Expense Account and Bill for Services in Consultation

of

ROBERT A. KEHOE, M. D.

Trip to visit National Lead Company Plant in St. Louis from Rochester, New York.

Airplane fare, equivalent to that from Cincinnati to St. Louis and return	$48.06
Hotel - 1 night	11.44
Meals	5.19
Taxi, airport limousine, tips and incidentals ...	9.65
	74.34
Consultation fee - 1 day -	150.00
TOTAL.	$224.34

September 23, 1960

Mr. Henry J. Whitson
National Lead Company
111 Broadway
New York 6, New York

Dear Mr. Whitson:

I enclose herewith two copies of a report which is a composite of a fairly detailed report provided to me by Mr. Cholak and of my interpretation and conclusions. This will cover the ground I believe, and while it has been long in coming forth it is sufficient in detail and scope to suit your purposes. As I pointed out to you on the telephone, it does not advance the purpose which we had in mind in undertaking it. It supplies useful information, however, that enables us to speak with some assurance from the aspect of industrial hygiene.

I cannot in all honesty accuse myself of any negligence in not having put the fully assembled information in your hands sooner, for I have done the best I could do, with one exception, in trying to work my way out from under the difficulties which were brought upon me by the necessity of going abroad on a special and wholly unanticipated mission in June and July. I should, however, have noted carefully the analytical findings on the blood of your Company's employees instead of glancing at them hurriedly and making certain assumptions about them. I should then have reported them to you, in advance of the completion of the report, with my recommendations concerning them. I sincerely hope that no harm will have come to the men or to your situation through my failure to act promptly in this way, but whether there has been, or may later be, trouble about this, I do not excuse myself for this professional fault.

In due course, when we have put the proper information in the hands of the business office of the Laboratory, a bill will be sent to cover the cost of the performance of this work and the preparation of the reports. Meanwhile, if you wish to direct any inquiry to me as to what might be done further, I shall be able to reply reasonably promptly. I am returning on October 13th to London to be gone until the 28th.

Cordially yours,

Robert A. Kehoe, M.D.

RAK:ss

Enclosure - 2 copies of report

The Potential Hazard of Lead Absorption Associated With the Handling of a Specific Paint Pigment Developed and Manufactured by National Lead Company

I. Statement of the Problem and the General Methods of Investigation.

A special pgiment has been developed for the purpose of providing better and more lasting protection of metallic surfaces against corrosion than that which appears to be given by previously available paints. it seemed likely that a pigment with such properties of resistance to chemical attack might also be relatively inert within the human body and, therefore, might be relatively low in potential hazard, from the occupational viewpoint, when used in paints to be applied to metallic surfaces and objects in the production lines of industry. In order to obtain some evidence, of at least a suggestive type, on this point, prior to the actual introduction of such paint into commercial use on a large scale, certain observations were planned and carried out, whereby the order of magnitude of the respiratory exposure of the few workmen, who have been engaged in the production and packaging of the dry pulverized pigment, would be estimated, and the extent of the absorption of lead by these individuals could be determined. By such means, one might hope to discover whether the absorption of lead by the workmen was in general keeping with the apparent intensity of their respiratory exposure to lead, or whether there was a fairly obvious quantitative discrepancy between exposure and absorption. In view of the impossibility of making a precise appraisal of the conditions to which the workmen had been exposed during the period of employment which preceded this survey, and considering, also the extent to

which the physiologic responses of men to the absorption of lead are dependent upon the factors of time and the variability of the daily intake of lead, it was evident that little or nothing could be learned by any number of observations of the type contemplated, unless the discrepancy between the estimated magnitude of the exposure and the quantitative evidence of absorption should turn out to be large. Nevertheless the attempt seemed to be justified, since even a limited number of observations could be expected to reveal the status of the workmen, with respect to the extent of their absorption of lead.

Pursuant to these considerations, two types of information were sought in connection with the operations by which the paint pigment was being manufactured. No other operations, save those concerned with the production of this product, were being carried out within this isolated part of the general plant, and there was no reason to believe that other operations in adjacent areas of the plant were exerting an influence upon the basic environmental conditions which surrounded these operations.

1. A single brief survey of the dispersion of lead compounds in the atmosphere in the vicinity of all of the operations was made while the operations were being carried out in routine manner. The air was sampled in such a way as to yield fairly representative results and the samples were returned to The Kettering Laboratory for analysis. The results, and a brief discussion of their significance, are provided in part II of this report.

