Lead Used Extensively In New Hospital Addition

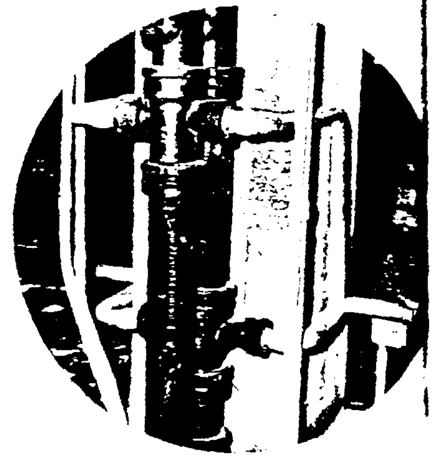
The new 110-bed addition to the Springfield, Ill., Memorial Hospital was designed by Burnham and Hammond, architects of Chicago, Ill.

THE construction of the new addition to the Springfield, (Ill.) Memorial Hospital now nearing completion is a prime example of the usefulness of lead's many properties in modern construction. Lead's density serves as a shield in the X-ray rooms, lead's flexibility and durability are taken advantage of in the plumbing system and lead, being impervious to moisture, is used for flashings and under shower stalls.

The new 110-bed addition, designed by Burnham and Hammond, architects of Chicago, Ill. will have complete X-ray facilities located in a lead-lined room. Surprisingly enough, lead, the heaviest of the common metals, is generally the lightest and most economical material for X-ray shielding. This paradoxical situation occurs because the effectiveness of a shield depends on the density of the shielding material, and lead, the densest of the commonly available materials, will give the greatest protection per unit of thickness.

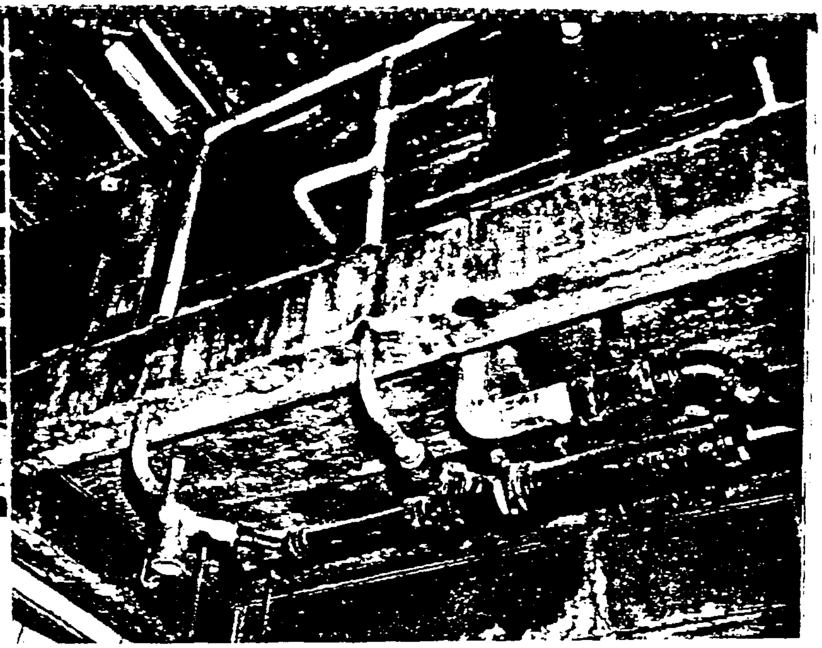
The walls of the X-ray room have been built-up of concrete blocks with an unperforated sheet of lead sandwiched and anchored in the center of each block. The 6-lb. sheet lead extends beyond the edges of the block and when set in place, the lead of one block overlaps the lead of the surrounding blocks. Supporting columns extending into the X-ray room were covered with overlapping lengths of 6-lb. sheet lead. The floor where the X-ray beam will be concentrated has been lined with overlapping 24-lb. (3/8 in. thick) sheet lead. Where pipes or wires pass through the lead shield, they should be offset so that the opening can be backed with large lead patches that will prevent rays passing through at any angle.

