February 8, 1964

William Weingarten, M.D.
Nassau Smelting and Refining Company, Incorporated
Staten Island 7, New York

Dear Doctor Weingarten:

I enclose with this report (and the bill for the analytical service) a fairly detailed interpretation of the findings with recommendations. Since I do not know much about the problem of personal relations with which you (and the management of the Company) are faced, I have separated the interpretation from the analytical report, although they are parts of the same document. I cannot emphasize more than is appropriate, however, the importance of facing the facts represented in this report in a realistic manner. It is necessary to protect these men against the immediate hazard of their job, when it reaches the point of danger in the individual case. It is also essential to recognize that there is only one way to deal, in the long run, with the general hazard - namely, to reduce it to the point of safety, by satisfactory technical control of the environment.

It is barely possible to bring about such control, temporarily, by means which will control the respiratory and alimentary exposure of the individuals by an adequately disciplined and supervised use of satisfactory respiratory devices, by the careful avoidance of such respiratory exposure through meticulous cleanliness of body and clothing outside of the hours of work, and by the avoidance of the ingestion (swallowing) of lead during the day's work. In the long run, however, the facilities of the plant must be such as to prevent, automatically, all dangerous forms of respiratory and alimentary exposure during the day's work, through the elimination of opportunities for exposure which call for anything more than the ordinary caution and alertness of the average workman.

I realize that what I have said above is sometimes difficult and costly to achieve. I can not alter it on that account. It is the only sound advice that can be given.

Sincerely yours,

RAK:vr

Robert A. Kehoe, M.D.

Encl. - 5

Plant: Nassau Smelting and Refining Company, 1 Nassau Place, Tottenville, Staten Island, New York 10307

Inspection: September 13, 1964, by J. Cholak

Survey: September 22 - 23, 1964, by L. J. Schafer and D. Yeager

The plant reclaims lead and other metals (tin, copper, copper alloys) from scrapped telephone equipment. The operations are conducted in several buildings and in open-sided roofed-over areas. Such operations as stripping and sweating are carried out in the partially enclosed shelters, while melting, alloying, casting and extruding and trimming facilities are located in totally enclosed buildings. In the partially enclosed shelters, natural ventilation and the use of filter respirators are depended upon to protect the workmen. Except for a few kettles or pots, most of those used for melting and alloying purposes are located beneath canopy hoods, which are usually provided with sides to enclose the vessels partially. A large kettle, used to prepare "blue metal", and the two pots on the die casting machines are not provided with ventilated hoods or with local exhaust ventilation.

Procedure

Air-borne fume and dusts were removed from the atmosphere at the various operations by drawing air at a rate of 3 cu. ft. per minute through the collector tube of a portable electrostatic precipitator. A Homelite, portable generator of suitable capacity, driven by a gasoline engine, was used to provide the electric power needed to operate two electrostatic precipitators simultaneously. Samples of airborne fume and dust were also collected on membrane (Millipore) filters inserted into the sampling inlet of the Uni-jet sampler operated at a rate of 3 liters per minute. Sampling periods were generally more prolonged than 15 minutes, except for those operations (dross removal for example) which persisted for shorter periods of time. All samples were returned to the Kettering Laboratory for analysis of their content of lead by the standard colorimetric dithizone procedure used in the Laboratory. (Cholak, J., Hubbard, D. M., and Burkey, R. E., Microdetermination of Lead in Biological Material with Dithizone Extraction at High pH. Anal. Chem. 20, 671, 1948)

<u>Results</u>

The levels of concentration of lead, expressed as Mg./M^3 in the atmosphere at the various operations, are listed, by area, in a terminal table.

<u>Discussion</u>

<u>Areas for Receiving and Sorting Scrap:</u>

Freight cars, partially or totally filled with scrapped, lead-covered cable, are unloaded by a crew clothed specially for such work and equipped with toxic dust respirators. The cars may contain loose cable which must be handled manually, or the cable may have been loaded into the car in bundles fastened to skids which are removed by tow motor. During this survey, the air was sampled in a car partially filled with loose cable that was being handled manually. The concentration of lead in the air within the car was found to be 0.94 mg./M^3 of air. Since the unloading crew spends approximately half of its time within the car, it was considered, for convenience, that these men were being subjected to exposure roughly equivalent to the average concentration of 0.5 mg. Pb/M^3 of air during the eight hours of the work day. At the sorting area of the truck-receiving station, the air contained 0.11 mg. Pb/M^3 while scrap was being sorted.