2. Samples of the urine and blood of the workmen were obtained in containers supplied by this Laboratory, according to prescribed procedures, and were shipped to the Laboratory. The samples were identified by labels on which the name of the workman was inscribed, and a brief notation of the employment status of each man was provided. The information obtained in the latter notations is tabulated in part III of this report.

II. The Results of a Survey Made on One Day Only in The Plant in Which Basic Lead Silico Chromate Pigment, "M50" was Being Produced.

A brief analytical survey was undertaken on June 28, 1960, to determine the concentrations of lead in the air in association with the manufacture of basic lead silico chromate pigment "M50", in the St. Louis, Missouri plant of National Lead Company. The findings are representative only of the conditions existing on that day. They cannot be regarded as indicative of generally prevailing conditions, for there may be wide variations from time to time in accordance with seasonal influences or changes in the rate of production of the pigment.

Operating Conditions:

Pigment "M50" is a chemically active paint pigment, of which the colored ingredient is bonded to the surface of a chemically inert material. The pigment is produced in what may be considered an essentially closed system, except as it is vented to dust collectors, on the one hand, and is emptied into containers, on the other. Fine silica charged from bags into a hopper is carried by means of a screw conveyor and a ventilated elevator conveyor to a pebble mill, where it is ground in water for several hours. The contents of the pebble mill are then emptied into a reaction vessel to which the appropriate quantities of litharge and chromic acid are added. The charge of litharge is added mechanically through a weighing tank, while the chromic acid charge is prepared manually by dumping the contents of two drums into water to form a solution which is added to the reaction vessel. After a suitable period of residence in the reaction tank the slurry is pumped to a surge tank and the above process is repeated to produce the next batch of pigment.

The slurry is pumped to an Oliver drum-suction filter, where the pigment

is separated from the water and is transferred by means of a screw conveyor to a kiln for drying. The dried pigment then is carried by an elevator to storage, from which it is fed continuously to a Raymond Ink Mill in which the particles are ground to the desired size. The ground product passes to a storage tank and finally to a bagging machine for packaging.

Four dust-collectors are connected to the various units of the production equipment. One collector serves the silica elevator and pebble mill, a second is used to collect dust produced in the equipment used to charge and move the litharge and chromic acid, a third serves the kiln, elevator, conveyor, pigment storage and the Raymond Mill, while the fourth air-cleaning unit collects dust produced by the bagging machine.

The greatest and most continuous exposure to dust occurs at the charging hopper, when bags of silica are emptied, and at the bagging machine, when the pigment is packaged. The amount of dust produced at the latter machine depends partly on the manner in which the operator check-weighs the bags and handles the filled bags while loading the palletes. A brief exposure to particulate chromic oxide occurs during the time that each drum of chromic acid is emptied, and exposure to lead dusts may also occur when the contents of the weigh-tank are added to the reaction-tank. On the day of this survey, the slide valve on the weigh-tank was warped and particles of litharge escaped into the room for a short period of time. This opening was sealed by applying a mastic material to the valve, after which the weigh-tank was emptied satisfactorily of its content of litharge. The employees always wore respirators when working at the litharge weigh-tank and the bagging machine, and when emptying bags of silica.

The housekeeping in the plant generally was good, floors and equipment

being cleaned up several times during each shift. Nevertheless the floors in some areas were stained with the highly colored pigment, and the clothes of the workmen also became contaminated with pigment and silica when they handled the bagged materials. Compressed air was used to remove dust from the clothing, and some dry sweeping was being carried out with a push broom and "dust down". These two procedures are unsatisfactory, as will be indicated later.

Procedures:

Dusts were removed from the air in the various areas of the plant by means of an electrostatic precipitator, or by filtering the air through Whatman #40 filter paper or through a millipore filter. The samples of dusts were then analyzed for their content of lead by the colorimetric dithizone extraction procedure customarily used in The Kettering Laboratory.

Results:

The concentrations of lead in the air at the various locations in the plant are tabulated in Table 1. The content of lead in dusts removed from various structures is also indicated. A summary giving the average concentration of lead at the various locations, and the overall average concentration of lead in the air of the plant, is given in Table 2.