The extensive plumbing system of the new addition, involving 565 separate plumbing fixtures, many of them peculiar to hospitals, such as wash-up sinks, bed pan washers and special



The lead waste and vent connections in the Springfield Memorial Hospital are compact and require a minimum number of joints.

The X-ray room is lead-lined with 6-lb. sheet lead. The supporting columns are wrapped with sheet lead and walls are made with cinder block lead sandwiches.



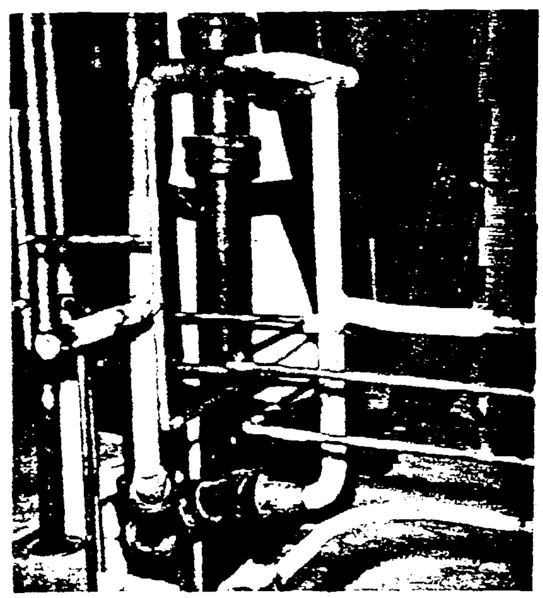
The plumbing roughing-in for the Springfield Memorial Hospital has used lead extensively, above, for special hospital fixtures and at right, for complete bathrooms.

baths, have flexible lead pipe for the wastes and vents and lead traps and bends for the fixture connections. Joints in the cast-iron soil pipe lines were made gas and watertight with lead. The accompanying photographs graphically illustrate one of lead's major advantages in a piping system, the absence of joints even at 90 deg. changes of direction.

In addition to the special hospital fixtures, the plumbing contractor, Edwards Plumbing & Heating Co., Springfield, Ill., installed 116 water closets, 232 lavatories, 16 bathtubs, 10 drinking fountains and 32 showers. In the new wing, lead pans made from 6-lb. sheet lead were used under all showers. Where vent piping extended through the roof, lead flashings, prefabricated by the plumber from 6-lb. sheet lead, were used to prevent leakage at this generally very vulnerable point. Roof drains were also flashed with 6-lb. sheet lead.

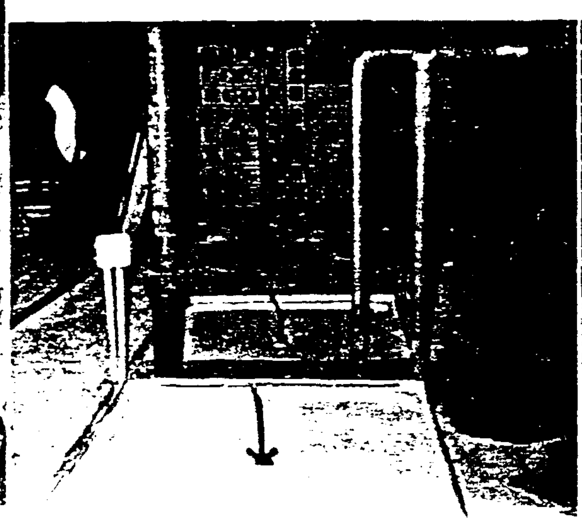
General contractor on this addition to the Springfield Memorial Hospital is the Evans Construction Co., Springfield, Ill.

