Lead Plumbing Selected for School Laboratories

PLUMBING in the chemical laboratory and physical preparation room of the large new Mount Pleasant Regional Senior High School, Providence, R. I., was done with lead to solve the vexing problem of handling corrosive chemical wastes. About 1500 ft. of lead pipe, of which some 75 per cent is 2 in. pipe weighing 12 lb. per ft., has been used in this installation. There are 86 lead stubs and 7 lead stacks; lead bag traps are also being used.

ADVERTISERS STUDIOS

Mount Pleasant Regional Senior High School, Providence, R. I., where lead is used in the laboratory plumbing.

Lead serves admirably for chemical wastes, not alone because it resists corrosion by such a variety of modern chemicals, but because it also has flexibility that is absolutely essential in any piping system if it is to endure. Building movement and settlement are taken up by lead pipe without damage or strain, an unusual feature in corrosion resistant materials. Furthermore, since joints in lead chemical wastes can be made by lead "burning", making continuous homogeneous runs of lead pipe, joint troubles may be eliminated.

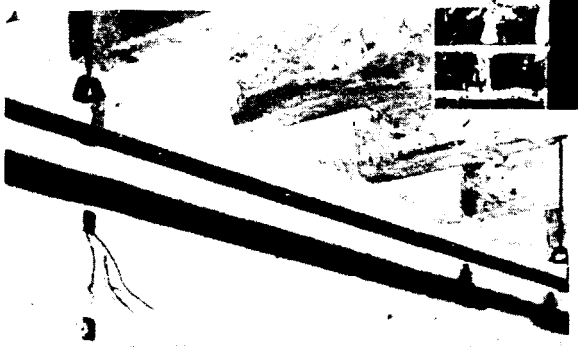
Horizontal runs of lead pipe in the Providence school were hung in drop ceilings and vertical runs in brick chases. Lead stubs coming through the concrete floors were encased in sheet iron sleeves. These are excellent practices that should be followed in all piping installations wherever possible, as it removes the danger of damage that may result from embedding pipes directly in concrete or masonry. The horizontal runs are supported continuously on 2 x 2 in. angle irons with hangers shaped to fit the angles.

Attention should be given to the heavy weight of lead pipe used in this installation. For chemical wastes greater wall thickness is naturally required than for ordinary wastes since conditions are more rigorous. Minimum weight of lead pipe for this purpose should be Lead Industries Association Standard B or M weight, which may be identified by the Lead Industries' "Seal of Approval", the letters B or M, the diameter and the manufacturer's name or trade mark stamped on it. This pipe weighs:

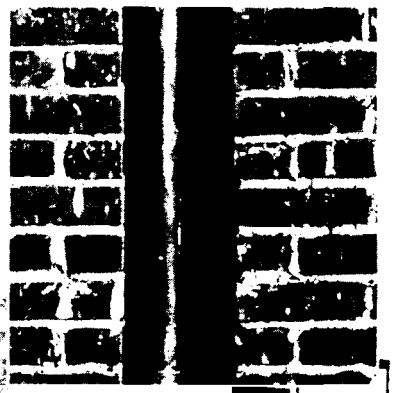
Inside Diameter Inches	*Weight per Running Foot*	
	Pounds	*Ounces*
1	3	4
$1\frac{1}{4}$	3	12
$1\frac{1}{2}$	5	
2	7	

Since solder is corroded by many chemicals that do not affect lead all joints in chemical work should be made by lead "burning". In this way nothing but durable lead is presented to the attack of corrosives.

The architect for Mount Pleasant High School is Irvin Gorman, of Providence. Plumbing was done by C. H. Cronin, Inc., of Boston.