Discussion and Conclusion:

When the findings are considered in relation to the threshold limit of 0.2 mg. Pb/M^3 commonly regard as applicable to safe industrial practice in the U.S.A., it appears that the environmental conditions, in this respect, are satisfactory. It should be borne in mind, however, that the findings of this survey relate only to a single day of operation, and that

Table 1

Levels of Concentration of Lead in the Atmosphere at a Number of Locations in the Area Where M50 Pigment Was Being Manufactured

Analysis Number	Location	Time	Mgs. Pb/M^3
60A-5297	General Air. 15 feet from the bagging operation and 15 feet from the outside door (No bagging being done)	8:32-8:54 a.m.	0.036
60A-5298	Breathing Zone. While the Raymond Hammer Mill was being repaired (No bagging being done)	8:35-8:45 a.m.	0.160
60A-5299	Breathing Zone. Between the kiln and control panel	8:56-9:28 a.m.	0.023
60A-5300	General Air. 15 feet from the bagging machine and 15 feet from the outside door	9:41-9:53 a.m.	0.036
60A-5301	Breathing Zone. While M50 was being bagged	9:43-9:53 a.m.	0.127
60A-5302	General Air. At the Raymond Hammer Mill	10:02-10:17 a.m.	0.071
60A-5303	General Air. Between X45 bagging machine and the silica charging conveyor	11:14-12:45 p.m.	0.035
60A-5304	Breathing Zone. At the Oliver filter	11:07-11:49 a.m.	0.179
60A-5305	Breathing Zone. While M50 was being bagged	11:22-11:43 a.m.	0.027
60A-5306	Breathing Zone. At the reaction tank while the pebble mill was being emptied	11:55-12:35 p.m.	0.033
60A-5307	Breathing Zone. At the reaction tank while 300 pounds of litharge were being added	12:37-12:51 p.m.	0.044

Table 1, Page 2

Analysis Number	Location	Time	Mgs. Pb/M^3
60A-5308	General Air. Near the operators desk and 15 feet from the bagging machine	12:50-4:07 p.m.	0.011
60A-5309	Breathing Zone. At the reaction tank while the tank was being rinsed and acid was added	12:55-1:23 p.m.	0.127
60A-5310	Breathing Zone. While two drums of chromic acid were being dumped	12:57-1:02 p.m.	-
60A-5311	Breathing Zone. At the reaction tank while litharge and chromic acid were being added	1:25-1:53 p.m.	0.093
60A-5312	Breathing Zone. While 4 bags of silica flour were being emptied	1:30-1:31 p.m.	-
60A-5313	Breathing Zone. While 4 bags of silica flour were being emptied	1:42-1:55 p.m.	-
60A-5314	Breathing Zone. Between the kiln and the control panel	2:02-2:32 p.m.	0.064
60A-5315	Breathing Zone. While bags of silica flour were being emptied	2:35-3:21 p.m.	-
60A-5317	Settled dust from structures over reaction tank	-	40.8%
60A-5318	Settled dust from structures over the kiln and hammer mill	-	16.0%

Table 2

Summary of Levels of Lead Concentration in the Atmosphere at
Number of Locations Where Pigment M50 Was Being Manufactured

Location and Description	Number of Samples	Duration of Sampling in Minutes	M Average
General Air. 15 feet from the bagging operation and 15 feet from the outside door	3	51	0.023
Breathing Zone. While Raymond hammer mill was being repaired (no bagging being done)	1	10	0.160
Breathing Zone. Between the kiln and the control panel	2	62	0.044
Breathing Zone. While M50 was being bagged	3	41	0.101
General Air. At the Raymond hammer mill	1	15	0.071
General Air. Between X45 bagging machine and the silica charging conveyor	1	91	0.035
Breathing Zone. At the Oliver drum filter	1	42	0.179
Breathing Zone. At the reaction tank during the charging operation	4	110	0.073
Average Concentration		422	0.070

the prevalent conditions of atmospheric contamination with lead can be portrayed only by a systematic program of repeated air sampling which would take into consideration the many factors affecting the dispersion of lead dusts into the atmosphere. Moreover, any factors that contribute to the ingestion (swallowing) of lead compounds must also be taken into account. Our observations in this plant indicated that several of the operations were potentially hazardous. These areas have been recognized, and respirators are worn regularly by the employees during the conduct of the operations. Careless habits of work, the use of ill-fitting respirators, or the failure to use a respirator during these operations might result in potentially hazardous exposure to lead.

III. The Results of a Single Survey of the Levels of Lead Absorption of Workmen Engaged in the Production of a Pigment, M50, as Demonstrated by the Concentration of Lead in their Urine and Blood.