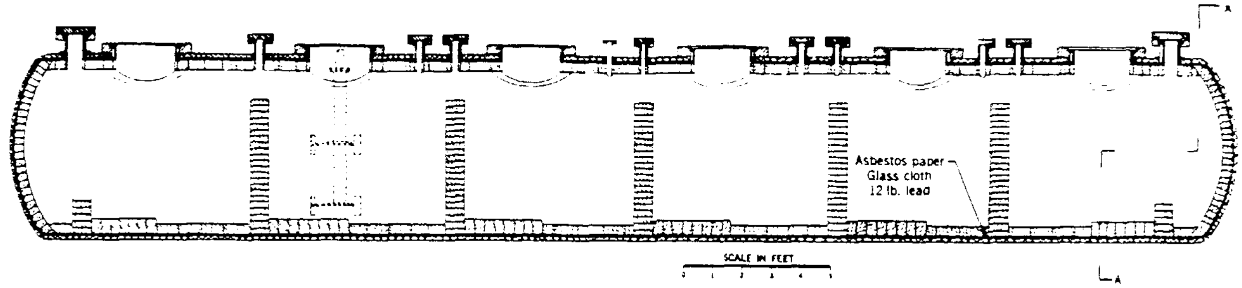
The flexibility of lead is used to good advantage in the hospital's plumbing system as at right.



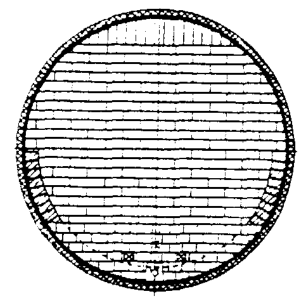
At left, flexible lead stubs and drum traps connect the fixtures from two private bathrooms to the rigid drain lines.

Vent stack flashings and shower pans are made with 6-lb. sheet lead with all joints lead burned. Precast shower receptors are then placed within the lead pans as at left, below.





The lead acid-brick lined oxidation autoclave above is divided into six equal compartments by acid-brick walls having overflow weirs at their upper extremities, thus allowing the oxidation slurry to flow from one compartment to the other.



SECTION "A-A"

Calera Mining Company Solves Corrosion Problem With Lead

Design and construction of Calera Mining Company's Garfield, Utah, cobalt refinery five years ago offered a number of unusual and difficult problems which had to be worked out by Chemical Construction Corp., which developed the process, and Calera's parent company, Howe Sound Co. Not the least of these was the design of the oxidation autoclave, a cylindrical pressure vessel 40 ft. long and 6 ft. in diameter which had to operate at 600 psi. in a temperature range of 400 to 450 deg. F.

Originally of carbon steel construction, internally clad with a 10 per cent type 316 stainless steel, it was coated with Epon paint, followed by glass cloth and asbestos paper, both applied with sodium silicate, and a final lining of one course of acid-brick. The oxidized solution slurry contained 30 per cent solids in the form of iron arsenate and calcium sulphate, and had the following approximate analysis:

	Grams/Liter
Cobalt	60–75
Nickel	2–3
Iron (ferrous)	5–7
Iron (total)	10–12
Copper	2–4
Arsenic	2–4
H_2SO_4 (free)	100–250

Just two years ago the brick lining showed localized failure and examination, during repairs, revealed corrosion of the stainless and deterioration of the other supplementary materials. As a result the vessel was completely relined using a 12-lb sheet lead membrane, glass cloth and asbestos paper applied with sodium silicate and one course of acid-brick. This was based on the knowledge that lead and lead wool in the environment had good corrosion resistance as long as it was not subject to abrasion, splashing or washing action.

The lead was purchased in 9 ft. by 25 ft. rolls, cut in lengths approximating one-half the vessel's circumference and placed so that seams were staggered. All seams were burned and lead nozzle liners were installed and burned to the shell liner. During installation and burning, overhead lead sections were supported by a ¾ in. plywood template, a segment of a cylinder about 6 ft. long, supported by cables passing through nozzle openings. The template was removed after the brick lining had been installed a course or so above the autoclave's horizontal center line.

"Tell-tale" weep holes were provided in the shell to give warning of leakage but recent examination of one of the nozzles showed the lead liner to be in excellent condition with a good oxide or sulphate coating and apparently original thickness.

Linings of this type — a lead membrane with acid-brick to protect the lead from abrasion or erosion and to insulate it against high or fluctuating temperatures — have given excellent performance in many similar installations. Lead acid-brick construction is ideally suited to such use in both new and repair-type construction.

