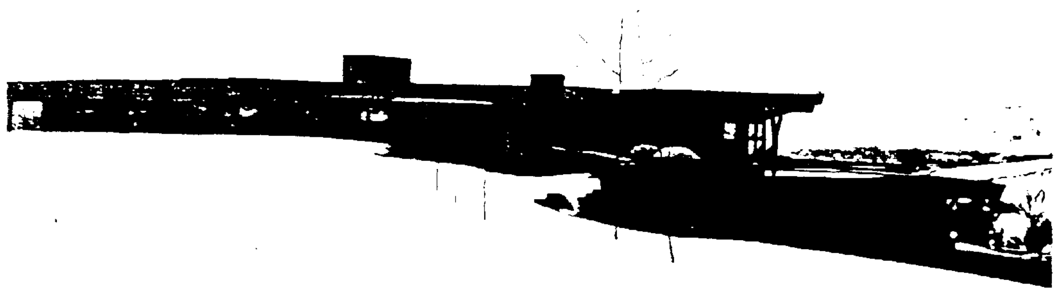


Protection against rugged Vermont winters and contribution to architectural beauty are the dual functions of lead in this house, designed and built by Miriam Hilliard Flick at Randolph.

Lead In Ultra-Modern Architecture

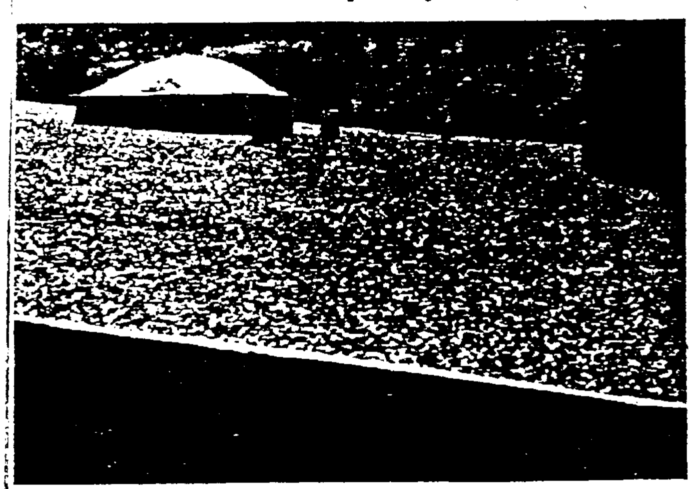
ONE of the latest and most interesting examples of lead's use in modern architecture is in a house recently completed at Randolph, Vermont, and designed by architect Miriam Hilliard Flick as a Climate Control Study. The purpose of this project is to combine the advantages of new materials of construction with the latest design in order to cope best with climatic conditions in a specific part of the country.

Lead, one of the first metals to be used in architecture, boasts a background of thousands of years of successful applications under all sorts of climatic conditions. The Hanging Gardens of Babylon, for example, were floored with sheet lead to protect the structure and also retain the moisture necessary for the gardens. The public baths of the ancient Romans were often completely lined with sheets of lead, a fact which contributed much to their present state of preservation. Today, with modern advances in design and materials, lead has remained an important part of architecture—adding beauty while at the same time safeguarding against the ravages of weather and moisture.

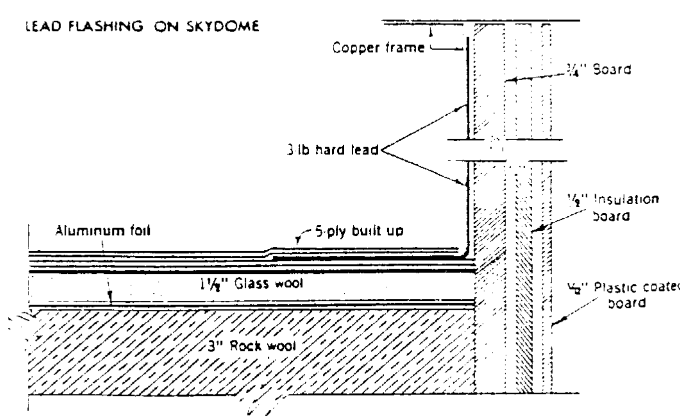
Weather conditions in Randolph, Vermont, are severe. Temperatures hover below zero for many months while in the summer burning sun produces temperatures in the high extremes. Snow, sleet, rain and high winds add to the rigorous demands of nature in this area.