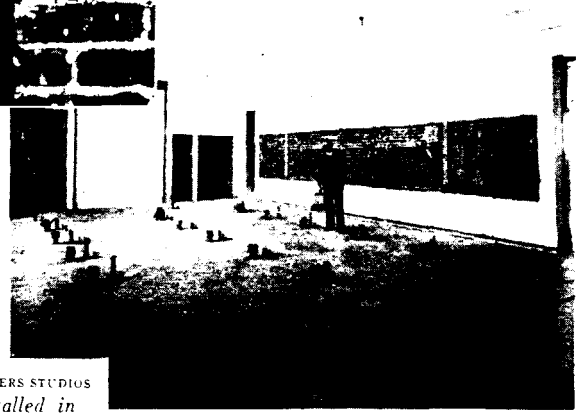


Lead laboratory waste pipes supported continuously on 2 x 2 in. angle irons, suspended on hangers shaped to fit the angles.



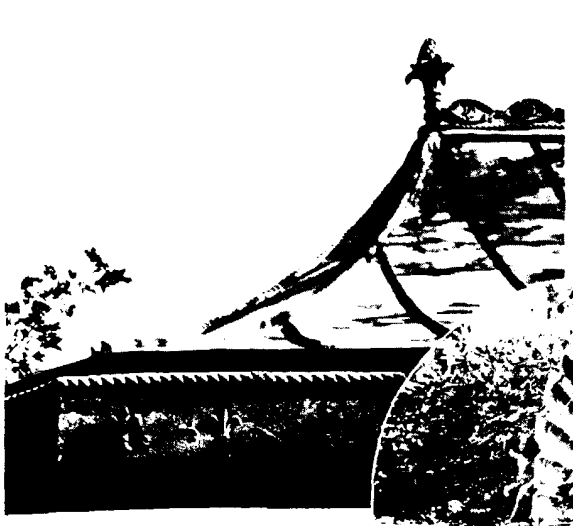
PHOTOS BY ADVERTISERS STUDIOS

Lead pipe installed in chase in brick wall of the Mount Pleasant School.



View showing some of the many lead stubs used to resist corrosive chemicals and provide flexibility in the school laboratory plumbing.

Lead Covered Columns Feature Garden House Lead Work



Close-up showing cast lead gutters, loose-locked, standing seam roof, ornamental rope molding, and lead crest and finial.

Detail of the hand-hammered lead covering for the wood columns; also shows lead leadheads, gutters and leaders.

PHOTOS BY WURTS BROS.

Two hundred-year old lead cistern and statuettes that ornament the garden pool of the Gelder estate.

WOOD columns covered with ornamental lead are a distinctive and ingenious feature of the suburban garden house shown in the accompanying illustrations. Lead work for this little building includes, in addition to these lead covered columns, a lead roof, crest and finials, lead gutters, leaders and leader-heads, and other ornamental work which enhances the appearance of the house. In the seven years since this work was installed rigorous atmospheric conditions, including exposure to salt air, encountered along the shores of Long Island have had little effect on the lead beyond weathering it to the beautiful gray patina that makes lead work so valued and admired. Besides the lead work on the garden house a two hundred-year old cistern and ornamental statuettes grace the rear wall of the garden pool.

The columns are of wood, 6 ft. 2 in. in height and 8 in. in diameter, with a hand hammered covering of lead running in a spiral from top to bottom. The spiral band that may be seen in the close-up photograph of the column is made with a leaf design and is augmented by fleur-de-lis at intervals along the face of the column. The fleur-de-lis also form the design for the ornamented face of the cast lead gutters and is a device that has been used for many years in lead work.

The roof of the garden house is comprised of lead sheets 1 ft. 6 in. in width and of varying lengths depending on the slope. Standing seams are used to loose-lock adjacent roof sheets together. Loose-locks are also provided between roof sheets and gutter, and between roof sheets and ridge at the crest, providing for expansion and contraction in all directions. The ornamental crest and pine-apple finial which surmount the roof are of cast lead with a lead rope molding running around the crest. Lead rope moldings also form the hip joints and the top of the gutter face and leader-heads. The style and application of these moldings serve to avoid sharp and severe looking joints and edges and yet provide an artistic appearance that harmonizes well with the general theme of the construction.

