

BOARD OF DIRECTORS MEETING MINUTES

New York, N. Y.

December 5, 1961

The first regular meeting of the Board of Directors of the Lead Industries Association, Inc., was held in the offices of the Association at 9:30 A.M. on Tuesday, December 5, 1961.

PRESENT

J. Vuillequez, Chairman
J. Bers
R. D. Bradford

D. R. Carter
J. A. Costello
A. Fletcher
K. W. Green
F. Hurless

S. D. Strauss
W. P. Wilke, III

REPRESENTING

American Metal Climax, Inc.
Bers & Co., Inc.
Federated Metals Division
American Smelting and Refining Co.
The Eagle-Picher Co.
Ethyl Corp.
St. Joseph Lead Co.
Electric Storage Battery Co.
International Smelting and Refining Co.
(Anaconda Sales Co., Agents)
American Smelting and Refining Co.
Hammond Lead Products, Inc.

OTHERS PRESENT

R. Hendricks	Consolidated Mining and Smelting Co. of Canada Limited
C. R. Ince	St. Joseph Lead Co.
G. H. LeFevre	United States Smelting Refining and Mining Co.
D. A. Merson	National Lead Co.
C. E. Schwab	The Bunker Hill Co.

Robert L. Ziegfeld, Secretary-Treasurer
David M. Borcina, Assistant to Secretary
Schrade F. Radtke, Director of Research
Samuel E. Eck, Research Engineer

The secretary reported a quorum was present.

The chairman presided and the secretary kept the minutes of the meeting.

The secretary presented a copy of a notice of the meeting which had been mailed to each director as provided in Section 4.03 of the Corporation's By-Laws. A copy was ordered filed with the minutes, as per Exhibit "A-1."

CERTIFICATE OF INCORPORATION

The chairman reported that he had been advised that the Certificate of Incorporation of the Corporation had been filed in the office of the Secretary of State of New York on October 23, 1961. He explained that the Certificate of Incorporation effected the incorporation of Lead Industries Association, the Corporation's predecessor unincorporated association, pursuant to the Membership Corporations Law of the State of New York and that, upon such incorporation, (i) each member of the unincorporated association became a member of the Corporation with one vote, (ii) each associate member of the unincorporated association became an associate member of the Corporation with no vote, (iii) the officers, directors and members of the Executive Committee of the unincorporated association became the officers, directors and members of the Executive Committee of the Corporation, and (iv) the property and liabilities of the unincorporated association became the property and liabilities of the Corporation. A copy of the Certificate of Incorporation was ordered filed with the minutes.

APPROVAL OF BY-LAWS

The secretary distributed copies of the By-Laws of the Corporation that had been approved by the members of the unincorporated association prior to incorporation of the Corporation. Upon motion duly made and seconded, the following resolution was unanimously adopted:

RESOLVED that the By-Laws of the Corporation presented to this meeting be and they hereby are approved, and a copy thereof is ordered filed with the minutes.

CORPORATE SEAL

The chairman next presented a proposed seal of the Corporation, conforming with Section 8.01 of the By-Laws, an impression of which is as follows:

Upon motion duly made and seconded, the following resolution was unanimously adopted:

RESOLVED that the proposed seal of the Corporation presented to this meeting be and it hereby is approved and adopted as the seal of the Corporation.

CONFIRMATION OF OFFICERS

The chairman suggested that it was in order to confirm that the officers of the unincorporated association had become the officers of the Corporation. Upon motion duly made and seconded, the following resolution was unanimously adopted:

RESOLVED that each of the following persons be and he hereby is confirmed to hold the office of the Corporation set forth opposite his name, at all times since the Corporation's incorporation, and until his successor shall have been elected and qualified, or until his death, resignation or removal, whichever shall first occur:

<u>NAME</u>	<u>OFFICE</u>
Jean Vuillequez	Chairman
Jean Vuillequez	President
J. A. Costello	Vice President
C. R. Ince	Vice President
S. D. Strauss	Vice President
R. L. Ziegfeld	Secretary
R. L. Ziegfeld	Treasurer

CONFIRMATION OF EXECUTIVE COMMITTEE

The chairman suggested that it was in order to confirm that the members of the Executive Committee of the unincorporated association had become the members of the Executive Committee of the Corporation. Upon motion duly made and seconded, the following resolution was unanimously adopted:

RESOLVED that J. Vuillequez, J. A. Costello, A. Fletcher, J. A. Martino, C. G. Rice, and S. D. Strauss, and each be and he hereby is confirmed to be a member of the Executive Committee of the Corporation, at all times since the Corporation's incorporation and until he ceases to be a director or until his successor shall have been elected and shall have qualified or until his death, resignation or removal, whichever shall first occur.

BANK ACCOUNTS

The chairman stated that the bank accounts of the unincorporated association had become the bank accounts of the Corporation and that it was in order for the Corporation to adopt banking resolutions confirming the authority of the individuals authorized to sign on behalf of the Corporation. Upon motion duly made and seconded, the following resolution was unanimously adopted:

I, as Secretary of LEAD INDUSTRIES ASSOCIATION, INC., a corporation duly organized and existing under the laws of the State of New York, hereby certify to The Chase Manhattan Bank that a meeting of the Board of Directors of said corporation was duly called and held at its office in the City of New York and State of New York on the 5th day of December 1961, that at said meeting a quorum was present and voting throughout, and that the following resolutions on motion duly made and seconded were unanimously adopted and are now in full force and effect:

"RESOLVED, that The Chase Manhattan Bank (hereinafter referred to as the "Bank") be and hereby is designated as a depository of this corporation (Regular and Special Accounts) and that the officers and agents of this corporation be and hereby are, and each of them hereby is, authorized to deposit any of the funds of this corporation in the Bank either at its head office or at any of its branches.

RESOLVED, that, until the further order of this Board of Directors, any funds of this corporation deposited in the Bank be subject to withdrawal or charge at any time and from time to time upon checks, notes, drafts, bills of exchange, acceptances, undertakings, or other instruments or orders for the payment of money when made, signed, drawn, accepted or endorsed on behalf of this corporation, by any one of the following: President, Vice President, Treasurer and by the Assistant to Treasurer in amounts up to and including \$500.00 (Five Hundred Dollars).

RESOLVED, that the Bank is hereby authorized to pay any such instrument or make any such charge and also to receive the same from the payee or any other holder without inquiry as to the circumstances of issue or the disposition of the proceeds even if drawn to the individual order of any signing person, or payable to the Bank or others for his account, or tendered in payment of his individual obligation, and whether drawn against an account in the name of this corporation or in the name of any officer or agent of this corporation as such, and, at the option of the Bank, even if the account shall not be in credit to the full amount of such instrument or charge."

I FURTHER CERTIFY that there is no provision in the Charter or By-Laws of the said corporation limiting the power of the Board of Directors to pass the foregoing resolutions, and that the same are in conformity with the provisions of said Charter and By-Laws.

I FURTHER CERTIFY that the present officers of said corporation and the offices respectively held by them are as follows:

<u>Name</u>	<u>Title</u>
Jean Vuillequez	President
J. A. Costello	Vice President
C. R. Ince	Vice President
S. D. Strauss	Vice President
Robert L. Ziegfeld	Treasurer
David M. Borcina	Assistant to Treasurer

December 5, 1961

IN WITNESS WHEREOF, I have hereunto set my hand as Secretary of said corporation and affixed the corporate seal this 15th day of December 1961.

Signed: Robert L. Ziegfeld
As Secretary Of The Said Corporation
(Corporate Seal)

Signed: Jean Vuillequez
President

The treasurer reported that similar resolutions required by other depository banks had not yet been received by the Association.

The chairman, with the approval of the Board, thereupon instructed the treasurer to incorporate the resolutions required by each of the depository banks of the Association into the minutes of this meeting.

* * * * *

The minutes of the previous meeting of the Board of Directors of the unincorporated Association held on May 2, 1961, were approved.

CONSIDERATION OF 1962 BUDGETS

The secretary presented his 1962 budget data, as per Exhibit "A-2."

The chairman reported that the recommended 1962 budget for Industry Development had been thoroughly reviewed by the Industry Development Committee.

The Board suggested that the secretary attempt to reduce the 1962 travel expenses by the use of economy flights whenever possible.

ORDINARY AND HEALTH AND SAFETY FUNDS

The secretary reported that his recommended 1962 budget for the Ordinary Fund totaled \$62,750, and for the Health and Safety Fund \$32,200. He suggested that the 1962 subscription rates be established at 16 cents for miners, 4 cents for smelters, refiners and manufacturers,

and 2 cents for producers of assembled products, to raise approximately \$85,000 for both funds with the balance roughly \$10,000 to be taken from reserves in each fund, if necessary.

INDUSTRY DEVELOPMENT FUND

The secretary reported that his recommended budget for the 1962 Industry Development Fund totaled \$366,050 and that a 1962 rate per ton on 1961 domestically sold pig lead of 65 cents would raise approximately the amount budgeted.

After due consideration, a motion was made, seconded and unanimously approved that the 1962 Ordinary, Health and Safety, and Industry Development Funds totaling \$461,000, as submitted by the secretary, be approved, as per Exhibit "B" attached.

The chairman then stated that it was in order to consider the 1962 subscription rates per ton.

A motion was thereupon made, seconded and unanimously approved that the 1962 rates per ton for the Ordinary, Health and Safety, and Industry Development Funds, as recommended by the secretary, be approved.

SUGGESTED COMBINED BUDGET

The secretary then presented his proposal to have only one budget presented henceforth which would combine all activities of the Association except Research.

Financing of the recommended combined budget would be on the basis followed in the past for membership subscriptions; that is, a ratio of 4 for miners, 1 for smelters and refiners and manufacturers, and 1/2 for producers of assembled articles. The monies thus raised from membership

subscriptions, based on whatever rates per ton are decided each year, would then be deducted from the total budget for that year and the balance charged to the sellers on their domestically sold pig lead.

A motion was thereupon made, seconded and unanimously approved that the secretary's proposal for a combined budget and method of financing be adopted for 1962 and subsequent years.

EXPANDED RESEARCH FUND

The Research Director presented his 1962 Budget Data as per Exhibit "C."

Dr. Radtke then reviewed several research projects which have shown or were showing promise of early success from both the technical and commercial standpoint. Among these were the development of the continuous lead cable sheathing machine which is being sold and utilized widely abroad, the development of lead-fiber composite bearings and solder tapes which are in the process of being commercialized by the Huyck Corporation, the development of two superior lead alloys through powder metallurgy, and the development of technology for use of lead in sound attenuation which is receiving considerable attention.

He then reviewed the individual research projects which have been proposed for the 1962 Research Budget after recommendation and approval by the Technical Subcommittees, the Technical Steering Committee and the Industry Development Committee. The budget recommendations were summarized in relation to market areas as follows:

Architectural	\$127,370
Transportation	40,000
Cable Sheathing	60,670
Chemical	30,000
Paint	1,500
Textile	5,000
Ceramics	34,000
General	35,000
Miscellaneous & Reserve Fund	<u>54,500</u>
TOTAL RESEARCH	\$388,040
ADMINISTRATION	<u>111,190</u>
TOTAL BUDGET	\$499,230

It was mentioned that approximately 25 per cent of the research projects were fundamental with the remaining 75 per cent applied. A revised list of research projects was distributed and is attached as Exhibit "D." (This replaces the earlier list sent to the Board on November 29, 1961, with the Budget Data.)

The increase over previous years in both the research and administration budget were noted and discussed by the Board. Comments, pro and con, were made on the following specific items:

1. Financial limits being placed on the overall budget.
2. The necessity of administration staff increases.

The effectiveness of the Technical Subcommittees Ideas Sessions in providing new areas of research was noted with favor.

It was mentioned that closer coordination between the Expanded Research Program and the Industry Development Committee was required and that it is proposed to have a research meeting at the Annual Meeting.

Mr. Wilke commented on the effectiveness of the ceramic fellowship program in increasing the consumption of litharge in the United States ceramic industry, and Mr. Ince mentioned the beneficial effect of the cable sheathing project on lead consumption abroad.

Mr. Hendricks, speaking as representative of the associate members of the Expanded Research Program, mentioned their endorsement of the research program as proposed.

On motion duly made and seconded, the 1962 Research and Administration budget as proposed was approved.

On motion duly made and seconded, the assessment rate of 26 cents per ton of pig lead produced was approved.

A revised budget performance statement presenting details of inter-budget transfers, assessment rate, cash position and future assessment was distributed and is attached as Exhibit "E." (This replaces the earlier statement sent to the Board on November 29, 1961, with the Budget Data.)

Approval of Projects From The 1961 Research Budget

On motion duly made and seconded, a recommendation for funding or partially funding three programs from the 1961 Reserve Fund was approved. These are \$19,850 for LM-7-61, A Study of Lead-Asbestos Pads; \$12,500 for LM-26-61, Lead Powder Cladding of Steel; and \$3,750 for LM-45, Pilot Plant Production of Lead Powder Metallurgy Sheet and Extrusion.

Provisions For Expenditures On Appropriate Activities Not Provided For In The Budget

Chairman Vuillequez reported that on motion duly made and seconded, the Research Executive Committee resolved that the Director of Research be authorized to expend sums not exceeding \$1,000 per project for individual contracts, purchases or other appropriate activities not provided for in the ERP budget, and that the Director of Research be authorized, with the approval of the Chairman of the Research Executive Committee, to expend such sums, not exceeding \$5,000 per project, all such expenditures not to

exceed a total of \$20,000 per budget for lead and to remain within the limits of contingency funds and other unallocated monies available in the annual lead budgets.

Provision For Expenditures On Formally
Budgeted Program Overages

Chairman Vuillequez submitted the following resolution to the Directors for consideration:

IT IS RESOLVED that the Director of Research be authorized, with the approval of the Chairman of the Research Executive Committee, to increase expenditures for contracts and proposals contained in the budget up to 10 per cent above the budget figure for contracts not exceeding \$50,000, and with the approval of the full Research Executive Committee for contracts exceeding \$50,000, all such increased expenditures to remain within the limits of contingency funds or other unallocated monies available in the annual lead budget.

On motion duly made and seconded, the resolution was approved by the Board of Directors.

Additional Office Space For Expanded Research Program

Chairman Vuillequez reported that the Research Executive Committee, and Messrs. Kimberley, Ziegfeld and Dr. Radtke had agreed on providing additional office space to the ERP by utilization of the Boardroom and the Lead Industries Association's portion of the reproduction room (the Lead Industries Association using a portion of their secretarial space for a new reproduction department.)

The Board of Directors agreed to these space allocations.

NOMINATING COMMITTEE FOR DIRECTORS

With the approval of the Board, the chairman appointed the following representatives of member companies to serve as a nominating committee for members of the Board of Directors for election at the next annual

meeting of the Association:

Ivor Thompson, Chairman
C. B. Anderson

F. P. Barton
C. E. Bassett
J. C. Pierce

Cerro Sales Corp.
Delco Remy Division,
General Motors Corp.
The B. A. Avril Co.
Dixie Lead Co.
Shattuck Denn Mining Corp.

NOMINATING COMMITTEE FOR OFFICERS

With the approval of the Board, the Chairman appointed the following members of the Board to serve as a nominating committee for officers for election at the next annual meeting of the Association:

Don Carter, Chairman

The Eagle-Picher Co.

F. H. Hurless

International Smelting &
Refining Co. (Anaconda Sales
Co., Agents)

C. G. Rice

United States Smelting
Refining and Mining Co.

AMENDMENT TO ARTICLE I - MEMBERSHIP AND ASSESSMENT

The chairman presented for consideration an amendment to Article I - Membership and Assessment, by the addition of the following to Section 1.08 ASSESSMENT:

"For any one fiscal year, no assessment for any member including his wholly owned subsidiaries, shall exceed 25 per cent of the total assessment of all members for the same period."

At a question, the secretary stated that this amendment would encompass all assessments of the Association, including Research.

A motion was made, seconded and unanimously approved that the amendment, as presented, be added to Section 1:08 ASSESSMENT, of the By-Laws of the Association.

ELECTION OF EXECUTIVE VICE PRESIDENT

The chairman stated that under the By-Laws of the newly incorporated Association, the Board was empowered to create such other officers as they may from time to time elect. It was therefore his recommendation that the Board create the office of Executive Vice President, and that they appoint Robert L. Ziegfeld to serve in this capacity.

A motion was thereupon made, seconded and unanimously approved that the office of Executive Vice President of the Association be established and that Robert L. Ziegfeld be appointed to serve in this capacity while also filling the offices of the Secretary and Treasurer, as outlined in the By-Laws of the incorporated Association.

INTERNATIONAL CONFERENCE OF LEAD ASSOCIATIONS

The secretary reported that he had been invited to attend the International Conference of Lead Associations to be held in London, Eng. in 1962, and requested the Board's advice as to his participation in this conference.

The Board was in unanimous agreement that the secretary attend the International Conference when held and that his visit include various countries on the European continent.

EXECUTIVE COMMITTEE ACTION OF SALARIES

The president reported on the action taken by the Executive Committee on the salary of the Secretary-Treasurer which he was confirming to the Secretary-Treasurer by personal letter.

AIR POLLUTION IN CALIFORNIA

The secretary reported that a meeting between the Association's health and safety director, and representatives of the Ethyl Corp. and

the duPont Company, had been held in the offices of the Association on December 1, 1961, to discuss the problem of leaded gasoline as it affects air pollution. He then presented an oral report of the meeting and stated that there apparently are areas where the Association can contribute its time and money to further the study of lead and its effect on air pollution. The secretary further stated that a report of the meeting between L.I.A. and the TEL groups would be sent to the directors as soon as possible.

Mr. Costello then commented that as far as his company can determine, TEL does not contribute to smog. It does, however, affect the efficiency, to a greater or lesser degree, of the various catalysts used in automobile exhaust afterburners. The work now underway by his company is to develop a catalyst that will not be affected by TEL. He also stated that if the answer is not soon forthcoming there is a strong possibility that the Los Angeles authorities would rule out the use of leaded gasoline and that his company looks on this situation with the utmost concern for the continued use of TEL in gasoline.

AMOCO GASOLINE ADVERTISING CLAIMS

The secretary reported on the television commercials of the American Oil Co. with respect to their Amoco grade gasoline and stated that they may be misstating the case against the addition of lead to gasoline and may also be making misleading or untrue statements to the detriment of lead.

After some discussion, it was the consensus that the American Oil Co. be approached in an effort to obtain modification of their advertising.

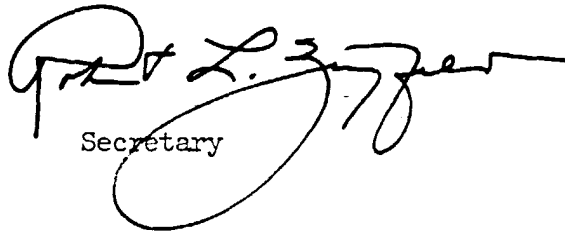
MEMBERSHIP

Recording is made of the election of Metals Disintegrating Co., Elizabeth, N. J. and Compania Minera Asarco, S.A., Apartado 38 Bis, Mexico 1, D.F., Mexico, to full and associate membership respectively, and the resignation of the River Smelting and Refining Co., Cleveland, Ohio.

The secretary reported that the Consolidated Smelting Co., Detroit, Mich., notified him that their plant had been sold to the Electric Autolite Co., and membership should be canceled.

There being no further business, the meeting adjourned at 12:10 P.M.

RLZ:mk
Att.


Secretary

LIA01033

LEAD INDUSTRIES ASSOCIATION

292 MADISON AVENUE

NEW YORK 17, N. Y.

November 8, 1961

SUBJECT: NOTICE OF MEETING

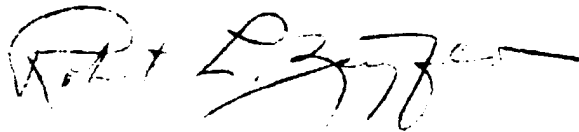
To the Board of Directors of the
Lead Industries Association:

A meeting of the Board of Directors of the Lead Industries Association will be held in the Association's offices on Tuesday, December 5, 1961 at 9:30 A.M.

The principal purpose of the meeting will be to discuss and approve budgets for the calendar year 1962 and to take up other pertinent matters. A detailed agenda and budget information will be sent you prior to the meeting.

Incidentally, you will probably be interested to know that incorporation of the Association has now been completed.

Very truly yours,

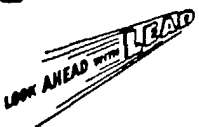


RLZ:mk

Secretary

LIA01034

N 673.01



CERTIFICATE OF INCORPORATION

RECEIVED
New York State
Department of Labor

AUG 7 1961

OF

LEAD INDUSTRIES ASSOCIATION, INC.

BOARD OF STANDARDS AND APPEALS
11 North Pearl St.
Albany, N. Y.

