39121

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February 21, 1996

Virginia Curry, Esq.
United States Environmental Protection Agency
Region II
290 Broadway
New York, NY 10007-1866

RE: Hoboken--Request for Newark Lamp Plant Cleanup Plan

Dear Virginia:

Attached is a copy of the Newark Lamp Plant ECRA Cleanup Plan that I promised you. I apologize for the delay--we had to send out the maps for copying and it took longer than I expected. Let me know if I can provide you with further information. We would be happy to sit down with the EPA technical staff to discuss this plan or other aspects of mercury testing if you would find that helpful.

Sincerely,

Jane W. Gardner

Jane W. Gardner

100441

NEWARK CLEANUP PLAN

FOR THE NEWARK PLANT

NEWARK, NEW JERSEY

Submitted to:

State of New Jersey

Department of Environmental Protection

Bureau of Industrial Site Evaluation

Trenton, New Jersey

Submitted by:

General Electric Company

Lighting Business Group

Nela Park

Cleveland, Ohio

April 30, 1985

GENERAL ELECTRIC

LIGHTING BUSINESS GROUP
GENERAL ELECTRIC COMPANY • NELA PARK • CLEVELAND, OHIO 44112 • (216) 266-

August 30, 1985

Ms. Maria Petix Kent
State of New Jersey
Dept. of Environmental Protection
Bureau of Industrial Site Evaluation
P. O. Box CN-028
Trenton, NJ 08625

RE: Newark Lamp Plant

Dear Ms. Kent:

Enclosed is the revised cleanup plan for the interior of the buildings at the Newark Lamp Plant.

This is a revision of the plan which was submitted to you on January 9, 1985. It includes additional information which you requested in your letter of March 20, 1985 and at our meetings on April 24, 1985 and June 20, 1985.

Also included is a discussion of the pilot cleaning operations we conducted and the excellent results they produced. We, therefore, request that the elaborate post cleanup sampling plan be eliminated in lieu of the documentation of the effectiveness of the cleaning methods to be employed in the cleanup.

Your timely review of the submittal would be appreciated. We would like to begin cleanup on the interior no later than 9-24-85.

Sincerely,

Dennis O. Correia
Program Manager-Health,
Safety and Environmental

DOC:dd-1949B

100443

PRE-CLEANUP SAMPLING, CLEANUP, AND POST-CLEANUP SAMPLING PLANS
FOR GENERAL ELECTRIC COMPANY'S NEWARK LAMP PLANT

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1.0 Introduction

Pursuant to the Environmental Cleanup Responsibility Act and the associated regulations (NJAC 7:1-3) of the New Jersey Department of Environmental Protection (NJDEP), General Electric Company has submitted information to the NJDEP concerning the planned closure of its lamp manufacturing facility in Newark, New Jersey. The submittals to date consisted of an initial notification covering sections 7:1-3(d)(1) through (8) on April 24, 1984 and a final notification covering sections 7:1-3(d)(9) through (17) on May 11, 1984.

A review of General Electric's submittals by the NJDEP, as reported in its letters dated June 25, 1984 and March 20, 1985, and discussed in subsequent meetings held on January 9, 1985, April 24, 1985 and June 20, 1985, revealed that further information was required. This revised submittal addresses those NJDEP requests.

2.0 REVIEW OF OPERATING HISTORY

Operations at the Newark Lamp Plant have been conducted by the General Electric Company between the year 1907 and April of 1984. As described in detail in the submittal dated May 11, 1984, nine different types of activities were conducted at the plant, over varying periods of time during the plant's operating history, in connection with incandescent lamp manufacturing. These activities included the following:

- Exhaust flare tube manufacturing;
- Mount assembly manufacturing;
- Incandescent lamp assembly;
- Q-Coat operation;
- E-coat operation;
- TUFFSKIN (protective coating) operation;
- TUFFSKIN stripping operation;
- Cleaning and repairing of mercury vacuum pumps; and
- Mixing of lamp base cement.

The two operations involving the use of mercury were incandescent lamp assembly, and cleaning and repairing of mercury diffusion vacuum pumps. During the assembly of incandescent lamps, mercury diffusion vacuum pumps were used to exhaust air from the lamps. Servicing of the equipment or the pumps sometimes required disconnecting these pumps from the equipment, which may have resulted in the release of small quantities of mercury. Also, due to the heat used to seal the lamps

after they are evacuated, some mercury may have vaporized from the pumps and subsequently recondensed on interior surfaces of the building in which the lamps were manufactured. In addition to the mercury in hese pumps, smaller quantities of mercury were used in manometers and leak detectors used for monitoring some of the process parameters associated with incandescent lamp assembly.

Disconnected pumps were removed from the lamp assembly equipment to the pump repair room (sometimes called the "trap and rubber" room). There the pump was disassembled, cleaned and repaired, and refilled with new mercury, to be returned to service when required. Waste mercury collected during this process was shipped offsite for recovery and re-use. Small quantities of mercury may have also been released during this operation.