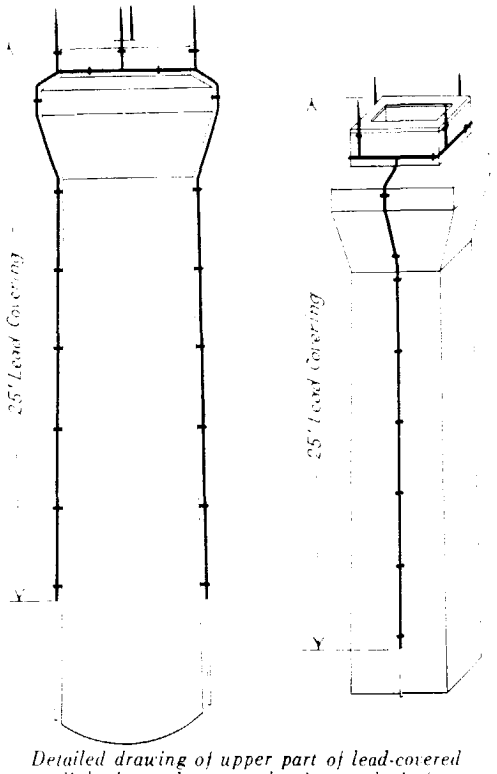
The lead cistern and statuettes are doubly interesting because of their antiquity. They were part of an English fountain and were made in 1738, as may be seen by the date cast on the front of the cistern. In spite of 200 years' service they are today in excellent condition and remain a tribute to lead's durability and to the craftsman who made them. This durability of lead, in addition to its ease of application and remarkably fine appearance, has been the keynote of lead's use in building construction through centuries.

Leroy P. Ward was the architect for this garden house which is on the estate of Mr. Irving L. Gelder, at Kings Point, L. I. Mrs. Annette Hoyt Flanders was landscape architect.

Lead Coverings Add Years to Lightning Rods

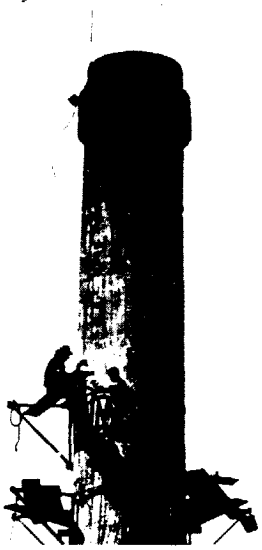
Prevent Flue Gas Corrosion

A LEAD covering is used to protect lightning rod systems for chimneys against the severe corrosion of flue gases as well as against ordinary atmospheric corrosion. In a system manufactured by the Building Maintenance Corporation of Milwaukee, Wis., the entire upper 25 ft. of the conductors is provided with a lead covering so that nothing but durable lead is exposed to the corrosive gases.



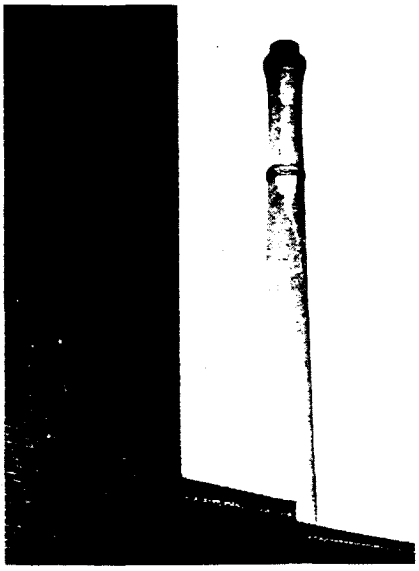
Detailed drawing of upper part of lead-covered lightning rod system showing method of installation.