The number of men engaged in this work was small, and consequently all were included in these examinations. It did not appear that a searching occupational history or a comprehensive medical history would contribute materially to the information being sought for the specific purpose of this investigation, however desirable such information might be for other reasons. Nor did it seem likely that detailed medical examinations would prove to be useful for the specific purpose indicated in part I of this report. The idea behind the observations, as so indicated, was that of establishing, in the simplest and least costly manner, the relationship between the occupational exposure of the men to lead and their physiological response thereto. Whatever else might be learned, from the aspect of industrial hygiene or other considerations, was regarded as purely incidental and subject to such later consideration as

circumstances might suggest. Accordingly, only the most pertinent facts concerning the employment of the men were obtained, together with their names and ages. These facts are assembled in Table 3 below.

Table 3

Pertinent Information Concerning Workmen
(Obtained June 23, 1960)

Name	Age (years)	Present job	Time so employed (years)	Previous jobs in plant	Intervals of freedom from exposure
[redacted]	25+	Operator	1	None	24 days, November 1959
[redacted]	37-	Operator	8-	None	8 weeks 1953 Vacations annually
[redacted]	22-	Packer	0.9	Oxide Dept.	63 days, November 1959
[redacted]	42+	Operator	6+	" "	No lay-off since 1958 No vacation since 1958
[redacted]	20	Packer	1	" "	63 days, November 1959
[redacted]	37	Packer	4.3	" "	No lay-off since Nov.1958 An.Vacation 1 wk.July 1959
[redacted]	20	Packer & Re.Operator	1	" "	25 days, N vember 1959
[redacted]	35	Operator	6	" "	An. Vacation -Dec.1959

The data obtained by the analysis of the urine and blood of the workmen have been assembled in Table 4 below.

Table 4

NAME	URINE			BLOOD				
					Spectrographic		Dithizone	
	Analysis Number	Vol. ml.	Mg.Pb/ Liter	Analysis Number	Weight Grams	Mg.Pb/ 100g.	Weight	Mg.Pb/ 100 g.
[redacted]	60A-5277	68	0.03	60A-5278	10.9	0.05	16.2	0.05
[redacted]	60A-5279	50	0.02	60A-5280	4.9	0.09	*	0.07
[redacted]	60A-5281	39	0.08	60A-5282	4.7	0.08	11.0	0.07
[redacted]	60A-5403	60	0.015	60A-5404	7.9	0.05	12.6	0.05
[redacted]	60A-5283	44	0.02	60A-5284	9.1	0.07	15.1	0.05
[redacted]	60A-5405	65	0.29	60A-5406	11.7	0.11	22.1	0.09
[redacted]	60A-5407	70	0.11	60A-5408	8.2	0.075	13.7	0.05
[redacted]	60A-5409	61	0.06	60A-5410			11.2	0.05**

*One tube; both analyses run from the same sample
**Checked

Physiological Significance of the Analytical Data

Viewing the results of the analyses of the urine and blood for their significance, without immediate reference to the specific question posed for answer, it is noted that one man in the group has absorbed a dangerous quantity of lead, and that two others have absorbed quantities, which, in terms of the concentration of lead in the blood, are not far from the threshold of danger. These men, in the decreasing sequence of the extent of their absorption, are Silas Taylor, whose blood and urine as well, give evidence of excessive absorption; William E. Hill, whose blood level,

if taken as the average of the two results, is just at the threshold value (we consider the value of 0.07 mg. per 100 grams to be nearer to the truth, in all likelihood, because of the demonstrably lesser variability of results obtained by the "dithizone" method of analysis), while the urinary concentration of lead is disproportionately low (probably by mere chance); and [redacted] whose blood level is not far from the threshold, while the urinary lead concentration is in the upper normal range. The other members of the group have yielded significantly lower (but probably not strictly normal) levels of lead concentration in their blood, and highly variable concentrations (all within the normal range but in the upper normal zone) of lead in their urine. The reason for the parenthetical reference to the improbability that any result on the blood is "strictly" normal, lies in the fact that, while values of 0.05 mg. per 100 grams are in the upper normal range, there is no representation, in this group of samples, of the low or intermediate zones of the normal range. One accepts the likelihood, therefore, that all persons within this group have absorbed some lead in the course of their employment.