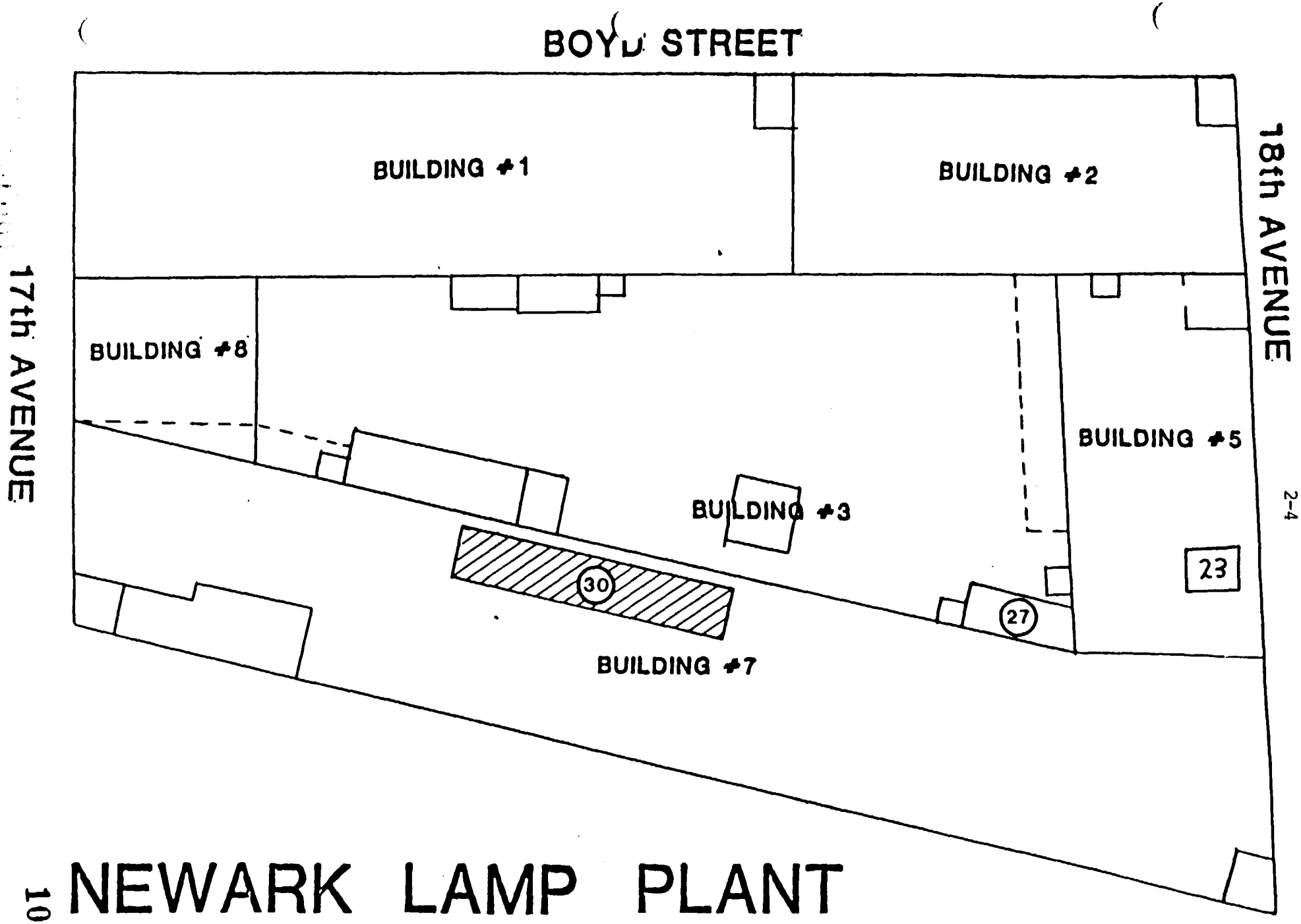
The operations described above took place on the third floor of Building 1, the third floor of Building 2, and, most recently, on the second floor of Building 7. Additionally, mercury was stored in a room on the second floor of Building 5.

The location of the areas on these floors where the operations actually took place are shown below (as originally listed in the submittal dated May 11, 1984).

Area No.	Description of Area	Location Floor/Bldg #	Dates of Operation (Estimated)
23	Stock Room (Room 21)	Second Floor/#5	(?) - Present
27	Diffusion Pump Maintenance	Second Floor/#7	1975 - Present
30	Incandescent Lamp Manufacturing	Second Floor/#7	1917 - Present
31	Incandescent Lamp Manufacturing	Third Floor/#1	1907 - 1960
32	Incandescent Lamp Manufacturing	Third Floor/#2	1910 - 1960

These areas are outlined on the maps of the second and third floors of the Buildings, as shown in Figures 2.1 and 2.2, respectively.

Mercury was present only as a component of some equipment used in the manufacturing of lamp parts and assembly of lamps as described above, not as a raw material in any manufacturing process. The presence of mercury residues in plant areas is the result of releases of mercury during maintenance of such equipment.