Lead was chosen by architect Flick both because it could provide economical and dependable protection against seepage and damage due to water and snow and for its aesthetic contributions. A lead facing strip around the entire roof and turned back over the roof prevents water from entering the roof edge and forms a gravel stop. At the same time the pleasing gray patina of the lead contrasts with the natural cypress finish

First duty of the lead facing strip shown in closeup here is to prevent water from entering the roof edge. Secondarily, it serves as an effective gravel stop.



Skydomes over kitchen and bathroom are to permit floods of light. The lead flashings on the domes, shown in detail drawing, are to block less welcome floods.



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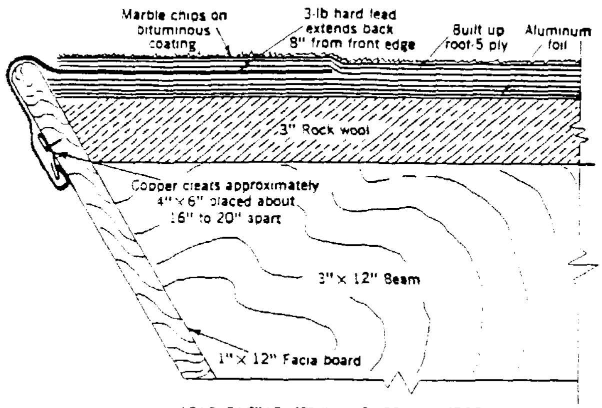
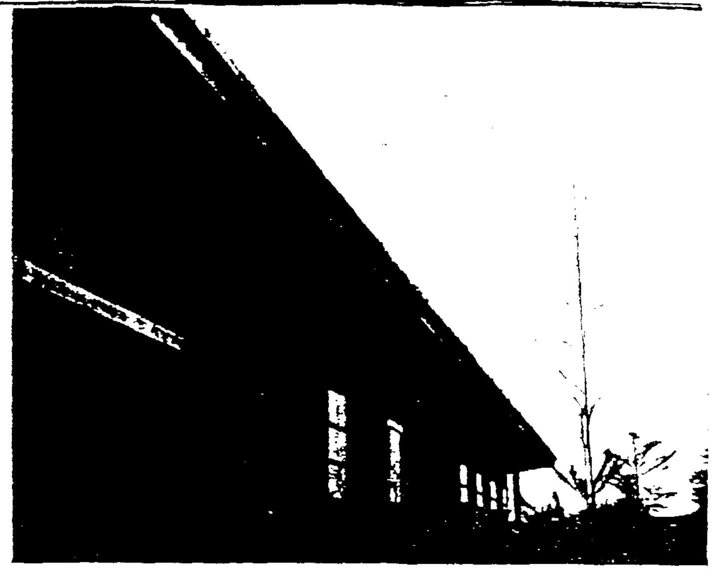




At left, detail drawing of the lead facing strip which can be seen in the front view of the Randolph, Vt. house at right. The gray patina of the lead strip offers a pleasing contrast to the natural cypress finish below.

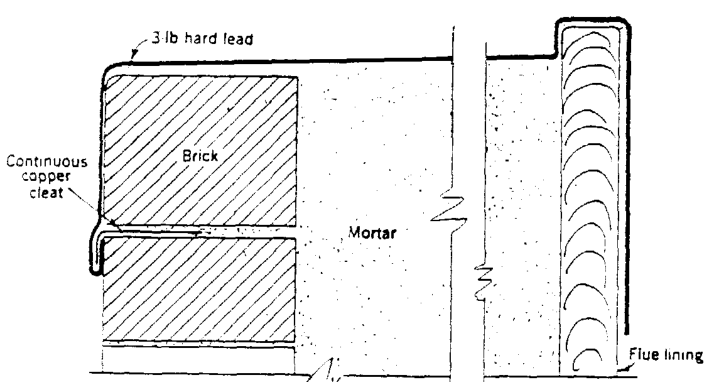
and adds to the attractiveness of the design. This decorative crown of lead where the flat, straight form of the roof meets the sky has a most pleasing color relationship to the wood below and the blue above. The satiny gray coloring recalls the effect created by a row of pewter plates in front of a panelled wall so often found in early New England dining rooms. Similarly, two lead chimney caps, whose primary function is to prevent breakdown of the mortar and weather damage to the chimneys, serve also for contrast, presenting a wide band of gray color between the red brick and the blue of the sky. The lead is used as an accent motif defining the silhouette of the building in preference to a metal which would have approached the wood in color.

