

LEAD

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Many thousands of gallons of high octane, "leaded" gasoline are stored in the modern aircraft carrier to furnish the fuel indispensable to the efficient operation of its bomber, fighter and torpedo planes. Tetraethyl lead injected in the form of "aviation fluid" serves to raise the octane rating of "ordinary" gasoline, resulting in increased power through greater motor efficiency.

420 Lexington Ave. **Lead Industries Association** New York, N.Y.

Washability of Pure White Paint Answers Pittsburgh's Painting Problem

REXOWNED for many years as a steel center, Pittsburgh, Pa. is today booming under a heavier-than-ever schedule of industrial production for war. Claiming the world's largest manufacturers of aluminum, air brakes and plate glass as well as many other firsts in heavy industry, this city is of vital importance to the National war effort. As greatly as these industries contribute to the importance of Pittsburgh, they have certain drawbacks. Smoke and soot from countless stacks hasten the discoloration and dirtying of interior as well as exterior surfaces. Although Pittsburgh's smoke control is steadily being improved, interior paint decoration is still confronted with the problem either of frequent repaintings or of equally frequent washings of interior surfaces. It is the same problem that every city faces to a greater or lesser degree. The City of Pittsburgh—like many another progressive municipality with a wide variety of buildings to maintain—has found the most economical and

satisfactory answer to this problem in the long lasting decorative ability and high washability of pure white lead paint.

Although the standard specifications of the Pittsburgh municipal government allow the use of alternate painting materials, the Dept. of Lands and Buildings under whose direction city buildings are maintained, uses pure white lead for practically all painting work. During their experience of many years they have come to the positive conclusion that flat white lead paint mixed from paste white lead and lead mixing or lead reducing oil produces a more satisfactory job than any other type of interior paint. Not only the low initial cost but also the low average yearly cost are strong contributing factors in this preference for pure white lead and oil paint. This combined with white lead's year-after-year beauty and durability under repeated washings make it the recognized high standard for public building maintenance.



Located in the City-County Building is this attractive office of the Mayor of Pittsburgh decorated throughout with pure white lead and oil paint

The walls of the City Council Chamber in the City-County Building, Pittsburgh, Pa., are styled in harmonizing tints with pure white lead paint



The Carnegie Free Library, a municipally maintained public building. Interior walls are decorated with white lead and oil

The East End Fire and Police Station at Broad and Euclid Streets, Pittsburgh, Pa. The interiors of this combination building are decorated with pure white lead paint in accordance with standard city practice



Tetraethyl Lead Raises Gasoline Octane Rating Essential for Maximum Efficiency of Mobile Forces

LEAD plays an essential role in the production of high octane gasoline which has been rightly termed the life blood of the war program. Our air arm would be paralyzed and the motorized and armored forces severely handicapped without an abundant supply of high test fuels, an important ingredient of which is a minute quantity of a liquid lead compound—tetraethyl lead. The unique chemical properties of tetraethyl lead serve to control the burning of the highly compressed air-fuel mixture in the combustion chamber.

To understand the function of tetraethyl lead it is necessary to delve briefly into the phenomenon of combustion. At the time of ignition the combustion space is completely filled with a charge of gasoline and air which has been compressed by the upward movement of the piston to top dead center. Burning is started by the spark plug and as it progresses across the cylinder the flame further compresses and heats the unburned portion of the charge ahead of it until when the last part of the charge is burned it is subjected to tremendously high pressures and temperatures. If the pressures and temperatures to which the last part of the charge is subjected are too high for the fuel to withstand, an explosion occurs at this point. This results in an audible knock or ping and loss of energy into heat which otherwise would have been converted into power. Tetraethyl lead acts as a controlling

agent which causes the flame to burn smoothly all the way across the combustion chamber, thus exerting an even, powerful downward push on the piston.

During the past 15 years the anti-knock quality of gasolines has risen steadily due in part to improved refining methods, but in even larger measure to the increased use of tetraethyl lead. With engines designed to take advantage of these improved fuels, the horsepower of the average automobile has increased approximately 100% with scarcely any increase in the size of the engine. It has been estimated that the existence of leaded gasolines has added annually to American automobiles approximately fifty times the 1,800,000 horsepower of Boulder Dam. Among other contributions tetraethyl lead has aided oil companies in the conservation of petroleum in their gasoline refining processes and has made possible the present peaks of performance in our military and civilian airplanes.