Pursuant to the Membership Corporations Law

WE, the undersigned, desiring to incorporate
a presently existing unincorporated association pursuant
to the Membership Corporations Law of the State of New
York, do hereby certify and state as follows:

1. The name of the proposed Corporation shall
be LEAD INDUSTRIES ASSOCIATION, INC.

2. The purposes for which it is to be formed
are:

(a) to collect and publish statistical in-
formation relating to the production, distribu-
tion, marketing, consumption and use of lead and
lead products;

(b) to disseminate accurate information re-
garding lead products and how they best may be
used;

(c) to develop methods for the improvement
of the welfare of those engaged in the lead
industries, or in the use of its product; and
for such other purposes as, from time to time,
may be of benefit to the lead industries; and

292650

(d) in general to promote the serviceability of the lead industries to the community at large.

No agreement, understanding, combination or arrangement or any form of concerted action to curtail production, fix prices, suppress competition, or in any other manner to restrain trade or commerce, or to monopolize or attempt to monopolize any part of the trade or commerce of the country shall be permitted in the Corporation, nor any other act or acts which may be in contravention of law or good business practice. Each member of the Corporation shall be wholly free to conduct his or its business without legal or moral accountability to the Corporation or to any other member.

3. The territory in which its operations are principally to be conducted is the United States of America.

4. The office of the Corporation is to be located in the City of New York, County of New York, State of New York.

5. The number of its Directors shall be not less than three, nor more than fifteen, none of whom is required to be a member of the Corporation.

6. The names and residences of the Directors until the first Annual Meeting of the Corporation are as follows:

<u>Name</u>	<u>Address</u>
Julian Bers	400 Newbold Road Jenkintown, Pennsylvania
Robert D. Bradford	20 Church Street Greenwich, Connecticut
Donald R. Carter	6824 Hammerstone Way Mariemont 27, Ohio
Joseph A. Costello	Byram Shore Road Byram, Connecticut
William H. H. Cranmer	45 East 62 Street New York 21, N. Y.
Henry L. Day	114 Cedar Street Wallace, Idaho
Andrew Fletcher	Cherry Lane Mendham, New Jersey
Kenneth W. Green	121 Roslyn Avenue Glenside Montgomery County, Pa.
Frank H. Hurless	102 Lovett Avenue Little Silver, New Jersey
Harold E. Lee	1000 Chestnut Street San Francisco, California
Joseph A. Martino	Shelter Rock Road Manhasset, L.I., New York
Charles G. Rice	861 Main Street Hamilton, Massachusetts
Simon D. Strauss	68 Perth Avenue New Rochelle, New York
Jean Vuillequez	Pond Road Stamford, Connecticut
William Wilke, III	Grand Beach Michigan

LI401037

7. All subscribers to this Certificate are of full age, at least two-thirds of them are citizens of the United States; at least one of them is a resident of the State of New York. Of the persons named as Directors, at least one is a citizen of the United States and a resident of the State of New York.

8. The Corporation is not organized for profit and no part of its net income shall enure to the benefit of any member, Director or other person.

9. Nothing contained in this Certificate shall authorize or empower the Corporation to perform or engage in any acts or practices prohibited by Section 340 of the General Business Law or other anti-monopoly statute of this State.

IN WITNESS WHEREOF, we have made, subscribed and acknowledged this Certificate this 3rd day of August, 1961.

D. Broward Craig

William C. Campbell

Richard P. Kohn

Rory R. Bryan

Thomas J. Richmond

STATE OF NEW YORK)
 : ss.:
COUNTY OF NEW YORK)

On this 3rd day of August, 1961, before
me personally came D. Broward Craig, William D. Gaillard III,
Richard D. Kahn, Barry R. Bryan, and Thomas W.
Richmond, to me known, and known to me to be the
same persons described in and who executed the foregoing
Certificate of Incorporation, and they thereupon
severally duly acknowledged to me that they executed
the same.

Sheila Dickler (Kolodkie)
Notary Public

SHEILA DICKER, Notary Public,
State of New York, No. 24-6022215
Qualified in Kings County
Certificate filed in New York County
Commission Expires March 30, 1962

STATE OF NEW YORK)
 : ss.:
COUNTY OF NEW YORK)

D. Broward Craig, William D. Gaillard III,
Richard D. Kahn, Barry R. Bryan and Thomas W. Richmond,
each being duly sworn, each one for himself deposes
and says that he is one of the persons described in
and who executed the foregoing Certificate of
Incorporation, that the purposes set forth in such
Certificate of Incorporation are the same as those
of the LEAD INDUSTRIES ASSOCIATION, a presently

LIA01039

existing unincorporated association which proposes to become incorporated by the filing of such Certificate of Incorporation, and that the persons described in and who executed such Certificate of Incorporation constitute a majority of the members of the committee authorized to incorporate such unincorporated association by vote as required by the organic law of such unincorporated association for the amendment of such organic law.

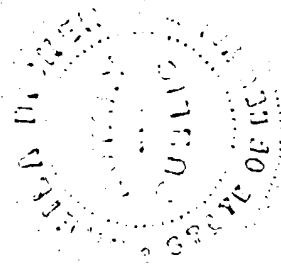
D. Broward Craig
Wm. J. Gaffney
Richard D. Kahn
Barry R. Bryan
Thomas J. P. P. P.

SWORN to before me this
3rd day of August ,
1961.

Sheila Dickel (Kolodkin)
Notary Public

SHEILA DICKER, Notary Public,
State of New York, No. 24-6022215
Qualified in Kings County
Certificate filed in New York County
Commission Expires March 30, 1962

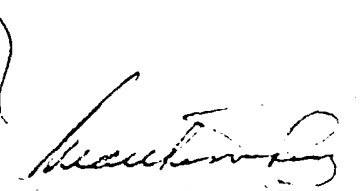
LIA01C40



I, MATTHEW M. LEVY, a Justice
of the Supreme Court of the State of New York, in
and for the First Judicial District, hereby approve
the foregoing Certificate of Incorporation of
LEAD INDUSTRIES ASSOCIATION, INC., pursuant to the
Membership Corporations Law, ~~and consent that the~~
~~same be filed.~~

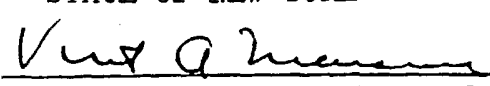
Dated: New York, New York

October 13, 1961


Justice of the Supreme Court of the
State of New York,
First Judicial District

COPY OF THE WITHIN CERTIFICATE OF INCORPORATION
RECEIVED, PURSUANT TO § 10, MEMBERSHIP CORPORATIONS
LAW. NO OBJECTION. FURTHER NOTICE WAIVED.

LOUIS J. LEEKOWITZ
ATTORNEY GENERAL
STATE OF NEW YORK


Assistant Attorney General

LIAC1041

RESOLUTION OF APPROVAL

WHEREAS:

1. An application has been duly made for approval of said certificate of incorporation.

State of New York
DEPARTMENT OF STATE } ss.:

7720

I CERTIFY That I have compared the preceding copy with the original

Certificate of Incorporation of

LEAD INDUSTRIES ASSOCIATION, INC.,

filed in this department on the 23rd day of October, 1961, and that such copy is a correct transcript therefrom and of the whole of such original.

Witness my hand and the official seal of the Department of State at the City of Albany, this thirty-first day of October, one thousand nine hundred sixty-one.

Caroline K. Simon
Secretary of State

By John J. F. [Signature]

LIAC1042

In the Matter of the Application for
Certificate of Incorporation
of

LEAD INDUSTRIES ASSOCIATION, INC.

RESOLUTION OF APPROVAL

WHEREAS:

1. An application has been duly made for approval of said certificate of incorporation;
2. The Board has made such inquiry into the objectives of the proposed corporation as it has deemed advisable, and finds that a hearing in this case is unnecessary;
3. The Board now finds and determines that the objectives of the proposed corporation are in all respects consistent with public policy.

STATE OF NEW YORK
DEPARTMENT OF LABOR

STATE OF NEW YORK)
)
BOARD OF STANDARDS AND APPEALS) SS:

H. MYRON LEWIS, CHAIRMAN OF THE BOARD OF STANDARDS AND APPEALS of the New York State Department of Labor, DO HEREBY CERTIFY that I have compared the foregoing copy of decision rendered by, and resolution adopted by the Board of Standards and Appeals with the original thereof, duly filed in the office of said Department on the Sixth day of Sept. 1961, and the same is a true and correct copy and transcript of the said decision and resolution and of the whole thereof.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of the Department of Labor this Sixth day of Sept. 1961.


CHAIRMAN

STATE OF NEW YORK
DEPARTMENT OF LABOR



BOARD OF STANDARDS AND APPEALS
HOME SAVINGS BANK BUILDING
11 NORTH PEARL STREET
ALBANY 7, N. Y.

State of New York
Department of Labor
Board of Standards and Appeals

-----X
In the Matter of the Application for Approval of a
Certificate of Incorporation

of

: CASE NO. CI-22-61
:

LEAD INDUSTRIES ASSOCIATION, INC.
-----X

RESOLUTION OF APPROVAL

WHEREAS:

1. An application has been duly made for approval of certificate of incorporation;
2. The Board has made such inquiry into the objectives of the proposed corporation as it has deemed advisable, and finds that a hearing in this case is unnecessary;
3. The Board now finds and determines that the objectives of the proposed corporation are in all respects consistent with public policy and the Labor Law;

THEREFORE, IT IS RESOLVED, that the said certificate of incorporation be and the same hereby is approved and that a certified copy of this resolution of approval be annexed thereto.

WITNESS the signatures of the Chairman and Members of the Board of Standards and Appeals of the State of New York and the seal of the Department of Labor at Albany, New York, on the Sixth day of September 1961.

H. MYRON LEWIS
H. Myron Lewis, Chairman

GEORGE S. RAYMOND
George S. Raymond, Member

HARRY R. MASON
Harry R. Mason, Member

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S. 10/23
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RECEIVED
New York State
Department of Labor

AUG 7 1961

APPLICATION FOR INCORPORATION

BOARD OF STRAIGHTS AND APPEALS
11 North Pearl St.
Albany, N. Y.

of

91

LEAD INDUSTRIES ASSOCIATION, INC.

23255 Pursuant to the Membership Corporations Law

STATE OF NEW YORK
DEPARTMENT OF STATE
FILED OCT 23 1961
TAX : none
FILING FEE : 50

Caroline K. Linn
Secretary of State

By: J. T. Linn

10

LIA01045

LEAD INDUSTRIES ASSOCIATION

Substitution of Member of Incorporation Committee

The undersigned, who was appointed a member of the Incorporation Committee established by resolution of the Board of Directors of Lead Industries Association adopted at a meeting of such Board held on December 6, 1960, hereby confirms that he did exercise, effective August 3, 1961, the power of substitution granted to him by such resolution and did appoint as a member of such Incorporation Committee, in the stead of the undersigned, William D. Gaillard III.

WITNESS the signature of the undersigned this
16th day of November, 1961.

Philip S. Winterer

Philip S. Winterer

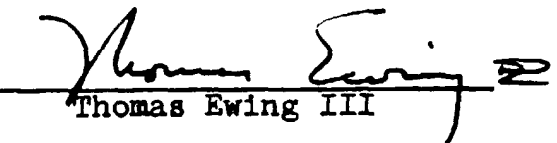
LIA01046

LEAD INDUSTRIES ASSOCIATION

Substitution of Member of Incorporation Committee

The undersigned, who was appointed a member of the Incorporation Committee established by resolution of the Board of Directors of Lead Industries Association adopted at a meeting of such Board held on December 6, 1960, hereby confirms that he did exercise, effective August 3, 1961, the power of substitution granted to him by such resolution and did appoint as a member of such Incorporation Committee, in the stead of the undersigned, Richard D. Kahn.

WITNESS the signature of the undersigned this
16th day of November, 1961.


Thomas Ewing III

LEAD INDUSTRIES ASSOCIATION, INC.
a New York Membership Corporation

BY-LAWS

TABLE OF CONTENTS

Article I

<u>Membership</u>	Page
Section 1.01. Membership	1
Section 1.02. Classes of Membership	1
Section 1.03. Admission	2
Section 1.04. Change in Status	2
Section 1.05. Voluntary Withdrawal	3
Section 1.06. Termination	3
Section 1.07. Voting Rights	3
Section 1.08. Assessment	4

Article II

Meetings of Members

Section 2.01. Annual Meetings	4
Section 2.02. Special Meetings	4
Section 2.03. Place and Time	5
Section 2.04. Notice of Meetings	5
Section 2.05. Quorum	5
Section 2.06. Voting	6
Section 2.07. Representation at Meetings; Proxies	6
Section 2.08. Annual Report	7

Article III

Board of Directors

Section 3.01. Powers	7
Section 3.02. Number	7

	Page
Section 3.03. Qualification of Directors . .	7
Section 3.04. Election and Term of Office .	7
Section 3.05. Resignation	8
Section 3.06. Removal	8
Section 3.07. Vacancies	8

Article IV

Meetings of Board of Directors

Section 4.01. Annual and Other Regular Meetings	9
Section 4.02. Special Meetings	9
Section 4.03. Notice	9
Section 4.04. Quorum	10
Section 4.05. Voting	11

Article V

Officers

Section 5.01. Titles and Qualification . . .	11
Section 5.02. Election and Term of Office .	12
Section 5.03. Resignation	12
Section 5.04. Removal	12
Section 5.05. Vacancies	12
Section 5.06. Powers and Duties	12
(a) Chairman	13
(b) Vice Chairman	13
(c) President	13
(d) Vice President	14
(e) Secretary	14
(f) Treasurer	15
(g) Assistant Secretary and Assistant Treasurer	16
(h) Other Officers	16

Article VI

Compensation of and Contracts with Directors and Officers, etc.

Section 6.01. Compensation of Directors and Officers, etc.	17
---	----

Section 6.02. Contracts with Directors or Officers.	17
--	----

Article VII

Committees

Section 7.01. Executive Committee	18
(a) Powers	18
(b) Term of Office	18
(c) Resignation	18
(d) Removal	19
(e) Vacancies	19
(f) Procedures	19
Section 7.02. Other Committees	19

Article VIII

Miscellaneous Provisions

Section 8.01. Corporate Seal	20
Section 8.02. Fiscal Year	20

Article IX

Amendments

Section 9.01. Amendments	20
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LEAD INDUSTRIES ASSOCIATION, INC.

a New York membership corporation

BY-LAWS

Article I

Membership and Assessment

1.01 Membership. The membership of the Corporation shall be the subscribers to the Certificate of Incorporation, all individuals, corporations, associations, partnerships and other organizations that were members or associate members of the Corporation's predecessor unincorporated association, Lead Industries Association, immediately prior to the Corporation's incorporation, and such additional members and associate members as shall be admitted from time to time as provided in Section 1.04.

1.02 Classes of Membership. The membership shall be divided into three classes as follows:

(a) Members. Any individual, corporation, association, partnership or other organization admitted to membership which is engaged within the United States in lead mining, smelting and refining, manufacturing or consumption shall be a member of the Corporation.

LIA01051

(b) Associate Members. Any individual, corporation, association, partnership or other organization admitted to membership which is engaged solely outside the United States in lead mining, smelting and refining, manufacturing or consumption shall be an associate member of the Corporation. Except as provided in Section 1.07, associate members shall have all rights of membership that members have.

(c) Incorporating Members. The five individuals who are subscribers to the Certificate of Incorporation shall be incorporating members and their membership shall terminate five days after due incorporation of the Corporation.

1.03 Admission. Any individual, corporation, association, partnership or other organization may apply to become a member or an associate member by submitting a written application which briefly describes his or its business within each of the lead industry's four branches (mining, smelting and refining, manufacturing and consumption) and which contains an agreement to be bound by these By-Laws and the Certificate of Incorporation of the Corporation. Approval by resolution of the Board of Directors or Executive Committee shall elect an applicant to membership.

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1.04 Change in Status. If the business of any member or associate member shall change so as to make him eligible under Section 1.02 for membership in the

other class of membership and no longer eligible for membership in the class to which he or it has belonged, his membership shall thereupon be changed to such other class.

1.05 Voluntary Withdrawal. Any member or associate member may withdraw from the Corporation at any time by so notifying the Chairman, President or Secretary in writing. Unless otherwise specified in the notice of withdrawal, such withdrawal shall take effect upon the delivery of such notice, except that such member or associate member, as the case may be, shall continue to be liable for all amounts assessed or to be assessed against him for expenses of the Corporation incurred prior to such withdrawal's taking effect.

1.06 Termination. The membership in the Corporation of any member or associate member shall terminate forthwith upon his or its ceasing to satisfy the requirements of either paragraph (a) or paragraph (b) of Section 1.02 or upon the adoption of a resolution by the Board of Directors terminating such membership for cause, except that such member or associate member, as the case may be, shall continue to be liable for all amounts assessed or to be assessed against him for expenses of the Corporation incurred prior to such termination.

1.07 Voting Rights. Each member shall be entitled to one vote on each matter voted upon by the members. Associate members shall not be entitled to vote.

1.08 Assessment. From time to time members and associate members shall pay to the Corporation for its expenses such amounts as they shall be assessed under assessment formulae of the Corporation then in effect. Such assessment formulae shall be adopted by the members and may be amended by them at any time and from time to time, provided that no such amendment shall operate to increase the proportionate share of any member or associate member of expenses incurred by the Corporation prior to such amendment.

ARTICLE II

Meeting of Members

2.01 Annual Meetings. The annual meeting of the members of the Corporation for the election of directors and for the transaction of such other business as may properly come before such meeting shall be held on such day in April or May as may be designated by the Board of Directors or, if no such designation is made, on the third Wednesday in May, if not a legal holiday, or, if a legal holiday, then on the next succeeding day not a legal holiday.

2.02 Special Meetings. Special meetings of the members may be called at any time by order of the Board of Directors, the Chairman or the President, or by order of a

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majority of the members in good standing (who shall give written notice thereof to the Secretary).

2.03 Place and Time. Each meeting of the members shall be held at the place (which may be within or without the State of New York) and time specified in the notice or waiver of notice thereof.

2.04 Notice of Meetings. Notice of each meeting of the members shall be mailed to each member entitled to vote, addressed to such member at his or its address as it appears on the records of the Corporation, not less than ten nor more than forty days before the scheduled date of such meeting. Each such notice shall state the purpose or purposes for which the meeting is called, the time and place thereof and, if such notice shall be a notice of a special meeting, by whose order the meeting was called.

No notice of any meeting need be given, however, to any member who waives notice thereof in writing or by telegram or cable before or after such meeting, and no notice need be given of any adjourned meeting of the members. Any business may be transacted at any adjourned meeting which might have been transacted at the meeting as originally scheduled.

2.05 Quorum. Except as at the time otherwise required by statute, the presence at any meeting of the

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members, in person or by proxy, of a majority of the members entitled to vote shall be necessary and sufficient to constitute a quorum for the transaction of business. In the absence of a quorum, a majority of the members present in person or by proxy and entitled to vote or, if no member is present, any officer of the Corporation present, may adjourn the meeting sine die or from time to time for a period not exceeding twenty days in any one case.

2.06 Voting. Except insofar as at the time otherwise required by statute, all matters acted upon at any meeting of the members shall be decided by the vote of a majority of the members entitled to vote thereon and represented at the meeting.

2.07 Representation at Meetings; Proxies. Any member may be represented and vote at any meeting in person by any officer, director or partner of such member or by proxy by any one or more of the officers, directors, partners or employees of any member or of the Corporation or their respective counsel who shall be appointed as proxy by written instrument executed by such member and filed with the Secretary. No proxy shall be valid after the expiration of eleven months from the date of its execution, unless the member executing it shall have specified therein a longer duration.

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2.08 Annual Report. There shall be presented at each annual meeting of the members such report as at the time may be required by §46 of the New York Membership Corporations Law or other applicable statutes.

Article III

Board of Directors

3.01 Powers. The activities, affairs and property of the Corporation shall be managed, directed and controlled by the Board of Directors, except as otherwise provided by statute or by these By-Laws.

3.02 Number. The number of directors shall be such number as shall be fixed by the members from time to time at annual or special meetings, but shall not be less than three nor more than fifteen.

3.03 Qualification of Directors. All directors shall be individuals of full age who are members or representatives of members. At least one of them shall be a citizen of the United States and a resident of the State of New York.

3.04 Election and Term of Office. Directors shall be elected at the annual meetings of the members and may be elected at any special meeting thereof. Each director shall hold office until he, if he is a member, or the

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member he represents shall cease to be a member of the Corporation or until his death, resignation or removal, or until a successor shall have been elected and shall have qualified, whichever shall first occur.

3.05 Resignation. Any director may resign at any time by delivering a written resignation to the Chairman, President or Secretary. Unless otherwise specified therein, such resignation shall take effect upon such delivery.

3.06 Removal. Any director may be removed at any time either for or without cause by the vote of a majority of all the members entitled to vote thereon given at any meeting of the members. Any director representing a member may also be removed at any time either for or without cause by the vote of the member so represented at any meeting of the members or by written instrument executed by such member and filed with the Secretary.