NEWARK LAMP PLANT

NEWARK, NEW JERSEY

FIGURE 2.1. LAMP MANUFACTURING AREA IN BUILDING 7, SECOND FLOOR

SCALE: 1": 60'

100450

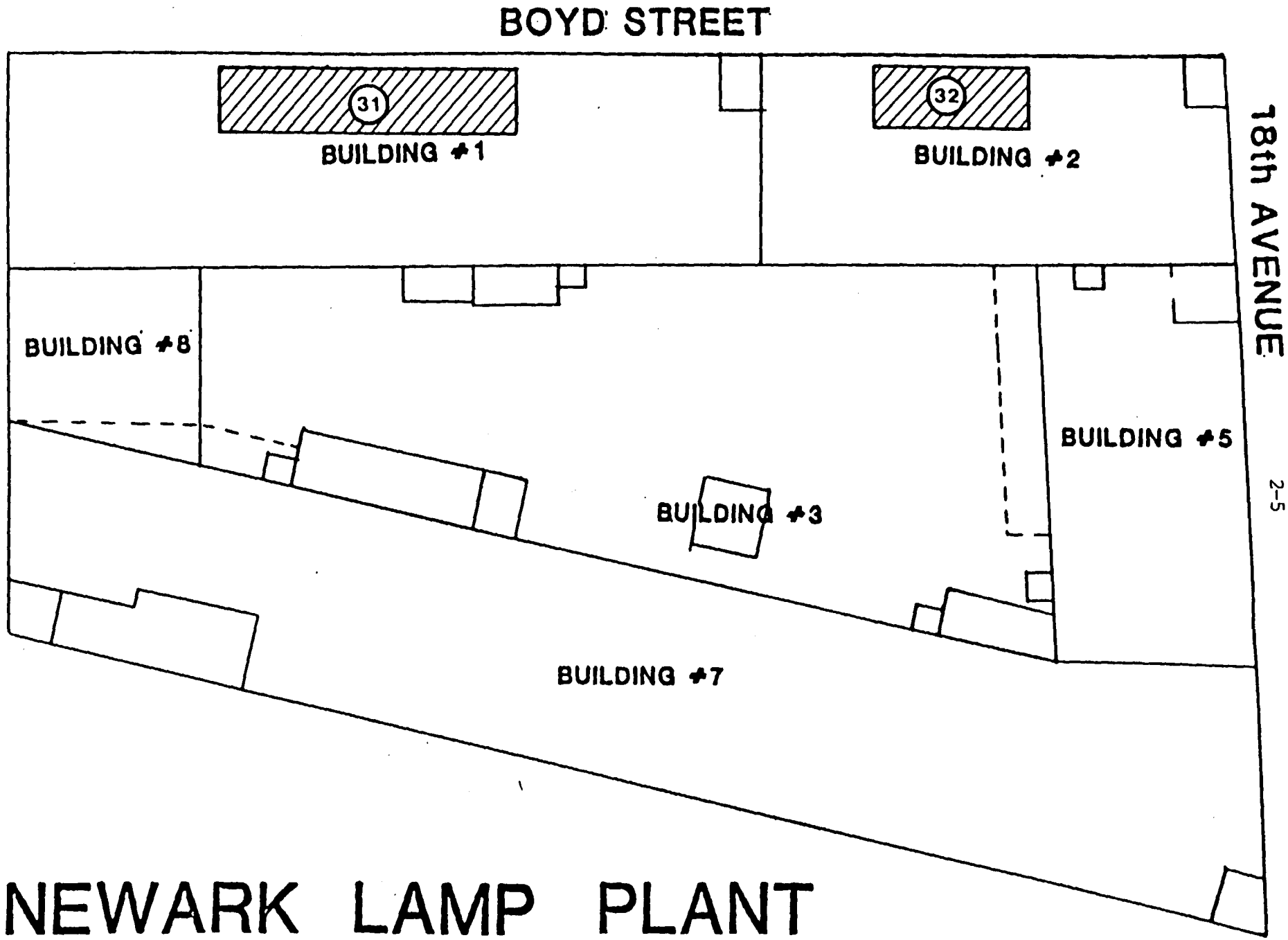


FIGURE 2.2. LAMP MANUFACTURING AREAS IN BUILDINGS 1 and 2, THIRD FLOOR

3.0 MERCURY CLEANUP ACCOMPLISHED TO DATE

3.1 Equipment

All equipment used for incandescent lamp manufacturing, including the mercury vacuum diffusion pumps, was sent to other lamp manufacturing plants of the General Electric Company. No residues contaminated with mercury were generated during this activity.

3.2 Exhaust Ductwork and Vacuum Lines

The exhaust ventilation ductwork and vacuum lines, used with the incandescent lamp manufacturing equipment, have been cleaned and are being held to be disposed as a non-hazardous waste. Mercury residues have been disposed, or held for disposal, as hazardous waste.

3.3 Diffusion Pump Maintenance Room

The room on the second floor of Building 7 used for the maintenance of mercury vapor diffusion pumps, shown as No. 27 in Figure 2.1, has been cleaned. The walls and floor have been washed with a solution of trisodium phosphate.