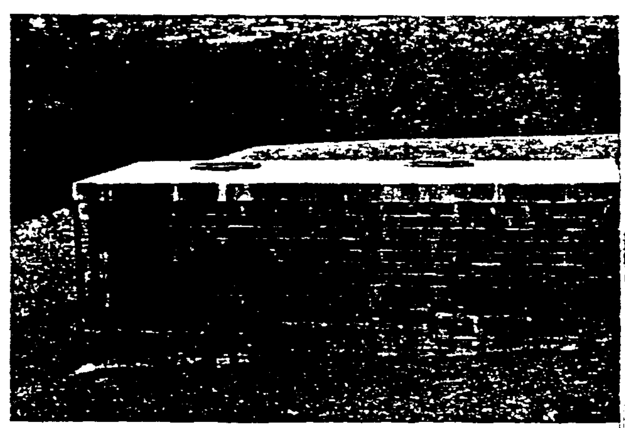
The rest of the lead used in the Randolph home is in the form of flashing. A natural stone retaining wall is flashed with sheet lead where it joins one of the roofs. An elevated level of the house is flashed with lead where it meets the roof of the lower level. The plexiglas sky domes, letting light into the kitchen and bathrooms, are flashed with lead and all of the vent pipes for the plumbing system are flashed with lead.

Two thousand nine hundred pounds of 3-lb. hard lead (6 percent antimony) and 43 lbs. of 6-lb. soft lead were used in the Randolph house. Lead was used for a number of reasons: Its unexcelled durability makes its ultimate cost extremely low. Ease of installation and the fact that it does not cause unsightly stains or discoloration on adjacent materials adds further to its appeal to architects. Its pleasing gray color, which does not change with the years, blends well with practically any color scheme and it is highly resistant to corrosion by the elements. In fact, lead is often used in seashore residences because of its proven resistance to the corrosive effects of sea atmospheres—one of the severest types of atmospheric exposures, so far as metals are concerned.

Though far removed in time and distance from ancient Babylon, the new home at Randolph, Vermont, serves as an excellent example of the long recognition enjoyed by lead in architecture and, furthermore, demonstrates the versatility of lead — the ancient metal that belongs to modern industry.

The important matter of chimney protection is provided by a lead chimney cap. A drawing and the actual installation of one of two chimney caps for the Vermont house are shown below.





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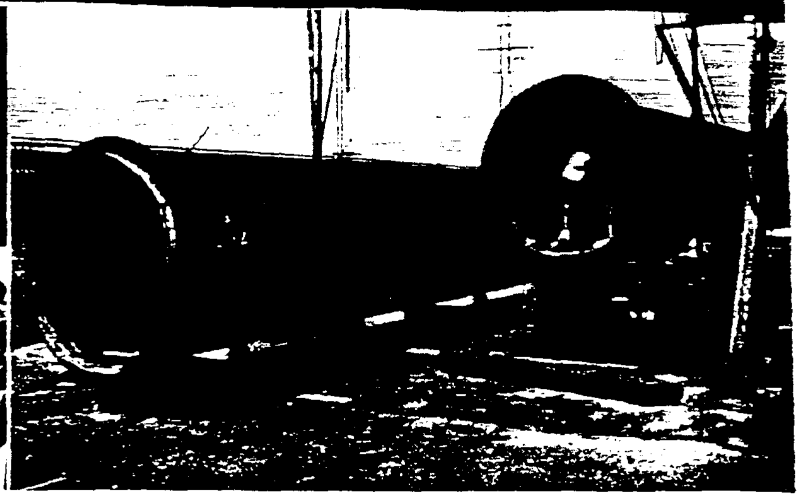


Left, loading the power driven stud driver with an assembled stud and cartridge. Some of the varieties of studs and cartridges can also be seen. Right, the 16 lb. lead lining of these corrosive fume ducts is held against the steel shell by stud fastened steel straps.