Red Metal Area:

The concentration of lead in the air of this area (0.03 mg./M^3) appears to be within satisfactory limits.

Stripping Area:

In this area are located nine machines which are used to strip lead, plastic or rubber coverings from wire. As a rule, lead is stripped from cable by six of the machines. On the day of this survey, the concentration of lead in the air exceeded the recommended threshold limit at all locations in the shelter. (All of the operators of the machines by which lead was being stripped wore respirators, and the impression was gained that they were expected to wear them at all times when in this area.) The highest levels of concentration of lead were found at the breathing zone of the operators of the machines. These levels varied from 0.36 mg./M^3, in the general air in the center of the area, to 3.33 mg./M^3 at the breathing level of the operator at the feed end of machine #9. It was learned that an operator spends approximately four hours at the machine but remains in the stripping area for approximately seven hours. It may be taken, therefore, that these men are exposed to average daily levels somewhat more than 2 mg. Pb/M^3 of air. Some of them, no doubt, are subjected to greater than average exposure. The lead is not dispersed in the air solely by the machines, for a great deal of the dust appears to arise from the handling of cable before and after the lead shield passes through the machines.

The Lead Sweating Area:

Lead is removed from the lead-coated wire in what can be considered an automated process. This process involves the use of a moving chain grate which carries the material through a furnace at 1000°F. Lead is "sweated" off the wire and passes through a number of openings in the side of the furnace where it is collected. The stripped wire is then removed from the grate at the discharge end of the furnace. Operators are stationed at the feed and discharge ends of this furnace. The levels of concentration of lead at these two locations were well below the threshold limit. The concentration of lead near the openings through which the molten lead flowed was 0.2 mg./M^3 of air, but since this part of the process requires infrequent attention, the exposure to lead at this level for only brief periods of time is not considered to be potentially dangerous to health.

White Metal Area and Dross Storage:

On the day prior to sampling in this area, rafters and other superstructures were being cleaned by vacuum. This operation, however, was interrupted at 5 p.m. on September 22, so that, when sampling was started at 8 a.m. on the following morning, 15 hours had elapsed, during which particulate material containing metallic lead or its compounds had been permitted to settle out of the atmosphere into which it had been dispersed during the cleaning process.

The storage and transportation of dross to and from the storage bins, as carried out at present in covered drums, do not give rise to dangerous concentrations of lead in the air of the area. Lead-containing dust was found in the air of the storage bins in the concentration of only 0.04 mg. per cubic meter. The housekeeping in this area was excellent, and the new procedure of using covered drums for storing and transporting dross, as well as the improved housekeeping, have been important factors in reducing the concentration of lead in the air of this area.

Potentially hazardous levels of lead concentration were encountered near the melting kettles, and at the splice-cutting and "pulling" operations. The average concentration of lead over the period of eight hours near the melting kettles was estimated at approximately 0.5 mg. Pb/M^3 of air. During the brief period of 6 to 15 minutes, while dross was being removed from a kettle, the concentration of lead in the air reached the level of 2.58 mg./M^3 of air. Since the drossing operation is carried out for only 5 to 15 minutes once per day, this brief contamination of the atmosphere had only a minor effect upon the average content of the air throughout the working day, increasing it by about 10 per cent. The average concentration at the splice-cutting machine, during the working day,(assuming that the machine was attended for six hours) was calculated to be about 0.35 mg./M^3 of air.

The Area of the Presses:

The concentration of lead in the area of the presses varied from well below the threshold limit to levels slightly in excess of the recommended threshold limit of 0.2 mg./M^3 of air. At the sleeve press, it ranged from 0.13 mg./M^3, at the breathing level of the operator of the press, to 0.25 mg./M^3 at the breathing level of the men engaged in cutting and packing the lead tubing. At the solder extrusion presses (0.10 mg./M^3), and at the die casting machines (0.04 mg./M^3), the levels were satisfactory on the day of sampling. The casting of "E-wipe" pigs produced a concentration of lead (0.23 mg./M^3) that slightly exceeded the threshold limit.