3.4 Wooden Floors on the Second Floor of Building 7

Areas of wooden floor on the second floor of Building 7 (No. 30 in Figure 2.1), on which equipment with the mercury vacuum diffusion pumps were mounted, have been removed. Areas underneath those floors were cleaned with a vacuum cleaner specially designed for use with mercury residues and a new plywood floor installed. Mercury residues and the removed flooring sections are being held for disposal as hazardous waste.

3.5 Wooden Floors on the Third Floor of Buildings 1 and 2

The wooden floor areas on the third floors of Buildings 1 and 2 (Nos. 31 and 32 in Figure 2.2) were swept to remove dust and dirt.

4.0 Extent and Degree of Mercury Residues

The extent and degree of contamination by mercury in the Newark Lamp Plant was established from available historical information and from sampling. This sampling included measurements of mercury concentrations in air, on wall and floor surfaces, in floor residues and in residues on overhead structures. The sampling results are listed in Tables 1 through 5.

The principal areas defined as exhibiting relatively high concentrations of mercury were as follows:

Building 1, third floor - a prior manufacturing area;

Building 2, third floor - a prior manufacturing area;

Building 7, second floor - a prior manufacturing area;

Building 1, second floor - immediately below a prior manufacturing area;

Building 5, second floor - Room 21, an equipment storage area used to store containers of new mercury; and

Building 7, second floor - a pump maintenance and repair room.

Sampling of the first three areas, previously identified as areas of historical use of mercury-containing equipment, disclosed relatively high concentrations of mercury on floors (Table 3). Relatively high concentrations of mercury in floor residues were also found on the second floor of Building 1, one level below a prior manufacturing area. That situation may be attributed to mercury that traveled downward from the third level to the second level through cracks between wooden flooring elements or through penetrations or holes in the floor accommodating pipes, wiring, etc.

One other room, previously used for mercury storage was found to exhibit a relatively high concentration of mercury when sampled by means of the wipe technique (Table 4). This room is identified as Room 21 on the second floor of Building 5.

Of the five areas listed above, the pump repair room was identified as the most significantly contaminated area in the plant.

Levels of mercury residues detected on floor surfaces (Tables 3 and 4) other than those discussed above, may be attributed to the tracking or transfer of mercury on shoes of plant personnel or the wheels of carts or other vehicles and such concentrations of mercury were judged to be secondary or indirect in nature, i.e., not the result of actual use or spills of metallic mercury.

The mercury content of accumulated dust on overhead pipes and ducts (Table 2) was found to be fairly uniform throughout the plant with relatively high concentrations found only on the Third and Fourth floors of Building 1.

In general, wall surfaces of all buildings, with the exception of the pump repair room, showed relatively low levels of mercury when subjected to wipe sampling (see Table 5) and were evaluated as possessing no or negligible potential as future sources of mercury contamination.

TABLE 1. MERCURY CONTENTS OF AIR SAMPLES - MICROGRAMS PER CUBIC METER

Floor/ Level	Building Number 1	2	5	7	8
	Outside on Rooftop 0.06				
4					
3	1.28	0.62		0.76	
2	0.81	0.69		0.21 Pump Room - 2.2	
1	0.47			1.2	----
B	----				----

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TABLE 2. MERCURY CONTENTS OF OVERHEAD DUSTS - PARTS PER MILLION

Floor/ Level	Building Number 1	2	5	7	8
4	220 280	11	25	11 13	
3	215 130	30	25	2.8	
2	12 89	20 34	52	18 18 23	
1	78	10	16	19	----
B	----	17	39 42	32 35 13	----

Revision 2
8/26/85

TABLE 3. MERCURY CONTENTS OF FLOOR SCRAPINGS- PARTS PER MILLION

Floor/ Level	Building Number 1	2	5	7	8
4	81 51	52 13 0.5		14 3.4	
3	636 304 171 60 200 219 (Wood) 4/38/107 (Paper) 14/23/47	1,460 328 375 280 256		5 5	
2	36 210 1,186 310 48	53 17		3,150 27 4,230 18	
1			18		----
B	----			4.5	----

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TABLE 4. MERCURY ANALYSES OF FLOOR WIPES - MICROGRAMS PER 100 SQUARE CENTIMETERS

Floor/ Level	Building Number 1	2	5	7	8
4	.15	0.08	0.07	0.09	
3				0.25	0.06
2	1.40		Storage Rm. 21 - 5.3	0.47 0.13 Pump Room - 9.2 0.71 0.26	
1	0.30		0.88	0.23	----
B	----	0.13		0.07 0.09	----

Revision 2
8/26/86

TABLE 5. MERCURY ANALYSES OF WALLS WIPES - MICROGRAMS PER 100 SQUARE CENTIMETERS

Floor/ Level	Building Number 1	2	5	7	8
4	0.44	0.01 0.026		0.27	
3	0.36, 0.13 0.03, 0.046 0.23	0.03	0.02	<0.01 <0.01 0.004 0.006 0.02 0.036	
2	0.05	0.004	0.007	0.055 .25 0.01 .13 0.03 0.14 0.01 0.119 0.003 Pump Rm. 275* 0.05, 3.7**	0.03
1	0.43		8	0.13	----
B	----				

*Before Cleaning
**After Cleaning

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5.0 PROPOSED CLEANUP LEVELS FOR MERCURY

There are two potential health and safety concerns arising from mercury residues at the Newark Lamp Plant:

(1) contamination of future building occupants and articles used or manufactured within the buildings by surface residues;

(2) exposure of future building occupants to airborne vapors from residues on surfaces and in floors.