Stud Driver Cuts Costs Of Lead Linings

COST savings of 60 percent, with improved performance to boot, have been the accomplishment of a new method of installing lead linings by the use of a cartridge powered stud driver. Field tested now for two years, equipment erected with the aid of the stud driver has proved the method an eminent success.

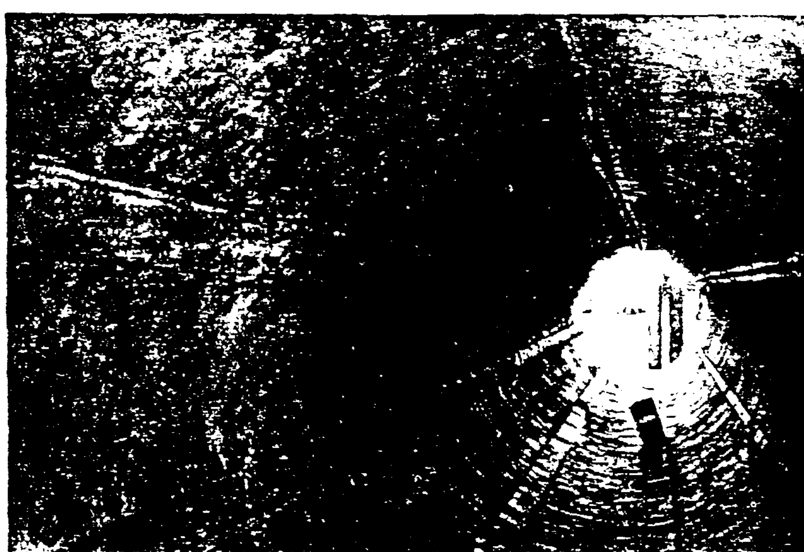
In the many applications in chemical construction where lead is required for the handling of corrosive liquids or fumes, strapped lead lining is often employed. The stud driver makes such installations just that much easier and more economical. The tool will securely anchor steel straps to a lead lined steel vessel without drilling and matching bolt holes or will fasten sheet lead to concrete rapidly and economically. It has also been used with marked success and great cost savings in X-ray room lining operations for fastening sheet lead to cinder block walls, after which the studs are covered with small patches of sheet lead to form a radiation-proof shield. If desirable, wood studding can be anchored to concrete, steel or cinder block with the stud driver. The sheet lead is then anchored to the studding.

A typical experience with the stud driver was the installation of a lead lining in a tank 35 ft. deep without having to erect scaffolding on the outside and, more important, without the expense and time of the operation. With the stud driver all the work was done from the inside in less than half the time normally involved. On another job, the contractor estimated 500 hr. for drilling and bolting of straps but by using the stud driver the company was able to reduce this time to only 150 hr.

Operation of the stud driver is extremely simple and safe and does not require a skilled operator. The proper stud for the job (simple nail-type, break-off head type, or threaded, each in suitable length) is selected and inserted in the end of the cartridge (of whatever driving force required). The assembled stud and cartridge is then inserted in the chamber of the portable driver. The tool is pressed in position against the steel strap, safety

Driving a nail-headed stud into a strap, lead lining and steel shell.

Inside of a lead lined fume duct. Lead strip, as seen in the right foreground, is unrolled to cover the steel straps, which are stud fastened to the vessel shell. The strip is then welded on both sides to protect strap and studs from corrosion.



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lever depressed, and the trigger pulled, leaving the strap firmly secured to the steel shell with the lead lining held tightly in between. Tests on the strength of the stud have shown that the normal nail-type stud will continue to hold long after a 1/4-in. mild steel nut and bolt would have failed by shearing. The normal procedure for covering the steel straps with a strip of sheet lead burned to the lead lining is followed as a final step to provide an entirely lead surface.