The air terminals of this system are solid copper bars spaced around the chimney head and connected by a woven copper-wire conductor that runs around the chimney. Two similar conductors lead down from this circuit cable, one on each side of the chimney and fastened to it, to 5/8 in. star-shaped solid copper grounding bars buried in the ground. The air terminals, circuit cable, and all fittings and down conductors within 25 ft. of the top are completely covered with lead not less than 1/16 in. thick. The lead is monolithically cast on the job to cover all connections and fittings and where joints in the lead covering are necessary they are made by autogenous welding (lead "burning") so there is no possibility of exposed metal other than lead.



Close-up view of chimney where an unleaded lightning rod system was corroded away by flue gases.

According to the manufacturers lead has been found to be the only metal that satisfactorily resists the flue gases and this method has been found to increase the life expectancy of their lightning rod systems from a life of three to five years to greater than the life of the chimney itself. This experience is in keeping with the experience of architects and engineers who frequently specify lead for chimney caps and for roofing and flashing on industrial plants or in industrial areas where corrosive gases are common. Tests of the relative durability of metals when exposed in industrial atmospheres, made by a prominent authority on corrosion, bear out the experience of users of lead and were reported in LEAD, March, 1931. Reprints of this article will be supplied upon request.



New lead-covered lightning rods on chimney previously damaged by lightning after original unleaded rods had corroded. Note the new masonry thereby necessitated.

Lead Joints for Pneumatic Mail Transportation

THE practice of using lead calked joints with cast-iron pipe, which for 40 years has proved so successful in New York City's pneumatic mail transportation system, has been continued in the recently completed link that connects the new Post Office at Church and Vesey Sts. with existing lines.

Where once mail transport between central offices and outlying sub-stations was effected by horse-drawn vehicle or, later, by motor truck, it is now accomplished by means of 8 in. diameter cast-iron pneumatic tubes. Heavy cartridges, often containing as many as 600 letters, course through the tubes easily with a minimum speed of 30 miles per hour, propelled by compressed air. In order to eliminate friction as much as possible each pipe length is bored to size on a lathe at the foundry and carefully cleaned with kerosene on the job. Joint friction is avoided to a large extent by using a dovetail cut on the inside of the bell matched by another at the end of the spigot. Thus a minimum shoulder results on meshing two ends, the joint space then being calked with lead.

Permanence is a major requisite of such a system. The problem of determining a route through the maze of pipes, tubes, and other conduits in large metropolitan centers is, at best, very difficult. In many cases the most feasible right-of-way is found to be many feet below the level of the street, sometimes being as far down as 27 ft. when subway lines and other obstructions are encountered. Likewise, it is often necessary to lay the lines within a few feet of the surface, subjecting the pipe to the full effect of ground settlement and the pounding of traffic. Consequently, as it necessitates considerable expenditure to excavate for repairs, great care must be taken to insure dependability and durability. The joints between the lengths of pipe must be air-tight at all times and yet flexible, to provide for underground movement caused by heavy traffic, subways and elevated trains. Calking lead fills these requirements admirably. Joints made with lead have been used in the New York City system since 1898 and have rendered trouble-free service throughout the years.

Pneumatic mail transportation lines in the new New York City Post Office Building, joined with lead as described in the article.

COURTESY U. S. PIPER

COURTESY U. S. PIPER

Installation of twin mail lines calked with lead, running under Barclay Street, New York, N. Y.

During this time approximately 56 miles of mail transport pipes have been laid under New York City. These conveyors run in pairs from the Battery up both the East and West Side to 126th St., in addition to several crosstown lines, one of which, connecting the Brooklyn Bridge sub-station, being an original line installed in 1898. At the present, plans are being made to extend the system up to the Bronx and also to the site of the 1939 World's Fair at Flushing Meadows, L. I.

Installation of the tubes for the new Post Office was made for the New York Mail and Newspaper Transportation Co. by the Beaver Engineering and Contracting Co. of New York City.

