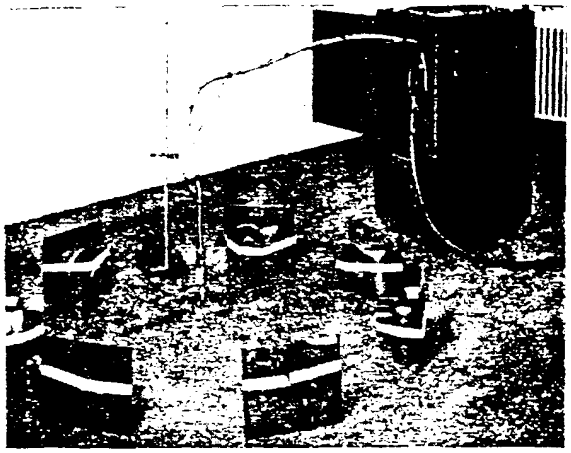
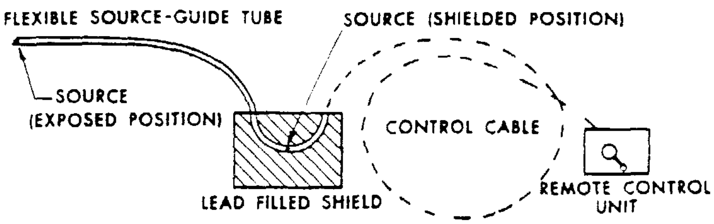




ALL ILLUSTRATIONS COURTESY TECHNICAL OPERATIONS, INC

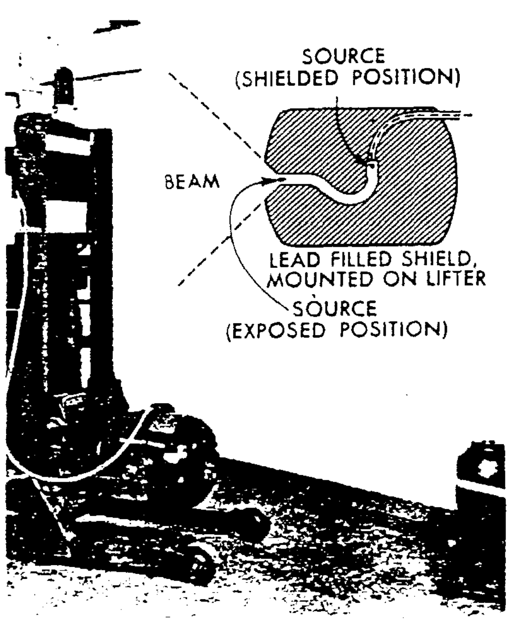
At left, the setup for nondestructive testing by panoramic gamma radiography. Above, a schematic drawing showing the lead safe in which is contained the radioactive source when not in use at the end of the flexible source-guide tube.

Lead Safe Used In Gamma Radiography

ONCE a laboratory process, the time-tested method of nondestructive testing by use of radioactive isotopes in the production of radiographs has now become a practical, low-cost industrial tool. This transition to easy gamma radiography, as the process is commonly called, has been made possible by the availability of high-strength radioactive materials from the nation's nuclear reactors.

Modern gamma radiography possesses three major advantages — low cost, flexibility, and portability. The flexibility results from the small radiation source, which can be inserted into confined locations not accessible to an X-ray tube. This also permits panoramic (360°) exposures which

Directional gamma radiography equipment is shown in the photograph, while the drawing shows how the lead container serves both to direct the rays and to shield personnel from dangerous radiation exposure.



increase production rates. And, since the source is a point source, the obtention of sharply defined pictures is facilitated. Isotope radiography does not require electric power. As a result, the testing equipment can be carried to the work, whether it be a pipe line in the wilderness or bridge construction 500 ft. in the air. Because complex power and control systems are not required, gamma radiography equipment and sources cost only a fraction of comparable X-ray equipment.

Safety, of course, as with most modern industrial equipment, is an important consideration in gamma radiography. The safety problem is the same in principle as, but somewhat less acute than, X-rays. One aspect of safety protection, the shielding of the radioactive source — which may be cobalt 60, cesium 137, iridium 192 or, in the future, a number of new isotopes now under investigation —is achieved in the equipment shown here which is manufactured by Technical Operations, Inc. of Arlington, Mass., by containing the source in a lead safe.