Tetraethyl lead ($Pb(C_2H_5)_4$) is an organo-metallic compound produced by the action of ethyl chloride on a powdered alloy of lead and sodium. It is combined with ethylene dibromide, ethylene dichloride and a dye for identification purposes. The ethylene dibromide and ethylene dichloride supply the halogen for converting the lead to a volatile form which will be blown from the engine combustion chamber.

The famous PT boats are but an example of the many branches of the armed forces on land, sea and in the air which are dependent on the abundant supply of high octane fuel made possible by tetraethyl lead



U. S. OFFICIAL NAVY PHOTO



Many thousands of tons of pig lead are required annually to meet the military as well as civilian demands for high octane gasoline

The Ethyl Corporation is the sole manufacturer and supplier of tetraethyl lead and anti-knock fluid containing tetraethyl lead in this hemisphere. Two fluids are sold to oil refiners—one called "aviation fluid" for use in aircraft fuels and one called "motor fluid" for use in automobiles.

Although only a very small quantity of these anti-knock fluids is commonly added to a gallon of gasoline, the total amount of pig lead required to produce high octane fuel runs into many thousands of tons annually.

While Ethyl fluid naturally holds the spotlight, there are other indispensable functions which lead performs in the petroleum industry. Lead pipes and tank linings are featured in refining apparatus to resist the corrosive action of the sulphuric acid which serves to remove the tar substances inherent in petroleum products. In addition, a solution of litharge—lead oxide—in caustic soda produces sodium-plumbite which, when added to the petroleum tank, neutralizes whatever sulphuric acid may remain following the acid treatment, the sulphur precipitating out as lead sulphide.

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No. 14

Historic Homes Reveal Early Architectural Trends

THE widespread existence today of buildings which have seen useful service in their communities for a century or more is strong evidence of the stability of our American institutions and a form of guarantee that the American way of life will continue in force for centuries to come. These landmarks have stood firmly through-

Orton Mansion, the plantation house at Orton located on the old river road between Wilmington and Southport, North Carolina. This plantation was started in 1725 as a rice field and today wild rice still grows in the marshes on the bank of the Cape Fear River in front of the mansion. Pure white lead paint protects this landmark from the hot sun and high humidity of this locality

The Wentworth-Gardner House built at Portsmouth, N. H. in 1760 by Madame Mark Hunking Wentworth as a gift to her son Thomas. Later in 1796, it was purchased by Major William Gardner. Protected with pure white lead paint, this home is considered to be the perfect Georgian type erected at the height of the colonial period

Colonial Jonathan Murdock House at New Lebanon, N. Y. Colonel Murdock, an officer in the American Forces during the Revolution and one of the first settlers in this locality, built this home for himself in 1800. The gleaming freshness of this landmark is maintained with pure white lead paint



DEPARTMENT OF CONSERVATION AND DEVELOPMENT, N. C.

THIS IS NO. 14 OF A SERIES REPRESENTATIVE OF THE MANY AMERICAN LANDMARKS IN VARIOUS SECTIONS OF THE COUNTRY THAT ARE PRESERVED FOR THE FUTURE WITH PURE WHITE LEAD AND OIL PAINT. MANY OF THEM HAVE ALWAYS BEEN PROTECTED WITH THIS RELIABLE MATERIAL ACCORDING TO AVAILABLE RECORDS.

out our history, many of them having been built before the Revolution. Every threat to American freedom has only served to heighten their historical interest and to point them out as guide posts to our early culture.

Man-made threats are not the only dangers facing these treasured landmarks. Climatic and environmental conditions of varying severity are continuously at work threatening their destruction. However, the quality of the original materials and workmanship that went into their construction as well as a wise maintenance program featuring white lead paint—mixed on the job from the pure ingredients—assure their preservation for future generations to enjoy.

Sheet Lead Lining for X-Ray Rooms Most Effective Protection for Operators

BEHIND the scenes in the many industries now devoted wholly or largely to war work, as well as in government factories producing explosives and other munitions, lead plays a role than can not be over-estimated. Industrial x-rays, for instance, used to examine many products for hidden flaws and for other purposes, are a great aid in speeding production and assuring the soundness of the items produced. X-rays, however, are injurious to humans exposed to them indiscriminately, so operators and others in industrial plants where they are used must be protected against them.