NEW LEAD BUILDING CONSTRUCTION BULLETIN ISSUED

Lead Building Construction Bulletin No. 3 — Specification for Lead Chemical Laboratory Drainage Systems, is now available, free of charge, upon request to the Lead Industries Association, 60 East 42nd Street, New York 17, N. Y.

The specification has been prepared for the guidance of architects, engineers and plumbers in designing chemical laboratory drainage systems for both industrial and educational facilities. Detailed drawings of suggested methods of installing lead waste lines for wall laboratory tables and center laboratory tables with center troughs and end sinks are included.

Previous "Bulletins" in this series are described in "The Lead Library" section on Page 8.

Lead Shielded Manipulator Box For Handling Radioactive Materials

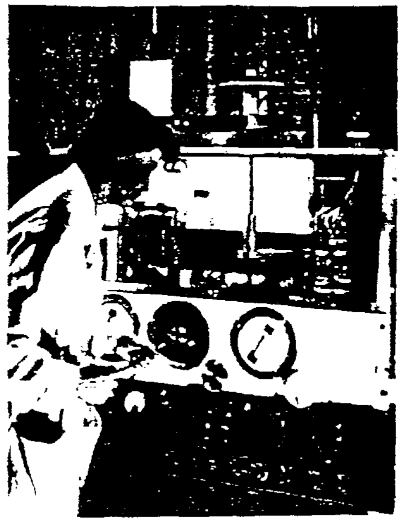
ANOTHER example of lead's usefulness as a gamma shield may be found in the Berkeley lead shielded manipulator box, designed by the University of California Radiation Laboratory under sponsorship of the Atomic Energy Commission, which enables personnel to perform necessary chemical operations in a totally enclosed system. A high level of radiation safety is provided for handling hazardous material through use of the shielded box since the material is isolated from the worker's environment entirely.

The box is designed so that complete laboratory operations may be performed through the ports in the front panel either by hands encased in special gloves or by remote controlled devices. Gloves which become defective may be removed, replaced, and disposed of in the box without exposure to the atmosphere. One remote controlled device, the two-piece rotating tong, with its curved tong end (to which a spring actuated receding finger can be attached) enables the operator to perform many operations which are characteristic of this specially designed manipulator. In addition, other special equipment may be used which is remote controlled and operated through the lead shield and box wall depending on the amount of radiation present.

Another feature of the box or hood is the filtered air intake and outlet which simplifies air decontamination because air flow is reduced to one per cent of the volume required for a full-sized hood. Contamination which occurs is controlled by the use of filters and blowers. Individual waste containers for the temporary storing of liquids and solids during an experiment are placed within the box. These may be removed without hazard as their outside surfaces are uncontaminated. Any spills that occur are confined to the inside of the box. When this occurs or when the experiment is finished the box can be removed from the laboratory for decontamination without interruption of other work.

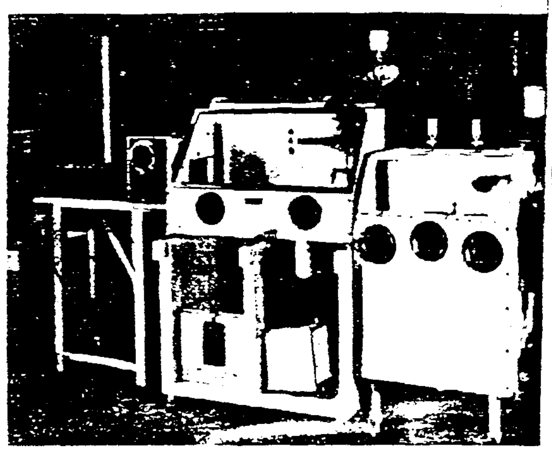
The box is mobile as installed which permits easy transfer from different locations and economic shielding is provided by using standard lead slabs, 2 in. thick which are bolted to an angle iron frame. These lead shields which surround the manipulator box are separable and can be removed and used on other boxes since they are not subject to contamination.

Lead, as indicated in this application, is adaptable to practically all types of equipment handling gamma-active materials. It is particularly advantageous for mobile units such as shipping containers, doors, trucks and ships.