For panoramic radiography, the radiographic source is mounted on the end of a flexible control cable and stored in the lead container. This storage safe, containing about 500 lb. of lead, is designed so that the radiation level at the surface of the container does not exceed a maximum of about 50 mrhr. In operation, the source travels into exposure position through a flexible source-guide tube. This source positioning is under the control of the radiographer, using the remote control unit. Control cable and source tube lengths can be adjusted to meet the needs of the application. Primary radiation protection for the operator is gained by the distance between the operator and the source, and shielding, if required, interposed between the operator and the exposed source.

The techniques of panoramic radiography may be divided into the classifications of multiple specimen radiography and circumferential radiography. In the former, specimens, backed by X-ray film, are placed in a circle around a radiation source in the center and all are then radiographed simultaneously.

In circumferential radiography, made possible by the very small size of a gamma radiation source, the source is placed inside any closed vessel such as a storage tank or transmission pipe line, and the X-ray film is placed on the outside. One exposure radiographs the entire circumference.

Directional radiographic equipment is used where there are considerations of space limitation or where large heavy products cannot be moved easily to the radiography room or for speed in plant locations where the heavy shielding of a directional projector shields the operators from the strongest available gamma radiography sources. In this case the lead storage container of the projector also functions as the exposure shield. Approximately 1,100 lb. of lead are required for the container.

LIA26060

Skyscrapers East And West Have Lead Connections

The Socony Mobil Oil Building in New York City will, when completed early in 1956, be the largest air-conditioned commercial office building in the world. Lead fittings speed its construction and provide against settlement and vibration damage.

There are 429 bathrooms in the Park Towers Apartments in Houston, Tex. All of the waste connections for these and for the kitchens are of flexible, efficient lead.

ON New York's East Side where, near the United Nations Buildings area, there has been a tremendous building boom in recent years to alleviate the city's office space shortage, the Socony Mobil Oil Building, the largest air-conditioned commercial office building ever undertaken, is being hastened towards spring 1956 completion. Meanwhile, out West, the penthouse-topped Park Towers Apartments are rising 15 stories into the Texas sky in the Medical Center-Shamrock Hotel area of Houston. In common, both of these modern developments make extensive use of lead plumbing fittings and lead flashings.

The Socony Mobil Oil Building will tower 45 stories above the street and its base covers a full square block about two acres in area. Its gross area will be 1,600,000 sq. ft., the net rentable area 1,300,000 sq. ft. The sanitary requirements, obviously, are huge. Almost six hundred 4-in. lead stubs were needed for water closet connections. The building's roof and floor drains required 70 sheet lead flashings. Lead will be used in the building also to line the X-ray rooms of two tenants.

At the Park Towers Apartments 429 bathrooms, together with kitchen sinks, service sinks, and laundry tubs, will be fitted with lead waste connections. In addition, the vent stacks, where they pierce the roof, will be flashed with sheet lead. In detail, the fittings being installed are 4-in. lead bends, 4-in. x 8-in. lead drum traps and 1½-in. lead waste pipe, except for the service sinks where 2-in. lead pipe is being used.

All the leadwork on both of these jobs is prefabricated in the shop on the job site. The prime consideration, of course, in calling for the extensive use of lead, is lead's proven high degree of performance in the sanitary system. But after the service requirements are met the most sought-after qualities are mechanical characteristics that make for efficient working. Especially under construction pressure, where the demand is for early completion and, thus, early renting, materials that lend themselves to rapid mass production are needed. The high output of preassembly work that has assured a steady stream of fittings when they are needed for both the Socony Mobil Oil Building and Park Towers Apartments jobs tells the story of lead's aptness to mass production.

At the actual installation lead's flexibility has special importance. First, structural discrepancies that cause major headaches with some materials are simply compensated for by smooth bending lead. Or, space-saving short cuts and unusual formings are easily made. Finally, the flexibility provides protection for fixture and piping itself against damage caused by building settlement, vibration and expansion and contraction.