3.07 Vacancies. Whenever a vacancy shall occur on the Board of Directors because of the death, resignation or removal of a director who represented a member, such member may fill the vacancy with a person appointed by it. In all other cases vacancies, unless theretofore filled by the members, may be filled by the Board of Directors.

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Article IV

Meetings of Board of Directors

4.01 Annual and Other Regular Meetings. The annual meeting of the Board of Directors for the election of officers and the transaction of other business shall be held within 24 hours after the close of the annual meeting of members at such time and place (which may be within or without the State of New York) as the Chairman or President shall determine. Another regular meeting shall be held near the end of the calendar year at such time and place (which may be within or without the State of New York) as the Chairman or President shall determine.

4.02 Special Meetings. Special meetings of the Board of Directors may be called at any time by the Chairman, the President or any three directors and shall be held at such place (which may be within or without the State of New York) and time as shall be specified in the notice or waiver of notice of the meeting.

4.03 Notice. Notice shall be given of the time and place of each regular meeting of the Board of Directors and of the time, place and purposes of, and person or persons calling, each special meeting of the Board of Directors. Such notices shall be mailed to each director addressed to him at his address as it appears on the records

LIA01060

of the Corporation at least five days before the scheduled date of the meeting, or shall be sent by telegram or cable to such address, or delivered to such director personally, at least two days before the scheduled date of the meeting.

No notice of any meeting need be given, however, to any director who shall attend such meeting or who waives notice thereof in writing or by telegram or cable before or after such meeting, and no notice need be given of any adjourned meeting of the Board of Directors. Any business may be transacted at any regular meeting of the Board of Directors, or at any special meeting at which each director is present, notwithstanding that any notice or waiver of notice of such meeting does not specify such business as one of the purposes thereof, and any business may be transacted at any adjourned meeting which might have been transacted at the meeting as originally scheduled.

4.04 Quorum. Except as at the time otherwise required by statute, the presence at any meeting of the Board of Directors of one-third of the authorized number of directors shall be necessary and sufficient to constitute a quorum for the transaction of business. In the absence of a quorum, a majority of the directors present

or, if no director is present, any officer of the Corporation present, may adjourn the meeting sine die or from time to time until the next regular meeting of the Board of Directors.

4.05 Voting. Each director shall have one vote. At all meetings of the Board of Directors, except as at the time otherwise required by statute, all matters shall be decided by a majority of the directors present at the meeting.

Article V

Officers

5.01 Titles and Qualification. The officers of the Corporation shall consist of the Chairman, the President, the Secretary, the Treasurer and such other officers, who may include a Vice Chairman and one or more Vice Presidents, Assistant Secretaries and Assistant Treasurers as the Board of Directors may from time to time elect. The Chairman and the Vice Chairman, if any, shall be chosen from the directors and each may hold such office only so long as he remains a director; any other officer may, but need not, be a director. Any two or more offices may be held by the same person, except that the same person shall not be Chairman and Vice Chairman or President and Vice President. No person shall serve more than two terms

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consecutively in the office of Chairman, Vice Chairman, President or Vice President.

5.02 Election and Term of Office. Officers shall be elected at the annual meetings of the Board of Directors and may be elected at any other regular or special meeting thereof. Each officer shall hold office until his successor shall have been elected and shall have qualified or until his death, resignation or removal, whichever shall first occur.

5.03 Resignation. Any officer may resign at any time by delivering a written resignation to the Chairman, President or Secretary. Unless otherwise specified therein, such resignation shall take effect upon such delivery.

5.04 Removal. Any officer may be removed by the Board of Directors at any time either for or without cause. Such removal shall be without prejudice to the contract rights, if any, of the person so removed.

5.05 Vacancies. Any vacancy in any office may be filled by the Board of Directors at any time for the unexpired portion of the term.

5.06 Powers and Duties. The officers of the Corporation shall have such powers and duties, except as may be modified by the Board of Directors, as generally

LIA01063

pertain to their respective offices and such other powers and duties as from time to time may be prescribed by the Board of Directors. Any officer may be required by the Board of Directors to give bond for the faithful discharge of his duties in such form and amount and with such surety as the Board of Directors may determine. In furtherance and not in limitation of the generality of the foregoing and subject to the direction of the Board of Directors, the powers and duties of the respective officers shall be as follows:

(a) Chairman. The Chairman shall be the senior officer of the Corporation. He shall preside at all meetings of the members and of the Board of Directors and may sign any contract or other instrument authorized by the Board of Directors.

(b) Vice Chairman. The Vice Chairman shall, at the request or in the absence or disability of the Chairman, perform the duties and exercise the powers of the Chairman.

(c) President. The President shall be the chief executive officer of the Corporation. Directly and through the Secretary, he shall have general charge of the business, affairs and

LIA01064

property of the Corporation and general supervision over its officers and agents and shall cause all orders and resolutions of the Board of Directors to be carried into effect. He shall preside at meetings of the members and of the Board of Directors in the absence of the Chairman and the Vice Chairman and may sign any contract or other instrument authorized by the Board of Directors.

(d) Vice President. The Vice President (if there are more than one, then in the order of their seniority) shall, at the request or in the absence or disability of the President, perform the duties and exercise the powers of the President.

(e) Secretary. The Secretary shall:

(1) have general and active supervision of the affairs of the Corporation, subject, however, to the control of the Board of Directors and the President;

(2) have custody of the records and documents of the Corporation, which shall at all reasonable times be open to inspection by any director;

LIA01065

(3) have custody of the seal of the Corporation and affix such seal to any contract or other instrument when so authorized or directed by the Board of Directors;

(4) cause all notices to be duly given in accordance with the provisions of these By-Laws and as required by statute;

(5) keep the minutes of all meetings of the members, the Board of Directors and the Executive Committee; and

(6) keep a record of the names and addresses of the members and associate members and of the directors.

(f) Treasurer. The Treasurer shall:

(1) have care and custody of the funds and securities and of the financial records of the Corporation;

(2) deposit all moneys received by him for the Corporation in such banks, trust companies or other depositories as from time to time may be designated by the Board of Directors;

(3) have charge of the disbursement of the funds of the Corporation in accordance with the directions of the Board of Directors;

(4) keep correct and complete records of account, including a record of receipts and disbursements of the Corporation, which shall at all reasonable times be open to inspection by any director; and

(5) render to the Board of Directors whenever requested, a report of the financial condition and operations of the Corporation.

(g) Assistant Secretary and Assistant Treasurer. An Assistant Secretary shall, at the request or in the absence or disability of the Secretary, perform the duties and exercise the powers of the Secretary. An Assistant Treasurer shall, at the request or in the absence or disability of the Treasurer, perform the duties and exercise the powers of the Treasurer.

(h) Other Officers. Such officers other than those enumerated above as may be elected by the Board of Directors shall perform such duties

and exercise such powers as the Board of Directors may from time to time determine.

Article VI

Compensation of and Contracts with Directors and Officers, etc.

6.01 Compensation of Directors and Officers, etc. No employee of any member or associate member and no director of the Corporation as such shall receive compensation from the Corporation, but the Board of Directors may authorize the payment by the Corporation of the reasonable expenses incurred by such employees or directors in the performance of their duties and of reasonable compensation for special services rendered by any such employee or director. The salaries or other compensation of the officers who are not such employees shall be fixed from time to time by resolution of the Board of Directors.

6.02 Contracts with Directors or Officers. Any director or officer may be interested, directly or indirectly, in any contract or transaction relating to the operations conducted by the Corporation, or in any contract or transaction for furnishing supplies or services thereto, provided that such contract or transaction shall be approved by the Board of Directors and that the fact of such interest shall have been disclosed or known to the directors present at the meeting at which such contract or transaction is so approved.

Article VII

Committees

7.01 Executive Committee. At its annual meeting the Board of Directors shall appoint from among its members an Executive Committee consisting of six directors (one of whom shall be designated Chairman by the Board of Directors) to hold office subject to the following provisions:

(a) Powers. During the intervals between meetings of the Board of Directors, the Executive Committee shall have and may exercise all powers of the Board of Directors, except the power to amend these By-Laws and such powers as the Board of Directors may from time to time specifically reserve to itself.

(b) Term of Office. Each member of the Executive Committee shall serve until he ceases to be a director or until his successor shall have been elected and shall have qualified or until his death, resignation or removal, whichever shall first occur.

(c) Resignation. Any member of the Executive Committee may resign at any time by delivering a written resignation to the Chairman, President

LIA01069

or Secretary. Unless otherwise specified therein, such resignation shall take effect upon such delivery.

(d) Removal. Any member of the Executive Committee may be removed by the Board of Directors at any time either for or without cause.

(e) Vacancies. Any vacancy on the Executive Committee may be filled by the Board of Directors or, for the interval prior to the first meeting of the Board of Directors after the vacancy occurs, by the Executive Committee.

(f) Procedures. Subject to control by the Board of Directors, the Executive Committee may fix its own rules of procedure, but all matters, unless otherwise required by law, shall be decided by a majority of those present and not less than three members shall constitute a quorum for the transaction of business. Directors who are not members of the Executive Committee may attend and join in discussions at any meeting of the Executive Committee.

7.02 Other Committees. The Board of Directors or, if authorized by the Board of Directors, the Chairman, the President, or the Secretary may from time to time

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appoint other committees which shall have such membership and such functions as the Board of Directors or the appointing officer, as the case may be, from time to time may determine. Subject to the regulation of the Board of Directors and the appointing officer, if any, each such committee may act by meeting or in writing, may elect its own chairman and other officers and may fix its own rules of procedure. Any such committee may be abolished at any time by the Board of Directors or the appointing officer, if any.

Article VIII

Miscellaneous Provisions

8.01 Corporate Seal. The seal of the Corporation shall be circular in form and shall bear the name of the Corporation, the year of its incorporation and the words "Corporate Seal New York."

8.02 Fiscal Year. The fiscal year of the Corporation shall begin on the first day of January in each year and shall end on the 31st day of the following December.

Article IX

Amendments

9.01 Amendments. Subject to compliance with any provisions of the New York Membership Corporation Law or

LIA01071

other applicable statute at the time in force as to By-Laws regulating an impending election of directors, these By-Laws may be amended or repealed and new By-Laws may be made by the members of the Corporation or by the Board of Directors at any time, provided that the following provisions of these By-Laws may be amended or repealed only by the vote of a majority of all the members entitled to vote thereon given at an annual or special meeting of the members:

(a) Section 1.08 relating to voting rights in the case of members and associate members;

(b) Sections 3.06 and 3.07 relating respectively to removal and vacancies in the case of directors; and

(c) this Section 9.01;

and provided further that no amendment of these By-Laws or any new By-Law shall require any member or associate member during the fiscal year in which such amendment is adopted or new By-Law made to make any payment or assume any obligation in addition to the payments and obligations, if any, at the time required of such member or associate member by these By-Laws, unless approved by such member.

LIA01072

LEAD INDUSTRIES ASSOCIATION, INC.
292 Madison Avenue
New York 17, N. Y.

December 19, 1961

RE: LEAD INDUSTRIES ASSOCIATION-
PENSION FUND

Mr. Frank Schell, Assistant Vice President
Savings Banks Trust Company
14 Wall Street
New York 5, N. Y.

Dear Mr. Schell:

This is to advise that our Association has been incorporated as a New York membership corporation and the savings accounts in the name of the Lead Industries Association-Pension Fund should now read:

Lead Industries Association, Inc.-Pension Fund

There has been no change in the officers or directors or the Association's activities as a result of incorporation and we are still a non-profit organization.

When having the interest added to the 16 accounts enclosed won't you kindly have the change in name recorded.

Very truly yours,

Secretary.

LIA01073

N 673.04

LEAD INDUSTRIES ASSOCIATION-PENSION FUND SAVINGS ACCOUNTS

The American Savings Bank, 125 W. 42nd St.	171,715
The Bank for Savings, Lexington Ave at 78 St.	112,891
Bowery Savings Bank, 110 E. 42nd St.	832,391
Brevoort of Brooklyn, Seaview & Rockaway Aves.	C 176
The Brooklyn Savings Bank, Pierrepont & Clinton Sts.	M935,447
Central Savings Bank, Broadway at 73 St.	385,699
Dry Dock Savings Bank, 742 Lexington Ave.	1500,943
East River Savings Bank, 41 Rockefeller Plaza	140,425
Emigrant Industrial Savings Bank, 5 E. 42nd St.	648,661
Excelsior Savings Bank, 66th St. & 2nd Ave.	16,444L
Fulton Savings Bank, 395 Jay St.	289,603
Harlem Savings Bank, 42nd St. & Second Ave.	12,426L
The Manhattan Savings Bank, 385 Madison Ave.	92,669
The Seamen's Bank for Savings, 546 Fifth Ave.	95,373L
Union Square Savings Bank, 20 Union Square	373,076
Union Dime Savings Bank, 1065 Avenue of the Americas	120,229,01

LEAD INDUSTRIES ASSOCIATION, INC.
292 Madison Avenue
New York 17, N. Y.

December 19, 1961

Mr. Frank Schell, Assistant Vice President
Savings Banks Trust Company
14 Wall Street
New York 5, N. Y.

Dear Mr. Schell:

This is to advise you that our Association has been incorporated as a New York membership corporation and the savings accounts in the name of the Lead Industries Association should now read:

Lead Industries Association, Inc.

There has been no change in the officers or directors, or the Association's activities as a result of incorporation and we are still a non-profit organization.

When having the interest added to the 20 accounts enclosed won't you kindly have the change in name recorded.

Very truly yours,

Secretary.

LIA01075

N 673.05

LEAD INDUSTRIES ASSOCIATION SAVINGS ACCOUNTS

Broadway Savings Bank, 239 Broadway	244,765
The Bronx Savings Bank, Tremont & Park Aves.	306,710L
Bushwick Savings Banks, Grand St & Graham Ave.	284,249
City Savings Bank of Brooklyn, Lafayette Ave at Flatbush	157,079
The Dime Savings Bank of Brooklyn, Fulton St & DeKalb Ave.	1,721,297
The Dime Savings Bank of Williamsburgh, Havemeyer & S.5th Sts.	332,000L
Dollar Savings Bank, 101 E. 170 St.	132,672
East Brooklyn Savings Bank, Bedford Ave & DeKalb	323,006
The East New York Savings Bank, Atlantic Ave. at Penn.	449,423-3
Empire City Savings Bank, 2 Park Ave.	82,806
The Franklin Savings Bank, Eighth Ave & 42nd St.	862,691
The Greater New York Savings Bank, Fifth Ave., 9 & 10 Sts.	497,7260
The Greenpoint Savings Bank, Manhattan Ave & Calyer St.	372,155
The Greenwich Savings Bank, 3 W. 57th St.	067,496
Kings County Savings Bank, 539 Eastern Parkway	194,448
Kings Highway Savings Bank, Kings Highway at E. 16	318,979
New York Savings Bank, 1230 Avenue of the Americas	A35,971
South Brooklyn Savings Bank, Atlantic Ave & Court St.	579,383
West Side Savings Bank, 390 Avenue of the Americas	192,333
The Williamsburgh Savings Bank, 1 Hanson Pl.	567,403

LEAD INDUSTRIES ASSOCIATION

292 MADISON AVENUE

NEW YORK 17, N. Y.

November 29, 1961

SUBJECT: 1962 BUDGET DATA

To the Board of Directors
of the Lead Industries Association:

On the attached pages you will find data relative to the various Association budgets, including budgets approved for 1961, estimated actual expenditures in 1961, and recommended budgets for 1962, as follows:

- | | |
|------------------------------|--------|
| 1. Ordinary Fund | Page 1 |
| 2. Pension Fund | Page 1 |
| 3. Health and Safety Fund | Page 2 |
| 4. Industry Development Fund | Page 3 |
| 5. All Funds Combined | Page 8 |

The Expanded Research Fund is to be sent you separately by the Research Director.

Items 1, 2, 3 and 4 above are presented in the same manner as in previous years. Item 5, however, is a recapitulation of these and is presented as a suggested simplified form of accounting and budgeting in the future.

In other words, it is proposed that only one budget be presented henceforth which would combine all activities of the Association except Research. This has not been done in the past because all Association members subscribe to the Ordinary and Health and Safety Funds on one basis (a 4:1:1:½ ratio between miners, smelters and refiners, manufacturers, and producers of assembled articles like batteries, cable and ammunition) and only pig lead producers to the Industry Development Fund on a flat rate per ton of lead sold in the United States. Many expenses such as rent, salaries, pension payments and the like have been more or less arbitrarily pro-rated between the various funds.

In the future, if the combined budget is presented, the number of accounts would be greatly reduced, pro-rating would be avoided, and yet we feel a true and clear picture

LIA01077

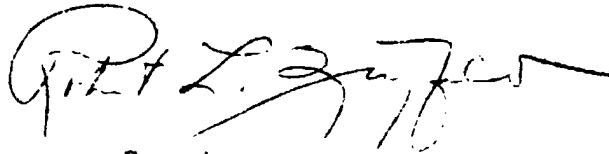
N 673.06

November 29, 1961

of the Association's finances would still be available. Once such an overall budget is approved by the Board, the Board could then establish rates for membership subscriptions to be charged to all members. It is suggested that these rates for 1962 be 16¢ per ton for miners, 4¢ per ton for smelters, refiners and manufacturers, and 2¢ per ton for producers of assembled articles, since these are the average rates for the last three years. It is estimated that the sum thus subscribed would approximate \$85,000 in 1962.

This would then be deducted from the total budget and the balance would be charged to the pig lead producers uniformly on the basis of their sales in the United States. It is not likely that this procedure would create any major changes in the cost of supporting the Association's activities, and it has the endorsement of the president.

Very truly yours,

A handwritten signature in dark ink, appearing to read "G. L. Z. Z. Z.", with a long horizontal flourish extending to the right.

Secretary

RLZ:mk
Att.

LIA01078

ORDINARY FUND BUDGET

	Approved 1961	Est. Actual 1961	Recommended 1962
Salaries and Taxes	30,700	25,700	30,000
Group Insurance	300	200	300
Furniture, Fixtures and Equipment	2,000	1,800	2,000
Rent and Light	9,000	8,700	9,000
Travel	5,000	4,700	5,000
Entertainment and Luncheons	1,000	1,000	1,000
Meetings	2,500	2,500	2,500
Office Supplies	2,500	3,000	3,000
Mailing	2,000	1,000	1,000
Telephone and Telegraph	2,000	2,000	2,000
Printing	500	500	500
Association Dues	100	150	150
Books and Subscriptions	300	300	300
Transfer to Pension Fund	3,000	2,300	3,000
Miscellaneous and Contingencies	2,500	3,600	3,000
	63,400	57,450	62,750
Balance, January 1, 1961	\$56,075		
Subscriptions	48,194		
Lead in Mod. Ind.	150		
ERP Pension Fund	380		
Interest	980	49,704	
Total Available	105,779		
Less: Expenditures	57,450		
Advances	2,050	59,500	
Balance, January 1, 1962	\$46,279		

PENSION FUND

	1961	1962
Balance, January 1	\$137,935	\$130,547
Receipts:		
Transfers from Ordinary Fund	2,298	3,000
Industry Development Fund	7,694	8,000
Interest	5,000	5,200
	152,927	146,747
Disbursements:		
Retirement Annuity	22,380	-
Balance, December 31	\$130,547	\$146,747

HEALTH AND SAFETY FUND BUDGET

	Approved 1961	Est. Actual 1961	Recommended 1962
Salaries and Taxes	\$ 7,500	\$ 5,700	\$23,000
Travel	1,500	2,000	2,500
Entertainment and Luncheons	300	200	500
Office Supplies	400	100	500
Telephone and Telegraph	300	150	300
Books and Subscriptions	600	500	500
Association Dues	150	150	200
Mailing	400	150	400
Research and Research Materials	500	2,200	2,500
Legal and Consulting Fees	2,500	300	500
Meetings	300	50	300
Miscellaneous and Contingencies	<u>1,000</u>	<u>1,000</u>	<u>1,000</u>
	\$15,450	\$12,500	\$32,200

Balance, January 1, 1961 \$25,820

Subscriptions	15,450	
Interest	590	
Proceedings	<u>10</u>	<u>16,050</u>
Total Available		41,870

Less: Expenditures	12,500	
Advances	<u>300</u>	<u>12,800</u>

Balance, January 1, 1962 \$29,070

The total recommended for the Ordinary Fund in 1962 is approximately the same as that approved for 1961. However, the Health and Safety Fund total is substantially larger than in 1961, the difference being almost entirely the salary of our new Health and Safety Director, which was not provided for in the 1961 budget.