In general, the absorption of lead by the men in this group, as revealed by the analyses of the blood, have not been such as to categorize their jobs as hazardous, but two packers have yielded relatively high results (one is in danger), while only one of the operators has a comparatively high value. It seems reasonably certain that the worst hazard attaches itself to the job of "packing".

Some remarks on the practical significance of the concentration of lead in the urine and blood, as an indication of the time of occurrence and the extent of the absorption of lead, as well as the relationship of

of these matters to the initiation of lead poisoning, may be useful at this point in this report. It has been demonstrated experimentally and in practice, that the concentration of lead in the blood, and the rate of the excretion of lead in the urine, when considered in relation to the duration of occupational exposure, provide the best means of appraising the hygienic significance of the exposure and the extent of the hazard associated therewith. Indeed, it has been shown that these are the only reliable means of estimating the significance of occupational exposure to lead, from the aspect of preventive medicine. All other methods are non-specific, and are unsatisfactory, in that they do not constitute a means of measuring the intensity of the exposure to, and the absorption of, lead. To abbreviate and go straight to the point, it has been shown beyond controversy that the normal, healthy individual in the general population, who has had no occupational or otherwise unusual exposure to lead, has a level of lead concentration in his blood which may range within the limits of 0.01 to 0.05 mg. per 100 grams and will average 0.03 mg. per 100 grams. Under the conditions of non-hazardous exposure to lead, the concentration in the blood may be as high as 0.07 to 0.075 mg. per 100 grams, but if the exposure (and absorption) is such that the level is in excess of 0.08 mg. per 100 grams, the individual may develop symptoms and signs of intoxication. Through comparative investigations in industry, it has been demonstrated, entirely pragmatically, that cases of poisoning occur within groups of workmen under conditions which give rise to levels of lead concentration in their blood in excess of 0.08 mg. per 100 grams, and that the incidence of the disease (which does not affect all individuals at the same time or at any time) increases, as does also its severity, as the concentration in the blood of groups of workmen

increases. Hence we may use the blood level associated with a specific occupation or industry, as an indication of the hazard therein, and as a means of determining whether or not measures of hygienic control are required to prevent poisoning. In the case of the individual, we remove him from exposure, before he has a chance to become ill, when he reaches a point just under the threshold value, and return him to work later when he has returned to a normal or safe level, preferably after the unsatisfactory situation has been corrected.

The same general principles apply also to the lead in the urine, with the exception that one can never be quite so precise in his appraisal of the status of an individual, because of the intrinsic variability of the urinary excretion of lead, for physiological reasons. Thus more frequent and more extensive sampling and analysis of the urine are required to provide information equivalent to that which can be obtained by the analysis of the blood. Under the conditions of occupational exposure to lead, however, the urinary findings are highly useful, in themselves, since, as a generalization which does not always hold true in the individual case, the rate of the urinary excretion of lead by the members of an occupational group provides a very good indication of the extent and the variability of the exposure of the men in their daily work, from time to time. The blood, on the other hand, reveals, much better than the urine, the extent of the body burden of lead (the total, overall accumulation of lead in the tissues). The normal concentration of lead in samples of urine of small volume (80-120 ml.) ranges from 0.01 to 0.12 (occasionally as high as 0.14) mg. per liter, the mean (or average) being 0.03 mg. per liter. The levels may range up to 0.17 or even 0.20 mg. per liter and average around 0.10 - 0.12 mg. per liter, under

the conditions of safe occupational exposure to lead, but when they reach or exceed 0.30 mg. per liter and average around 0.15 to 0.18 mg. per liter, (dependent upon climatic and certain other factors) they are indicative of the same degree of danger that is associated with blood levels of 0.08 mg. or more per 100 grams of whole blood.

In the light of the preceding paragraphs, it will be apparent that the work in which certain of these men have been engaged is hazardous, and that cases of lead poisoning can be expected to develop among these men at some future time unless steps are taken to reduce the number and severity of the opportunities for absorbing lead in the course of their work. This applies with special pertinence to the job of filling bags with the pigment.

The status of Silas Taylor was such that his exposure to lead should have been terminated summarily. He was not ill, presumably, or at most, not ill enough to be unable to work, and he may not have developed any illness since, but even if he is without any complaint, he should be transferred to work involving no exposure to lead until the lead in his blood shall have dropped to a safe level. The other two men with relatively small margins of safety should also be protected by suitable means against further excessive exposure, and certainly, improvements in the environmental conditions should be made promptly. Some such improvements (elimination of sweeping and use of compressed air jets for dusting, avoidance of breakage of bags and spillage of contents during filling operations) can be affected at once. Such other steps as may be needed to maintain complete safety can be determined later as required.