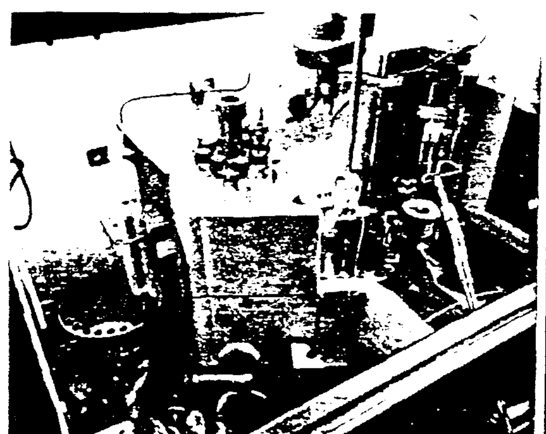


Remote control devices are a part of the lead shielded manipulator box designed by the University of California Radiation Laboratory.

The lead shielded box set up for use with a Beckmann spectrophotometer and centrifuge.

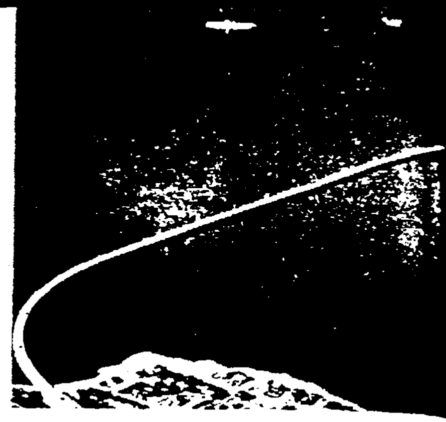


At left, the lead shielded manipulator box is being used here to house the container used to dissolve pile-bombarded slugs.



At right, the interior of the 2-in. thick lead shielded box processing Hanford-irradiated transuranic elements: left-hand area is shielded from gamma-active right-hand side.

Porcelain Enameled Aluminum Used On Ceiling Of New Tunnel



The approach bridges to the man-made islands at which the portals of the new Hampton Roads Tunnel are located.

LEADED porcelain enamels on aluminum have soared into the sky as curtain walls and panels on many of the country's newest skyscrapers and now they have plunged under the sea in the newest of the vehicular tunnels, the Hampton Road Tunnel in Virginia.

Among the several important "firsts" on this new tunnel is the use of leaded porcelain enamel on extruded aluminum panels for the tunnel ceiling. Quoting directly from the dedication program, this type panel was selected " . . . to assure low, long-term maintenance costs."

Over 14,000 leaded porcelain enameled extruded aluminum panels, 12 ft. 9 in. long by 1 ft. wide, were required for the tunnel ceiling. The steel supports for the ceiling were painted with another type of lead compound, rust-inhibitive red lead paint, to protect the steel against corrosion.

Still another lead compound was used in the glaze of the almost 2,000,000 ceramic wall tiles installed on the sidewalls. Lead compounds added to the glaze composition used for such tiles insure for many years a glaze with greater brilliance, luster and smoothness.

Opened for traffic on November 1, 1957, the Hampton Roads Bridge-Tunnel System is one of the world's major water crossings. Including approaches, it is 23.6 miles long and is the largest and most extensive project ever built by the Virginia Department of Highways.

The tunnel itself is the longest in the world built by the trench-type method of construction and the portal to portal length, 7,479 ft., ranks it as sixth among the world's highway tunnels.

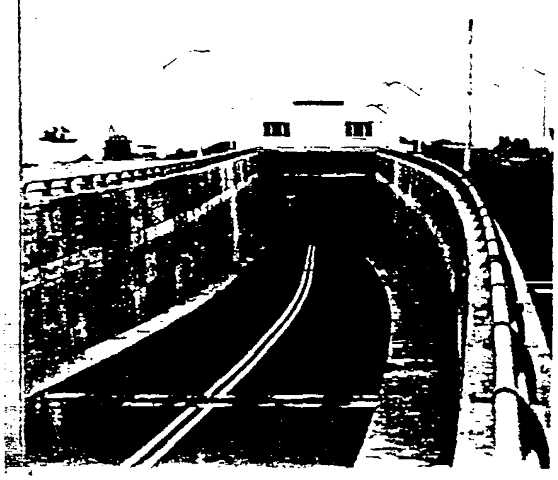
Twenty-three prefabricated steel tubes, each 37 ft. in diameter, approximately 300 ft. long and weighing 12,000 tons, make up the tunnel. The north approach bridge extends 3,250 ft. from a causeway in Hampton to the portal on North Island and the south approach bridge, ending at the portal on Willoughby Spit, is 6,150 ft. long. Both portals are located on "man-made" islands.