Lead bends, lead drum traps and other lead waste connections are shown where they were fabricated in the job-site shop at the Park Towers Apartments. Some U.A. officials, in Houston for a convention, look over the work.

Lead stubs in the Socony Mobil Oil Building extend through the floors and will be embedded in concrete. They provide the necessary give between the rigid pipe, rigid floor and rigid fixture.

Lead Oxides Enhance Beauty Of Dinnerware

THE peculiar advantages of dining from papaya leaves, or even paper plates, cannot be denied and some of our fellows would have it no other way. But most of us prefer to take our food from glistening dishes. Like flaming swords, sensuous floral arrangements and figurines sculpted in ice cream, attractive dinnerware adds to the pleasure of eating and without special expense or effort. The new bride, in her starter set, and the accomplished hostess, in her elegant formal settings, seek the sparkle and beauty that make the difference between feeding and dining. The gleam on dinnerware is its glaze, which also adds brilliance to the underlying design for a net effect that is most appetite-provoking. Universally, these dinnerware glazes contain lead oxide.

COURTESY LENOX, INC.

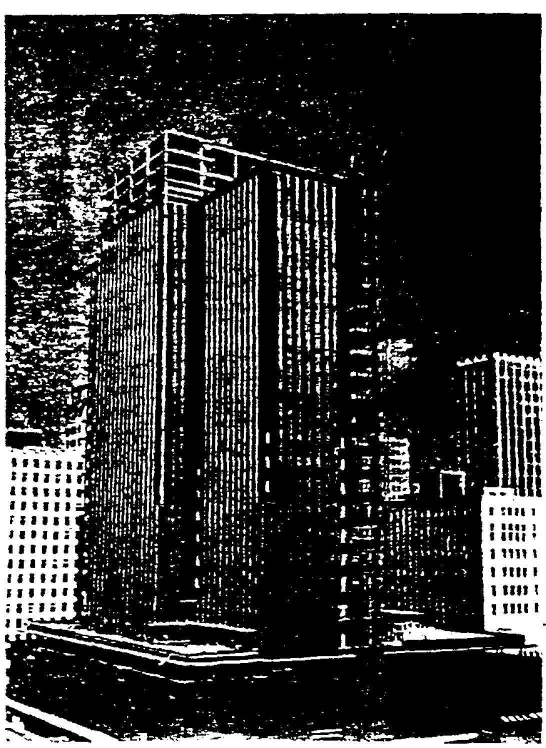
Lead oxides are an important constituent of the glazes that give sparkle and brilliance to dinnerware.

Glazes perform an important function in rendering the body surface impervious, thus making the ware more sanitary, but they are surely more widely thought of in terms of the smooth, decorative sheen they impart. This comes about from the nature of the glaze which is simply a glass applied to and formed in place on a vitreous or semi-vitreous ceramic. The unique properties of a glaze are taken advantage of in many applications, beyond dinnerware, on such products as tile, artware, structural ceramics like pipe, dielectrics, sanitary ware, and terra cotta.

Lead is used in glazes in the form of litharge, red lead, white lead and lead silicate. But, whatever the form, the essential portion of these compounds is the available lead monoxide (PbO). The functions of the oxide, which is the function of lead in all ceramicware, are, first, to act as a flux which aids in the melting and solution of the batch materials, and, secondly, to give desirable properties to the glaze after melting and in firing. The lead glazes have a low melting range. This lowers cost since, obviously, it is cheaper if high furnace temperatures or long firing time do not have to be attained. The lead glazes also have a wide softening range which means that a margin of safety is provided during firing where temperatures vary through the cross section of the kiln, so that the lead-based glazes are virtually foolproof in the working.