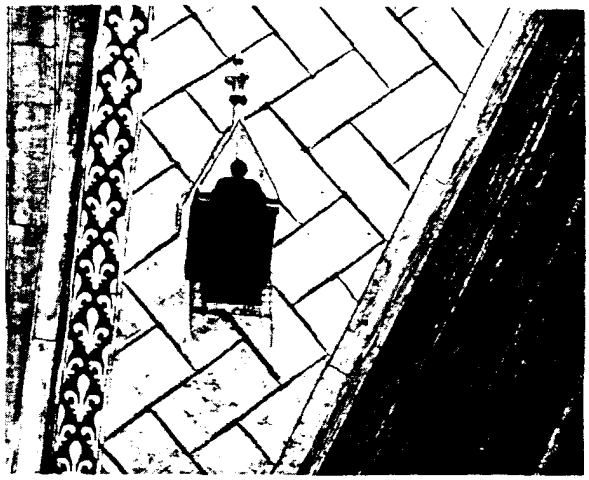
Restored Rheims Cathedral Roofed With Lead

A LEAD roof has again been employed in the reconstruction of the Rheims Cathedral, at Rheims, France, which is of very great interest to both historians and architects. The Cathedral is a superb monument of French art in the middle ages, for which the original plan was conceived by Jean D'Orbais in 1211. The new roof replaces one set in 1481 which lasted in good condition up to the German bombardment of 1914.

M. Deneux, the architect in charge of the tremendous project of restoration, naturally insisted that the edifice be rebuilt in minute and exact detail. This involved the employment of many tons of lead for the roof, the roof crest, and other parts of the Cathedral.

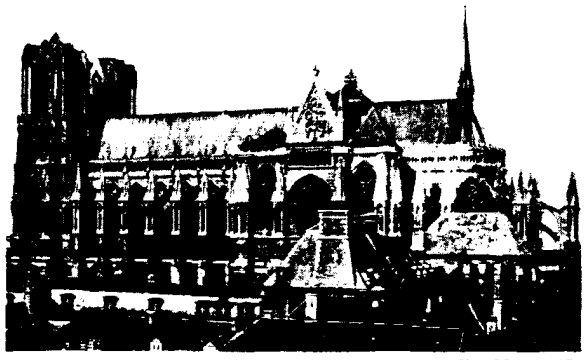
The use of lead for roofing is indeed international and has been used abroad for centuries. As far back as 1771 the Academy of Rouen reported on the qualities of lead and emphasized its very excellent durability, a characteristic which, augmented by its beauty, has won high esteem for lead in this country.

However, to gain the utmost advantage from this type of roof, several precautions should be taken and care exercised in construction. Lead, as are all other metals, is naturally subject to expansion and contraction. For this reason the roof should be made up of sheets of small size which minimize this tendency and should be loose-locked to adjacent sheets in order to provide in all directions for the expansion and contraction that may occur. Nails should never, under any condition, be driven through the lead. Therefore, cleats are used to hold the sheets to the supporting structure. For more specific and detailed information on the installation of lead roofing and flashing, "A Summary of Notes" on this subject may be obtained from the Lead Industries Association upon request.



Interesting pattern formed by loose-locked roof sheets and one of the gilded arrises with the fleur-de-lis design.

Close-up of the loose-locked roof sheets of the restored Rheims Cathedral.



CL. ARCH. PHOT.

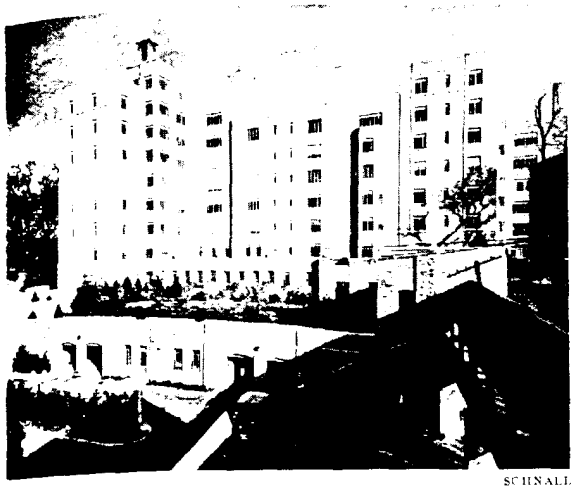
A general view of the Rheims Cathedral before the 433 year old lead roof was demolished in the bombardment of 1914.