INDUSTRY DEVELOPMENT FUND BUDGET

Page 3

	Approved 1961	Est. Actual 1961	Recommended 1962
Publications:			
"Lead"	\$ 24,000	\$ 22,000	\$ 23,000
Reprints	2,000	4,000	4,000
Con. & Arch. Flyers	4,000	4,000	5,000
Ceramic Supplements	3,000	2,500	2,000
Sweet's Catalogs	13,500	13,500	13,500
Pigment Manual	2,000*	-	7,000
Anti-Vibration Report	5,000	1,600	4,000
Delivery Truck Brochure	4,000	200	4,000
Monograph	1,000	-	1,500
Pigment Technical Letter	-	2,000	-
Noise Control Manual	-	-	7,000
Cable Handbook	-	-	3,000
Motive Power Batteries	-	-	2,000
Total Publications	58,500	49,800	76,000
Advertising:			
Design	18,000	18,000	19,000
Arch. & Const.	24,000	24,000	26,600
Ceramics	11,000	11,000	10,300
Pigments	10,000	-	6,000
Cable	-	-	6,500
Management	-	-	8,150
Production	-	-	20,250
Misc.	1,200	2,000	2,000
Total Advertising	64,200	55,000	98,800
Miscellaneous Promotion:			
Motion Picture Scenario	3,000	3,000	-
Conventions & Exhibits	16,500	16,500	16,500
Apprentice Contest	600	600	600
Total Misc. Promotion	20,100	20,100	17,100
Administrative & Tech. Service:			
Salaries & Taxes	97,000	94,200	101,000
Group Insurance	1,000	750	1,000
Rent & Light	7,000	7,000	7,000
Transfer to Pension Fund	10,000	7,700	8,000
Consulting Fees	2,000	500	1,000
Travel	15,000	13,000	15,000
Test Programs	1,500	1,500	1,500
Entertainment & Lunches	1,500	2,200	2,000
Meetings	1,000	1,500	1,200
Mailing	2,000	2,000	2,000
Assn. Dues	500	900	1,000
Tel. & Tel.	700	1,200	1,200
Books & Subscriptions	500	500	500
Abstracting Service	3,750	1,875	3,750
Misc. & Contingencies	3,000	4,000	3,000
Total Administrative & Technical Service	146,450	138,825	149,150
Product Development & Contingencies	1,250**	-	25,000
TOTAL	\$290,500	\$263,725	\$366,050

LIA01081

INDUSTRY DEVELOPMENT FUND BUDGET
(Continued)

Page 4

Balance, Jan. 1, 1961		\$ 84,295
Subscriptions	\$277,151	
"Lead Work"	800	
Interest	<u>700</u>	<u>278,651</u>
Total Available		<u>362,946</u>
Less: Expenditures	263,725	
Advances	800	
Against Accts. Pay.	<u>11,806</u>	<u>276,331</u>
Balance, Jan. 1, 1962		\$ 86,615

*This amount approved for transfer to Pigment Technical Letter.

**This item originally approved at \$15,000 but during the year \$10,000 was transferred to pigment advertising, and \$3,750 to abstracting service.

The foregoing Industry Development Budget is recommended to the Board and has been approved by the Industry Development Committee, which also recommended a subscription rate of 65¢ per ton of pig lead sold in the United States to raise the required funds.

The following notes are in explanation of the detailed Industry Development Fund items.

PUBLICATIONS

"Lead." This eight-page quarterly dealing with the overall uses of lead is circulated to some 50,000 people in the United States and, through the cooperation of the L.D.A. and members outside the U.S., to an additional 4,500 people in the United Kingdom and Canada. We consider it one of our most valuable promotional media, a source of a large number of live inquiries, and its publication should be maintained.

Reprints. Each year a number of articles appear in the trade press, usually prepared by the Association staff or through staff cooperation with trade paper editors, which describe various uses of lead. It is our practice to reprint the more valuable of these for circulation to members and other interested parties not covered by the magazines in which they appear. So successful has the placing of these articles been in 1961 that our budget for reprints was exceeded by about 100 per cent. We therefore recommend doubling this item in the 1962 budget to equal the amount actually spent in 1961.

Construction Bulletins and Architectural Flyers. This series was started at the suggestion of our architectural consultants, Skidmore, Owings & Merrill, several years ago. We believe a modest increase is warranted to support the work of our own architect, now that we have one full time on our staff.

LIAC1082

Ceramic Supplements. Since the publication of our book, "Lead in the Ceramic Industries," several years ago, we have issued one or two supplements to it each year to keep it up to date. We believe this practice should be continued on a moderately reduced scale.

Sweet's Catalogs. No change in this item is recommended. We are now using the following catalogs in Sweet's:

<u>File</u>	<u>Subjects</u>
Architectural	Roofing, Plumbing, Noise & Vibration Control
Light Construction	Plumbing
Industrial Construction	Roofing, Noise & Vibration Control
Design Engineering	All aspects of lead usage

Pigment Manual. Last year the Pigments Technical Committee called attention to the need for a basic manual on lead pigments, their properties and uses, similar to our ceramics manual. It would serve to educate young paint chemists who know little about both old and new lead pigments and as a reminder to older paint chemists as to what lead pigments can do for them. The I.D.C. agreed that such a manual should be prepared. One section is now in rough draft form and it is believed the book can be completed in 1962. Provision is made for its printing and distribution, although the cost estimate is of necessity rough until the extent of the book is better known.

Pigment Technical Letter. Since 1961 will see the completion of a voluminous Technical Letter on red lead paints, no new Technical Letters are contemplated in 1962, although the series may be resumed at any time it appears to be advantageous.

Anti-Vibration Report. It is understood that the original report on lead-asbestos anti-vibration pads may soon be ready for issuance in inexpensive form as a progress report to be followed by confirmatory research. If further work substantiates the effectiveness of these pads, a more comprehensive report should be issued later. Provision is made for these reports in the budget.

Delivery Truck Brochure. Provision was made in the 1961 budget for publication of a brochure on short haul street delivery trucks powered by storage batteries. The brochure was not issued due to lack of reliable operating cost data. It is hoped that the data will be available in 1962 and we feel that the budget should again provide for publication of this brochure.

Monograph. One-thousand dollars was budgeted in 1961 for the A.C.S. Monograph on lead, copy for which is now largely in our hands. This money was not spent but arrangements have been made with Dr. Alex Stewart, former research director of National Lead Co., to complete the editing. Provision for this cost is made in the 1962 budget.

Noise Control Manual. We are informed that the research program on lead for noise control will result in material for a comprehensive manual on the subject in 1962. Provision is made for printing such a manual, although the cost estimate is rough since little information is available at this time as to the size and nature of the manual.

Cable Handbook. It is proposed to enlist the assistance of our Cable Sheathing Task Group in the preparation of a manual setting forth the advantages of lead for cable sheathing and how it overcomes

some of the defects of competitive materials like plastics, aluminum and steel.

Motive Power Batteries. As storage batteries are becoming more and more widely used to power such equipment as lawn mowers, small boats, golf carts and personnel carriers, it is felt that a modest brochure suggesting how batteries may be and are being used for motive power should be prepared.

ADVERTISING

In 1961 L.I.A. carried advertising campaigns in one architectural, one construction, three design engineering, one metal product manufacturing and three ceramic magazines. At the annual meeting an additional campaign in three paint magazines was approved, which is now in preparation and will start running shortly.

It is proposed to continue the above campaigns, increasing the number of insertions in the architectural publication. It is also proposed to start a modest campaign on lead cable sheathing in "Electrical World" on the advice of an important cable manufacturer and an important cable user. All of these reach specific industries on specific lead products.

Addition of a modest campaign in "Factory" to reach middle management in a great variety of industries is also proposed. This will be used to promote such products as battery powered industrial trucks, noise and vibration control items.

MISCELLANEOUS PROMOTION

Motion Picture. In the current year \$3,000 was approved for preparation of a preliminary scenario for a motion picture on lead on which to make a final decision as to the desirability and nature of such a picture. This is in preparation and no further recommendation is made until it is completed and studied.

Conventions and Exhibits. No change in budget is recommended here. In 1961 we exhibited in the Homebuilders, Design Engineering, Plumbing Contractors, Chemical and Industrial Building Shows. It is believed that an exhibit at the annual meeting of the American Institute of Architects can also be included without a budget increase.

Apprentice Contest. This is a modest expense, largely for supplying lead materials and prizes for the annual plumbers' apprenticeship national contest and teacher training course, which should be continued.

Product Development and Contingencies. As a result of our advertising we are more and more frequently being approached by many companies for assistance and samples for their own testing after incorporation in their own products or plants. We have heretofore had no funds for this purpose. Sometimes we are able to obtain samples at no cost; other times some expense is involved. Since interest of this kind by others is extremely valuable, we believe we should be in a position to render whatever assistance is necessary promptly. For this purpose we recommend budgeting a somewhat larger amount for this purpose and to enable us to act quickly in instances, for example, where a research project may unexpectedly or prematurely yield material needing advertising of one kind or another, or where some new promotional effort or publication may seem warranted during the year.

ADMINISTRATIVE AND TECHNICAL SERVICE

The only change of consequence recommended in this part of the budget is in the salary account. The increase in this item is intended largely for the addition of one clerk to assist in handling the thousands of inquiries we are receiving annually as a result of our advertising and to classify them as to source so that we may better judge the effectiveness of the various media.

COMBINED BUDGET

Page 8

	<u>Approved 1961</u>	<u>Est. Actual 1961</u>	<u>Recommended 1962</u>
Administrative & Tech. Service:			
Salaries & Taxes	\$135,200	\$125,600	\$ 154,000
Group Insurance	1,300	950	1,300
Furniture, Fixtures & Equipment	2,000	1,800	2,000
Rent & Light	16,000	15,700	16,000
Travel	21,500	19,700	22,500
Entertainment & Lunches	2,800	3,400	3,500
Meetings	3,800	4,050	4,000
Office Supplies	2,900	3,100	3,500
Mailing	4,400	3,150	3,400
Telephone & Telegraph	3,000	3,350	3,500
Printing	500	500	500
Assn. Dues	750	1,200	1,350
Books & Subscriptions	1,400	1,300	1,300
Transfer to Pension Fund	13,000	10,000	11,000
Test Programs	2,000	3,700	4,000
Legal & Consulting Fees	4,500	800	1,500
Abstracting Service	3,750	1,875	3,750
Miscellaneous	6,500	8,600	7,000
Total Administrative & Tech. Service	\$225,300	\$208,775	\$244,100
Publications:			
"Lead"	24,000	22,000	23,000
Reprints	2,000	4,000	4,000
Const. & Arch. Flyers	4,000	4,000	5,000
Ceramic Supplements	3,000	2,500	2,000
Sweet's Catalogs	13,500	13,500	13,500
Pigment Manual	2,000*		7,000
Pigment Technical Letter	-	2,000	-
Anti-Vibration Report	5,000	1,600	4,000
Delivery Truck Brochure	4,000	200	4,000
Monograph	1,000	-	1,500
Noise Control Manual	-	-	7,000
Cable Handbook	-	-	3,000
Motive Power Batteries	-	-	2,000
Total Publications	58,500	49,800	76,000
Advertising:			
Arch. & Const.	24,000	24,000	26,600
Design	18,000	18,000	19,000
Ceramics	11,000	11,000	10,300
Pigments	10,000	-	6,000
Cable	-	-	6,500
Management	-	-	8,150
Production	-	-	20,250
Miscellaneous	1,200	2,000	2,000
Total Advertising	\$ 64,200	\$ 55,000	\$ 98,800

LIA01086

COMBINED BUDGET
(Continued)

Page 9

	<u>Approved</u> <u>1961</u>	<u>Est.</u> <u>Actual</u> <u>1961</u>	<u>Recommended</u> <u>1962</u>
Miscellaneous Promotion:			
Motion Picture Scenario	\$ 3,000	\$ 3,000	\$ -
Conventions & Exhibits	16,500	16,500	16,500
Apprentice Contest	600	600	600
Product Development & Contingencies	(15,000)	1,250** (13,750)	- 25,000
Total Miscellaneous Promotion	<u>21,350</u>	<u>20,100</u>	<u>42,100</u>
Grand Total	<u>\$369,350</u>	<u>\$333,675</u>	<u>\$461,000</u>

Balance, Jan. 1, 1961

Ord. & Health & Safety	\$ 81,895	
Ind. Dev.	<u>84,295</u>	\$166,190

Subscriptions:

Ord. & Health & Safety	63,644	
Ind. Dev.	277,151	
Books	960	
ERP Pension Fund	380	
Interest	<u>2,270</u>	<u>344,405</u>

Total Available		510,595
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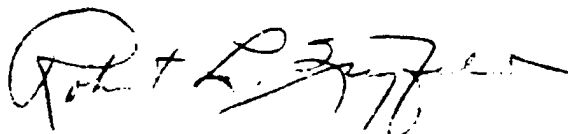
Less: Expenditures	333,675	
Against Accts. Payable	11,806	
Advances	<u>3,150</u>	<u>348,631</u>

Balance, Jan. 1, 1962		\$161,964
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*This amount approved for transfer to Pigment Technical Letter.

**This item originally approved at \$15,000 but during the year \$10,000 was transferred to Pigment Advertising and \$3,750 to Abstracting Service.

Respectfully submitted,



Secretary-Treasurer

RLZ:mk

LIA01087

APPROVED 1962 COMBINED BUDGET

Exhibit "B"

Administrative & Tech. Service:

Salaries & Taxes	\$154,000
Group Insurance	1,300
Furniture, Fixtures & Equipment	2,000
Rent & Light	16,000
Travel	22,500
Entertainment & Lunches	3,500
Meetings	4,000
Office Supplies	3,500
Mailing	3,400
Telephone & Telegraph	3,500
Printing	500
Assn. Dues	1,350
Books & Subscriptions	1,300
Transfer to Pension Fund	11,000
Test Programs	4,000
Legal & Consulting Fees	1,500
Abstracting Service	3,750
Miscellaneous	7,000
Total Administrative & Tech. Service	<u>\$244,100</u>

Publications:

"Lead"	23,000
Reprints	4,000
Const. & Arch. Flyers	5,000
Ceramic Supplements	2,000
Sweet's Catalogs	13,500
Pigment Manual	7,000
Pigment Technical Letter	-
Anti-Vibration Report	4,000
Delivery Truck Brochure	4,000
Monograph	1,500
Noise Control Manual	7,000
Cable Handbook	3,000
Motive Power Batteries	2,000
Total Publications	<u>76,000</u>

Advertising:

Arch. & Const.	26,600
Design	19,000
Ceramics	10,300
Pigments	6,000
Cable	6,500
Management	8,150
Production	20,250
Miscellaneous	2,000
Total Advertising	<u>98,800</u>

Miscellaneous Promotion:

Motion Picture Scenario	-
Conventions & Exhibits	16,500
Apprentice Contest	600
Product Development & Contingencies	25,000
Total Miscellaneous Promotion	<u>42,100</u>

Grand Total\$461,000

LIA01088

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EXHIBIT "C"

AZI-LIA EXPANDED RESEARCH PROGRAM

LOOK AHEAD WITH LEAD

AMERICAN ZINC.
INSTITUTE, INC.

LEAD INDUSTRIES
ASSOCIATION

292 MADISON AVENUE
NEW YORK 17, N. Y.

OR 9-6020

SCHRADE F. RADTKE
Director of Research

IN REPLY REFER TO
PROJECT NO.

November 29, 1961

To All Members of the Board of Directors
of the Lead Industries Association

Gentlemen:

Subject: Meeting of the Board of Directors
December 5, 1961

Enclosed is the Expanded Research Program portion of the minutes of the Industry Development Committee meeting held on November 28, 1961, together with a copy of our letter of transmittal to the Industry Development Committee, which describes the research budget proposed for 1962.

We are also enclosing our proposed administrative budget for 1962 and our budget performance on past as well as proposed budgets.

So that you may have complete background information on the new research proposed, we are including a set of work statements describing these projects. We are also enclosing a copy of our most recent Progress Report to bring you up to date on the research which has been accomplished on existing programs.

You will note that the total Expanded Research Program budget, including administrative as well as research budgets, was approved in toto by the Industry Development Committee.

We look forward to discussing this with you personally at the Board of Directors Meeting on December 5.

Very truly yours,

SFR:sw

List of Enclosures: ERP portion of minutes of Ind. Dev. Com. Meeting
Copy of letter to IDC
Budget Recapitulation
Administrative Budget
Budget Performance on Past and Proposed Budgets
Set of work statements
Report of the Expanded Research Program

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November 29, 1961

INDUSTRY DEVELOPMENT COMMITTEE - LEAD INDUSTRIES ASSOCIATIONEXPANDED RESEARCH PROGRAM PRESENTATION

The Research Director, Dr. Radtke, discussed the work statements for new research which were the results of idea sessions held by the subcommittees during the summer. Dr. Radtke also reviewed that research reaching significant stages during the last year which included the following: The research on powder metallurgy which has brought about a new mechanism for producing improvements in wrought properties, the work in acoustics which showed excellent progress and for which a technical manual is being prepared, the cable sheathing press which has improved the cable sheathing process for the high strength alloys, the cladding of steel with lead by means of particulate metallurgy, organolead research being done by TNO yielding a potential PVC stabilizer and anti-fouling pigment, research on a ferrous corrosive inhibiting primer paint for which descriptive literature is being prepared, fiber metallurgy where the unique capabilities of retaining molten lead in the matrix provide unique properties applicable to bearings and solder tape.

Dr. Radtke then reviewed the 1962 research budget recommended by the Technical Steering Committee and discussed each project separately.

The committee reviewed various phases of the 1962 budget recommendations and the following comments were noted:

1. It was suggested that more fellowships be distributed in other countries.
2. It was suggested that the need existed for technical presentations in Europe of lead research progress.
3. It was suggested that research houses employing lead and/or zinc to the utmost be designed and built from which performance data could be obtained for ultimate promotional exploitation by the LIA program and/or AZI. This is similar to the program of research houses of the National Association of Home Builders.
4. The projects developed from the idea sessions were reviewed, and it was pointed out that the economic value of proposed projects be expanded as much as possible.
5. Much discussion followed concerning the total amount of research expenditures. It was noted that the proposed budget had been screened by the various technical committees and that the Technical Steering Committee had already substantially reduced the budget initially proposed to them. It was pointed out that cognizance had been taken by the Executive Committee of the ERP of the cash on hand available from previous budgets and that the assessment on member companies had therefore been reduced to bring the end-of-year cash balance to the lowest reasonable operating level.

A motion was then made and seconded to approve \$388,040.00 for the 1962 ERP research budget and the motion was carried by a vote of 8 to 3.

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November 29, 1961

Discussion was held on the administrative budget of the ERP. Dr. Radtke noted that the main reason for the increased budget was the addition of a fourth man to the ERP staff, the various expenses connected with travelling, additional space, committee activities, furniture and the retirement fund.

A motion was made and seconded to approve \$111,190.00 for the 1962 ERP administrative budget, and the motion was carried by a vote of 9 to 3.

A motion was made, seconded and unanimously approved to fix the assessment rate of 26¢ per ton.

In the course of further discussion, it was suggested that greater scrutiny be given to proposed projects for their market feasibility. Where projects have a substantial market potential, such as the program on sound attenuation, consideration should be given to enlarging the research effort. It was also agreed that a closer liaison was required between the Industry Development Committee and the ERP and that more frequent meetings might be advisable.

Finally, it was agreed that at future IDC budget meetings each project be discussed separately by the committee to permit full consideration of the economics of the program, project by project.

Louis Kettler
Secretary of the Meeting

LIA01091



AZI-LIA EXPANDED RESEARCH PROGRAM

LOOK AHEAD WITH LEAD

AMERICAN ZINC.
INSTITUTE, INC.

LEAD INDUSTRIES
ASSOCIATION

292 MADISON AVENUE
NEW YORK 17, N. Y.
OR 9-6020

SCHRADE F. RADTKE
Director of Research

IN REPLY REFER TO
PROJECT NO.

November 22, 1961

To All Members of the Industry Development
Committee of the Lead Industries Association

Gentlemen:

Attached for your review of the proposed research budget for 1962 is a set of documents describing the existing programs we recommend be continued, new work we propose to initiate during the coming year, and a financial recapitulation of the proposed work.

For your detailed review we have included the following:

- (a) - A brief review of the program in toto, broken down by market areas.
- (b) - Minutes of the meeting of the Technical Steering Committee.
- (c) - A recapitulation of our budget recommendations.
- (d) - A summary of the Technical Steering Committee's budget recommendations for 1960, 1961 and 1962.

We recognize that your technical personnel have undoubtedly briefed you on the programs projected for the coming year; however, you may wish to have more information and for this reason we are attaching a copy of our latest quarterly report which will bring you up to date on the programs already under way. We are also enclosing a set of work statements projecting the new programs contemplated in 1962.

Because of the large number of budget meetings, it has been necessary for us to hold to date to formulate this program presented herein, we have been unavoidably delayed in getting these data together for you. We hope you will understand and that it will not inconvenience your review of our projected program.

LIA01092

Yours very truly,

N 673.11

BUDGET PRESENTATION TO THE INDUSTRY DEVELOPMENT COMMITTEE
OF THE LEAD INDUSTRIES ASSOCIATION

INTRODUCTION

The need to protect and expand their markets is exerting increasing pressure on all industries to improve the competitive quality of existing products and to develop new products. A survey of manufacturers by the McGraw-Hill Company (1) indicated that 10% of their actual sales during 1960 consisted of products not produced in 1956. Significantly, the consensus of manufacturers is that by 1964, new products (defined as products not produced in 1960) will rise to 14% of total sales.