To describe in loose terms what is in fact an exacting art, glazes are applied to vitreous ware as aqueous slurries, most commonly by spraying, and then fired. Lead glazes may be grouped into raw lead glazes, containing no frit or frits, and fritted lead glazes, which include at least one frit. A frit is a glass which has been prepared by a melting operation. Usually it is quenched from the

Porcelain Enameled Aluminum

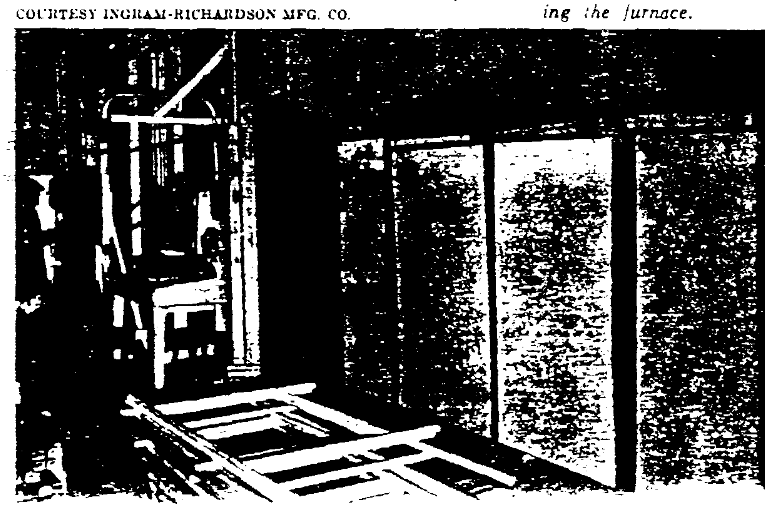


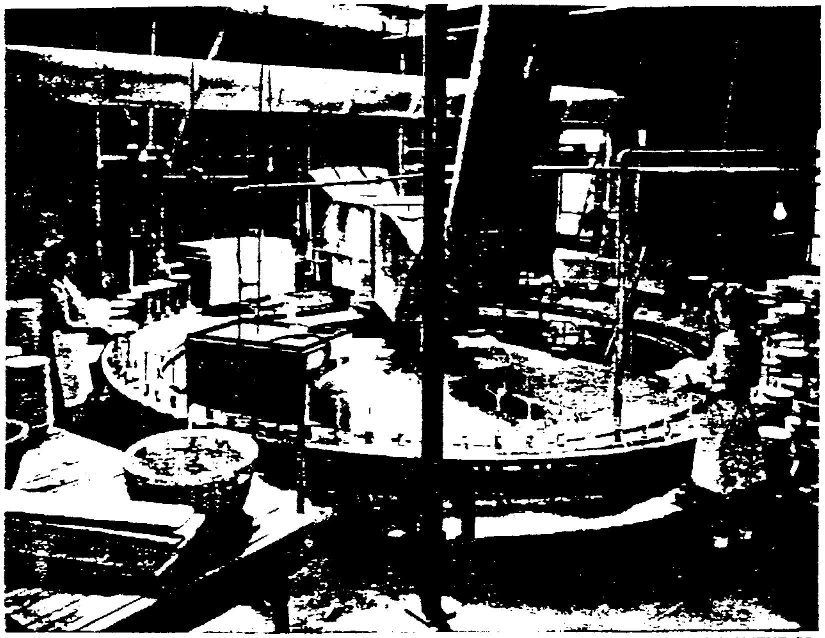
Maroon strips of porcelain enamel run twenty stories high and set off the aluminum skin of the Second National Bank Building in Houston, Tex.

COURTESY INGRAM-RICHARDSON MFG. CO.

Porcelain enamel on based frits, is finding examples of use of are pictured here.

Porcelain enameled aluminum sheets used as bulkhead components on the craft carrier USS Forrestal are shown ing the furnace.





COURTESY SCHWEITZER EQUIPMENT CO.

In this circular glazer, the girl at left loads the ware onto the machine. The dishes are preheated in the first tunnel and sprayed, while rotating, with the lead-containing glaze in the second. The third tunnel dries the glaze. The girl at the right loads the ware on a stilliard, ready to be taken to the kiln.

molten state by pouring into water. The severe thermal shock accompanying the operation shatters the resulting glass, giving a granular product which is easily ground in the glaze preparation. One object of fritting is to convert water-soluble materials into an insoluble form, to prevent their solution in the aqueous slurry. Another object is to supply a quantity of pre-formed glass to aid in the melting of the glaze. A raw glaze requires a higher temperature, or longer firing time, than a fritted glaze of composition which is equivalent.