It is also recommended, as a means of controlling the hazards of

this and other parts of the plant (Oxide Department), that some monitoring of the atmospheric conditions be initiated and repeated at suitable intervals, and that the medical supervision be revised to comply with modern criteria of preventive medicine (we were not consulted in relation to these matters, but a reasonable degree of professional responsibility and candor calls for these advisory remarks.)

IV. Discussion of the Findings in Relation to the Original Objective.

It will be evident that the analytical findings in the blood and urine of the workmen in this plant, when considered in relation to the results of the analysis of samples of air, do not justify the conclusion that there is any striking, intrinsic obstacle to the absorption of this lead compound. On the contrary, the air analyses, of themselves, would appear to demonstrate that the environmental conditions associated with its production have been generally safe (there is sufficient reason, on the basis of certain observed practices to believe that this is not strictly true), whereas the analyses of the urine and blood have revealed the existence of a potentially dangerous degree of absorption. The conclusion must be, therefore, that the same type of precautions must be taken to avoid occupational exposure to this lead-containing product that are applied to other, more common compounds of lead. We see no good reason why the control of exposure should not be achieved satisfactorily in the establishments in which this product is projected for use. This, however, is not pertinent to this discussion, except in passing.

Certain properties of this pigment have come to our attention in the course of these observations (and a preliminary visit to the plant).

One of these that is noteworthy in limiting the hazard of various procedures concerned with the handling of the material in a dry state, is the heaviness of the compound, as well as a tendency on the part of the particles to clump together and fall out of the air rapidly, instead of giving rise to a more or less persistent dispersion of dust in the air. Despite our lack of information as to how this product would be supplied to its users, and our assumption that it would be provided as a ready-mixed liquid paint or more concentrated paste, it seems worth while to mention this property of the product. From this aspect of the matter, this pigment should be capable of being handled with less hazard, under a given set of conditions, than that which is associated with some of the fluffier pigments.

From The Kettering Laboratory in the Department of Preventive Medicine and Industrial Health, College of Medicine, University of Cincinnati, Cincinnati, Ohio

Work and report by:

Robert A. Kehoe, M. D.
J. Cholak, Ch.E.
L. J. Schafer, B.S.E. (Ch.E.)

Approved: Robert A. Kehoe
Robert A. Kehoe, M. D.
Director

Date: July 18, 1960

Source: Employees of National Lead Company, 5548 Manchester Avenue, St. Louis 10, Missouri

Material: Urine and Blood

Submitted: 6-30-60 and 7-5-60 by Mr. H. J. Whitson, National Lead Company, 111 Broadway, New York 6, N. Y.

Required: Lead Analyses

Name	URINE			BLOOD				
					Spectrographic		Dithizone	
	Analysis Number	Volume ml.	Mg. Pb/ Liter	Analysis Number	Weight Grams	Mg. Pb/ 100 g.	Weight Grams	Mg. Pb/ 100 G.
[redacted]	60A-5277	68	0.03	60A-5278	10.9	0.05	16.2	0.05
[redacted]	60A-5279	50	0.02	60A-5280	4.9	0.09	*	0.07
[redacted]	60A-5281	39	0.08	60A-5282	4.7	0.08	11.0	0.07
[redacted]	60A-5403	60	0.015	60A-5404	7.9	0.05	12.6	0.05
[redacted]	60A-5283	44	0.02	60A-5284	9.1	0.07	15.1	0.05
[redacted]	60A-5405	65	0.29	60A-5406	11.7	0.11	22.1	0.09
[redacted]	60A-5407	70	0.11	60A-5408	8.2	0.075	13.7	0.05
[redacted]	60A-5409	61	0.06	60A-5410			11.2	0.05**

*One tube; both analyses run from the same sample
**Checked

Reported: 7-12-60

KE 0018403

ST. LOUIS LEAD AND OIL WORKS

June 23, 1960

CALCINED PRODUCTS DEPARTMENT

NAME: [redacted] DATE OF BIRTH: 11/25/35 JOB: Operator

DATE IN DEPARTMENT: 6/23/59

LAYOFF DATES: 11/13/59 - 12/7/59

VACATION DATES: None

PREVIOUS JOBS IN PLANT: None

KE 0018404

ST. LOUIS LEAD AND OIL WORKS

June 23, 1960

CALCINED PRODUCTS DEPARTMENT

NAME: [redacted] DATE OF BIRTH: 7/29/23 (60 ~~37~~) JOB: Operator

DATE IN DEPARTMENT: 5/13/52

LAYOFF DATES: 12/23/53 - Approximately 8 weeks

VACATION DATES:

Week Ending
9/5/53
7/9/54
7/8/55 & 7/15/55
7/9/56 & 7/16/56
7/5/57 & 7/12/57
7/11/58 & 7/18/58
7/5/59 & 12/27/59

PREVIOUS JOBS IN PLANT: None

KE 0018405

ST. LOUIS LEAD AND OIL WORKS

June 23, 1960

CALCINED PRODUCTS DEPARTMENT

NAME: [redacted] DATE OF BIRTH: 11/17/38 JOB: Packer

DATE IN DEPARTMENT: 8/12/59

LAYOFF DATES: 11/13/59 - 1/18/60

VACATION DATES: None

PREVIOUS JOBS IN PLANT: Oxide Department - Laborer

KE 0018406

ST. LOUIS LEAD AND OIL WORKS

June 23, 1960

CALCINED PRODUCTS DEPARTMENT

NAME: [redacted] DATE OF BIRTH: 1/24/18 JOB: Operator

DATE IN DEPARTMENT: 3/11/54

LAYOFF DATES:

12/1/54	-	Approximately 4 weeks
3/18/55	-	" 5 "
1/1/56	-	" 3 "
10/31/56	-	1/28/57
4/5/57	-	5/6/57
11/1/57	-	3/3/58

VACATION DATES:

Week Ending
7/9/54
7/8/55
7/9/56 & 7/19/56
7/5/57 & 7/12/57
7/11/58 & 7/18/58
1959 - None

PREVIOUS JOBS IN PLANT: Oxide Department - Packer

KE 0018407

ST. LOUIS LEAD AND OIL WORKS

June 23, 1960

CALCINED PRODUCTS DEPARTMENT

NAME: [redacted] DATE OF BIRTH: 6/10/40 JOB: Packer

DATE IN DEPARTMENT: 7/15/59

LAYOFF DATES: 11/13/59 - 1/18/60

VACATION DATES: None

PREVIOUS JOBS IN PLANT: Oxide Department - Laborer

KE 0018408

ST. LOUIS LEAD AND OIL WORKS

June 23, 1960

CALCINED PRODUCTS DEPARTMENT

NAME: [redacted] DATE OF BIRTH: 8/27/23 JOB: Packer

DATE IN DEPARTMENT: 2/9/56

LAYOFF DATES:

12/2/55	-	Approximately 6 weeks
3/23/56	-	" 4 "
10/31/56	-	1/28/57
3/29/57	-	5/13/57
11/1/57	-	3/3/58

VACATION DATES: Week Ending
7/9/56
7/5/57
7/11/58 & 7/18/58
7/5/59 & 7/12/59

PREVIOUS JOBS IN PLANT: Oxide Department - Laborer

KE 0018409

ST. LOUIS LEAD AND OIL WORKS

June 23, 1960

CALCINED PRODUCTS DEPARTMENT

NAME: [redacted] DATE OF BIRTH: 10/13/40 JOB: Packer and Relief Operator

DATE IN DEPARTMENT: 7/13/59

LAYOFF DATES: 11/13/59 - 12/7/59

VACATION DATES: None

PREVIOUS JOBS IN PLANT: Oxide Department - Laborer

KE 0018410

ST. LOUIS LEAD AND OIL WORKS

June 23, 1960

CALCINED PRODUCTS DEPARTMENT

NAME: [redacted] DATE OF BIRTH: 6/29/25 JOB: Operator

DATE IN DEPARTMENT: 2/26/54

LAYOFF DATES:

12/1/54	-	Approximately	4 weeks
3/18/55	-	"	5 "
1/1/56	-	"	3 "
3/23/56	-	"	4 "
10/31/56	-	1/28/57	
4/5/57	-	5/14/57	
11/1/57	-	3/4/58	

VACATION DATES:

Week Ending
7/9/54
7/8/55
7/9/56 & 7/16/56
7/5/57 & 7/12/57
7/11/58 & 7/18/58
7/5/59 & 12/27/59

PREVIOUS JOBS IN PLANT: Oxide Department - Packer

KE 0018411