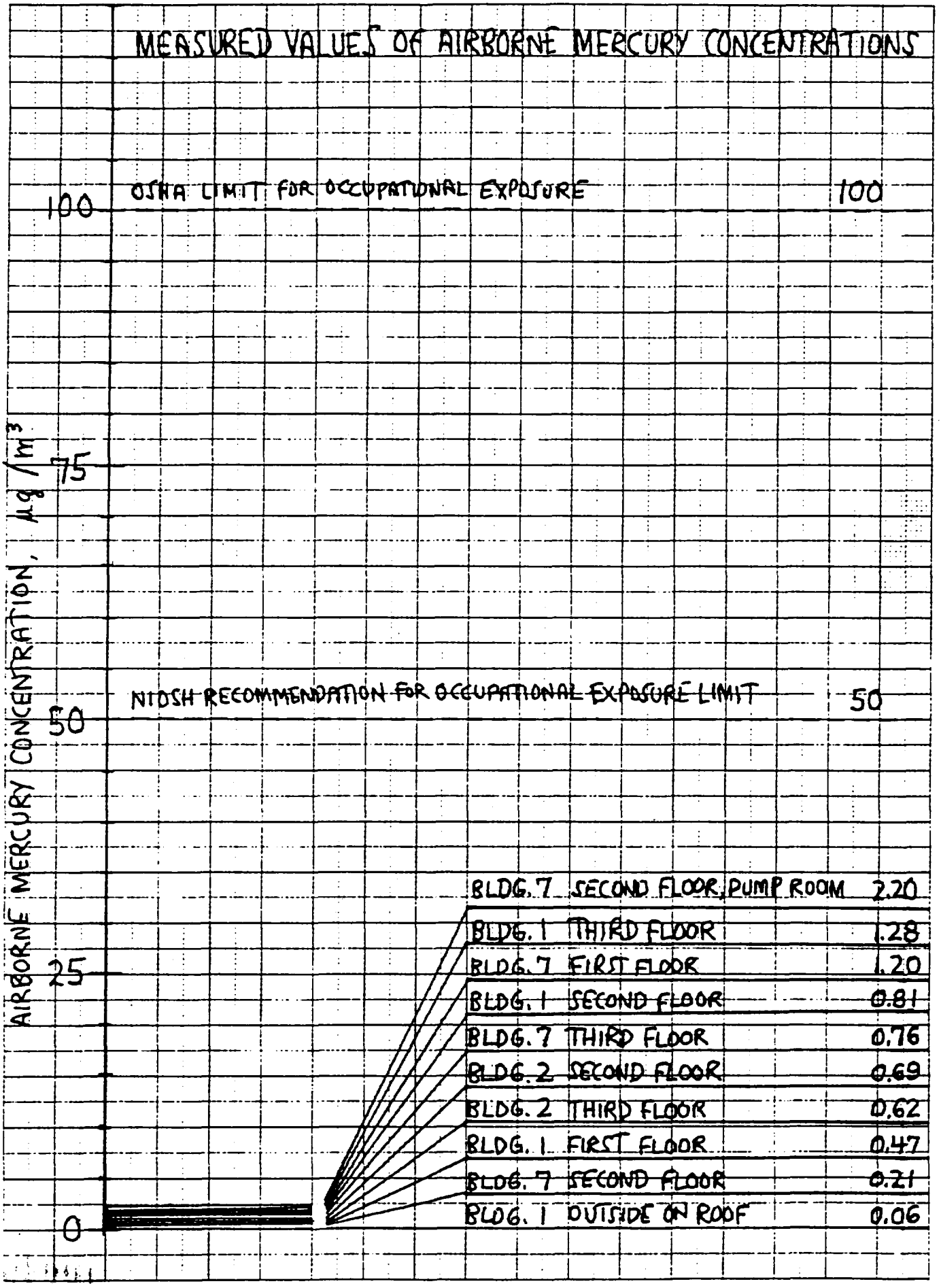
5.1 Surface Contamination Level for All Surfaces

It is proposed that one (1) microgram per hundred square centimeters (1 $\mu g/100\ cm^2$) of surface area be established as the acceptable level of mercury contamination for floors, walls, ceilings, and overhead structures. A uniform contamination level of that amount on all interior surfaces would result in a total of less than fifteen (15) grams of mercury in the entire facility. Appendix I describes the effect that this level of surface contamination would have on the concentration of mercury vapor in air assuming 100% vaporization. Appendix K describes the effect that this level of surface contamination would have on occupants from sources of mercury other than vapor, such as by contact and ingestion.