Litharge and red lead are commonly used in fritted glazes. White lead is ideal for raw lead glazes since it is insoluble in water, does not hydrate or change in character, is the most easily suspended of the lead compounds, and is more reactive than litharge or red lead in the melting operation. Lead silicates are actually lead in fritted form so that they may take the place of a prepared frit in the fritted glazes.

A typical fritted lead glaze for semi-vitreous dinnerware can be stated, in the ceramist's way of molecular formulas, as:

Fluxing or Basic Oxides	*Intermediates*	*Glass Former*
0.43 CaO 0.26 PbO 0.12 K_2O 0.06 Na_2O 0.13 ZnO	0.27 Al_2O_3 0.31 B_2O_3	2.60 SiO_2

Or, on a basis of percentages of melted formula, perhaps more graphic to the general reader:

CaO	7.70%
PbO	18.54
K_2O	3.61
Na_2O	1.19
ZnO	3.38
Al_2O_3	8.79
B_2O_3	6.90
SiO_2	49.89

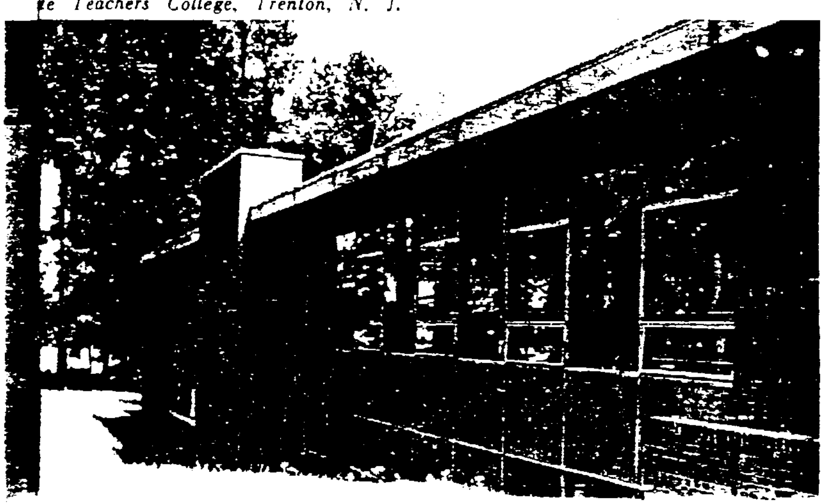
...w Buildings, Subways, At Sea

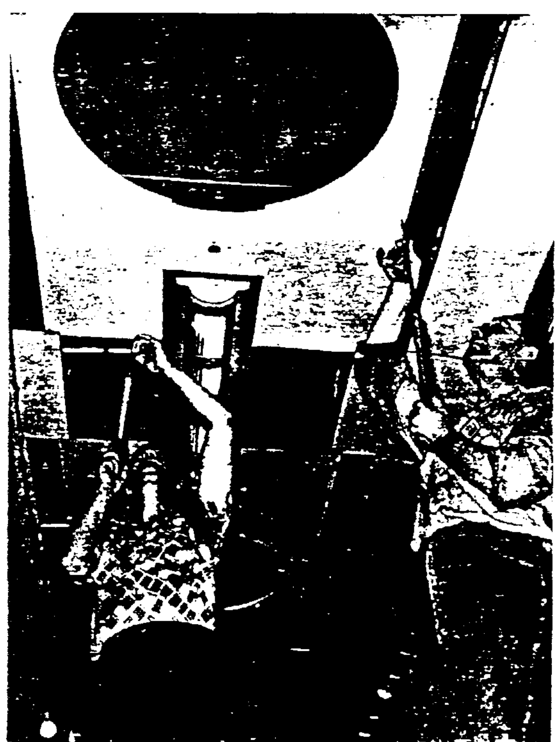
...n ...ade feasible with lead-...ing...tion every day. Some ...of ... easy-to-work material

...s ...ht blue panels of corrugated porcelain ...the...meled aluminum give beauty to this ...n ...k dormitory building at New Jersey ...te Teachers College, Trenton, N. J.

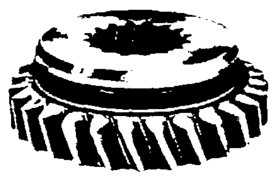
Easy working porcelain enamel ceiling panels being installed in this subway car of the New York City Transit Authority.