The maximum thickness of strapped lead lining thus far successfully fastened with the stud driver is through 1/4 in. steel strap, plus 1/4 in. lead lining, plus 1/4 in. steel shell. There is evidence that the thickness of the lead is more or less inconsequential inasmuch as it behaves more as a lubricant for the steel stud rather than as an impediment. The studs as now produced are hardened steel with a Rockwell C of 51 to 55. They obviously are not recommended for penetrating cast iron or specially hardened steel.

In a typical strapped sheet lead line steel vessel, the use of the stud driver eliminates the drilling of the strap and shell, an operation requiring about 12 min. after marking, and the set-up operation which takes about 2 min., making a total of 14 min. for each hole. Set-up applies to the erection of the necessary staging and equipment so that the operators can have proper leverage for drilling. Stud driving, on the other hand, takes approximately 2 min. per hole for loading the gun and shooting the rivet after the set-up, making a total of only 4 min. per hole, a time saving of more than 70 percent. Furthermore, marking time can be cut down considerably because in driving studs it would not be necessary to adhere to a specific spacing. They could be driven virtually at random.

Here is a method of erecting lead linings that is making its mark on the continuing and expanding use of lead in the changing technology of modern times.

Lead Door, Lead Bricks, And Leaded Glass In Supervoltage X-ray

Looking through 4 in. thick leaded glass at the new two million volt X-ray machine at the Tumor Institute of Swedish Hospital, Seattle, Wash. Windows up to 2 ft. thick have been made of this high density glass, remarkable for exceptional clarity.

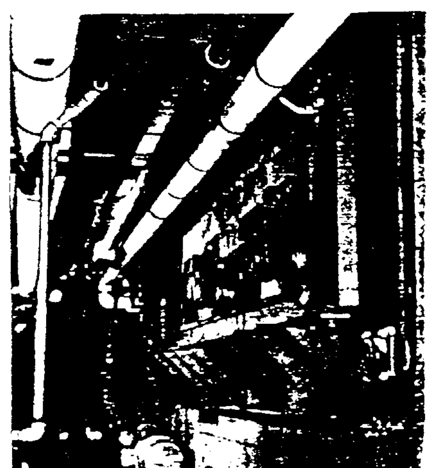
DENSEST of common materials, lead finds multiple application in the new supervoltage X-ray therapy room of the Tumor Institute at Swedish Hospital in Seattle, Wash., in whose expanded quarters there was recently installed a two million volt X-ray machine. A huge lead door and a new high-density leaded glass are utilized for radiation protection, while lead baffles appear in the X-ray beam shaping apparatus of the machine itself.

Source of the X-rays is a Van de Graaff generator, a pressure-insulated electrostatic accelerator manufactured by the High Voltage Engineering Corp. of Cambridge, Mass., and one of ten machines of its type in the United States. The high-energy X-rays generated by the apparatus are cap-

ocking stray radiation is the b of this special lead door at the Tumor Institute.

A step in the construction of the lead door. A sheet of light gauge steel about to be placed on one side of a sandwich of 1 in. mild steel between two sheets of 3/4 in. thick lead.

The lead door drops below the floor level to effect a complete seal and slides on a 90 lb. railroad rail.



able of penetrating and delivering high doses of energy to deep-seated tumors with a minimum effect on sensitive skin tissues. The use of supervoltage X-ray does not replace medium voltage therapy in the majority of cases, but patients for whom supervoltage therapy is indicated derive advantages from these well defined, penetrating X-rays that are not obtained with conventional X-ray equipment.