In addition to the leaded porcelain enameled ceiling panels, other important tunnel firsts are the first ever constructed with its portals emerging on "man-made" islands and the first vehicular tunnel to utilize adjustable-pitch blades on axial-vane fans for varying the quantity of air in the ventilating system.

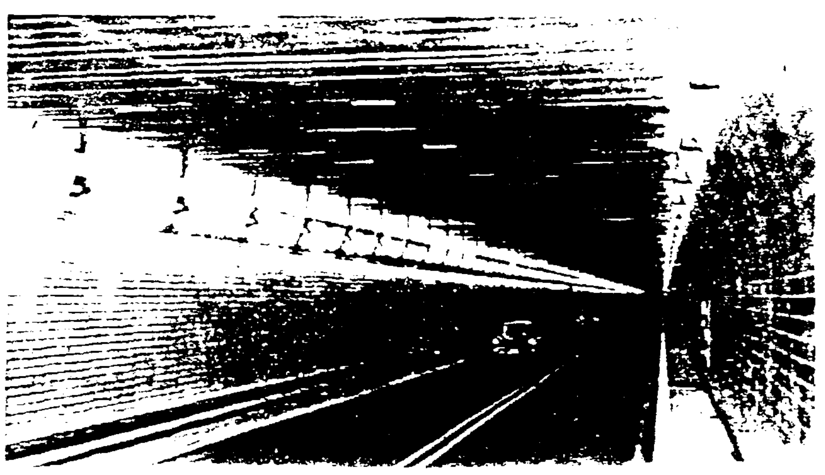
Engineering consultants on final design and construction were Parsons, Brinckerhoff, Hall & Macdonald and the Atlas Tile & Marble Works, Inc., Long Island City, N. Y., as one of the prime contractors, installed the ceiling and the ceramic sidewall tiles. The leaded porcelain enamel was applied to the extruded aluminum ceiling panels by Halrick, Inc., Danbury, Conn. and the lead glazed ceramic wall tile was produced by the United States Ceramic Tile Co., Canton, Ohio.

One of the important advantages of lead in porcelain enamels is the increased resistance to chipping it imparts to the enamel. As a result it can be punched or drilled, sheared or sawed with little or no chipping. The lead also imparts greater smoothness and brilliance as well as improving the enamel's elasticity and increasing its chemical resistance. Also, the addition of lead to porcelain enamel compositions materially reduces the firing temperature at which the enamel can be applied to the base metal. This is particularly necessary when aluminum is the base metal and particularly advantageous when the porcelain enamel is being applied to steel.

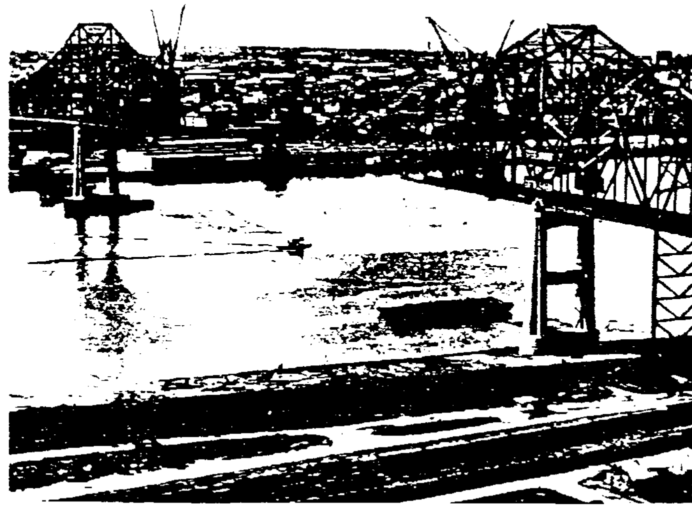
The Hampton Roads Tunnel entrance on man-made North Island in Hampton Bay.