COURTESY ACF INDUSTRIES, INC



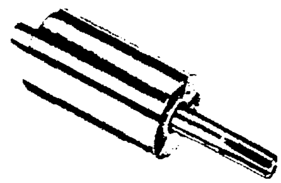


LEADED STEELS HAVE REDUCED MACHINING COSTS OF THESE PARTS

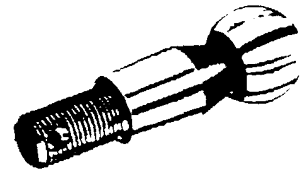


Switching to leaded steel for this spur gear meant the following improvements:

	AISI 4140	AISI 4140 LEADED
Machine Speed, r.p.m.	90	128
Feed, inch/rev.	.007	.010
Cycle Time	6 ft., 15 in.	4 ft.
Finish	Fair	Excellent



Through use of a leaded steel automatic screw machine, production on this rotor was upped 25 percent. Saw blade life (used in sawing radial slots) increased from 18 to 60 pieces—a remarkable improvement representing a considerable savings in production costs.



Use of leaded steel improved automatic screw machine production nearly 40 percent on this ball stud.

	AISI 8640	AISI 8640 LEADED
Spindle Speed, r.p.m.	345	495
Machine Cycle, seconds	26.3	19.1
Production per machine hr.	108	150
Finish	Fair	Excellent

Leaded Steels Are Freer Machining

THE manufacturer of a spray nozzle part has increased his production of the part from 16 to 24 pieces per hour. Another manufacturer, who makes gears for agricultural equipment, now gets 11 to 14 spiral gears before he has to regrind his tool where formerly he had to regrind after every 6 to 8 pieces. In addition, the finish is so much improved that the noise factor of the particular gear in operation has been completely eliminated. And a screw machine shop runs its spindle at 495 r.p.m. on a particular part where once speed could not exceed 345 r.p.m.

Key to these and similar increases in machinability—from 25 to 40 percent—is the addition of small amounts of lead to the steel from which the parts are made. Leaded steel means lower costs of parts through increased production. It also means more smoothly finished surfaces, longer tool life and more easily maintained tolerances. Leaded steel is particularly suited to use in low cost parts requiring extensive machining, like parts for business machines, automobiles, household appliances, hydraulic fittings and textile machinery.

The lead added does not go into alloy. Neither does it have any appreciable effect on the mechanical properties of the steel. The leaded steels have, in fact, superior heat treating properties. What the lead does do is to act as a lubricant between the cutting tool and chip and thus, by reducing friction, permit higher machining speeds. Chips are faster breaking and there is no build-up on the cutting tool. Cutting is cooler. Resulting increases in tool life have been as much as 100 percent.

The lead is added to the steel in a carefully controlled process whereby a stream of high purity, finely-sized lead shot is blown into molten steel as it is teemed into an ingot. The temperature of the steel is adjusted so that segregation of lead in the product is minimized by balancing the flow of lead shot. Each ingot is checked for lead content and even lead distribution. Billets that show segregation under test are cut back and retested. Only the portion of the billet which shows no segregation is considered satisfactory. Thus uniform high quality is assured.

Copperweld Steel Co., Republic Steel Corp. and Jones and Laughlin Steel Corp. have entered production of leaded steels, under license from Inland Steel Co., which has been making the steels since 1939. A number of other domestic producers also have licenses as have foreign producers. Most commonly, the leaded steel is made available in bars that are hot rolled and cold drawn. The cold drawing die accurately shapes the bars and produces a smooth surface which is of great importance to the operation of high-speed automatic screw machines, lathes and such, since irregular stock might jam their feeding mechanisms.

While screw machine shops have been the largest users of leaded steels, the material is now finding growing use in forging shops. There is no difference in forging practice but the end product has the same improvements in machinability as have leaded steel bars. Tool and diemakers are also now interested in the use of leaded steels to cut their costs. And, for years, Allis Chalmers has made steam condenser baffle plates from leaded steels because they are able to reduce drill and ream time for the thousands of holes the plates contain.

One other important advantage that may be realized with leaded steel is that, for the same machinability, steel with improved physical characteristics may be used.