Lead was also used in making the "fleur-de-lis" crest that was demolished during the uprising of 1789. M. Deneux felt that this should certainly be replaced because of its historical significance and for architectural accuracy, as a crest is an essential feature of this type of cathedral and serves to break the more or less severe lines of the ridge.

Lead was used in other parts of the Cathedral, such as the monumental statues at the base. Over 400 tons were used in all and, because of its invaluable characteristics, insures that this famous and beautiful architectural masterpiece will last through the centuries to come.

The restoration was made possible by a gift from the Rockefellers and was recently dedicated.

White Lead Paint Economical for Interiors



SCHNALL

Full view of Hudson House, Ardsley-on-Hudson, N. Y. Shreve, Lamb and Harmon, architects.

PURE white lead paints were used for the interiors of Hudson House, Ardsley-on-Hudson, N. Y. Shreve, Lamb and Harmon, designers of such famous structures as the Empire State Building, were the architects for these modern apartments. White lead was specified for this building, which rises high on a hill alongside the Hudson and commands a superb view of the river, in order to obtain a durable paint surface with no increase in expense over paints of less durable nature. Furthermore, in specifying white lead the architects were assured of a beautiful finish, obtainable in a wide variety of shades, colors and decorative treatments.

Pure white lead paints gain the continued good will of apartment owners. Their long life eliminates frequent repainting which is so annoying and bothersome to tenants. Walls and ceilings painted with white lead may be washed often, removing dust and dirt with no effect other than regaining the original luster and beauty of these surfaces. Washing may be done when tenants are not at home and relieves them of the bother of having their rooms turned upside down for painting. For the owner this easy washing and the elimination of frequent repainting saves unnecessary maintenance.

In respect to painting costs, a very important problem when writing specifications, it should be remembered that the original cost per gallon is not indicative of the final expense. The coverage per gallon and the ease of application are major factors in such considerations. To gain an accurate view of resultant painting costs they should be reduced to a common factor, the cost per square foot. Two items enter into this: cost per square foot of material, and the cost per square foot of labor. A useful formula for computing painting costs represents the items in this manner:

$$C_x = \frac{C_g}{N_g} + \frac{C_{ld}}{N_{ld}}, \text{ where}$$

C_x = final cost per square foot of painting.
C_g = cost per gallon of paint.
C_{ld} = cost of a day of labor.
N_g = square feet of coverage per gallon.
N_{ld} = square feet covered by one painter in one day of labor.

In order to render an example of this let us take two paints, A and B. Paint A costs $2.20 per gallon; B costs $1.50 per gallon. A covers 700 sq. ft., B 450 sq. ft. per gallon. The cost of labor is $8 per day, while A and B cover 1400 and 1000 sq. ft. per day, respectively. Hence:

$$C_x = \frac{2.20}{700} + \frac{8.00}{1400} = .00884 \text{ (Final cost per sq. ft.)}$$