These findings provide a powerful impetus to industry to intensify their research and development programs and the expenditures for research performed by private industry during 1960 amounted to 10.5 billion dollars. Research and development performed by Federal funds absorbed an additional 2 billion dollars, thus bringing the total to 12.5 billion dollars in 1960 or 2.5% of the Gross National Product (GNP). A comparison of research and development expenditures as related to sales of individual industries (see Table I), shows a ratio as high as 28% for the aircraft industry and as low as .19% for the food industry. The research expenditures for the primary metal industries averaged about .60% of total sales, with research expenditures for nonferrous metals averaging .73%.

Where do we stand on this ladder of research and development expenditures? Using our 1961 research and development budget, including all administrative expenses, as compared to 1960 sales of one million tons of lead at 220 dollars per ton, we obtain a ratio of less than .16%, which is lower than the ratio of research to sales of any other industry.

What are the results of the research performed by the Expanded Research Program to date? Foremost among our many programs is one project relating to a product which has newness combined with the rare added advantage of an exceptionally large market potential. We are referring, of course, to the use of lead in sound attenuation, and much credit is due to the excellent promotional activities of the Lead Industries Association in this area. More than 40% of all inquiries are directed toward information on lead as a sound barrier and the project has reached a stage where commercial exploitation is gathering momentum. Interest in lead for sound attenuation is growing in Europe and Australia, and we are looking forward to greatly increased consumption of lead in architecture, transportation, and industrial plants as a result of this research.

Several of our ceramic programs also possess great exotic appeal. Among these we find programs concerned with investigations of solid state properties of lead compounds for application in dielectrics, piezoelectricity, magnetic ferrites, spark pumps, thermoelectricity, and similar uses. An additional 40% of inquiries received by the Lead Industries Association are directed toward information along these lines. The ceramic program is also concerned with the use of lead compounds in glasses, enamels and glazes for the coating of metals, structural clay products and other substrates--the ceramic market areas which constitute the bulk of lead utilization.

LIA01093

(1) 14th Annual Survey by McGraw-Hill Department of Economics

Budget Presentation to the Industry
Development Committee of the LIA

It must be remembered, however, that the football star making the winning touchdown would be much less of a hero without the solid support of his teammates. The programs dealing with alloy development, powder metallurgy, cladding problems, corrosion studies, lead chemicals and glasses,--these are the programs forming the backbone of our research. Here we are developing new compounds, fiber reinforced lead for bearings, and solder having improved physical properties and higher creep strength, new lead chemicals such as hexaphenyldilead for superior antifouling paints, and ferrous primer paints in water reducible vehicles. On occasion, the results of certain research projects do not measure up to expectations, but tomorrow they may produce another star performer. Our former program on the continuous extrusion of cable sheathing is continuing to enlarge the use of the machine developed during the course of this work, thus improving the position of lead in cable sheathing.

Our proposed research budget for 1962 is on the order of \$388,000. This sum is greater than the 1961 budget, but in line with the 1960 research budget. Much thought and discussion have gone into the preparation of the 1962 research budget, and it is the consensus of the technical committees and of the ERP staff that the research programs recommended in the following pages are of vital importance to the progress of the industry and the expansion of its markets.

In the following pages we will review the projects recommended by the subcommittees and the Technical Steering Committee as necessary for the protection and expansion of the lead industry. The projects will be discussed individually and, so far as feasible, their applicable market areas and market potentials will be considered and commented upon.

For easier reference a suffix has been appended to each project number to denote its general category.

Explanation of Suffixes: A - Applied Research
B - Basic Research
X - Extension of Existing Project
N - Newly Initiated Project
U - Unsolicited Work Statement

November 21, 1961

Budget Presentation to the Industry
Development Committee of the LIA

THE ARCHITECTURAL MARKET

The value of new construction put in place during 1960 is estimated by the Bureau of Census at 55 billion dollars. The projected amount that will be spent on new construction the next ten years will thus exceed the value of all the buildings standing in the United States today estimated at 500 billion dollars. Among the materials shipped to the construction industry during 1960, finished steel came close to 10 million tons and aluminum for construction exceeded 600 thousand tons. If the aluminum were replaced with an equivalent volume of lead, its weight would be 4.5 million tons.

These figures are quoted merely as an indication of the size of market areas available for potential applications in the construction industry. To capture a share of this growing market we must improve the properties of lead, design methods to install lead economically and develop technical data for builders to make them aware of the merits of lead in architectural applications.

LM-16-62 (XA) - LEAD FOR SOUND ATTENUATION IN ARCHITECTURE,
Lewis S. Goodfriend & Associates

The use of lead in architecture for the purpose of sound attenuation is being adopted enthusiastically by architects, builders and consumers. Several manufacturers have come out with leaded vinyl doors, lead impregnated woven fabric space dividers, and new products reaching the market as quickly as new designs are being developed.

The program now in progress at Goodfriend & Associates is proceeding at a very satisfactory rate and the study and evaluation of superior lead sound barriers is opening areas of application in architecture where lead had no entry heretofore.

Even casual inspection of pertinent architectural markets reveals the tremendous potentials for increased consumption of lead in this area. Considering the surface of office partitions and ceilings at a very low figure of 600 million square feet (Bureau of Census Estimate) and assuming the potential use of lead at 8 lbs. per square foot in only 1% of this area, gives us a total of 12,000 tons per year. Sound isolation of 1% of the bathrooms in 1.25 million small residential houses with 4 lbs. per square foot lead would consume over 8,000 tons of lead per year. The use of lead in existing buildings for similar purposes may be likewise assumed at 20,000 tons. Lead for sound attenuation can also be used in trailers, ships and airplanes for a greatly increased consumption of lead.

Required 1962 Funds - \$37,250

LM-7-61 (XA) - LEAD ASBESTOS PADS FOR VIBRATION ATTENUATION

The main objective of this somewhat controversial program is to justify conclusively the use of lead for vibration attenuation. At the present, about 500 tons of lead are sold annually for this purpose, primarily in the foundations of large buildings.

Budget Presentation to the Industry
Development Committee of the LIA

A look at the appliance market shows that the 1960 sales of air conditioners totaled 1.6 million units, refrigerators 3.5 million, freezers 1 million, washing machines 3 million, dryers 1.25 million, fans 3 million. Assuming 4 lbs. of lead for only 10 million of these units totals 2,000 tons of lead. Consideration of electrical and industrial machinery will increase this potential two fold and more.

Required 1962 Funds - NONE

LM-26-61 (XA) - LEAD POWDER CLADDING OF STEEL, PILOT DEVELOPMENT

The successful findings obtained from this research at the University of British Columbia warrant the extension of this program to produce lead coated steel economically. A pilot plant development program is recommended.

The application of lead to metal curtain walls, clad steel roofing, container stock and farm structures offers a market potential of about 2,000 tons. It is believed that many other areas, resulting in substantial lead tonnage, would use lead clad steel were it available more economically and with a range of coating thicknesses.

Required 1962 Funds - NONE

LE-36-62 (XB) - HIGH SPEED PLATING OF LEAD, GRAHAM SAVAGE & ASSOCIATES

The fundamental research performed by this contractor has produced very worthwhile results in the development of an improved fluoborate lead plating bath and of a sophisticated device for evaluation of lead deposits. Successful development of methods for the economic production of plated lead coatings at 2 mils thickness and heavier would offer a substantial architectural market opportunity. The present consumption of 3,000 tons of lead forterne plating would also be greatly increased if a low cost electroplated terne can be developed.

Required 1962 Funds - \$25,120

New research projects proposed for initiation consist of the following:

LM-44-61 (NA) - JOINING OF LEAD TO LEAD AND TO OTHER SUBSTRATES

This proposal from ASARCO concerns the evaluation of methods and adhesives for the joining of lead. Effectual and economic solutions to this problem will greatly increase the consumption of lead in the chemical industries and provide a sharp breakthrough in the development of lead composites.

Required 1962 Funds - NONE

Budget Presentation to the Industry
Development Committee of the LIA

LM-45-61 (NA) - LEAD POWDER METALLURGY SHEET AND EXTRUSION

The proposal received from ASARCO was selected by the Technical Committees over three other proposals and concerns the development of methods for producing utility sheet extrusions, and cable sheathing from lead powders.

This project is part of the broad program to produce superior wrought lead products by means of powder metallurgy and successful accomplishments in this area will be of great commercial value to the lead industry.

Required 1962 Funds - NONE

(ULM-1) (UA) - LEAD COMPOSITE PRODUCTS IN CONSTRUCTION

Lead composites have an exceptionally large potential in the architectural market and a workable development in this area will confer great benefit to other lead products for construction. This proposed program contains a fundamental soundness in that successful findings derived from this research can readily be applied toward the realization of other research objectives such as for sound attenuation. The objective of this program is to show the economic and technical feasibility of lead composite materials. Special consideration would be given to the continuous casting process developed by COMINCO and BEAS for producing low cost, thin sheet for the composites.

A highlight inspection of potential architectural applications shows that the 1 million new one-family houses being built each year provide a roofing area of about 12 hundred million square feet. If 1% of this area were covered with composite materials containing 1/3 of 1 lb. of lead per square foot, it would consume 2,000 tons of lead annually. Wall paper, with an annual consumption of 5,000 million square feet, could utilize about 20,000 tons of lead if 1/2% of the amount were bonded to .125 inch thick lead for sound attenuation. Many other areas of application in architecture can be reached with lead composites once their economy and utility are established.

Required 1962 Funds - \$5,000

(ULM-7) (UA) - HEAVY LEAD CLADDING FOR CHEMICAL PLANT USE

This proposal deals with the problems of bonding thick lead coatings onto steel to eliminate porosity of the coating, slow rates of application and consequent high costs. Research in this region may mitigate or eliminate the factors which militate against a greater consumption of lead for the cladding of metals. The main markets for heavy lead cladding are in the chemical industry and in nuclear shielding, but estimates of market potentials are premature at this time.

Required 1962 Funds - \$15,000

Budget Presentation to the Industry
Development Committee of the LIA

(ULM-13)(UA)-PLUMBING APPLICATIONS OF LEAD

It is interesting to note that lead pipe was selected in preference to other materials in selected areas in both Levittowns, Philadelphia and Long Island. The reason for this was that the plant efficiency of the contractor brought about economies in labor and low maintenance requirements for the lead installation further reduced costs on a yearly basis. For obvious reasons, similar savings are not available to the average user of lead plumbing, and the findings which may result from this research to reduce costly assembly methods of lead pipe and cast iron pipe and calking lead should greatly increase the present consumption of 80,000 tons of lead in this market area.

Required 1962 Funds - \$15,000

(ULC-1) (UA) - CERAMIC COATINGS FOR CEMENTITIOUS AND METALLIC SURFACES

This work statement has been prepared by Dr. Nordyke after extensive discussion with various experts in ceramic coatings. Glazed tile and porcelain enamel steel have long been held in high esteem because of their decorative appearance and durability. The development of suitable methods of application for lead glazes promises to open up an entirely new and sizable potential in the field of concrete blocks, structural clay bricks, and other cementitious and metallic construction products.

Considering only the minimum area that can be covered by the annual production of 7,000 million bricks in the United States in 1960, we obtain a surface area of 400 million square feet. Concrete blocks may be estimated conservatively as offering a surface area of 200 million square feet. The assumption of an additional 400 million square feet for other cementitious and metallic materials would bring the total market to 1,000 million square feet.

The present consumption of litharge in glazes being on the order of 1,000 tons per year, it is believed that an estimated market potential of 10,000 tons of lead per year deriving from this research is a modest appraisal of eventual future consumption.

Required 1962 Funds - \$30,000

Budget Presentation To The Industry
Development Committee of the LIA

THE TRANSPORTATION MARKET

The main divisions of the transportation market are automobiles, railroads, ships and airplanes. The projects discussed under this heading pertain primarily to the automobile and railroad industries, while the latter transportation markets are covered indirectly by programs reviewed under different headings. Similarly, several other projects, although finding application in the transportation market, are discussed under different headings.

LM-9-62 (XA) - Investigation of Metal Fiber Reinforced Lead, Armour
Research Foundation

As a result of our research at ARF, the recent discovery of the retention of molten lead in a fiber matrix has opened up new market opportunities for metallic lead as a bearing material in railroad and municipal transportation systems. The unique ability of lead to retain the same coefficient of friction under static and dynamic conditions is now buttressed by the added advantage that the lead will remain contained within its fiber reinforcement even when molten. This recommends its use in railroad car bearings under conditions of high temperature and pressure and should result in increased lead consumption.

Based on information received from the railroad industry, 1.8 million railroad cars define the size of market available for bearing applications. Counting 8 bearings per car, this would involve 100 lbs. of fiber reinforced lead. Assuming the yearly replacement of bearings at 10% of the total and our market share at 5% of these 10%, and an equal quantity for new bearings, we can estimate the market potential for maintenance and bearings at 1,000 tons of lead annually.

The property of lead retention in fiber reinforcement can also be used to advantage in body solders and solder tapes for use in automobiles, plumbing, cable sheathing, etc. With a yearly production of 7 million passenger cars and 1 million trucks, a market potential of 5,000 tons in this area would be a conservative estimate.

Required 1962 Funds - \$35,000

LC-34-62 (XA) - Anticorrosive Properties of Lead Pigments in Water
Reducible Ferrous Metal Primers, The Eagle-Picher Co.

This program relating to lead pigments in metal primers is discussed under transportation because of its large market potential in the automotive industry. Automobile manufacturers would welcome a water reducible primer free of volatile solvents and attendant fire and toxicity hazards.

An estimate of 1.5 gallon of primer per car, 15 lbs. of lead per gallon, and a yearly production of 8 million cars and trucks, brings the market potential to the total of 6,000 tons of lead annually. Considering steel priming, an additional consumption of 12,000 tons may be realized.

Budget Presentation To The Industry
Development Committee of the LIA

The progress made by Eagle-Picher on this research is being recognized by the technical committees as having particular value to the lead industry and continuation of the program is urged.

Required 1962 Funds - \$5,000

THE CABLE SHEATHING MARKET

A variety of factors, many beyond the scope of our research, have contributed to the diminishing consumption of lead for cable sheathing in the United States. New alloys possessing superior physical characteristics are still needed and a fresh approach toward the solution of this problem is being sought. Powder metallurgy extrusions have produced alloys with improved strength and creep resistance but more work in process metallurgy is required. Lead-plastic composites for cable sheathing hold forth great promise and proposed research in this direction will be discussed below.

IM-8-62 (XB) - Fundamental Investigation of Powder Metallurgy, Rensselaer
Polytechnic Institute

The findings of this fundamental research are steadily increasing our knowledge of this new metallurgical process and give fair promise of translating laboratory techniques into commercially valuable production methods. New alloy systems superior to systems producible by conventional methods, have resulted in significantly improved lead sheet and extrusions on a laboratory scale.

Required 1962 Funds - \$15,670

(UIM-5) (UA) - Development of Composite Plastic Cable Sheathing

The research proposed in this work statement offers a new approach towards increasing the use of lead in cable sheathing by use of a lead-plastic covering. The composite makes plastic-lead sheathing impermeable to moisture, improves the corrosion resistance, permits the production of a superior sheathing, and thereby markedly improves the performance of the composite structure.

Secondly, the lead-plastic composite, similar to other metal-plastic composites, may exhibit much greater ductility than either material by itself as a result of the molecular bonding between the plastic and the lead and the reduction in notch sensitivity of the lead sheath and improvement in fatigue resistance.

This program will be primarily of a defensive nature to arrest the decline in the use of lead for cable sheathing and, if technical and economic improvements will be made, to increase the consumption of lead for cable sheathing.

Required 1962 Funds - \$10,000

Budget Presentation To The Industry
Development Committee of the LIA

(UIM-10) (UA) Development of Commercial Lead Alloy Systems

Our fundamental research program (IM-4) on the nature of various lead alloy systems, has produced a wealth of fundamental technical data which should now be utilized and developed for commercial use. The members of the technical committees gave much thought to the alloy research performed by Armour Research Foundation and, although their conclusion was to discontinue work at ARF, they agreed unanimously that work on lead based alloys must be continued.

The proposed program which was approved by the technical committees suggests that alloy systems be selected from the most promising alloys developed in our fundamental investigations, and that the new research will be directed primarily toward the development of commercial alloy systems.

Successful developments will be of great benefit to the use of lead in all applications where it is used in the elementary state, but any evaluation of future market potentials at this time would be highly speculative.

Required 1962 Funds - \$35,000

Budget Presentation to the Industry
Development Committee of the LIA

THE CHEMICAL MARKET

The use of lead compounds in the chemical market is based almost exclusively on the production of tetraethyl lead. This compound represents a consumption of over 160,000 tons of lead, or 16% of the total lead consumption in the United States and is certainly an area of vital importance to the lead industry. However, 25 years ago, tetraethyl lead did not exist at all and the expanded use of jet engines and the potential threat of gas turbines, fuel cells, etc. may severely challenge the market within the next 15 years. The chemical market as a whole offers a realm of great opportunity. We must maintain and increase our efforts to develop and find applications for new lead chemicals, and our work must comprise both fundamental and applied research.

We feel that the projects discussed below offer a balanced program of research, that they are extremely important to the industry and that the findings will provide valuable data which will lead to wider application of lead chemicals.

IC-18-62 (XB) A Fundamental Study of Organolead Chemistry, Organisch
Chemisch Instituut, T.N.O.

The organolead compounds developed by this contractor show promise of commercial applicability and their application potentials are being presently investigated. Hexaphenyldilead, which offers intriguing properties for the plastic and paint industries, is being made available to commercial firms desiring to evaluate this material for new applications.

Market evaluation of this program is also premature at the present, but the findings of the research are being widely publicized and the importance of this program to the lead industry is self evident.

Required 1962 Funds - \$10,000

IC-28-60 (XB) Organolead Chemistry, Quartermaster Research &
Engineering Command

In principle, this program is similar to that being conducted at T.N.O. and its objectives include investigation of the biocidal properties of lead chemicals in insecticides and mildicides for possible application in textiles, paints, protective coatings and other related industries. This program has only recently been started and will be concerned with the synthesis of new compounds to be followed by evaluation of their properties in the applications laboratories of the Quartermaster Research & Engineering Command. Extension of this program is highly recommended.

LIA01102

Required 1962 Funds - \$10,000

(ULC-2)(UA) Opacifiers, Stabilizers and Crosslinking Agents for Polymers

The plastics industry, with a 1960 production of 6,500,000 pounds of plastics and resins, offers a vast and steadily growing market. Increased use of lead in this industry promises good profit potentials and this proposal suggests initiation of a preliminary survey to study areas for the

Budget Presentation to the Industry
Development Committee of the LIA

use of lead in polymers to determine where lead can be used to advantage. There is sufficient application of lead compounds at the present time to justify further study of its applicability.

Required 1962 Funds - \$5,000

(ULC-9) (UA) Lead Compounds in Adhesives

This proposed research concerns primarily an investigation of the litharge-glycerine system which, although in commercial use for many years, has never been studied on a scientific basis. Its superior resistance to acids and chemicals plus possible improvement through the employment of other polyhydroxy materials warrants further investigation on a scientific basis.

The market potential for an improved adhesive system should be in the order of 500 to 1,000 tons per year.

Required 1962 Funds - \$5,000

THE PAINT MARKET

The consumption of lead pigments in the paint market has been decreasing in recent years and our two programs in this area are designed to protect and expand the use of lead pigments in finishes. One program, LC-34, dealing with metal primers, has been discussed under the Transportation Market, and its expansion potentials have been noted. The second program is of a more defensive nature and is concerned with wood primers.

LC-50-62 (XA) The Use of Lead Pigments in Air Drying, Water Reducible Paints for Wood, The Eagle Picher Company

This project is concerned primarily with an investigation of the compatibility of lead pigments with water reducible vehicles for exterior house paint. These new paint systems are expanding into the market for conventional oil thinnable systems, and to retain the present market for lead, these compatibility studies must be conducted. It is recommended that the present program be extended to the end of 1962.

Required 1962 Funds - \$1,500

THE TEXTILE MARKET

Textiles, woven from both natural and synthetic fibers comprise an area in which the inclusion of lead has found little application heretofore. However, research performed by the Department of Agriculture at New Orleans and at the Texas Women's University, has shown that lead compounds can contribute significantly to the improvement of cotton materials. It stands to reason that other textile materials may similarly be improved by means of lead compounds. The potential of this market is great, and further work in this area should be initiated.

LIA01103

Budget Presentation to the Industry
Development Committee of the LIA

(ULC-3) (UA) Improvement of Fibrous Materials by Lead Chemical
Treatments

The objective of this proposed research is to augment the efforts of the Department of Agriculture and to investigate organic and inorganic lead chemicals for their ability to improve the performance of fibrous materials.