New York City Transit System Specifies Lead-Base Paints

A straight-red lead paint. New York City Transit Authority Formula M-1, is used in the rehabilitation painting of this elevated structure.

STEEL structures of the New York City Transit System are currently undergoing extensive rehabilitation, in pursuit of a program initiated by the Transit Authority when transportation facilities were taken over from the city by that group. The Transit Authority is undertaking many changes aimed at improving facilities, equipment and service to the public. One change not deemed necessary, however, is in the long-time use of lead-base paints for the protection of steelwork in the system. A straight red lead paint has served as the basic shop coating and maintenance primer for many years. Another red lead primer is used as a first field coat for new steel and in three-coat maintenance systems. A white lead-base finish coat is standard for elevated structures. Lead pigments are specified also in several other specialized paints used by the system.

Representative of work currently in progress is the repainting of the Myrtle Ave. Line elevated structure in the Ridgewood Section of Queens and Brooklyn. This structure has not been painted for twenty-five years, yet the performance of the old red lead primer and the properties of that same primer in the new application have enabled Authority engineers to call for surface preparation no more unusual than that of scraping and wire brushing, since the excellent wetting properties of Transit Authority Specification Paint M-1, provided by the linseed oil vehicle, permit it to be used where some slight rusting remains. The prime coat is followed by Specification Paint M-11, a green-tinted white lead paint, except up to 6 ft. 6 in. above ground level where a black enamel (also containing red lead) is used.

Because of the heavy volume of paint work underway, beyond the capacity of the transit system's maintenance staff, much of the work is done under contract. On the Myrtle Ave. Line, painting is being done by the Hudson Maintenance Corp. of New York City.

The M-1 formula of the New York City Transit Authority, for shop coating steel for new construction and for maintenance painting, is as follows:

PIGMENT:

	Percent by Wt.
Red Lead (95% Grade)	78.14

VEHICLE:

Raw Linseed Oil	13.37
Boiled Linseed Oil	6.74
Drier M-2*	0.62
Turpentine	1.13
	100.00

Wt./Gal. = 25 lb. 12 oz.

The paint shall dry hard in not more than 24 hr.

* Drier M-2

Dry Red Lead	20 lb.
Manganese Dioxide	15 lb.
Linseed Oil, Raw	50 gal.
Turpentine	50 gal.

RED LEAD TECHNICAL LETTER NO. 10 NOW AVAILABLE

Copies of the newest Red Lead Technical Letter, No. 10, "L.I.A. Formula 3-7, A Red Lead-Alkyd Vehicle Primer for Industrial and Marine Environments," may now be obtained free of charge from the offices of the Lead Industries Association. The formula contained in this Technical Letter has recently achieved wide popularity and has, after extensive in-service testing, been adopted as a standard primer by a major oil company.

For the first field coat for all new structural steel and as a second coat in maintenance work when a three-coat system is used, Transit Authority Formula SR is:

PIGMENT:

	Percent by Wt.
Red Lead (95% Grade)	14.7
Red Iron Oxide (85% Fe_2O_3)	20.6
Lampblack	2.4
Magnesium Silicate	4.9
Silica	6.4

VEHICLE:

Raw Linseed Oil	45.9
Drier Z*	5.1
	100.0

Wt./Gal. = 12 lb. 10 oz.

* Drier Z is same as Drier M-2 given above.

The gray-green finishing coat for elevated structures is designated Formula M-11 and is as follows:

PIGMENT:

	Percent by Wt.
Basic Carbonate White Lead	24.0
Basic Sulphate White Lead	12.0
Zinc Oxide	18.0
Tinting Colors	1.2
Silica	2.4
Magnesium Silicate	2.4

VEHICLE:

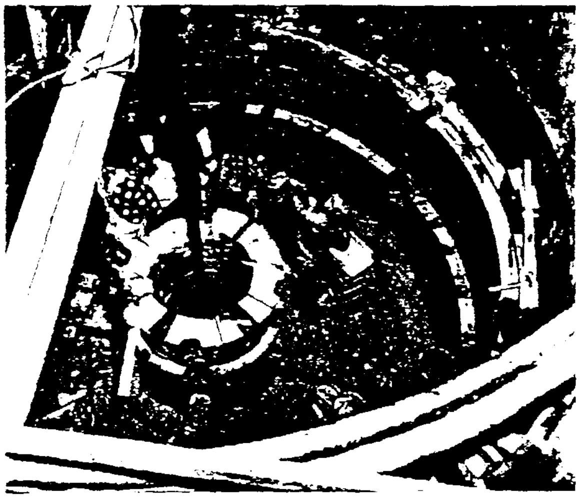
Raw Linseed Oil	36.8
Drier M-2*	3.2
	100.0

Wt./Gal. = 15 lb. 6 oz.