5.3 Airbourne Mercury Levels

Airborne concentrations recently measured at the Newark Lamp Plant, as depicted on Figure 5.1, are well below the level established by the Occupational Safety and Health Administration (OSHA) for occupational exposure (equivalent to 100 $\mu g/m^3$; see Appendix A) and the exposure limit recommended by the National Institute of Occupational Safety and Health (NIOSH) (equivalent to 50 $\mu g/cm^3$). Although increases in the temperature and in the activity level at the plant would ordinarily raise air concentration levels, it is believed that the reductions in surface contamination will have a more than counterbalancing impact. It is, therefore, proposed that maintenance or reduction of the airborne mercury concentration levels, at or below the levels measured prior to cleanup, should be acceptable.

FIGURE 5.1



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6.0 Cleanup Plan

A high-pressure wash will be utilized as the primary cleaning method for removal of contamination from the surfaces of walls, concrete floors, ceilings, overhead structures (piping, conduit, etc.), and equipment. This is a cleaning process whereby a trisodium phosphate solution in water is applied to a surface at a minimum 3000 psi at the tip of the applying wand. Water temperature will be maintained at a minimum of 80°F and the application distance between the surface to be cleaned and the applying wand tip will not exceed 24 inches. The rate of application will not exceed 30 square feet per minute.

All spent cleaning solutions will be immediately collected and containerized for subsequent wastewater treatment.

Any equipment or building components (fluorescent lamps, ventilation fans and ductwork, room partitions, suspended ceilings) which cannot be cleaned by this method will be removed for disposal as a hazardous waste if determined to be EP toxic, or vacuumed and then hand washed with a TSP solution if high pressure washing cannot be used.

TABLE 6.1

CHART OF CLEANUP ACTIONS FOR FLOORS

Floor/ Level	Building Number 1	2	5	7	8
4	Remove & replace oil stained sections of wood floor, vacuum wood floor.	Scrape oil-stained sections of wood floor, high pressure wash concrete floor, vacuum wood floor.	High Pressure wash concrete floor.	Remove & replace oil stained sections of wood floor, high pressure wash concrete floor, vacuum wood floor.	High pressure wash concrete floor.
3	Remove room partitions, remove and replace wood floor.	Vacuum wood floor & encapsulate, high pressure ash concrete floor.	Scarify TUFFSKIN residue from concrete floor in stripping room, high pressure wash concrete floor.	Remove & Replace oil stained sections of floor, high pressure wash concrete floor, vacuum wood floor.	Vacuum & hand wash all floors.
2	Scarify all wood floor area to a depth of 1/32", power scrub non-wood floor, vacuum wood floor, remove office carpeting, hand wash office floors.	Vacuum wood floor and encapsulate, high pressure wash concrete floor.	High pressure wash concrete floor.	Remove & replace all wood floor sections, high pressure wash all non-wood floors Pump Room - remove tile, acid etch terrazzo floor and high pressure wash.	Scarify wood floor to a depth of 1/32" high pressure wash non-wood floor areas, vacuum wood floor.
1	Discard oil-stained wood pipe chase cover, vacuum pipe chase, high pressure wash concrete floor.	Remove carpeting from offices, hand wash office floors, remove & replace oil stained section of wood floor, high pressure wash concrete floor.	High pressure wash concrete floor.	High pressure wash concrete floor.	N/A
B	N/A	High pressure wash concrete floor.	High pressure wash concrete floor.	High Pressure wash concrete floor.	N/A
Stairwells	High pressure wash.	High pressure wash.	N/A	High pressure wash.	N/A
Elevators	High pressure wash.	High pressure wash.	High pressure wash.	High pressure wash.	N/A

*All replacement of wood floors will include vapor barrier.

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6.1 Floors

The following specific cleanup actions are proposed for various floor areas within the plant, dependent upon the extent and degree of mercury contamination.

- Vacuum cleaning of wood floors to remove light residues of mercury;
- Scarification and vacuuming of wood floors with moderate residues of mercury;
- Removal of wood flooring with heavy residues of mercury;
- Encapsulation of flooring to seal existing areas combining mercury-contaminated wood with asbestos-containing nail-crete (specifically the third floor of Building 2). (See Appendix J.)
- High pressure washing of all concrete floors with a TSP solution.
- The floor in the mercury pump room will be acid etched after removal of the tile, and then high-pressure washed with TSP.

6.1A Vapor Barrier for Replaced Wood Floors on the Second Floor of Building 7

Two sections of hardwood floor on the second floor of Building 7 have already been replaced with two layers of 1/2-inch plywood; two other sections of hardwood floor are to be replaced. These areas are shown on the drawing on page B-26 of Appendix B. There is presently no vapor barrier in the replaced floor.

The two replacement floor sections aready installed will be removed and vapor barrier installed in the same manner as that planned for the hardwood floor on the third floor of Building 2 (see Appendix J). The two planned replacement floors will also be equipped with such a vapor barrier.