Therefore, x-ray rooms are completely lined with sheet lead, which is the most economical material capable of confining the rays to the room itself and preventing them from reaching people outside the room. Even windows in these rooms are made of glass with a high lead content so that operators may look into the rooms without the rays reaching them.

To be effective the lining must be

continuous. Therefore all joints in lead x-ray room linings are usually lead welded or "burned," thus introducing no other metal into the joints. This method also saves strategic tin used in solder. Doors must be so constructed that their lead coverings overlap the lead covering on the jambs all around. Where the wall must be perforated to permit the passage of wires or other things, the holes must be shielded in such a way that there is no direct route by which the rays might pass through. All straps, bolts or other supports for the lead must be covered with lead welded in place.

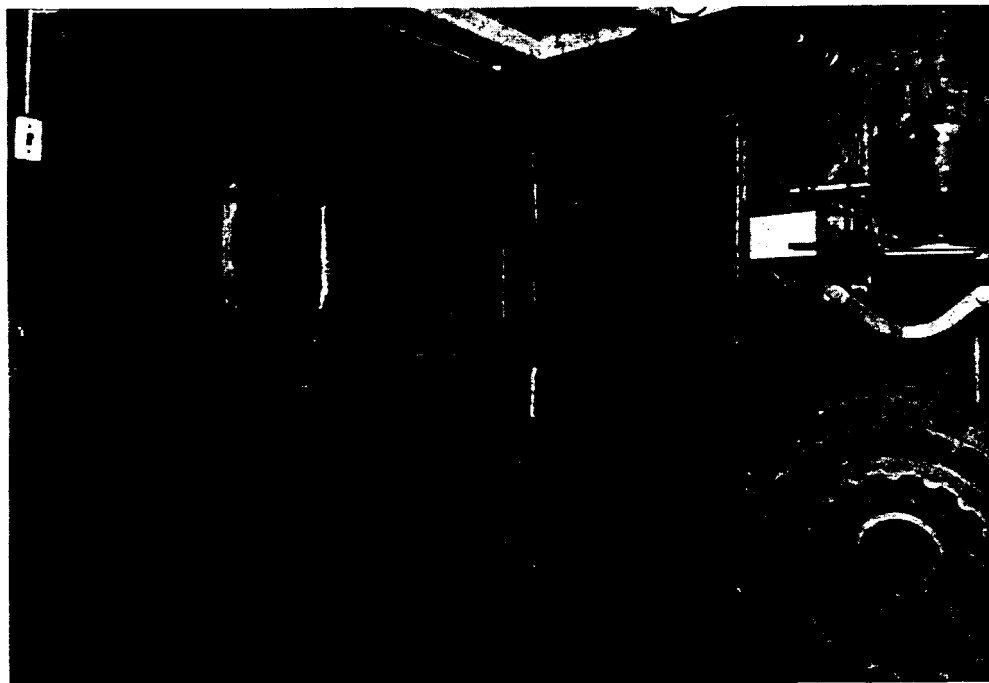
The National Bureau of Standards, U. S. Department of Commerce, has issued a complete booklet entitled "X-Ray Protection" (National Bureau of Standards Handbook HB20). This booklet states, "All x-ray rooms (except for dental radiography) or booths

shall be lined throughout with sheet lead or equivalent material of assured quality, uniformity, and permanency, care being taken that there be complete overlapping of all joints. 'Protective plasters' and lead-rubber wall board are considered to be unsatisfactory for providing protection exceeding 1-mm lead equivalent." It also gives the following thicknesses of lead necessary for adequate protection against x-rays generated by various voltages:

THICKNESS OF LEAD FOR VARIOUS VOLTAGES

<i>X-rays generated by peak voltages not in excess of—</i>	<i>Minimum equivalent thickness of lead</i>
kv	mm
75	1.0
100	1.5
125	2.0
150	2.5
175	3.0
200	4.0
225	5.0
300	9.0
400	15.0
500	22.0
600	34.0

SPECIFY **SEALOR LEAD INDUSTRIES' MATERIAL** APPROVAL



X-ray room of Wellman Engineering Company, which is engaged in war work throughout the country, completely lined with sheet lead. Note welded joints and lead coverings over hinges, bolts and other places where rays might escape. The x-ray procedure is viewed by the operator through glass with a high lead content which provides clear vision plus adequate protection

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Pure White Lead Paint on Shingles Solves a Defense Housing Problem

THE established position of white lead paint as the variable, economical medium for imparting distinction to low-cost homes is reflected in the resurgence of shingles in the defense housing program. As the ideal surface for paint styling—in contrast to the comparative difficulties encountered in decorating composition materials substitute for wood—cedar shingles are naturally gaining momentum where individuality must of necessity be created following construction by varied color treatments on siding, sash and trim due to the architectural limitations enforced by the speed and cost ceilings of the defense program. Abetting this trend is the scientific recognition of wood as an insulating material second to none which when protected with white lead paint will literally prove as durable as time itself.