The paint shall dry hard in not more than 18 hr.

* As given in first formula above.

Sulfuric Acid Concentrator Has Brick and Lead Lining



Corrosion-resistant lead lining in varying thicknesses is seen at upper right of this acid concentrator. In turn, the lead is protected from high temperature by the bricks.

When National Petro-Chemicals Corp. required long-life acid protection, at low maintenance cost, of certain installations at its synthetic ethanol plant in Tuscola, Ill., brick and lead lined construction was selected. One of these installations, shown here, is a sulfuric acid concentrator 16 ft. in diameter and 24 ft. high. Some 19 tons of chemical lead, varying in thickness from 16-lb. lead on the sides to 32-lb. lead on the bottom, was used in lining the vessel.

This type of lining is one means of using lead where high temperature is a problem. (Another method is the lead cladding of steel in which there is no insulating air gap between lead and steel so that the heat transfer properties of the steel are exploited.) It is used commonly in the 450 deg. F. range and has been used at higher temperatures. The brick lining provides a temperature gradient to insulate the lead from high temperatures within the vessel. At the same time, corrosives seeping through the brick are stopped by the lead and prevented from attacking the steel supporting structure.

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.

MATERIALS OF CHEMICAL CONSTRUCTION ANNUAL REVIEWS — LEAD AND LEAD ALLOYS
Up-to-date reports on new developments in the uses of lead and lead alloys in chemical construction including research progress, engineering applications, and technological advancements. With bibliography. 1955, 1954 and 1953 reviews (editions are not cumulative) available. Reprinted from "Industrial and Engineering Chemistry," October, 1955, October, 1954 and October, 1953.

LEAD REFERENCE SHEET (Parts 1 & 2)
A short outline of the types, grades, and chemical and physical properties of lead in chemical construction, with a summary of the corrosion characteristics of lead in use with a large number of common chemicals and solutions used in various industries. Reprinted from "Chemical Engineering Progress," January and February, 1955.

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. Reprinted from "Chemical Engineering," February, 1953.

MATERIALS OF CONSTRUCTION — LEAD
A brief survey of the uses of lead in chemical construction reprinted from the materials review published in "Chemical Engineering," Nov. 1954.

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.

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."

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.

SUGGESTED SPECIFICATIONS FOR CHEMICAL LABORATORY DRAINAGE SYSTEM
A complete guide to the selection and installation of drainage systems in chemical laboratories. Includes laboratory waste and vent piping, traps, sinks, acid trays, troughs, safe pans, neutralizing basins and other topics.

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.

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."

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.

RED LEAD TECHNICAL LETTERS
A series of technical letters containing red lead paint formulations. (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**
- **Technical Letter No. 9—Red Lead Paints for Galvanized Steel, Rusted, Weathered or Treated New**
- **Technical Letter No. 10 — L.I.A. Formula 3-7, A Red Lead-Alkyd Vehicle Primer for Industrial and Marine Environments.**

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.

RED LEAD PAINTS FOR GALVANIZED SURFACES
Presentation of five new red lead paint formulations for use on galvanized surfaces, with and without top coats. Reprinted from "Paint and Varnish Production," May, 1955.

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.

UPON REQUEST, THE LEAD INDUSTRIES ASSOCIATION WILL BE GLAD TO MAIL "LEAD" REGULARLY, FREE OF CHARGE, TO THOSE INTERESTED, AND WILL COOPERATE WITHOUT OBLIGATION IN THE SOLUTION OF YOUR LEAD PROBLEMS

PRINTED IN U. S. A.
BY ISAAC GOLDMANN COMPANY
NEW YORK CITY