A rough estimate of the size of the textile market, based on the Bureau of Census data, shows that the 1960 consumption of cotton in the United States was 2.2 million tons, consumption of rayon and acetate was 600,000 tons, wool was 200,000 tons and the consumption of silk and various synthetic fibers was 500,000 tons. Assuming the possibility of introducing 1/2 of 1% of lead into this total of 3.5 million tons would offer us a market potential of 60,000 tons of lead per year.

It should be noted that lead used in textiles, in chemical compounds and in paint pigments have the commercial advantage of being completely consumed and never returning to the market as scrap.

Required 1962 Funds - \$5,000

Budget Presentation to the Industry
Development Committee of the LIA

THE CERAMIC MARKET

The versatility of lead compounds in the ceramic industry justifies the fellowship program which has been in effect for a number of years. Our ceramic program is producing many advances in fundamental and technical knowledge which are of great help in increasing the utility of lead compounds in ceramic products. In addition, the favorable publicity created by this research, the papers being written, and the knowledge of lead materials being developed at the various universities endows our research in ceramics with a high return on our research expenditures.

The ceramic fellowship programs listed below were considered by the technical committees as representing a complete package of ceramic research covering fundamental as well as applied projects.

1. LC-12-62 - Wettability of Lead Glazes Upon Structural Clay Bodies, Clemson Agricultural College
2. LC-14-62 - Phase Relationship and Physical Properties of Selected Ceramic Systems, Pennsylvania State University
3. LC-19-62 - Low Temperature Lead Enamels Containing Molybdenum and Bismuth Oxides, University of Illinois
4. LC-21-62 - Development of Ultra-Low Loss Dielectrics, Rutgers The State University.
5. LC-22-62 - Fundamental Behavior of Lead in Glasses, Alfred University
6. LC-23-62 - Study of Ferro-Electrics Containing Lead Compounds, University of California
7. LC-37-62 - Polymorphs of Lead Oxides, Pennsylvania University
8. LC-51-62 - Lead Glazes for Structural Clay Products, Georgia Institute of Technology

Required 1962 funds - \$30,000

- LE-29-62 (XB) - A Fundamental Study of Surface Reaction of Lead, University of Melbourne

This fellowship program involves a fundamental study of the surface reactions of lead and the effects of environmental factors and alloying constituents on corrosion behavior. Experimental data obtained from this research are of great importance for the proper understanding of surface reactions, and extension of this fellowship through the 1962-1963 academic year is recommended.

Required 1962 funds - \$ 4,000

Newly proposed research programs relating to ceramics such as ULC-1 and ULC-2 have been discussed under other classification headings.

Budget Presentation to the Industry
Development Committee of the LIA

GENERAL

The following programs are listed separately because they are of a general nature and do not fit into specific market areas.

(ULM-4) (UB) - Determination of Surface Tension of Lead and Its Alloys

Data on the surface tension characteristics of lead and the impact of minor alloying constituents are to be determined. Existing data have been obsoleted by new techniques and results of this study should benefit our many areas of metallurgical research.

Required 1962 funds - \$5,000

(ULE-5) (UB) - Corrosion of Lead in Various Media

There is a definite need for information on the reaction of lead to the host of new chemical compounds being developed. The lead industry must be in a position to provide competent data on the effectiveness of lead so that its scope of commercial application can be widened.

It is being proposed that a survey of industry and literature data be made and that these be then assembled and incorporated into a manual for distribution to industry. To meet competition, assembly of this data into a useable form is deemed urgent.

Required 1962 funds - \$30,000

(ULM-8) (UA) - Improvement of Lead Collapsible Tubes

The high incidence of cracking encountered in lead tubes used for fluoridated toothpaste has been causing considerable concern. Proctor & Gamble, who use lead tubes for their Crest toothpaste, are anxious to see the cracking problem solved and the lead industry stands to lose a substantial part of this consumption if the problem is not solved. The growth of fluoridated toothpaste requiring lead tubes for corrosion resistance is a substantial market.

It is recommended that a contingency fund be included in the 1962 budget to cover needed expenditures in this area.

Required 1962 funds - \$3,000

LP-38-62 - Corrosion Research Council

This covers the industries' contribution to the Council which is devoting its efforts to the fundamental study of corrosion mechanisms. Because of the inherent place of lead in the field of corrosion, we recommend continued support of this effort.

Required 1962 funds - \$500

Budget Presentation to the Industry
Development Committee of the LIA

LP-52-62 - Abstracting Service

Because of the value of the ZDA and LDA abstracting program to our industries' technical personnel as well as our consumers, we recommend continuation of this effort. The library has been established and abstractors hired to permit this program to get underway by 1 January 1962.

Required 1962 funds - \$4,000

Undesignated Research Fund

Our Undesignated Research Fund has always played a vital part in permitting us to initiate urgent programs arising during the year, or completely formulated during the year. The fund has been used each year, in whole or in part, and we feel it must be included in our present budget as in past years.

Required 1962 funds - \$50,000

CONCLUSION

The projects discussed above represent the best efforts of the ERP and the technical committees to maintain a broad and well balanced program of lead research. It is proposed to extend and initiate work in new and critical areas. The work statements for new research were selected from the most promising proposals developed during the subcommittee idea sessions to enrich our research and to best serve the lead industry.

Table 1

RESEARCH AND DEVELOPMENT EXPENDITURES
AS A PERCENT OF SALES

<u>INDUSTRY</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>1960</u>
Primary Metals	.25	.33	.28	.35	.43	.51	.52	.60
Machinery	1.32	1.55	1.69	1.78	1.96	2.29	2.11	2.19
Electrical Machinery	3.98	4.67	5.51	5.89	6.42	7.35	7.29	7.50
Aircraft & Parts	8.91	10.02	12.26	16.40	19.86	26.48	28.88	28.26
Motor Vehicles & Other Transportation Equipment	1.02	1.51	1.76	2.48	2.49	4.01	2.99	3.20
Fabricated Metals & Instruments*	1.02	1.15	1.11	1.34	1.57	1.78	1.80	1.91
Chemicals & Allied Products	1.94	2.07	2.06	2.19	2.42	2.62	2.57	2.55
Paper & Allied Products	.32	.36	.37	.40	.45	.48	.52	.61
Rubber Products	1.07	1.34	1.16	1.30	1.32	1.59	1.46	1.48
Stone, Clay & Glass	.53	.58	.53	.65	.75	.92	.84	.91
Petroleum & Coal Products	.57	.59	.56	.64	.66	.78	.81	.83
Food & Kindred Products	.12	.12	.14	.15	.17	.18	.18	.19
Textile Mill Products	.21	.27	.24	.24	.28	.27	.24	.24
<u>ALL MANUFACTURING</u>	1.13	1.31	1.43	1.74	2.04	2.48	2.43	2.44

NOTE: Approximately 90% of all research expenditures are spent on applied research and 10% on basic research.

Source: National Science Foundation, U. S. Department of Commerce, McGraw-Hill Department of Economics.

* Ordnance and miscellaneous manufacturing are also included.

Table 2

U. S. LEAD CONSUMPTION BY MARKETS
Source: Bureau of Mines - All Quantities in Short Tons

	1955	1956	1957	1958	1959	1960
Metal Products						
Calking	59,410	64,970	65,630	70,810	80,100	66,660
Casting	15,140	12,930	12,670	8,670	8,400	6,120
Pipe, etc.	29,760	28,030	24,740	23,040	24,820	21,770
Sheet	30,470	30,250	27,470	25,100	28,160	26,200
Terne	2,380	1,710	1,640	1,230	1,510	1,800
Total Constr.	137,160	137,890	132,150	128,850	142,990	122,550
Bearing Metals	34,570	28,320	27,000	18,980	23,300	20,160
Solder	88,750	75,290	70,680	59,650	68,870	57,650
Cable Sheathing	121,170	134,340	108,230	74,980	61,630	59,830
Misc.	46,820	44,440	42,510	40,220	45,330	43,550
Ammunition	24,040	27,060	24,490	20,380	24,260	20,070
Brass & Bronze	11,140	10,950	10,320	8,430	9,440	8,590
Collapsible Tubes	5,190	4,590	4,840	4,590	3,750	3,670
Foil	26,510	26,710	28,730	26,740	27,970	25,810
Type Metal	358,190	351,700	316,800	253,970	110,750	101,690
Total Misc.	195,790	191,570	185,620	159,800	187,280	170,700
Batteries	184,250	179,200	175,400	152,930	193,450	176,520
Antimonial Lead	380,040	370,770	361,020	312,730	788,270	709,100
Lead Oxides						
Metal Products, Total						
Paints	18,550	16,950	15,700	13,590	10,960	8,510
White Lead	87,500	79,200	78,320	64,890	74,120	75,570
Red Lead & Litharge	15,000	13,870	12,450	11,850	13,830	11,390
Pigment Colors	10,380	10,350	8,890	5,570	4,770	2,650
Other Pigments	131,430	120,370	115,360	95,900	103,680	98,120
Chemicals	165,130	191,990	177,000	159,410	160,020	163,830
Tetraethyl Lead	5,490	3,150	3,560	3,230	4,490	2,440
Other Chemicals	170,620	195,140	180,560	162,640	164,510	166,270
Other	35,230	33,850	32,230	32,290	34,720	28,790
Annealing, Galv., Lead Pltg.,						
Weights, Unclassified						
Grand Total	1,212,670	1,209,720	1,138,120	986,380	1,091,180	1,002,280

1962 BUDGET RECAPITULATION

ERP-LIA

<u>Project No.</u>	<u>Title</u>	<u>Contract Price</u>	<u>Funds Available from Previous Budgets</u>	<u>Funds Required 1962</u>
<u>Architectural Market</u>				
LM-16-62	Lead for Sound Attenuation in Architecture	\$37,250	----	\$37,250
LM-7-61	Lead Asbestos Pads for Vibration Attenuation	19,850	19,850	----
LM-26-61	Lead Powder Cladding of Steel	25,000	25,000	----
LE-36-62	High Speed Plating of Lead	25,120	----	25,120
LM-44-61	Joining of Lead to Lead and to other Substrates	25,000	25,000	----
LM-45-61	Lead Powder Metallurgy Sheet and Extrusion	23,750	23,750	----
ULM-1	Lead Composite Products in Construction	5,000	----	5,000
ULM-7	Heavy Lead Cladding for Chemical Plant Use	15,000	----	15,000
ULM-13	Plumbing Applications of Lead	15,000	----	15,000
ULC-1	Ceramic Coatings for Cementitious and Metallic Surfaces	30,000	----	30,000
<u>Transportation Market</u>				
LM-9-62	Investigation of Metal Fiber Reinforced Lead	35,000	----	35,000
LC-34-62	Anticorrosive Properties of Lead Pigments in Water Reducible Ferrous Metal Primers	5,000	----	5,000
<u>Cable Sheathing Market</u>				
LM-8-62	Fundamental Investigation of Lead Powder Metallurgy	15,670	----	15,670
ULM-5	Development of Composite Plastic Cable Sheathing	10,000	----	10,000
ULM-10	Development of Commercial Lead Alloy Systems	35,000	----	35,000
<u>Chemical Market</u>				
LC-18-62	A Fundamental Study of Organolead Chemistry	10,000	----	10,000
LC-28-62	Organolead Chemistry	10,000	----	10,000
ULC-2	Opacifiers, Stabilizers, and Crosslinking Agents for Polymers	5,000	----	5,000
ULC-9	Lead Compounds in Adhesives	5,000	----	5,000

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<u>Project No.</u>	<u>Title</u>	<u>Contract Price</u>	<u>Funds Available from Previous Budgets</u>	<u>Funds Required 1962</u>
	<u>Paint Market</u>			
LC-50-62	The Use of Lead Pigments in Air Drying Water Thinnable Paints for Wood	1,500	----	1,500
	<u>Textile Market</u>			
ULC-3	Improvement of Textile Materials by Lead Chemical Treatments	5,000	----	5,000
	<u>Ceramic Market</u>			
LC	Ceramic Fellowship Program	30,000	----	30,000
LE-29-62	A Fundamental Study of Surface Reactions of Lead	4,000	----	4,000
	<u>General</u>			
ULM-4	Determination of Surface Tension of Lead and Its Alloys	5,000	----	5,000
ULE-5	Corrosion of Lead in Various Media	30,000	----	30,000
ULM-8	Improvement of Lead Collapsible Tubes	(3,000 from 1962 Undesignated Research Funds)		
LP-38-62	Corrosion Research Council	500	----	500
LP-52-62	Abstracting Service	4,000	----	4,000
	Undesignated Research Funds	50,000	----	<u>50,000</u>
	1962 BUDGET RECOMMENDATIONS GRAND TOTAL			\$388,040

LIA01111

November 28, 1961

LIA-EXPANDED RESEARCH PROGRAM
BUDGET PERFORMANCE

	I 1960	II 1961	III 1962
	Budget Performance (As of 12/31/61 Estimated)	Budget Performance (As of 12/31/61 Estimated)	Proposed Budget
A. Approved Budget			
1. Research	\$297,000.00	\$265,000.00	\$388,040.00
2. Administration	62,330.00	76,875.00	111,190.00
3. Total (1+2)	<u>\$359,330.00</u>	<u>\$341,875.00</u>	<u>\$499,230.00</u>
B. Receipts			
4. Pig Lead Assessment	\$365,038.00 (\$.34/ton)	\$309,701.00 (\$.26/ton)	\$334,478.56 (1) (\$.26 ton - 1,286,456 tons est.)
5. Interest on Savings Accounts	1,772.94	3,500.00	3,500.00
6. Miscellaneous	---	---	---
7. Total (4+5+6)	<u>\$366,810.94</u>	<u>\$313,201.00</u>	<u>\$337,978.56</u>
C. Interbudget Transfers			
8. From Previous Budgets	\$ 29,662.58	\$ 62,565.21	\$ 22,870.32 (I 18 + II 18)
9. Into Following Budgets	58,739.73	---	---
10. Readjusted Budget (7+8-9)	<u>\$337,133.79</u>	<u>\$375,766.21</u>	<u>\$360,848.88</u>
D. Disbursements			
11. Research	\$224,755.24	\$ 93,517.31	\$131,000.00
12. Administration	62,906.21	81,400.00	111,000.00
13. Total (11+12)	<u>\$287,661.45</u>	<u>\$174,917.31</u>	<u>\$242,000.00</u>
E. Balance Available for Operations			
14. Lines (10-13)	\$ 50,072.34	\$200,848.90	\$118,848.88
F. Remaining Project Expenditures			
15. Projects Under Contract	\$ 35,009.23	\$168,041.69	
16. Projects Approved-Contracts to be let	12,500.00	12,500.00	
17. Total (15+16)	<u>\$ 47,509.23</u>	<u>\$180,541.69</u>	
G. Reserve Fund			
18. Lines 14-17)	\$ 2,563.11	\$ 20,307.21	

LIA-Expanded Research Program
Budget Performance

November 22, 1961

H. Cash on Hand at End of Fiscal Years

19. 12/31/1958	\$(17,650.72)	(Actual)
20. 12/31/1959	92,888.62	(Actual)
21. 12/31/1960	218,621.57	(Actual)
22. 12/31/1961	250,921.24	(Estimated - Lines I 14 + II 14)
23. 12/31/1962	131,348.88	(Estimated - Note 2 below)

(1) The assessment rate required to provide funds for the total 1962 budget is \$.368/ton which would yield \$473,415.81. This sum combined with that in column III, lines 5 and 8 total \$499,786.13. The Industry Development Committee recommends that the assessment rate be reduced as shown to diminish the cash position. It is estimated that the reduced assessment will result in a cash position of \$131,348.88 on 12/31/62 (line H 23 above). In order to meet the total project commitments of the 1962 budget it is estimated that a minimum of \$88,000 additional (\$.07/ton) will have to be raised through assessment in 1963. (This will be over and above the funds required to finance the 1963 budget through fiscal year 1963).

(2) Funds Available for Operations in Fiscal Year 1962

a. Cash on Hand 12/31/1961	\$250,921.24	(H 22 estimated)
b. 1962 Total Receipts	331,978.26	(III 7)
c. 1962 Operations Fund (Lines a+b)	\$588,899.80	

Expenditures in Fiscal Year 1962

d. From 1962 Budget	\$242,000.00	(III 13 estimated)
e. From 1961 Budget	168,041.69	(II 15 estimated)
f. From 1960 Budget	47,509.23	(I 17 estimated)
g. Total Expenditures (Lines d+e+f)	\$457,550.92	

Cash on Hand 12/31/62

h. (Lines c-g)	\$131,348.88	
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November 28, 1961

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LIA-EXPANDED RESEARCH PROGRAM
BUDGET PERFORMANCE

	I 1960 Budget Performance (As of 12/31/61 Estimated)	II 1961 Budget Performance (As of 12/31/61 Estimated)	III 1962 Proposed Budget
A. Approved Budget			
1. Research	\$297,000.00	\$265,000.00	\$388,040.00
2. Administration	62,330.00	76,875.00	111,190.00
3. Total (1+2)	<u>\$359,330.00</u>	<u>\$341,875.00</u>	<u>\$499,230.00</u>
B. Receipts			
4. Pig Lead Assessment	\$365,038.00 (\$.34/ton)	\$309,701.00 (\$.26/ton)	\$334,478.56 (1) (\$.26 ton - 1,286,456 tons est.)
5. Interest on Savings Accounts	1,772.94	3,500.00	3,500.00
6. Miscellaneous	---	---	---
7. Total (4+5+6)	<u>\$366,810.94</u>	<u>\$313,201.00</u>	<u>\$337,978.56</u>
C. Interbudget Transfers			
8. From Previous Budgets	\$ 29,662.58	\$ 62,565.21	\$ 22,870.32 (I 18 + II 18)
9. Into Following Budgets	58,139.73	---	---
10. Readjusted Budget (7+8-9)	<u>\$337,133.79</u>	<u>\$375,766.21</u>	<u>\$360,848.88</u>
D. Disbursements			
11. Research	\$224,755.24	\$ 93,517.31	\$131,000.00
12. Administration	62,906.21	81,400.00	111,000.00
13. Total (11+12)	<u>\$287,661.45</u>	<u>\$174,917.31</u>	<u>\$242,000.00</u>
E. Balance Available for Operations			
14. Lines (10-13)	\$ 50,072.34	\$200,848.90	\$118,848.88
F. Remaining Project Expenditures			
15. Projects Under Contract	\$ 35,009.23	\$168,041.69	
16. Projects Approved-Contracts to be let	12,500.00	12,500.00	
17. Total (15+16)	<u>\$ 47,509.23</u>	<u>\$180,541.69</u>	
G. Reserve Fund			
18. Lines 14-17)	\$ 2,563.11	\$ 20,307.21	

LIA-Expanded Research Program
Budget Performance

November 22, 1961

H. Cash on Hand at End of Fiscal Years

19. 12/31/1958	\$(17,650.72) (Actual)
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(1) The assessment rate required to provide funds for the total 1962 budget is \$.368/ton which would yield \$473,415.81. This sum combined with that in column III, lines 5 and 8 total \$499,786.13. The Industry Development Committee recommends that the assessment rate be reduced as shown to diminish the cash position. It is estimated that the reduced assessment will result in a cash position of \$131,348.88 on 12/31/62 (Line H 23 above). In order to meet the total project commitments of the 1962 budget it is estimated that a minimum of \$88,000 additional (\$.07/ton) will have to be raised through assessment in 1963. (This will be over and above the funds required to finance the 1963 budget through fiscal year 1963).

(2) Funds Available for Operations in Fiscal Year 1962

a. Cash on Hand 12/31/1961	\$250,921.24 (H 22 estimated)
b. 1962 Total Receipts	337,978.56 (III 7)
c. 1962 Operations Fund (Lines a+b)	\$588,899.80

Expenditures in Fiscal Year 1962

d. From 1962 Budget	\$242,000.00 (III 13 estimated)
e. From 1961 Budget	168,041.69 (II 15 estimated)
f. From 1960 Budget	47,509.23 (I 17 estimated)
g. Total Expenditures (Lines d+e+f)	\$457,550.92

Cash on Hand 12/31/62

h. (Lines c-g)	\$131,348.88
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9/29/61
ULM-1

WORK STATEMENT

LEAD COMPOSITE PRODUCTS IN CONSTRUCTION

INTRODUCTION

Lead is historically noted for its long life and samples in excellent condition have been found which date back to Roman times. Lead also forms a very pleasing patina on its surface, is flame proof in that sparks, etc. will not ignite it and is non-staining. Many buildings in Europe, built in medieval times still stand under their original lead roofs, and even in the United States there are examples that date back to the seventeenth century. In today's competitive market, however, lead is handicapped by problems of creep, antiquated methods of joining and prohibitively high costs of installation which completely price lead out of the picture. In order for lead to re-enter the architectural market, it is necessary that advances be made in lead materials to meet today's competitive market, and that the problems mentioned above be solved effectively and economically.