Pilot Plant:

The levels of concentration at all operations in this area were below 0.2 mg./M^3 of air.

Conclusions and Recommendations

Apparently the most hazardous operations are those involved in stripping the lead covered cable, sawing and cutting metallic materials and products, melting certain materials, and unloading freight. Therefore, the following recommendations are suggested for consideration.

1. Unloading Freight. Since the unloading of scrap lead cable is intermittent in nature, the protective measures used at present should be continued. If respirators are employed faithfully and properly during these intermittent operations, they should protect the men who do this work, provided adequate attention is given to the cleanliness of the clothing and person of these men afterward. It is likely that respirators can be dispensed with in the open sorting area. Although there may be times when respiratory protection is required, the decision in this matter is a responsibility of supervision. In any case, the relaxation of present procedure should be instituted only after repeated examination of the area confirms the findings of this survey.

2. Bad Metal Area. Conditions are satisfactory, in so far as the concentration of lead in the air is concerned, and no change in procedures or controls is necessary.

3. Operations in the lead sweating area, as observed during this investigation, did not appear to constitute a serious hazard. It is possible, however, depending upon the state of the lead coatings, that the concentration of lead at times may exceed the range noted in this survey. The air at the loading and unloading stations of the chain grate furnace should be monitored repeatedly, to determine the need for the use of respirators, as a temporary measure of control. (The employment of filter respirators cannot be

recommended for continuous use, and if future tests yield results consistently in excess of 0.2 mg./M^3, exhause ventilation should be applied at these stations.)

4. <u>The Area of the Presses</u>. The levels of concentration of lead in the air at the sleeve press, and at the station where "E-wipe" pigs are cast, exceeded slightly the threshold limit. If the range of concentration in this area is maintained at or somewhat below the present level, it would appear to be unnecessary to employ exhaust ventilation at these operations.

5. <u>White Metal Area</u>. The levels of concentration of lead in the air near the melting kettles (including the casting area), and at the splice-cutting and pulling operations, indicate the need for improved exhaust ventilation at these operations. General ventilation in this area may also need to be increased. More complete enclosure of the kettles and larger volumes of exhausted air may be required at these locations.

6. <u>The Stripping Area</u>. This area, without question, is the most hazardous of those in this plant, from the aspect of exposure to lead. A number of control measures are suggested, choice among them to be made on the basis of practical considerations. Thought should be given to the application of local exhaust ventilation at appropriate points on the machines and at other points where dust may be generated. The manual handling of cable in feeding the machines, the operation of the machines themselves, and the storing of

salvaged lead on the pallets produce visible clouds of dust. Frequent and conscientiously maintained cleaning schedules (using a vacuum system) should be instituted on each shift to clean floors, machines and superstructures. Respirators should be worn by everyone in the entire area at all times, until future tests show that measures of control are adequate. Serious thought should be given to the feasibility of automating the operation so as to station the operators at some distance from the rolls and knives of the machines. Complete and satisfactory control of these operations through exhaust ventilation may be difficult or impossible because of the nature of the work. In this case it would be necessary to provide each worker in the area with a forced air respirator (helmet type) as an assured and comfortable means of providing clean air.

7. General Recommendations

(a) A regularly scheduled and frequent schedule of house cleaning to remove settled dusts and so to prevent their redispersal into the air should be instituted in all departments. Vacuum cleaning only should be employed.

(b) The use of filter respirators throughout the hours of work cannot be counted on to provide protection, and every effort should be made to control the atmospheric contamination by engineering procedures. Respirators of either filter or air supply type should be used only in the conduct of infrequent operations in which engineering controls are not feasible, or in connection with continuous operations which cannot be controlled adequately by engineering means. The respirators, and their maintenance and use, should be under the supervision of an instructed and responsible person or group of persons.

Adequate, clean locker and shower rooms should be provided. Eating in the production areas must be forbidden, and a suitable room so located and arranged as to be free of contamination with lead-containing dusts should be provided to serve as a lunch room.

The type of hood and the amount of exhaust ventilation to be employed will need careful study at each operation. Since some of the reclamation processes are such that dusts may be generated by operations other than those of the machines themselves, and since these sources may not be readily identified, the type of hood and quantity of air to be exhausted may vary considerably from operation to operation, and even in the same operation in different places or circumstances. Only by trial and error will it be possible, in all instances, to determine the type of control best suited for the machine, the work and the man.