White Lead Traditional

Traditional as the use of shingles in America is the pure white lead and oil which is so largely responsible for the excellent preservation of so many of our most treasured colonial landmarks. The pliability and even wearing properties of the film formed by the chemical reaction of white lead in linseed oil is the secret of the unsurpassed durability of white lead paint, because paints forming hard, inelastic films inevitably fail by cracking and scaling as climatic conditions cause shingles to expand and contract. Likewise those composed largely of inert and transparent extender pigments lack "backbone" and adhesion, wearing or washing away after but limited exposure. In either case the necessity for costly surface preparation and a new priming coat multiply maintenance costs.

Weathering Eliminates "Bleeding"

Red cedar shingles—which after all comprise the majority used today—should be allowed to weather thoroughly before painting. This precaution permits the dark colored soluble substances in cedar to deposit out, eliminating any possibility of these excretions from "bleeding" through to discolor the paint.

Beware Creosote Stains

Shingles which have been previously stained should be thoroughly tested to determine the type of stain used; since it is inadvisable to style with paint areas impregnated with creosote. Creosote stains penetrate so deeply into the wood pores that they tend to "bleed" through to spoil the decorative finish regardless of the vigorous use of the wire brush or sandpaper which obviously can affect the surface only. As a result, paint styling following creosote stains should be confined to the darker colors, so that the discoloration will be as inconspicuous as possible. To test for creosote, apply a single coat of white lead to a small, inconspicuous area. If discoloration results within two or three weeks, creosote is indicated.

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Priming Coat Important

As the first or priming coat a mixture of 3 parts (by volume) soft paste white lead, 4 parts raw linseed oil to 2 parts of pure gum spirits of turpentine must be brushed in well to saturate and seal the edges as well as the faces of the shingles to form a firm foundation for the topcoats to follow. Due to the exceptional porosity of shingles, but 200 square feet per gallon can be expected on the initial coat as compared to the 600 square feet commonly achieved on clapboards.

Flat or "Glossy" Finish

The coverage to be expected from the body and finish coats is likewise less on shingles than on less porous siding areas. As a result, the standard body coat of 2 parts soft paste white lead to 1 each of linseed oil and turpentine as well as the gloss finish formula of equal parts of soft paste white lead and linseed oil spread approximately 400 and 600 square feet per gallon respectively. To obtain a flat finish merely substitute lead mixing oil or lead reducing oil for the raw linseed oil in the gloss finish coat. Naturally, an endless variety of colors are readily produced by the simple addition of small quantities of colors-in-oil.

Drier Expedites Oxidation

To expedite the oxidation—drying—of the paint, add $\frac{1}{4}$ pint of liquid drier per gallon of raw linseed oil in all coats. Drier is unnecessary with the use of lead mixing oil or lead reducing oil.

Ready-Mixed White Lead Paint

Ready mixed pure white lead paint for two coat application is now readily available. However, in shifting over to the two-coat system, it is essential to remember that the paint varies considerably in opacity and brushing properties from that specified for three coat work. This necessitates shorter brush strokes and extra care all around to assure a smooth, satisfactory finish.

Ceiling Panels of Clinton State Prison Chapel Receive Colorful White Lead Stencil Treatment

THE Church of the Good Thief—recently completed within the walls of Clinton Prison, Dannemora, New York—is the culmination of three years of arduous labor by the inmates themselves. Under the careful supervision of The Reverend A. R. Hyland, the impressive, cathedral-like edifice was built to serve generations to come being constructed of native stone from the old prison wall and the most durable materials obtainable throughout.