"To assure low, long-term maintenance costs," leaded porcelain enameled extruded aluminum panels are used for the ceiling of the new tunnel and the wall tiles are lead glazed to assure greater brilliance.



Red Lead On Newest And Longest Cantilever Bridge



Red lead paint protects the steelwork of the Greater New Orleans Bridge, longest cantilever type bridge in the United States.

THE Greater New Orleans Bridge, spanning the Mississippi River at New Orleans, with a center span of 1,575 ft., will be the longest cantilever-type span in the United States when completed in 1958. The cantilever structure, including an anchor arm of 853 ft. on the New Orleans side and one of 591 ft. on the west bank, will be 3,019 ft. long. Elevated approaches will add another 7,700 ft. bringing the over-all length of the bridge to over 10,700 ft.

Designed and engineered by Modjeski & Masters, of Harrisburg, Penna., the bridge is being built for the Mississippi River Bridge Authority.

The cantilever structure will be supported on four reinforced concrete piers, three on huge caissons which have been sunk deep into the ground to a safe supporting stratum of earth, and the fourth supported on piles. Structurally the bridge will be flanked on each side by deck truss spans supported on concrete piers, and these deck truss spans in turn will be followed by a trestle-type construction consisting of steel towers and bents on pile supported pedestals. The approaches will descend on easy 3½ per cent grades to the highway and street connections at either end of the bridge.

The bridge roadway between curbs will be 52 ft. wide, providing initially two 12-foot lanes for traffic in each direction and if traffic warrants it, a fifth lane can be established for reversible traffic flow.

The bridge superstructure and approaches are under construction by Bethlehem Steel Co., Bethlehem, Penna., and will involve more than 33,000 tons of fabricated structural steel requiring more than 18,000 gallons of paint for the primer and intermediate coats.

As is current practice on almost all of the highway bridges of the United States, red lead based paints will be used for the primer and intermediate coats on the steel work of the Greater New Orleans Bridge. The paints were specified by the consulting engineers, Modjeski & Masters, and the formulations accompany the text.

Red lead paints have long proved effective in protecting steel work against corrosion under particularly rugged atmospheric conditions, such as high humidity coupled with high industrial activity, the same type of corrosive conditions that can be expected to surround the Greater New Orleans Bridge.

GREATER NEW ORLEANS BRIDGE

EXTRACT OF PAINT SPECIFICATIONS FOR STRUCTURAL STEEL

(Primer paint shall be either Type A or Type B)

PRIMER, TYPE A—RED LEAD IRON OXIDE—LINSEED OIL

This type priming coat shall be pigmented with red lead and iron oxide in the proportions of 75 per cent red lead (95% Pb_3O_4 grade), and 25 per cent iron oxide (not less than 78% Fe_2O_3). The dry pigments mixed to a heavy paste shall be ground with a vehicle in the proportion of one-half (½) gallon raw linseed oil to one-half (½) gallon of kettle boiled linseed oil to which has been added six (6) ounces of drier and one (1) ounce of pure gum turpentine. The finished product shall weigh not less than twenty-two (22) pounds per gallon and shall have the proper viscosity and consistency and be ready for application.

PRIMER, TYPE B—RED LEAD IRON OXIDE—LINSEED OIL SYNTHETIC VARNISH

	Per Cent by Weight (±2.5)
Pigment:	
Red Lead (95% Grade)	75.0
Iron Oxide (78% Fe_2O_3)	25.0
	100.0
Vehicle:	
Raw Linseed Oil and Synthetic Resin*	80.6
Drier and Thinner	19.4
	100.0
Pigment (per cent by weight)	80.0 ± 2.5
Vehicle (per cent by weight)	20.0 ± 2.5
Weight per gallon (pounds)	23.5
Drying time (ready for recoating)	18 hours

* The synthetic resin shall be of the glyceryl phthalate type, and compatible with linseed oil.