6.1B Cleanup of Isolated Spots of PCB-Contaminated Oil at Isolated Floor Locations Inside the Buildings

1. Background

Note: This item was not included in the NJDEP review letter, since details concerning the extent of oil residues containing PCBs on the floors of the buildings were not available at the time of our meeting and submittal of cleanup plans on 1/9/85.

(a) History

Prior to November 1984, there were no reasons to believe that residues of PCB oils were present inside the buildings of the Newark Lamp Plant. To the best of our knowledge, no PCB oils were ever purchased for use in that plant.

However, in November 1984, we shipped twelve drums of waste oil to Chemical Waste Management Company for appropriate disposal. The disposal company, in routinely testing 25% (three drums) of the shipment for PCB oils, found levels of 650 ppm of the 1016 arochlor (commonly used in transformers), and 80 ppm of the 1254 arochlor (commonly used in capacitors) in a composite sample of three randomly selected drums. The disposal company returned the twelve drums of waste oil to us.

(b) Further Sampling of Waste Oil in the Drums

Upon receipt of the above information and the returned drums, we undertook to sample the oil in each of these twelve drums. The results (given in analytical report from Clayton Environmental Services, Inc. and enclosed as Appendix E) are given in Table 6.1.

Table 6.1 - PCB Contamination Levels in Waste Oil Drums

Drum #	Analysis Results ppm of PCB	Drum #	Analysis Results ppm of PCB
1	5*	7	6.9**, 11.9+
2	5	8	5
3	5	9	5
4	5	10	5
5	5	11	5
6	5	12	1680**

* 5 ppm is the minimum detectable level reported by Clayton Environmental Services, Inc.
** 1016 Arochlor
\+ 1254 Arochlor

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These results showed that only two of the twelve drums contained PCB-contaminated oil. They also showed that the PCB was apparently present as a contaminant.

Following these analyses, we obtained approval for disposal of the oil from Chemical Waste Management, and we successfully concluded the disposal transaction.

(c) Initial Investigation

Upon discovering the presence of PCB-contaminated oil in the facility, we launched an investigation concerning the source of the PCB. The report of this investigation is enclosed as Appendix F. The investigation showed that there seems to have been no known use of PCB oils in the Newark Lamp Plant during the time that manufacturing operations were going on there.

As can be seen in this report, there was no reason for us to believe that any PCBs had ever been used in the Newark Plant. Nevertheless, we continued to look for a potential source of PCB-contaminated oil from which the oil in the two waste drums could have been generated.

(d) Floor Scrape Samples

After the PCB contamination was discovered in two of the twelve drums, scrapings of wood floor surface were taken in nineteen locations on wood floors throughout the facility and one on the concrete floor in the truck garage area of the facility. Results of these analyses are shown in Table 6.2 (the analysis report from Environmental Testing and Certification, Inc. is shown in Appendix G). Description and location of sites whose scrapes were taken are shown in Table 6.3.

As can be seen from the results of these analyses of floor scrapes, traces of both the 1016 and 1254 arochlors of PCB were detected in all areas, with several areas showing somewhat higher levels.

Table 6.2 - Analyses Results for Floor Scrape Samples

Sample Location Number	PCB Content, ppm Arochlor #1016	Arochlor #1254	Sample Location Number	PCB Content, ppm Arochlor #1016	Arochlor #1254
1	4.9	5.1	11	0.8	0.8
2	3.0	1.9	12	2.3	5.4
3	2.8	2.8	13	8.1	1.6
4	6.6	3.9	14	4.9	5.9
5	1.6	1.8	15	3.0	5.0
6	50.2	487.1	16	0.8	5.9
7	0.7	18.8	17	1.1	15.8
8	3.2	6.4	18	9.1	15.2
9	1.0	28.2	19	18.7	12.0
10	3.2	6.2	20	0.3	8.9

Additional sampling of wood floors was conducted to determine background levels for non oil stained areas. Only one area - Bldg. 8, 2nd floor - showed levels exceeding 5 ppm. It is suspected that this was from the use of a floor wax which may have contained PCBs as a wax extender. Sampling of oil stained concrete areas was conducted by taking core samples and analyzing the concentrations in 1/2" depth increments. Concrete dust samples were also analyzed. Results of the additional wood and concrete sampling is attached as Appendix N.

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NEWARK LAMP PLANT
12-26-84 FLOOR SCRAPING SAMPLE LOCATIONS

Sample		
1	Gr. #25 Sealex	Bldg. 7, 2nd Floor
2	H-30	" " " "
3	Sealex	" " " "
4	Base Fill Machine	" " " "
5	" " "	" " " "
6	Old Std. Knapp scrapped machine	Bldg. 7, 3rd Floor
7	Jones Machine	" " " "
8	" "	" " " "
9	Seaboard S&R Machine Gr. ?	Bldg. 1, 3rd Floor
10	" " " Gr. ?	" " " "
11	" Flange Seal Gr. ?	Bldg. 2, 3rd Floor
12	" " " Gr. ?	" " " "
13	Scrap Wood from Bldg. 7, 2nd Floor	
14	" " " " " " "	
15	Flare Dept.	Bldg. 7, 2nd Floor
16	" "	" " " "
17	Bldg. #1, 2nd Floor ?)	Dark marks on floor indicated past presence of some kind of equipment using oil.
18	" " " " ?)	
19	Bldg. 7, 2nd Floor	Area where scrap oil drum stood.
20	Bldg. #1, 1st Floor	Garage floor.