With the paramount emphasis on quality and an eye to the future, white lead paint was the logical selection for the panel decorations. Over the regular priming and body coats, a blue-green flat finish serves as the background for a glazed stencil theme resulting in a most effective ceiling treatment. The blue-green base was prepared by reducing paste white lead and colors-in-oil to painting consistency with flattening oil, while for the stencil glaze whitening

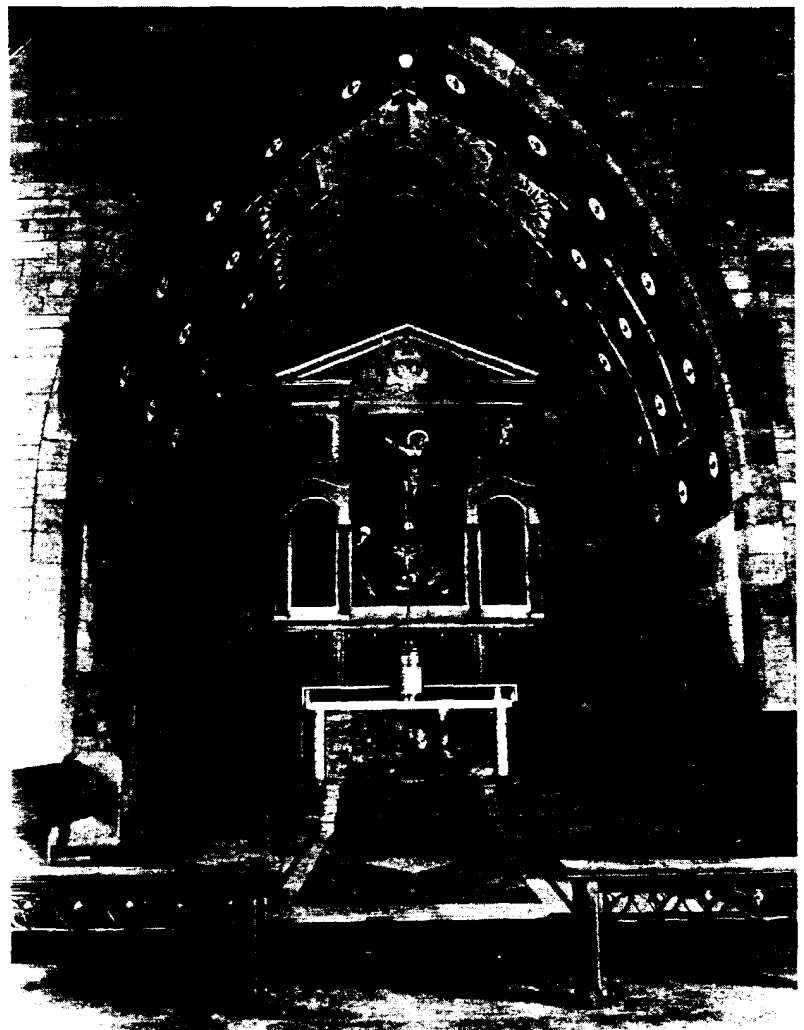
was added to the tinted paste thinned only with turpentine.

Since the highly adhesive, pliable white lead film will not chip or crack and exhibits as well unsurpassed retention of color values, the utmost in service and maintenance economy is assured. The durability of white lead paint is such that the decorative treatment will mellow with age, actually appearing to improve as the years roll by, making repainting necessary only should redecoration be desired.



Rough hewn walls of native stone lend charm and permanence to the beautiful Gothic edifice

The Sanctuary of the Church of the Good Thief with white lead featured in ceiling panels and altar decorations



Talented inmate craftsmen at Clinton Prison applying finishing touches to church interior under white lead stencilled roof

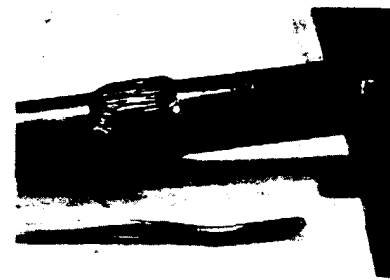


Government Orders Permit the Use of Lead for Water Services as Well as Caulking

THE water works engineer's problem of providing adequate water distribution facilities in the face of mounting material shortages is a difficult one. Fortunately, however, he can still rely on lead for both water service pipe and calking. There are at present no government orders of any kind prohibiting the use of lead for these purposes, whether it be to supply war housing, war factories or other kinds of construction. Lead is in sufficient supply to take care of all military requirements as well as essential civilian needs.