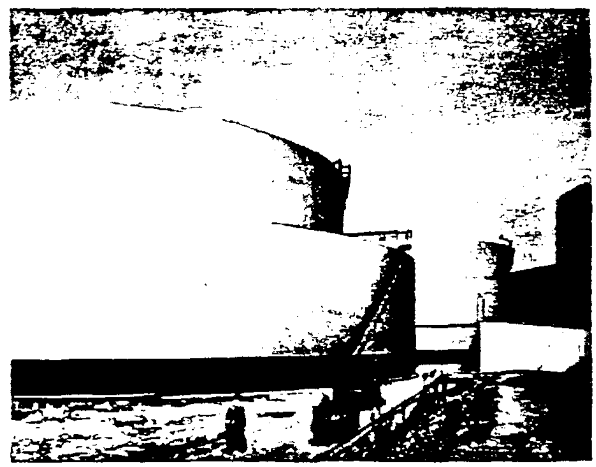
The deep therapy room is on the ground level of the Swedish Hospital and has walls and ceiling of concrete up to 4 ft. thick. The entrance to the room is a 4 ft. x 7 ft. opening in the concrete. To effectively seal the aperture from stray radiation a unique lead door was designed. Measuring 6 ft. x 9 ft., the door was constructed by joining to each side of a 1 in. mild steel plate a sheet of lead 3/4 in. thick. In turn, the lead was covered with a 3/16 in. steel plate. Since the weight of the door then totalled 9,000 lb., it was designed to slide on a 90 lb. railroad rail. Power operated by a 3/4 h.p. motor, the door rolls on standard ball-bearing pillow blocks at a rate of 4 ft. in 20 secs. The leading edge of the door is, of course, protected with a safety device to prevent anyone being caught as it closes. In case of power failure, the door can be hand operated. The door was designed by G. A. Pangborn, consulting engineer of Seattle and built by Pacific Steel Products Co., also of Seattle.

Behind the machine is the control room where the operator looks through glass that could almost be called transparent lead, since it analyzes 75% metallic lead by weight. This remarkable glass, called Hi-D and developed only recently, is endowed with a high refractive index, permitting extreme wide angle viewing, and exception clarity. The high density glass is . most as heavy as steel, weighing abo 390 lb. per cu. ft., which is 2½ tim as heavy as ordinary window glas Its radiation shielding value is on half that of metallic lead. Windows u to 2 ft. in thickness have been ma from Hi-D glass, which is made by th Penberthy Instrument Co. Inc., Seattle.

Finally, lead is used extensively the X-ray generator, to absorb th rays not being used for therapy. A 1 in. diameter lead shield, weighin 1700 lb. surrounds the X-ray sour at the base of the machine, and in cludes two sets of 3 in. thick lead-bric shutters which shape the X-ray bean to be directed at the patient. Thes bricks are easily adjusted in positio by finger-tip control.

Red Lead Primers For Oil Storage Tanks

THE oil storage tanks of Hess Inc. in Perth Amboy, N. J. are subjected to the rigorous environment of a heavily industrialized area plus a sea air atmosphere. Protective coating of the equipment puts exacting requirements on the paints used to withstand successfully the dual corrosive conditions which are in addition to the ordinary effects of weathering.



Newly painted oil storage tanks of Hess Inc. at Perth Amboy, N. J., dependably protected with red lead.

Recently, two of the Hess tanks were painted with a three coat system. A first primer coat of red lead paint, Fed. Spec. TT-P-86a, Type I, was followed by a coat of red lead paint, Fed. Spec. TT-P-86a, Type II. The job was then finished with a top coat of aluminum paint.

Particular benefits result from this system. Excellent wetting is achieved with the first coat of Type I, which is a straight red lead-linseed oil paint. Even over rusted surfaces this characteristic will implement a first line stoppage to corrosion by the red lead pigment. The second coat, Type II, which is a red lead mixed pigment-alkyd varnish-linseed oil paint, is a faster drying paint which allows quicker recoating and consequent reduction in scaffolding time. Additionally the different color of the Type II paint provides a contrasting color to aid in the avoidance of painting holidays.

Choice of the top coat then depends on the job in question. Sometimes it will be merely a matter of color preference, sometimes a question of heat absorption may have to be considered, or sometimes a special condition with special requirements will obtain. Whatever the case, the job of corrosion inhibiting primer will be well done by red lead.

The formulations of the two red lead primers used on the oil tanks follow:

Federal Specification TT-P-86a, Type I

		Percent
PIGMENT:	Red Lead (97% Grade)....	99.7
	Aluminum Stearate	0.3
		100.0
VEHICLE:	Raw Linseed Oil..........	49.0
	Pale Heat Bodied Linseed Oil, Z-2 Viscosity.......	17.0
	Mineral Spirits	29.0
	Liquid Driers	5.0
		100.0