INTERMEDIATE COAT

The intermediate coat shall be of the materials and proportions specified for Type B—priming coat except that it shall be tinted with sufficient black magnetic iron oxide to produce a distinctive shade which can be readily identified when painted over the shop coat. The tinting materials shall replace part of the red iron oxide and shall be ground with the pigment.

LIA26129

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THE Lead LIBRARY of Technical Information

The following articles and reprints contain information, drawings and specifications on the use of lead products helpful to architects, engineers and others interested. They are available free of charge except where otherwise indicated, upon request to the LEAD INDUSTRIES ASSOCIATION, 60 EAST 42nd STREET, NEW YORK 17, N. Y.

MATERIALS OF CONSTRUCTION ANNUAL REVIEWS—LEAD AND LEAD ALLOYS

Lead and lead alloys in chemical construction including research progress, engineering applications, and technological advancements. With bibliography. 1957 and 1956 reviews (editions are not cumulative) available. Reprinted from "Industrial and Engineering Chemistry," September, 1957 and September, 1956.

INSPECTING LEAD LININGS

Latest methods of testing and inspecting sheet lead and bonded lead linings used in the chemical process industries are described. Reprinted from "Chemical Engineering," November, 1956.

BEST DESIGNS FOR LEAD INSTALLATIONS

A special report on the applications of lead and lead alloys in the chemical and metallurgical industries. Recommended practice for joining lead sheets, and the construction of wood stave tanks, launders, towers and flues where lead is involved are included. Reprinted from "Chemical Engineering," March, April and May, 1956.

PORTABLE RADIATION-SHIELDING MATERIALS

A special report on commercially available shielding forms that can be used to build readily assembled, hand stacked shielding walls. Prepared by the editors of "Nucleonics," May, 1955.

LEAD IN MODERN INDUSTRY

$1.50 Postpaid

A fully illustrated, 230 page, cloth bound book describing all phases of the production and use of lead, lead alloys and lead compounds.

LEAD WORK FOR MODERN PLUMBING

$1.50 Postpaid. $1.00 per copy in quantities of 10 or more

Profusely illustrated with over 140 photographs and drawings, the textbook presents clearly to the plumbing student the necessary tools, procedures and the methods required for lead work.

LEAD BUILDING CONSTRUCTION BULLETINS

A series of specifications for the use of lead in building construction. (Available separately.)

BULLETIN NO. 1

Specification for Lead Waste Connections for Plumbing Fixtures with Integral Traps (Water Closets—Pedestal Urinals—Service Sinks).

BULLETIN NO. 2

Specifications for Lead Shower and Safe Pans.

BULLETIN NO. 3

Specification for Lead Chemical Laboratory Drainage Systems.

LEAD IN MODERN PLUMBING—WHY, WHERE, HOW IT IS USED

A 24 page booklet containing descriptive information as well as four pages of detailed drawings for plumbing installations in various type houses.

LEAD WELDING

An informative as well as practical guide to lead welding. Reprinted from the "Welding Handbook, Third Edition" published by the American Welding Society.

LEAD FLASHINGS IN MODERN CONSTRUCTION

Lead flashings as used in an ultramodern house in Randolph, Vt. Reprinted from "National Roofer," October, 1954.

SHEET LEAD WORK FOR THE SMALL HOME

A specification for the use of the new $2\frac{1}{2}$ lb. hard sheet lead on small homes.

THE STORY OF LEAD — MATERIALS THE RAILROADS BUY (Parts 1 and 2)

Lead from mine to finished product with special reference to its uses by the railroads. Reprinted from "Railway Purchases and Stores," December, 1954 and February, 1955.

RADIATION PROTECTION

The place of lead in shielding against radiation in X-ray and atomic energy applications. Principles of lead shielding construction. Reprinted from "Lead In Modern Industry."

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A series of technical letters containing red lead paint formulations. (Available separately.)

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- **Technical Letter No. 10 — L.I.A. Formula 3-7. A Red Lead-Alkyd Vehicle Primer for Industrial and Marine Environments.**
- **Technical Letter No. 11 — Recommended Surface Preparation of Steel for Red Lead Paints.**
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