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

<u>Work</u> <u>and</u> <u>Report</u> <u>by</u>:

J. Cholak, Ch.E.
L. J. Schafer, B.S.E.(Ch.E.)
D. Yeager, B.S.

Approved: Robert A Kehoe, M.D.
Director

The Concentration of Lead in the Atmosphere at Various Operations in the Plant of the Nassau Smelting and Refining Company

Location and Description	Date and Time of Sampling	Milligrams of Lead Per Cubic Meter of Air
Scrap Handling Area		
Breathing zone of the operators while scrapped lead cables were being unloaded from a box car (respirator worn).	9-22-64 10:10-10:30 a.m.	0.94
Breathing zone of the "sorter" while sorting scrap in the sorting area.	9-23-64 10:25-10:45 a.m.	0.11
Red Metal Area		
General Air in front of "D" reverberatory furnace.	9-22-64 10:30-10-45 a.m.	0.08
Stripping Area		
General air in the center of the area.	9-22-64 11:29-12:08 p.m.	0.36
Breathing zone of the operator at the discharge (wire) end of stripping machine #10.	9-22-64 11:30-11:45 a.m.	5.14
Breathing zone of the operator while scrap lead cables were being fed to the stripping machine #10.	9-22-64 11:30-11:45 a.m.	2.90
Breathing zone of the operator while scrap lead cables were being fed to a one-man stripping machine.	9-22-64 11:55-12:10 p.m.	1.10
Breathing zone of the operator while scrap lead cables were being fed to stripping machine #5.	9-22-64 11:50-12:02 p.m.	5.83

Location and Description	Date and Time of Sampling		Milligrams of Lead Per Cubic Meter of Air
Lead Sweating Area			
Three feet from the "lead spout."	9-22-64	10:50-11:08 a.m.	0.20
Breathing zone of the operator while loading the traveling grate.	9-22-64	10:56-11:07 a.m.	0.03
Breathing zone of the operator at the discharge end of the traveling grate while unloading fired wire.	9-22-64	10:50-11:10 a.m.	0.01
White Metal Area			
Breathing zone of the operator while dross was being skimmed from melting kettle #3 (900°F).	9-23-64	8:45-8:51 a.m.	2.58
Breathing zone of the operator at the casting conveyor.	9-23-64	8:59-9:14 a.m.	0.48
Three feet from the "Blue Metal" kettle.	9-23-64	8:59-9:15 a.m.	0.37
General air in the center of the area (70 feet from melting kettles).	9-23-64	9:25-9:49 a.m.	0.07
Breathing zone of the operator while splices were being cut near the entrance to building.	9-23-64	9:30-9:45 a.m.	0.49+
Breathing zone of the operator while splices were being "pulled."	9-23-64	9:30-9:45 a.m.	0.37
General air at the center of the dross storage area.	9-23-64	9:55-10:30 a.m.	0.04-

Location and Description	Date and Time of Sampling		Milligrams of Lead Per Cubic Meter of Air
Press Room (Adjoining White Metal Building)			
General air in the center of the area, operations down because of shift change.	9-22-64	2:40-3:00 p.m.	0.21
Breathing zone of the top saw man at the sleeve press.	9-22-64	3:09-3:18 p.m.	0.24
Breathing zone of the operator of the sleeve press.	9-22-64	3:10-3:28 p.m.	0.13
Breathing zone of the men at the sleeve press while cutting tubes to the required length.	9-22-64	3:15-3:25 p.m.	0.25
Breathing zone of the operator while "E-Wipe" pigs were being cast.	9-22-64	3:40-3:55 p.m.	0.23
Four feet in front of #2 solder extrusion press.	9-22-64	3:32-3:52 p.m.	0.10
Breathing zone of the operator at the die cast machine.	9-22-64	4:00-4:15 p.m.	0.04
Breathing zone of the operator while lead washers were being cut from the castings.	9-22-64	4:00-4:15 p.m.	0.04
Pilot Plant			
General air (east end) near the extrusion press.	9-22-64	3:10-3:40 p.m.	0.02
General air (west end) near #3 drawing machine.	9-22-64	3:10-3:40 p.m.	0.01