For B

$$C_x = \frac{1.50}{450} + \frac{8.00}{1000} = .01133$$

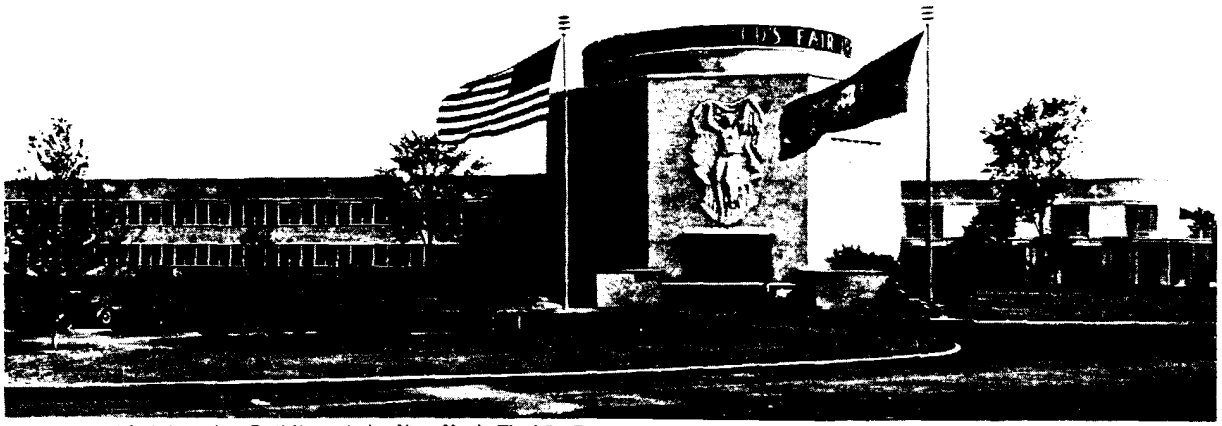
Thus it may be seen that, although A costs 70 cents more per gal., because of its high coverage and spreading rate it costs .00249 cents less per sq. ft.

By careful examination of painting costs, and by taking advantage of the high coverage and ease of spreading of pure white lead paints, architects are able to render prospective owners and builders a paint finish unexcelled in beauty, durability, and economy.

Furthermore, the ultimate cost of painting is the cost per sq. ft. per year, which is brought to a minimum by the excellent durability of white lead paints.

DAMORA

One of the interiors of the Hudson House, all of which were painted with white lead and oil.



Administration Building of the New York World's Fair of 1939, showing the steel flagpoles and light colored window shades, painted with lead chromate.

Lead Chromate Paint Gives Protection and Beauty

BASIC lead chromate paint has been used to provide a suitable and harmonizing color for decorating the Administration Building of the New York World's Fair. This pigment gives a very beautiful and attractive orange color and the use of lead chromate in this "international orange" is covered by Government specifications.

Lead paints are widely recognized for the superior protection given by them against the ravages of atmospheric conditions. This applies especially to outside metal structures which must be thoroughly and efficiently isolated from natural elements which tend to rust or corrode them and in consequence weaken the entire structure.

In painting the two steel flagpoles that grace the front terrace of this building, lead chromate not only serves as an excellent protective coating but also colors these poles to fit in with the modern color scheme.

As the chosen color combination for the Administration Building combines white, blue and international orange, the latter color is to be seen in great prominence. The colors blend together to give a very pleasing appearance. This combination has been carried out in the entire decoration of the building down to curtains, chairs and window shades. The latter are painted with the orange lead chromate for several reasons. Naturally, durability and completing the color scheme are two of these. According to the makers of the paint who supplied the shade manufacturers:

> "We used this basic lead chromate for two reasons: first, its dependability in light fastness; second, its non-bleeding quality which is essential in your processing."

In addition to these excellent characteristics of lead chromate paint, there is added that of high visibility. This is advantageously employed in airports where fences and other types of construction barriers are painted this color. Its high visibility should also render it very useful in painting bridges and highway markings. A striking example of lead chromate on a bridge is the Golden Gate Bridge at San Francisco [LEAD, July, 1937].

Companies licensed to use the "Lead Industries' Seal of Approval" on calking lead as of Dec. 28, 1937:

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BUNKER HILL & SULLIVAN MINING & CONCENTRATING CO.
CAMBRIDGE SMELTING CO.
THE EAGLE-PICHER LEAD CO.
FEDERATED METALS DIVISION OF AMERICAN SMELTING & REFINING CO.
GEORGIA LEAD CO.
GIBSON & PRICE CO.
INTERNATIONAL SMELTING & REFINING CO.
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