SCOPE

The objective of the research is to develop creep resistant inexpensive lead sheet. It must be economical, it must have long life so that the historical reputation of lead is maintained, and it must be of sufficient thickness to permit a patina to form on the surface and yet maintain a permanent lead sheet beneath the patina. This objective requires that lead be used in minimum thicknesses. It is believed that the greatest creep resistance and economy will be achieved by forming composites of lead with other materials, such as paper, plastics, asphalt impregnated papers, asbestos-cement tile, to provide rigidity or flexibility as desired/^{and} to eliminate the weight and creep which have inhibited the use of lead in construction.

In addition to developing composite materials which have good properties with respect to creep, strength, permanence and corrosion resistance, we must develop methods of joining the lead and the substrate.

Furthermore, designs must be developed to use the lead composites as shingles, as siding and as products which can be applied from a roll to achieve simplicity of installation and to minimize labor costs. Our economic studies will be conducted concurrently with these developments to determine the sections of the architectural market in which lead composites can compete most effectively. We will also make full use of the COMINCO-BHAS sheet casting process for producing thin lead sheet at minimum cost for subsequent lamination.

ECONOMIC INCENTIVE

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It is believed that with satisfactory products we can develop a market for at least 40,000 tons of lead per year in the United States, and this market could, with time, grow to many times this figure. The products to be investigated will be roofing, siding, flashing and acoustical materials for interior and exterior application. The broad objective of the program will be to maintain the

reputation of lead for its long life, its pleasing patina, its flame-proof characteristics, and to establish the low cost of the basic material as well as the low cost of installation. During the development stage, close contact will be maintained with manufacturers of building products and with the National Association of Home Builders and other organizations to provide field testing for the new lead composites and to substantiate their merits.

6/61
JLM7

WORK STATEMENT

DEVELOPMENT OF HEAVY LEAD CLADDING OF STEEL
SHEET, PLATE AND PIPE

Lead has been used for many years for the construction of chemical plant where corrosive conditions are encountered, and more recently has gained important applications as a radiation shielding material in nuclear installations. Due to its low mechanical strength and its tendency to fail by creep and by fatigue when exposed to cyclic stresses, its application has been seriously limited, particularly in conditions under which vessels constructed of it are exposed to internal pressure or vacuum.

"Homogenous" or clad linings have been developed to meet the requirements of such service, and to provide a continuous lining in vessels in which other means of support of the lead are inadequate. Such linings are usually applied in the fused state to the steel supporting sheet, to give a continuous bond between the lead and the steel over the entire surface.

The method of applying such clad surfaces includes a preliminary cleaning of the steel surface, followed by a fluxing, to remove all traces of oxide from the steel surface. Since pure lead will wet clean steel only with difficulty, it is necessary to deposit a preliminary coating of a lead alloy - usually an alloy with tin, antimony, or nickel, which is applied in the molten state on to the fluxed steel. The final pure lead coating is then melted or 'burned' on to the alloy layer to give the heavy protective coating of the required thickness.

In the United Kingdom, a process of bonding lead to steel by rolling has been developed experimentally. As in the cladding method by melting-on the coating, the steel is given a preliminary coating of a lead-tin or other lead alloy to promote wetting of the steel by the lead, and so obtain a bond. This is applied by dipping in the molten alloy. The main lead coating is then applied by passing the steel and a lead sheet through rolls, a method which is potentially much less costly than the traditional melting-on process. However, in tests at Trail on this type of coating, it was found that the bond between the alloy layer and the steel was not able to resist the heating effect of such operations as the welding of lead to the lead surface of the coating, and separation was found to occur in these locations.

The original method used for the preparation of lead-clad steel, was to lay the steel down in a perfectly horizontal position, and surround it with a low 'dam' along its four sides. The lead was then poured on to this sheet, (after it had been properly fluxed), to give a layer of the desired thickness. Before the lead solidified, it was stirred with a kind of rabble, or paddle, to decrease the porosity of the layer, and then allowed to cool to give a heavy lead coating. This method has been discontinued in favour of the more recent cladding procedures.

LIA01118

Still another approach to the problem is the roll-bonding of lead powder on to steel. This method is at present under study at the University of British Columbia for the production of relatively thin coatings, but has not yet been applied to heavy coatings of the type considered here.

The high cost of the currently used cladding methods, due to the need for meticulous care in fluxing the steel, in preparing the alloy layer to give a bond with the steel, and in the amount of time required to apply the heavy lead clad coating, has militated against the wider use of lead. Development of modern methods of coating steel with such products as PVC and other plastics, by a continuous process has made such coated steel products available industrially. The present program contemplates the development of such continuous processes to the application of a lead coating sealed to a steel sheet by a method which will have comparable unit production costs, and at the same time give a lead clad coating of good adhesion and free from pinholes and porosity.

Methods of cladding the interiors of pipe, as a means of combining the corrosion-resistance of lead with the strength of a steel pipe have been considered. One method has been the insertion of a lead pipe into the bore of a steel pipe, previously fluxed, and expanding the lead to give a tight fit by exerting of a high internal pressure, followed by external heating sufficient to make a bond. Another proposed method has been the centrifugal casting of lead in a precoated and fluxed steel pipe. As far as is known, this latter method has not been exploited commercially.

SCOPE

The investigation would embrace the study of the three factors which militate against the wider use of heavy lead coatings:

1. The difficulty in obtaining a strong bond between the lead coating and the steel surface: This might include a study of the factors affecting the wettability of steel by lead, in an effort to find an acceptable means of improving wettability and adhesion. An alternative which might dispense with the need for this wettability, such as the use of one of the newer adhesives might be sought.

2. The high labour cost and the slow rate of application of the conventional homogeneous coating: This would involve the search for methods of applying the lead to the steel sheet surface which could be more highly mechanized. Any approach to a continuous process would have the result of both decreasing the cost and of increasing the uniformity of the product.

10/6/61

CLM7

- 3 -

3. The tendency to form pinholes and porosity in the coating: This problem would automatically be decreased by methods of application which do not include the application of lead in the molten state, or which are continuous. The complete elimination of porosity would so improve the quality and reduce the cost of inspection, that it would increase the popularity of lead coatings.

4. A review of any method of forming lead coatings which would be a radical departure from the present methods based on the application of molten lead. This would include methods using lead powder, or any other method showing originality in approach which might promise substantial mechanization or simplification of techniques.

ECONOMIC VALUE TO THE INDUSTRY

The competitive position of lead as a corrosion-resisting clad lining is weakened as much, or more by the costly, labour-consuming methods used in its application as by the intrinsic cost of the metal itself. In many environments, particularly in the presence of sulphuric acid and the sulphate ion generally, lead is still the most effective corrosion barrier. If more perfect clad linings can be obtained by streamlined methods of application which are not too closely tied to special, and often rare trade skills, then a significantly wider field of application will be possible.

AT:db

October 4, 1961

LIA011 20

WORK STATEMENT

PLUMBING APPLICATIONS OF LEAD

INTRODUCTION

Lead is used in two principal applications in the general plumbing field. These applications, which jointly consume about 76,000 tons annually in recent years, are caulking lead for cast iron soil pipe and water mains (51,000 tons ave. 1956-59) and lead pipe for water service and drains (25,000 tons - includes utilization in the chemical industry). Because of the high labor cost involved in the installation of lead there has been a trend towards competitive materials in recent years. In domestic plumbing systems the use of copper drainage systems has supplanted, to a considerable degree, cast iron pipe which requires caulking lead. Although materials cost of a copper system is greater, labor savings in installation more than compensate this factor. The decreased usage of lead pipe in water service and drains in favor of competitive materials is due to the labor involved in making joints by wiping and the loss of the required skills by the plumbing trade.

Techniques for joining lead pipe and cast iron pipe by wiping and caulking respectively were developed many decades ago and have not changed or been improved upon since then in any appreciable manner.

SCOPE

The objective of the contemplated program is to develop alternate methods for joining of lead pipe and for lead caulking of cast iron pipe with major emphasis placed on effecting labor savings. The resistance to labor saving techniques by the trades is fully realized, but in the future, as in the past, improvements eventually will be accepted.

Caulking of soil pipe requires many time consuming operations. The bell and hub pipes are mated, oakum is inserted and packed in the joint, molten lead is poured on top of the oakum to fill the bell (if pipes are horizontal an asbestos runner must be set up to contain the molten lead), and finally the lead is caulked manually by hammer and caulking tools to achieve a tight joint. The bond and seal between the lead and cast iron is mechanical, and caulking is required to overcome solidification shrinkage of the lead.

An analysis of the time and motion involved in the procedure described above suggest the following possible avenues of approach.

1. Development of preformed oakum packing to minimize time of application.
2. Elimination of molten lead in preference to lead preforms (which would do away with runner set-up time in horizontal joints and the necessity of a supply of molten lead).
3. Development of a suitable yarning and caulking tool to reduce time of these operations. This may be based on a portable electric tool with a flexible shaft and an eccentric impacting mechanism or impacting mechanism such as is used in electric impact wrenches.

An alternate procedure which may offer possibilities is redesign of bell and hub joint to eliminate necessity of oakum and facilitate the use of lead preforms and electrical caulking tools.

An auxiliary point which would help in the retention of cast iron pipe in plumbing would be the development of a more labor saving method of cutting to desired length than the hammer, muscle and chisel technique. A possibility lies in the use of an electrical heating element which, through expansion and contraction by rapid cooling (water), would rupture the cast iron, hopefully in a controlled manner.

A more thorough study of the factors involved in making a caulked joint will undoubtedly lead to other possible approaches than those given above.

The joint wiping procedure used in making lead pipe joints almost defies description, and a description of it will not serve a useful purpose in developing alternate procedures. Basically it is a cored overlapping solder joint which takes considerable skill and time to develop.

Several alternate joining methods are suggested:

1. The use of the basic joint with a solder preform and a controlled means of heating so that the solder will melt without melting the pipe.
2. The use of a butt joint with fiber-reinforced solder preforms and controlled heat source.
3. The use of a butt joint and lead sleeve with adhesive bonding.
4. The use of mechanical compression fittings.
5. The use of mechanical compression fittings and solder or adhesives in combination.

The present wiping procedure makes use of molten lead solder as a controlled heat source to insure penetration and wetting of the solder into the cored joint without raising the lead pipe to the melting point. In view of this, the development of a portable controlled heat source may be the most significant factor in deriving alternate soldering methods.

The above suggestions are not to be considered as limiting other possible approaches.

ECONOMIC INCENTIVE

The application of lead in plumbing at present represents a large market which is well worth maintaining and provides a sizeable base on which small percentage increases would result in substantial increased tonnage. Actually the consumption of caulking lead has been increasing over a period of years on which statistics are available. In the period 1915-18 average annual consumption was 7,000 tons and the four year period averages have grown steadily to 51,000 tons in the 1956-59 period with setbacks only in the depression years 1930-39. In the period 1951 to 1959 average consumption was static, however, and it is felt that this is due to the pressure of competitive materials; definitely not to the lack of construction activity. It is apparent that less lead per dwelling is being utilized.

Success in these developments will make utilization of lead more competitive price-wise which is of utmost importance for maintaining or expanding markets in the construction industry where economics more than any other factor controls the choice of materials.

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9/29/61
ULC-1

WORK STATEMENT

CERAMIC COATINGS FOR CEMENTITIOUS AND METALLIC SURFACES

Introduction

Ceramic coatings in the form of glazes applied to ceramic bodies or cemented aggregates and porcelain enamels applied to metals have long been well and favorably known for their durability. Their weather resistance is excellent and their ability to protect and to decorate the substrate to which they are applied is excellent. Broadening of the field of application for ceramic coatings containing high lead content might well be accomplished in a significant way if new techniques of application could be developed which might help to overcome certain inherent limitations.

One use, which might well be developed with new application techniques, would be glazing of concrete block and other types of structural materials containing free silica in the form of quartz. Most glazes, formulated for application to ceramic bodies, require a temperature in the neighborhood of 2000°F for proper maturing. This temperature is substantially higher than the conversion temperature of quartz to trydimite and cristobalite. This conversion is accompanied by a marked expansion in volume resulting in popping and rupture of the pieces containing the free quartz. Use of good low temperature glazes and means of application, without the necessity of heating the entire piece, might open the way for expanded use of lead in glazes for such materials as concrete block and the mortar joints between.

All are familiar with many of the uses of enamels on steel, aluminum, copper, etc. It is conceivable that the excellent protective values of ceramic coatings in the form of high lead enamels might well be used in structural steel for buildings and bridges and for guard rails along our nations highways if suitable cost can be achieved. A major factor in cost is the cost of application. Another factor to be considered is the cost of repair to damaged areas. Because of the excellent durability of ceramic coatings it would appear that recoating would be required only when and where actual damage has occurred and that routine maintenance could be eliminated.

Good low-temperature enamel and glaze compositions are available at this time. Development of new application techniques will be necessary, however, for their use. Such development might require modification of existing formulas to adapt them to newly developed application techniques. As a result both factors must be considered in any development work undertaken. The greatest emphasis would be upon application techniques. Secondary emphasis would be on formulation.

Application Techniques

It is felt that flame spraying and flame flowing techniques should be investigated in connection with this work. It appears that either method offers a possibility of fusion of the coating upon the surface without the necessity of applying excessive heat to the interior of the material being coated.

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ULC-1

- 2 -

Low fusion temperature of the coating and the ability to apply and remove heat rapidly appear to be necessary conditions.

Formulations of glazes or enamels would most likely come within the range of 30 to 50% of PbO in the final coating. Under flame spraying techniques the fused coating composition would be sprayed directly onto the surface to be coated.

Flame flowing techniques would involve spraying the surface with a prepared slip or slurry of the coating in water or other appropriate vehicle. The surface coating then would be fused in place by the application of heat in the form of a flame such as from a welding torch. It is conceivable that similar techniques, with some modification, would be used whether the substrate is metallic or whether it is cementitious.

Structural members for bridge or building construction can be enameled by relatively standard methods following fabrication and before shipment to the construction site. It may be expected that some damage would be done to the coating in spots due to impact, welding, or insertion of bolts in the course of construction. Repair of such damage would be necessary and suitable technique must be available if enamels are to be used for such purposes. Flame spraying or flame flowing may very well be the answer to this problem.

Metal for guard rails has been coated with porcelain enamel in the factory. Methods of repairing damage in service, however, have not been available and it has been customary to repaint with the usual organic vehicle paints. Availability of suitable method of maintenance coating could very well greatly expand the use of porcelain enamels for this purpose.

Incentives

There are many other potential uses for ceramic coatings on metals which are not presently being exploited. These would include heavy machinery, electrical transmission towers and equipment normally exposed to the elements. One property of high lead enamels of added value in electrical field is that of high resistivity or good insulating values. Because of the combination of factors high lead ceramic coatings might find many new uses in areas of application in the electrical field if application techniques are developed which permit suitable repair.

Time Element

It should be possible to develop a reasonably good idea of the potential success of this investigation within perhaps one to two years. It is probable, however, that a development program might require a period of perhaps three to five years since there will be many directions of possible use and each would have to be investigated to some extent separately from the others.

LIAO1124

9/29/61
ULC-1

- 3 -

Potential Market

Any estimate of potential sale in terms of metallic lead equivalent resulting from successful completion of this research must consider the possibility that some avenues of potential use might prove to be fruitful while others may not be successful. It is felt, however, that the sum total of potential is very large and that, with all due allowance for full or partial success, we might mention a figure of 10,000 tons per year of metal equivalent resulting in due time from a successful conclusion of this development program.

LIA01124

9/29/61
ULM-5

WORK STATEMENT

DEVELOPMENT OF COMPOSITE LEAD-PLASTICS CABLE SHEATHING

INTRODUCTION

Little need be said about the competition from other materials which have caused a drastic decline in the use of lead for cable sheathing. Price, availability of lead and corrosion problems in certain cases have markedly affected the lead market. In addition, the inability of lead cables to elongate to the same degree as other products on the market, has also impaired its competitive position. Furthermore, the question of economics and weight have also given the edge to other materials in competition with lead.

Plastics, in particular, have taken over a large portion of the cable sheathing market which, previously, had been supplied by lead. In many cases, however, plastics suffer seriously from permeability which causes subsequent corrosion of the conductors on the inside of the plastic sheathing. A further point to be considered is that the life span of plastics in cable sheathing applications has not been clearly established.

Experience has shown that composites of lead and plastics do provide outstanding corrosion resistance, in that the lead shield insures impermeability. The development of improved methods for producing composites of lead and plastics to be used as cable sheathing could therefore achieve extremely long life and offer economic benefits to the cable sheathing industry. We must also improve the ductility of lead sheathing so that it may be competitive with other cable designs. In addition to that we must develop engineering and economic data to show the advantages in performance and life span of lead-plastics composites as compared to the other available materials. On the basis of the reasons outlined above it seems reasonable to assume that this study could greatly improve the position of lead in the cable sheathing industry.

SCOPE

For greatest effectiveness, we propose to subdivide this program into several specific areas which will be investigated separately. Initially, an engineering study will be made of the manufacturing process for lead-plastics composites as compared to the manufacture of other materials to establish economic data and performance characteristics. We would also want to conduct studies of corrosion resistance, fatigue characteristics, bending strength and over-all physical properties of the resulting composites.

Another major area would involve the study of methods to improve the ductility of the composite cable sheathing. It has been stated

LIA01125

9/29/61
ULM-5

- 2 -

that one of the major reasons for the loss of the missile orders for cable sheathing was that the present lead sheath cables could not meet the specifications requiring a 20% elongation. It is believed that a molecular bond between the plastic and the lead will greatly enhance the ductility of the composite sheathing and meet the specified 20% elongation requirement. Investigations of other metals sheathed with plastics have indicated that the ductility of the composite is greatly improved because of this molecular bonding and the distribution of stress over a wider area, thus reducing the danger of failure at a particular point. Studies will be made of composites of plastics and lead, hot bonded or adhesive bonded, and efforts will be directed toward achieving the desired ductility improvement.

ECONOMIC INCENTIVE

The obvious aims of this program are to inhibit further losses of lead cable sheathing markets and to improve the position of lead for cable sheathing in Australia, Europe and in other countries where our member companies are located. It is believed that the plastics, steel, and aluminum composites will become increasingly competitive in the European and Australian markets, unless we take steps to improve our own product. It should be recognized that the cable people have little incentive to promote research in this area and that the burden really rests with the lead industry to contribute improvements in lead cable sheathing.

LIA01126

9/29/61
ULM-10

WORK STATEMENT

COMMERCIAL DEVELOPMENT OF LEAD ALLOY SYSTEMS

INTRODUCTION

Since July of 1958, the Armour Research Foundation at Chicago, Illinois, has been carrying on a program of basic research designed to improve the existing state of knowledge concerning the properties of lead alloys, and to develop new lead alloys superior to those now in use. It was intended to do this work under closely controlled laboratory conditions in order to study the details of the necessary techniques of preparation and, of course, the fundamental properties of the alloys produced.

During the three years of activity, Armour has prepared and tested some 15 binary systems, and some 26 ternary systems containing lead. In the binary group, data have been obtained on (usually) 5 percentage compositions for each of the 15 systems. Determinations of tensile strength, elongation, and hardness have been made for most of the alloys, and other correlative figures are also available. The vital importance of minute amounts of oxygen in the alloys has been discovered, and quantitative results have been presented. The Armour program will continue at least until May of 1962 and, no doubt, further findings of value will be forthcoming.

SCOPE

With a wealth of basic information on which to proceed, it is in order to select those alloys which offer the best physical properties, and to establish a program for their development toward commercial uses.

From a total of approximately 100 individual compositions which appear in the Armour reports, the following systems show the most promise:

<u>Binary Systems</u>		<u>Ternary Systems</u>
Pb/Ca	(above 0.5 atomic %)	Pb/Sn/Ca
Pb/Ba	(above 0.5 atomic %)	Pb/Ba/Ca
Pb/Te	(above 0.015 atomic %)	
Pb/Sb		
Pb/Sn		
Pb/Ag		

The binary alloys of Pb with Ca, with Ba, and with Te have shown outstanding tensile strengths in the composition ranges listed above. Likewise, the ternary alloys of Pb with Sn and Ca, and Pb with Ba and Ca are in this category. While the binary alloys of Pb with Sb, with Sn, and with Ag have long been recognized and used, it is believed that opportunities for further commercial development still exist.

Although eight alloy systems have been listed as examples, ^{LA101127} it is not the intent of this work statement to limit the scope of the proposed program to these only. On the contrary, the Armour reports will be made available to prospective contractors, under certain confidential conditions, so that their technical staffs may review the data and make their own suggestions as to which of the Armour alloys will be specifically developed by their proposals. The information provided by the Armour findings will

be made available so that advantage may be taken of (1) the details of the alloying techniques, (2) the precautions to be observed against contamination, especially from unplanned oxygen pick-up, (3) the quantitative evaluation of the physical properties already accomplished, and (4) the consideration of the theoretical aspects of the work, which Armour has frequently discussed.

While the preceding paragraph permits the prospective contractors some reasonable latitude in which to introduce their own original ideas, it must be understood that it is the objective of this project to select the commercially exploitable alloys and then to concentrate on their development toward practical ends. The program must not stray from this goal of practical application.

