tool.

The performance of the new installation has been so successful Con Edison now plans to extend two more feeders for another 5 miles. Again, lead sheathed cable will be specified for this underground installation.

INTERESTING ODDS AND ENDS ABOUT LEAD

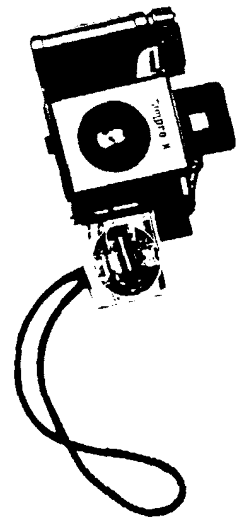
A SUBMARINE ROMP

For all those Walter Mitty's who've dreamed of commanding their own submarine, there's a handy-dandy lead acid battery-powered model, called a Perry Cubmarine Shark Hunter, ready and waiting. The tiny submarine weighs in at 1,100 pounds, batteries included, and is 14-ft. long. Three 12-volt heavy duty lead acid batteries provide the power. The batteries require about the same care as a car or boat battery. They can be recharged right in the Cubmarine at dock or marina facilities. Uses for the boat include business, research, as well as pleasure.

LEAD PLAYS A JAMES BOND ROLE

Modern espionage has become so sophisticated that "spies" are now using x-rays to read the combinations on safes and security desks. The Government of Great Britain has found a way to foil the villains. Lead-covered tumblers are being substituted for regular ones in all high security areas. Lead, of course, is impervious to the x-rays and makes the safes "crack-proof". The problem is serious enough and the solution so effective that $1 million is being spent on the conversion of the tumblers.

CAMERA EYE



In this novel application, a lead weight acts as the camera shutter actuator. Anchor Alloys, Inc., worked with the engineers of Simpro Corporation of America to develop a special lead weight for the pocket size Simpro-X camera. The tiny lead actuator weighs only 34 grams and is produced by a low cost casting process. The Simpro-X is small and simplified; easily slips on to any size 126 film cartridge rather than the cartridge into the camera. It will take an x-cube flash and color pictures.

INTERNATIONAL SYMPOSIUM ON LEAD TO MEET IN AMSTERDAM

The United States Environmental Protection Agency and The Commission of the European Communities are jointly sponsoring an international symposium on the environmental health aspects of lead in October of this year.

The Symposium will be held in Amsterdam, October 2nd through the 6th. Its objective is to examine current data on environmental lead and discuss how that information can be used to increase the protection of man and his environment.

The Symposium program will cover in detail the absorption and metabolism of environmental lead in man; the subclinical effects of lead and their role in establishing lead environmental and analytical methods and monitoring of environmental lead.

Scientific papers related to agenda topics have been invited. Papers can be submitted in English, French or German and must run no longer than 30 minutes in oral presentation. Admission to the Symposium is free.

All correspondence regarding the Symposium should be sent to:

Direction Protection Sanitaire
Commission des Communautes
Européennes 29, rue Aldringen
Luxembourg (Grand-Duché)

The Lead Industries Association, Inc., a non-profit organization, is a New York membership corporation. It is the trade association for the lead industry, with membership including both producers and users of lead. The Association neither produces nor sells lead, but collects and distributes information relative to the uses of this metal.

The major activities conducted by the Association on behalf of the lead industry are promotional in nature. They include technical service, public relations and publicity, motion pictures, technical and educational publications and statistical reports.

An extensive library of information about lead (for listing of typical literature see rear cover of this issue) is housed at the Association's New York headquarters, and data pertaining to lead and lead products are available without charge.

MEMBERS OF THE LEAD INDUSTRIES ASSOCIATION, INC.

Allied Lead Inc.	*Chicago, Ill. 60643*	**Gardiner Metal Company**	*Chicago, Illinois 60632*
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Alpha Metals, Inc.	*Jersey City, N.J. 07304*	**Globe-Union Inc.**	*Milwaukee, Wis. 53201*
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Cambridge Smelting Company	*Cambridge, Mass. 02138*	**NL Industries, Inc.**	*New York, N.Y. 10006*
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Cominco Ltd.	*Vancouver 1, B.C. Canada*	**Oatey Company, L.R.**	*Cleveland, Ohio 44135*
Day Mines, Inc.	*Wallace, Idaho 83873*	**Ozark Lead Company**	*Sweetwater, Mo. 63680*
Delco-Remy Division		**Penarroya**	*75 Paris 15, France*
General Motors Corporation	*Anderson, Indiana 46014*	**(Agent: NC Trading Co., Inc.)**	*New York, N.Y. 10022*
Division Lead Co.	*Summit, Illinois 60501*	**Quemetco, Inc.**	*City of Industry, Calif. 91747*
Dixie Industries Inc.	*Dallas, Texas 75221*	**Revere Smelting & Refining Corp.**	*Dallas, Texas 75222*
E. I. du Pont de Nemours & Co.	*Wilmington, Delaware 19898*	**St. Joe Minerals Corporation**	*New York, N.Y. 10017*
Dresser Minerals Division		**Schuylkill Metals Corp.**	*Baton Rouge, La. 70807*
Dresser Industries, Inc.	*Houston, Texas 77005*	**Tonolli Co. of Canada Ltd.**	*Mississauga, Ontario, Canada*
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Ethyl Corporation	*Richmond, Virginia 23217*	**Victory White Metal Co.**	*Cleveland, Ohio 44127*
Federated Metals Division		**Hyman Viener & Sons**	*Richmond, Virginia 23205*
American Smelting & Refining Co.	*New York, N.Y. 10005*	**Vulcan Lead Products Company**	*Milwaukee, Wis. 53204*
Aaron Ferer & Sons Co.	*Omaha, Nebraska 68102*	**Willard Lead Products Co.**	*Charlotte, N.C. 28203*

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lead

LIBRARY OF TECHNICAL INFORMATION

The following publications are available free of charge unless otherwise noted. Send request to the:

LEAD INDUSTRIES ASSOCIATION, I
292 Madison Avenue, New York, N.Y. 1

NEW LISTINGS

Lead in glazes

Reprint from American Ceramic Society Bulletin. Six papers on subject of lead release testing on ceramic dinnerware glazes. Charts and tables. Twelve pages. **B-10**

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**

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**

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**

Techniques for reducing machinery noise

Reprint from Pollution Engineering details materials and solutions for reducing machinery noise to acceptable levels. Specifics given for several machine types in common usage. Illustrated. Four pages. **J-11**

ARCHITECTURAL

Waterproofing with sheet lead

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

Lead roofing and flashing

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

PAINTS

Follow the safety line with chrome yellow

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

Red lead based paint systems

Provides details on general properties and suggested uses of recommended paints. Instructions on surface preparation for a variety of applications. Listing of LIA recommended formulations. Thirty-two pages. **F-1**

PLUMBING

Lead plumbing catalog and specifications

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

CHEMICAL CONSTRUCTION & CORROSION PROTECTION

Corrosion resistance of lead in chemical applications

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

Lead in modern chemical construction

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

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**

Electric trucks are the choice

Reprint from Electrical World. Operational and maintenance experience of various industrial companies with battery powered in-plant vehicles. Four pages. **L-10**

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. **M-21**

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**

ANTI-VIBRATION PADS

Ways to reduce press vibration

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

Lead asbestos anti-vibration pads

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

CABLE SHEATHING

Lead-covered underground cable use increasing

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

GENERAL

Primary lead production areas in the U.S.

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

The new lead belt

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

Use of lead in the automobile

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

Lead—The "Clydesdale" workhorse in space

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

The U.S. Lead Industry—1971

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**

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