Pigment = 77.8%
Vehicle = 22.2%
Wt. Gal. = 24 lbs.
PV = 36

Federal Specification TT-P-86a, Type II

		Percent
PIGMENT:	Red Lead (97% Grade)	65.0
	Siliceous Iron Oxide, 85% Fe_2O_3	15.0
	Magnesium Silicate	14.7
	Mica, 325 Mesh	5.0
	Aluminum Stearate	0.3
		100.0
VEHICLE:	Alkyd Resin Solution	56.0
	Raw Linseed Oil	28.0
	Petroleum Spirits	14.9
	Lead Naphthenate Drier (24% Pb)	0.75
	Cobalt Naphthenate Drier (6% Co)	0.35
		100.0

Pigment = 66%
Vehicle = 34%
Wt., Gal. = 16.7 lbs.
PV = 38

STEEL STRUCTURES PAINTING MANUAL

Making a significant contribution to industrial users of steel, the Steel Structures Painting Council has published the first volume of a two volume series on the painting of steel structures. The 432 page volume, entitled "Good Painting Practice" reviews the art of cleaning and painting steel structures from (1) a comprehensive literature survey, (2) a critical study of the present day practices in surface preparation of steel to receive anti-corrosive paints and (3) an economic study of the uses of various anti-corrosive paints. Primers containing red lead pigments are predominant among the recommended paints.

The manual is written from the paint user's viewpoint and is an encyclopedia of paint systems and practices that are most widely used by industrial steel producers and consumers. The paints are designed to give the greatest protection at the lowest maintenance cost.

Copies of "Good Painting Practice" may be secured at $6.00 each, postpaid, from the Steel Structures Painting Council, 4400 Fifth Ave., Pittsburgh 13, Pa.

A section of the 650-unit Raynor Hills Subdivision at Joliet, Ill., where lead fittings speeded completion of the low-rental housing.

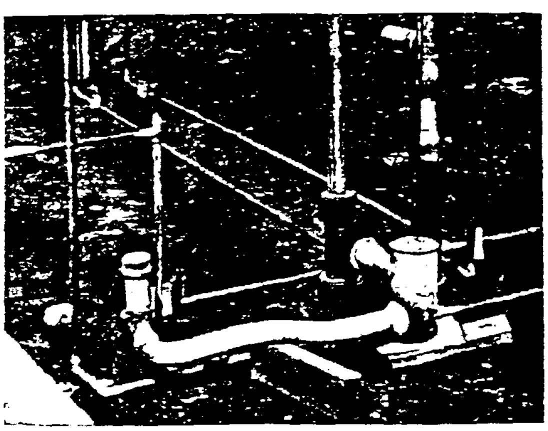
Lead Fittings Speed Construction Of Low-Rental Project

HEEDING the demand for speedy, delay-free plumbing installation on the 650-unit Raynor Hills Subdivision in Joliet, Illinois, the plumbing contractor on the job depended on shop prefabrication of lead fittings to comply with the builder's requirements. This adaptability of lead to mass production technique, universally taken advantage of by plumbing contractors, assured the builder that construction delays would not come from the plumbing work. Economy is always of importance, but particularly so in a low-rental project such as this. At the same time the quality performance expected of lead was in no way sacrificed.

Each housing unit at Raynor Hills is equipped with a lead drum trap and lead bath wastes plus sink and lavatory wastes. All necessary joint wiping and pipe forming was done, rain or shine, in the shop set up on the job. Whenever the houses were ready, so was the plumbing. Time and money were saved not just by the elimination of delays but also by the inherent economies of mass production.

But the advantages of lead do not stop there. When the fittings are set in place on the job, the flexibility of lead easily provides compensation for structural variations both on the spot and in the future when settling and other factors are likely to cause stresses in the plumbing that could mean trouble.

Beck-Utah Co. of Dallas, Texas, is the builder of Raynor Hills. The plumbing contractor is Waldo Plumbing & Heating Co. of Kansas City, Mo., and Phoenix, Ariz. Two hundred of the two and three-bedroom units in the project were completed between Sept. 1, 1953 and Feb. 1, 1954. Currently another 250 units are under construction with plumbing moving into the units steadily and promptly, thanks to the shop assembly technique made possible with lead fittings.



Smooth-bending lead made plumbing roughing-in completely adaptable to construction variations at the Joliet project.

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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, 420 LEXINGTON AVENUE, NEW YORK 17, N. Y.