Having decided upon a group of, say, six alloy systems that seem to offer potentially superior advantages in the engineering field, both technically and economically, proposals for further experimental production and testing of these alloys will be invited. It is expected that a suitable program will run for more than one year.

Among the information which will be required, the following areas are suggested:

<u>General Information</u>	
Production Methods	Castability
Production Costs	Machinability
Composition Limits	Extrudability
Methods of Analyses	Microstructure
<u>Physical Tests</u>	
Tensile Strength	Creep
Yield Strength	Corrosion Resistance
Elongation	Recrystallization Temperature
Hardness (Cold and Hot)	Grain Size

The particular areas in which the alloys may best be utilized must also be designated. These might be tank linings, cable sheathing, noncorrodible electrodes for batteries and other electrolytic processes, decorative castings or extrusions, building supports, and general protection of structures against corrosive atmospheres or liquids. An interpretation of the physical properties of the alloys and their correlation to the several areas of application must be developed and clearly presented to the consumer for consideration.

An important requirement of this program is to discard the tired complacency and to inaugurate a fresh, novel, and enthusiastic approach. In addition to technical competence, stimulating leadership will be a factor in our choice.

ECONOMIC VALUE TO THE INDUSTRY

The unique corrosion resistance of lead to chemical attack has always been the metal's primary virtue; in contrast, its relatively poor mechanical strength has been its principal defect. An alloy, high in lead in the interests of low cost, which will retain lead's immunity to corrosion but also acquire increased structural strength, would certainly be welcomed by the industry. Should such an alloy be developed, and its superior qualities be demonstrated by accelerated service tests, its market is assured.

It is futile at this stage to speculate on the monetary profit to be derived. When its production costs and its properties will be known, reasonable comparisons with competing materials may then be made, a selling price comparable with the competition determined, and the over-all economic benefits can then be intelligently calculated.

9/29/61
ULC-2

WORK STATEMENT

OPACIFIERS, STABILIZERS, AND CROSSLINKING AGENTS FOR POLYMERS

INTRODUCTION

This is an area where considerable work has already been done, but it is a growing and changing market and most certainly ought to be carefully watched and investigated to insure that lead compounds play their full part.

Lead compounds are already used as stabilizers for polyvinyl chloride. Approximately 2 - 4% by weight of P.V.C. can be lead compounds.

SCOPE

Lead compounds are low in cost in comparison to barium and cadmium. There are some inherent drawbacks to the use of lead which might be considerably reduced in importance by further work. These include

toxicity - not presently of overwhelming
importance, but we could benefit
by improvement

sulphide staining

thermal and light stability

refractive index

However, it may be possible to look to benefits such as

production of pearlescence
flame proofing
weather proofing
rot resistance
sound attenuation through densification
solidity
conductivity

POTENTIAL

It is suggested that polystyrene and the rubber industry might be given a close look and other classes of plastics investigated. There could be a substantial market for lead in this area, and a careful appraisal is necessary to enable the most fruitful area of research to be chosen.

9/29/61
ULC-9

WORK STATEMENT
LEAD COMPOUNDS IN ADHESIVES

The use of adhesive bonding is becoming increasingly popular in a wide range of industries. The metal working industries are becoming aware that modern techniques require alternatives to soldering, brazing, welding, rivetting, etc. The building industry is interested in more sophisticated techniques as their need for automation becomes apparent. Traditional methods of joining in the ceramics industry are inadequate while the vast plywood industry is continually searching for new bonding agents and this is particularly so when one considers the possible need to bond lead and other metals to the wood to improve acoustical properties and for other reasons.

Scope

An appraisal should be made as to where there is the need for adhesives of the characteristics which could be expected from a suitably formulated lead containing adhesive.

The following industries should receive attention:

Ceramics - (bond for cement blocks, low firing frits)

Building - Plywood bonding (to wood and metal), Tiles to plastics, metal, etc.

Plumbing

Chemical construction, acid resisting bonds.

The following characteristics should receive attention:

Package stability

Setting Time

Pot life

Organolead compounds as curing agents in a wide range of adhesives.

Development of low firing frits for ceramic bonding.

Incentive

The above applications are in many cases related to industries which consume very large quantities of materials.

We believe that the potential market is such that we cannot afford to neglect taking a closer look in order to be in a position to decide in which direction substantial effort is well justified.

LIA01131

WORK STATEMENT

IMPROVEMENT OF FIBROUS MATERIALS BY LEAD CHEMICAL TREATMENTS

Introduction

Fibrous materials, both natural and synthetic, suffer from exposure to weather and are attacked by ultra violet rays by bacteria and by insects. They are also sensitive to creasing, fire and abrasion, and their retention of color and of fiber strength needs improvement.

Work has been done by the Department of Agriculture at their own laboratories in New Orleans as well as their Texas Womens University. This research has shown that lead oxides and lead carbonates has application in this area and has significantly contributed to improved performance of cotton products.

With regard to other materials, however, much improvement is still needed. Wool and the synthetics could conceivably be improved by treatment with other lead chemicals as well as by the ones investigated in the Department of Agriculture program. There is great interest in the improvement of fabrics of all types and, in view of the favorable results obtained in the Department of Agriculture program, further work in this area is certainly indicated.

Scope

The objectives of the program would be to continue the efforts initially undertaken by the Department of Agriculture and to investigate other lead chemicals, organic as well as inorganic, for improving the performance of fibrous materials. There has been indication that lead borate and lead hydroxide can improve cotton used for ducking and tent materials by improving the weathering, mildew and flame resistance of the cloth. Investigation would also be made of the contribution of lead to wool and to synthetic materials to improve their physical and chemical properties. It would also be planned to consider the materials developed in our program on organolead compounds for the applications mentioned above.

Economic Incentive

During 1960, the consumption of cotton was 2.2 million tons, consumption of rayon and acetates was 600 thousand tons, wool was 200 thousand tons and consumption of silk and various synthetic fibers was 500 thousand tons, giving us a grand total of 3.5 million tons. The market for fabrics of all types is tremendous and offers a substantial potential for lead in this area. If we could introduce lead to the extent of 1/2 of 1% in this area, we would achieve a total consumption of over 16,000 tons of lead. Furthermore, the benefits to our industry would be a continuous consumption of lead which would never return to the market, because the lead would become a total loss when applied to fabrics.

9/29/61
ULM-4

WORK STATEMENT

DETERMINATION OF SURFACE TENSION OF LEAD AND ITS ALLOYS

Introduction

The considerable variation found in the reported information on the surface tension of lead is due to variations in over-all purity as well as in the specific impurities (1). The present availability of high purity, zone refined lead makes it highly desirable that this important constant be determined with accuracy. The limited data on the effect of small amounts of alloying elements on the surface tension of lead are based on the additions to metal of 99.99% purity, and hence should be repeated. An exact knowledge of the extent to which various alloying or impurity are surface active will permit much greater understanding of surface corrosion and will have bearing on the problems involved in casting thin sections.

Scope

The scope of this program comprises a fundamental study of the surface tension of molten lead and is directed toward three primary objectives:

1. Accurate determination of the surface tension of high purity lead and its temperature coefficient.
2. Investigation of the changes in the surface tension of pure lead caused by low levels of alloying elements.
3. Detailed investigation of those elements found to be particularly surface-active.

Suggested Approach

Probably the most direct and least troublesome approach to the measurement of the surface tension of lead and its alloys (coupled with a simultaneous density measurement) is through the bubble pressure method. This method (1-4) consists in measuring the maximum pressure attained in bubbles formed by an inert gas beneath the surface of the metal, and the methods of calculation may be found in the references. The major problem in the application to lead is in finding a capillary tube material which will not contaminate the lead or be eroded rapidly by it. High purity silica or boron nitride are suggested. With proper control of capillary size and arrangement of pressure read-out system, the method is capable of high precision.

Economic Value

As a fundamental research program, the economic value to the Industry cannot be estimated directly. It is certain that increased knowledge of the surface-active species which may be found in lead, will, for example, greatly broaden the understanding of surface corrosion and hence of reproducibility of weathering colors, etc.

9/29/61
UIM-4

-2-

- (1) Melford, D. A. and Hoar, T. P., Determination of the Surface Tensions of Molten Lead, Tin, and Indium by an Improved Capillary Method. J. Inst. of Metals 85, 193 - 205 (1957)
- (2) Sugden, S., The Determination of Surface Tension from the Maximum Pressure in Bubbles J. Chem Soc. 181, 858-66 (1922)
- (3) Greenaway, H. T., The Surface Tension and Density of Lead-Antimony and Cadmium-Antimony Alloys. J. Inst. of Metals 74, 133-48 (1947)
- (4) Adam, N. K., The Physics and Chemistry of Surfaces, Oxford University Press, London, 1941. P372 - The Maximum Bubble Pressure Method

LIA01134

10/6/61
ULE5

WORK STATEMENT

CORROSION OF LEAD IN VARIOUS MEDIA

Introduction

Lead and some of its alloys have been extensively used in the chemical industry because of their high resistance to corrosion in many media. However, many new chemical compounds have been synthesized in recent years, many new solvent systems have been developed, and all too frequently we lack the necessary information about the performance of lead in these new areas. Since we do not have adequate data on the effectiveness of lead for these new applications, we have little opportunity to recommend the use of lead in this area. The Lead Industries Association receives numerous inquiries relating to the applicability of lead in various chemical systems and they are unable to provide an answer because satisfactory data are not available.

If we are to promote the use of lead for these new applications, we must be in a position to provide ample and competent data to accentuate the advantages of lead as compared to its competitive materials, such as nickel alloys, stainless steel, aluminum, and plastics.

Scope

The program would be administered in several phases, and the findings of each would be used to determine the scope of the succeeding phase. First, a survey would be made of the industry and of the literature to accumulate exhaustive data on the performance of lead in various chemical media and under various exposure conditions. These data would then be assembled and incorporated into a manual, and made available for distribution to industry.

Secondly, we would establish a spool test, either directly by the Lead Industries Association or in collaboration with the International Nickel Company which is conducting similar investigations. A spool containing samples of various lead alloys would be sent to the organization requesting information on lead for a particular application. The lead spool would then be exposed to the corrosive media in question, under whatever conditions the lead might conceivably be employed in actual production, and data would be established for each specific use. These technical data would then be accumulated by us and filed away for future reference.

In addition, we would like to initiate a contract with a research laboratory, at a predetermined dollar maximum, to perform an open end study and to undertake high spot, independent evaluations of the corrosion behavior of lead in new applications. Prior to making such tests, we would send out field questionnaires or, if the potential market justified it, we would send an engineer to obtain factual data on the system in which lead was to be employed, and to determine such factors as gaseous atmospheres, temperatures, pressures, minor contaminating materials, etc. Once these data were established, then the high spot laboratory work would be undertaken to determine whether or not lead had potential application in the specific area.

LIA01135

10/6/61
ULE5

- 2 -

Economic Incentive

Although no economic data are available in this area, the 1960 consumption of lead in the chemical industries may be estimated with fair accuracy at 4,000 tons of lead pipe and 16,000 tons of lead sheet. This gives us a total average consumption of 20,000 tons per year.

There are many competitive materials to lead in the chemical industries, and the suppliers of plastics and corrosion resistant metals are sparing no expense in furnishing potential users with technical data and know-how concerning their products.

If we are to retain our market for lead and expand its use in the chemical industry, we should offer no less than the suppliers of competitive materials, and promptly initiate a program to study the corrosion resistance of lead in various media.

LIA01136

9/29/61
ULM8

C O N F I D E N T I A L

WORK STATEMENT

IMPROVEMENT OF LEAD COLLAPSIBLE TUBES

INTRODUCTION

It is estimated that lead collapsible tubes will consume 9600 tons of lead in 1961, and statements have been made that this consumption could grow to 20,000 tons in the near future. This is based on the general trend of tooth paste manufacturers to formulate fluoridated tooth paste following the lead of Proctor and Gamble's CREST tooth paste which, due to the American Dental Association endorsement, is a leading seller. Aluminum tubes and plastic dispensers are generally unsuitable for packaging fluoridated tooth paste because the former suffers from corrosion and the latter absorbs the flavoring oils which change the taste of the product.

The ERP staff was recently approached by the Bradley-Sun Division of the American Can Company concerning the high incidence of cracking of lead tubes from deformation during use. They along with Victor, Wheeling and Wirz supply Proctor and Gamble with tubes, and Proctor and Gamble claim that 40% incident of cracking occurs which they would like to see reduced to 10% or less. Their sudden concern apparently stems from competition entering the field of fluoridated tooth paste, one of which claims that their product will be packaged in aluminum tubes which normally do not crack. Proctor and Gamble as well as the tube manufacturers would like to see the cracking problem solved, and it appears that our industry stands to lose a portion of this market if it is not and stands to gain a larger portion if it is. Alternate packaging materials are being sought, but Proctor and Gamble at least would like to continue the use of lead tubes if possible according to a representative of this company.

SCOPE

At present COMINCO, National Lead Company, St. Joseph Lead Company, American Smelting & Refining Company and Anaconda Company, through representatives of these companies who are on the Lead Metallurgical Subcommittee, are evaluating tubes furnished by Bradley-Sun which were taken from various steps in the manufacturing process. Through this evaluation the mechanism by which tubes fail is being sought with the view towards recommending other tube alloys which will overcome the high cracking incidence, or, if manufacturing defects are responsible, to recommend other practices. Armour Research has also been requested to examine the tubes on the LP-4-60 program.

Pending the outcome of this investigation it may be necessary to initiate an alloy development and evaluation program; hence the matter is being included in a work statement for consideration at the budget meetings. The Bradley-Sun Division has offered their cooperation in evaluating recommended alloys.

LIA01137

It is recommended that either a formal contingency fund be included in the 1962 Budget or formal approval be given to draw on the Reserve Fund to cover possible expenditures in this area.

9/29/61
ULM8

ECONOMIC INCENTIVE

By reasons given in the introduction, the consumption of lead in collapsible tubes may decrease from the present substantial level if the incidence of cracking is not lowered. Conversely consumption may increase significantly if this problem can be overcome.

LIA01138

1962 BUDGET RECAPITULATION

ERP-LIA

Exhibit D

12/4/61

<u>Project No.</u>	<u>Title</u>	<u>Contract Price</u>	<u>Funds Available from Previous Budgets</u>	<u>Funds Required 1962</u>
<u>Architectural Market</u>				
LM-16-62	Lead for Sound Attenuation in Architecture	\$37,250	----	\$37,250
LM-7-61	Lead Asbestos Pads for Vibration Attenuation	19,850	19,850	----
LM-26-61	Lead Powder Cladding of Steel	25,000	25,000	----
LE-36-62	High Speed Plating of Lead	25,120	----	25,120
LM-44-61	Joining of Lead to Lead and to other Substrates	17,500	17,500	----
LM-45-61	Lead Powder Metallurgy Sheet and Extrusion	23,750	23,750	----
ULM-1	Lead Composite Products in Construction	5,000	----	5,000
ULM-7	Heavy Lead Cladding for Chemical Plant Use	15,000	----	15,000
ULM-13	Plumbing Applications of Lead	15,000	----	15,000
ULC-1	Ceramic Coatings for Cementitious and Metallic Surfaces	30,000	----	30,000
<u>Transportation Market</u>				
LM-9-62	Investigation of Metal Fiber Reinforced Lead	35,000	----	35,000
LC-34-62	Anticorrosive Properties of Lead Pigments in Water Reducible Ferrous Metal Primers	5,000	----	5,000
<u>Cable Sheathing Market</u>				
LM-8-62	Fundamental Investigation of Lead Powder Metallurgy	15,670	----	15,670
ULM-5	Development of Composite Plastic Cable Sheathing	10,000	----	10,000
ULM-10	Development of Commercial Lead Alloy Systems	35,000	----	35,000
<u>Chemical Market</u>				
LC-18-62	A Fundamental Study of Organolead Chemistry	10,000	----	10,000
LC-28-62	Organolead Chemistry	10,000	----	10,000
ULC-2	Opacifiers, Stabilizers, and Crosslinking Agents for Polymers	5,000	----	5,000
ULC-9	Lead Compounds in Adhesives	5,000	----	5,000

LIA01139

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<u>Project No.</u>	<u>Title</u>	<u>Contract Price</u>	<u>Funds Available from Previous Budgets</u>	<u>Funds Required 1962</u>
	<u>Paint Market</u>			
LC-50-62	The Use of Lead Pigments in Air Drying Water Thinnable Paints for Wood	1,500	----	1,500
	<u>Textile Market</u>			
ULC-3	Improvement of Textile Materials by Lead Chemical Treatments	5,000	----	5,000
	<u>Ceramic Market</u>			
LC	Ceramic Fellowship Program	30,000	----	30,000
LE-29-62	A Fundamental Study of Surface Reactions of Lead	4,000	----	4,000
	<u>General</u>			
ULM-4	Determination of Surface Tension of Lead and Its Alloys	5,000	----	5,000
ULE-5	Corrosion of Lead in Various Media	30,000	----	30,000
ULM-8	Improvement of Lead Collapsible Tubes	(3,000	from 1962 Undesignated Research Funds)	
LP-38-62	Corrosion Research Council	500	----	500
LP-52-62	Abstracting Service	4,000	----	4,000
	Undesignated Research Funds	50,000	----	50,000
	1962 BUDGET RECOMMENDATIONS GRAND TOTAL			\$388,040

December 4, 1961

LIA-EXPANDED RESEARCH PROGRAM
BUDGET PERFORMANCE

	I 1960	II 1961	III 1962
	Budget Performance (As of 12/31/61 Estimated)	Budget Performance (As of 12/31/61 Estimated)	Proposed Budget
A. Approved Budget			
1. Research	\$297,000.00	\$265,000.00	\$388,040.00
2. Administration	62,330.00	76,875.00	111,190.00
3. Total (1+2)	\$359,330.00	\$341,875.00	\$499,230.00
B. Receipts			
4. Pig Lead Assessment	\$355,038.00 (\$.34/ton)	\$309,701.00 (\$.26/ton)	\$334,478.56 (1) (\$.26 ton - 1,286,456 tons est.)
5. Interest on Savings Accounts	1,772.94	3,500.00	3,500.00
6. Miscellaneous	---	---	---
7. Total (4+5+6)	\$356,810.94	\$313,201.00	\$337,978.56
C. Interbudget Transfers			
8. From Previous Budgets	\$ 89,662.58	\$ 62,565.21	\$ 30,370.32 (I 18 + II 18)
9. Into Following Budgets	58,739.73	---	---
10. Readjusted Budget (7+8-9)	\$371,733.79	\$375,766.21	\$368,348.88
D. Disbursements			
11. Research	\$224,755.24	\$ 93,517.31	\$131,000.00
12. Administration	62,906.21	81,400.00	111,000.00
13. Total (11+12)	\$287,661.45	\$174,917.31	\$242,000.00
E. Balance Available for Operations			
14. Lines (10-13)	\$ 50,072.34	\$200,848.90	\$126,348.88
F. Remaining Project Expenditures			
15. Projects Under Contract	\$ 35,009.23	\$160,541.69	
16. Projects Approved-Contracts to be Let	12,500.00	12,500.00	
17. Total (15+16)	\$ 47,509.23	\$173,041.69	
G. Reserve Fund			
18. Lines 14-17)	\$ 2,568.11	\$ 27,807.21	

LIA01141

N 673.18

1961

December 4, 1961

-2-
 LIA- Planned Research Program
 Budget Performance

H. Cash on Hand at End of Fiscal Years

19. 12/31/1958	\$(17,650.72) (Actual)
20. 12/31/1959	92,888.62 (Actual)
21. 12/31/1960	218,621.57 (Actual)
22. 12/31/1961	250,921.24 (Estimated - Lines I 14 + II 14)
23. 12/31/1962	138,848.88 (Estimated - Note 2 below)

(1) The assessment rate required to provide funds for the total 1962 budget is \$.362/ton which would yield \$465,697.07. This sum combined with that in column III, lines 5 and 8 total \$499,567.39. The Industry Development Committee recommends that the assessment rate be reduced as shown to diminish the cash position. It is estimated that the reduced assessment will result in a cash position of \$138,848.88 on 12/31/62 (Line H 23 above). In order to meet the total project commitments of the 1962 budget it is estimated that a minimum of \$88,000 additional (\$.07/ton) will have to be raised through assessment in 1963. (This will be over and above the funds required to finance the 1963 budget through fiscal year 1963).

(2) Funds Available for Operations in Fiscal Year 1962

a. Cash on Hand 12/31/1961	\$250,921.24	H 22 estimated)
b. 1962 Total Receipts	317,278.56	(III 7)
c. 1962 Operations Fund (Lines a+b)	\$588,899.80	

Expenditures in Fiscal Year 1962

d. From 1962 Budget	\$242,000.00	(III 13 estimated)
e. From 1961 Budget	160,541.69	(II 15 estimated)
f. From 1960 Budget	47,509.23	(I 17 estimated)
g. Total Expenditures (Lines d+e+f)	\$450,050.92	

Cash on Hand 12/31/62	
h. Lines (c-g)	\$138,848.88

LIA01142