As water distribution is classed as an essential civilian need, the War Production Board, Army and Navy all permit the use of lead for this purpose. The following letter from the Lead Branch of the War Production Board illustrates this point:

"Supplies of lead at present are such that all military requirements are being promptly met and enough lead remains for essential civilian use. Since water distribution is essential, there seems to be no reason why lead water service pipe and calking lead should not be used. In fact, conserva-



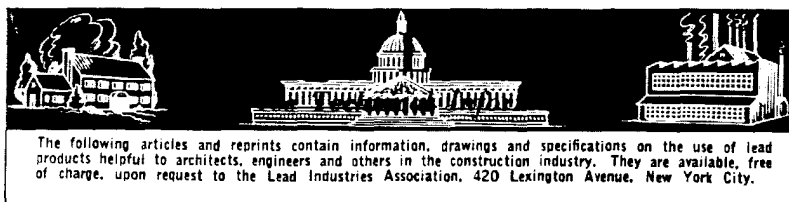
A completed service pipe weld. After the initial weld, loading of the joint is carried well over onto both pieces of pipe

tion measures which have been taken in lead have been with the intent of making enough lead available for military and such essential civilian purposes. It seems that lead, therefore, should be employed, particularly for water works extensions to war housing projects and other construction connected with the war effort.

"I would like to remind you, however, of the fact that while lead at the present time is in ample supply any unforeseen military or naval occurrences or demands not at present anticipated might change the entire picture."

The solder shortage, resulting from our loss of Far Eastern tin producing areas, need not interfere with the use of lead water services. Although wiping solder is still available to water utilities, it is desirable to conserve it as much as possible. Joints may be made by lead welding instead of soldering where practical. Such joints, properly made, have been tested without failure beyond the bursting point of the pipes they connect. There are already many mechanics able to make this type of joint, and a number of classes have been started to instruct others in the art which can be learned quickly by capable mechanics.

It must again be emphasized that the use of lead for water services and calking is in accordance with government orders and, while the lead supply situation remains so favorable, saves more critical materials.



The following articles and reprints contain information, drawings and specifications on the use of lead products helpful to architects, engineers and others in the construction industry. They are available, free of charge, upon request to the Lead Industries Association, 420 Lexington Avenue, New York City.

WHAT TO EXPECT FROM WHITE LEAD PAINT

An attractive 28-page booklet with charts, formulas, and mixing instructions covering some of the problems of painting and how white lead meets these problems.

PAINTING YOUR HOUSE by Dr. F. L. Browne, Senior Chemist, Forests Products Laboratory, Madison, Wisc.

A discussion of house painting reprinted from American Forests, May, 1939.

SOME PAINTING PROBLEMS AND THE ANSWERS

By Dr. F. L. Browne, Senior Chemist, Forests Products Laboratory, Madison, Wisc.

Reprinted from the National Real Estate Journal, Sept., 1939.

STAMFORD'S DOUBLE LIFETIME HOME

A complete analysis of hard lead flashing, white lead paint, lead plumbing, plywood and red cedar Certigrade shingle details and installation methods. Reprinted from the American Builder, July, 1939.

SHEET LEAD INSTALLATION DETAILS

A detailed analysis of the principles and application of lead flashing and sheet lead work for small homes. Reprinted from Sheet Metal Worker, June, 1939.

DON'T GAMBLE WITH PAINT

An instructive article on the selection of paint for farm use reprinted from the March 1942 issue of Country Gentleman.

BRUSH UP ON YOUR PAINTING

A practical article on the selection and application of paint reprinted from House Beautiful, June, 1941.

HOW LUMBER AND PAINT KEEP YOUR HOME ALWAYS IN STYLE

A brief digest of the advantages of painted lumber homes with color-styling suggestions and other interesting information.

LASTING LEADWORK IN MODERN PLUMBING

By T. N. Thompson, Technical Editor, Plumbing and Heating Journal.

Reprinted from Plumbing and Heating Journal, Feb., 1939.

COMMERCIAL STANDARDS:

Calking Lead, CS94-41
Lead Pipe, CS95-41
Lead Traps and Bends, CS96-41

Official publications by the Government Printing Office of the above Commercial Standards as promulgated by the U. S. Department of Commerce through the National Bureau of Standards, effective June 25, 1941.

NEW SIMPLIFIED STANDARD FOR LEAD TRAPS AND BENDS

File size leaflet with new standards for lead traps and bends as well as existing standards for lead pipe and calking lead, and other informative data.

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

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