LEAD AND LEAD ALLOYS
The corrosion resistance of lead and its alloys as materials of construction in the chemical process industries is shown for more than 188 industrial chemicals, citing the effects of concentration and temperature. The illustrated article also describes the forms of lead available for chemical construction and gives recommended practices for fabrication as well as applications. Reprinted from "Chemical Engineering," February, 1953.

MATERIALS OF CHEMICAL CONSTRUCTION ANNUAL REVIEW — LEAD AND LEAD ALLOYS
An up-to-date report on new developments in the uses of lead and lead alloys in chemical construction, including research progress, engineering applications, and technological advancements, such as methods of testing linings, automatic lead welding, and air pollution control. Reprinted from "Industrial and Engineering Chemistry," October, 1953. Bibliography.

LEAD LININGS—FASTER, CHEAPER, BETTER
A report on a new method of fastening strapped lead linings by the use of a cartridge powered stud driver. Reprinted from "Chemical Engineering," February, 1954.

LEAD IN MODERN CHEMICAL CONSTRUCTION
What you should know about the various types of lead construction in the chemical field. Reprinted from *"Chemical Engineering,"* Jan. 1952.

CONTROLLING CORROSIVE AIR POLLUTANTS
A discussion of the various methods in use today to control corrosive air pollutants. Reprinted from "Air Repair," May, 1952.

PHYSICAL AND CORROSION CHARACTERISTICS OF LEAD IN THE CHEMICAL INDUSTRY
A detailed discussion of the use of lead in the chemical industry presented before the National Association of Corrosion Engineers Conference, April 11-14, 1949.

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. Discussion of the physical and chemical properties of lead and its compounds is included. Sufficiently technical to be of practical value to the engineer in industry, yet broad enough for those with a more casual interest.

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, this textbook presents clearly to the plumbing student the necessary tools, procedures and the methods required for lead work. Each operation is given in step-by-step photographic sequence fully complemented by a detailed explanatory text. *Pocket sized with plastic ring binder.*

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.

FEDERAL SPECIFICATION, WW-P-325
For Pipe, Bends and Traps, LEAD
Part 5 of Section IV of the Federal Standards Stock *Catalog, published by the Government Printing Office.*

CALKING LEAD
Commercial Standard CS94-41
Promulgated by the National Bureau of Standards.

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.

RED LEAD TECHNICAL LETTERS
A series of technical letters issued by the Red Lead Division, Lead Industries Association. The numbers and titles follow: *(Available separately)*
- **Technical Letter No. 3—Red Lead Primers for Atmospheric Exposure**
- **Technical Letter No. 5—Red Lead-Vinyl and Coumarone Type Paints**
- **Technical Letter No. 6—Red Lead Paint Formulations**
- **Technical Letter No. 7—Paint Systems for Hydraulic Structures**
- **Technical Letter No. 8—Primers for Railroad Structures and Rolling Stock**

FEDERAL SPECIFICATION TT-P-86a
Paint: Red-Lead-Base, Ready-Mixed
Covers four types of red-lead-base paints including two fast drying formulations. Many intended applications listed.

METAL PROTECTIVE RED LEAD PAINTS
The versatility of red lead in protective primers to meet a wide range of surface conditions, drying schedules and economic demands is described. Reprinted from "Paint and Varnish Production," January, 1951.

AN INVESTIGATION OF PRIMERS FOR MARINE ATMOSPHERIC ENVIRONMENTS
Results of an investigation of synthetic vehicles and red lead mixed pigment primers over an exposure period of three and one-half years in a rigorous marine atmosphere. Reprinted from "Official Digest" published by The Federation of Paint and Varnish Production Clubs.

THE USE OF LEAD IN THE PULP AND PAPER INDUSTRY
Detailed description of various applications of lead in the modern pulp and paper mill. Covers all phases of paper pulp manufacture and treatment including sulphite acid manufacture, acid pulping, bleaching and stock handling. Reprinted from *"Paper Trade Journal,"* Oct. 26, 1950.

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EVANS METAL CO. .... Box 97, No. Side Br., Atlanta, Ga.
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6016-6120 S. Broadway, St. Louis 11, Mo.
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