Table 6.3 - Description of Sites for Floor-Scrape Samples

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6.1B (continued)

(e) Machine Oil

Following the review of the results of floor-scrape sampling shown above, we concluded that perhaps some machine oil used in the manufacturing process equipment had been, unbeknownst to us, contaminated with PCBs by the oil recyclers from whom it was purchased. We proceeded to track the location of lamp-making machines which were located in areas where concentrations of PCB contamination were found. Samples of oil from these machines have been analyzed and the results shown in Appendix L.

These machines which were transferred to other GE plants have been drained and flushed and the PCB contaminated oils properly disposed of.

6.2 Oil Spots on Floors

All of the oil spots on floors inside the buildings will be cleaned to a level at or below 5 as agreed to by NJDEP. Sections of wood floors with such spots will be removed, if more practical than cleaning, and disposed appropriately. Also, sampling has been performed at other appropriate locations within the facility to verify that the PCB oil contamination is isolated and limied (see Appendix N). Details concerning planned cleaning methods and locations at which post-cleanup PCB sampling will be done are attached as Appendix M.

6.3 Worker Health and Protection

To protect the health of the individuals performing the cleanup work, measures of respirators, air monitoring, and urine tests will be employed:

- All individuals in areas of active cleanup work will wear respirators equipped with Mersorb collection cartridges such as produced by Mine Safety Appliances or equivalent.
- Air sampling will be conducted during cleanup activities to determine potential for worker exposure. Selected workers will be equipped with personal air monitors equipped to detect mercury in air.
- Urine analyses for mercury will be performed on cleanup workers prior to the start of work, every two weeks during cleanup and at the completion of cleanup.

Details concerning these worker protection measures are given in Appendix B and Appendix C.

6.4 Protection of the Environment

The following measures will be implemented to protect the environment during cleanup:

- The vacuuming of mercury-containing dusts and residues will be performed using specially-modified industrial-type vacuum cleaners modified to provide for control of exhaust air using carbon absorption and high efficiency filters to remove mercury vapors and particulate dust. Residues (carbon, filters) - generated will be disposed of in a controlled manner as hazardous waste, or, if appropriately supported and documented, as non-hazardous waste.
- Any liquid waste generated, such as spent cleaning solutions, etc., will be disposed of in a controlled and documented manner. Solutions will be treated using commercially available carbon absorption treatments units (e.g., as available from Calgon or equivalent), held in storage tanks or containers pending analysis, and released to city sewers only when proven acceptable for discharge. Residues (i.e., carbon, final wash solutions) from water treatment will be disposed of in a controlled manner and managed as hazardous waste unless documented as non-hazardous.
- Any flooring or other materials stripped from the buildings during cleanup will also be managed as hazardous waste.

- All other residues or miscellaneous materials (rags, disposable materials, filters, tools) discarded during cleanup will be disposed of in a controlled manner as hazardous waste unless documented as non-hazardous waste.

7.0 Plan for Post-Cleanup Sampling for Mercury

The objective of the post-cleanup sampling plan is to verify that the cleanup of mercury residues from interior surfaces of the buildings at the Newark Lamp Plant has been accomplished to the specific cleanup levels. A summary of the plan is given below. Details of the plan are included in Appendix D and H.

7.1 Sampling Plan Design

The sampling plan consists of wipe sampling for floors, walls, overhead piping and duct work, and general air sampling. The plan takes into account the layout of the plant in terms of "open bay" areas and individual rooms.

7.2 Sampling Locations

The proposed location areas for wipe sampling are indicated in Table 7.1. The sampling locations take into consideration areas of known or suspected use of storage of mercury, as well as the existence of both separate offices and rooms and relatively large "open bay" areas. Wipe samples will be taken, as described in Table 7.1.

Air samples will be taken in each building at a fixed height of about two inches above the floor, and generally at the center of each floor. For Building 7, two air samples will be taken on each floor/level, and these will be located at the quarter and three-quarter points on the long axis of the building. Air sample readings will be corrected for differences in mercury vapor pressure as a function of temperature, to an ambient temperature of 100°F.

100476

TABLE 7.1. TYPES, NUMBERS, AND LOCATIONS OF SAMPLES FOR MERCURY

Building Number	Floor (Level)	Room or Area	Floor Wipes	Wall Wipes	Overhead Structure Wipes
1	Basement		-no Basement-	-	-
1	1	Open Bays	5	4	4
1	2	Open Bays	8	4	4
		3 Offices	1 ea	1 ea	1
1	3	Separate Rooms	1 ea	1 ea	1 ea
		Bay Areas	4	4	4
1	4	Separate Rooms	1 ea	1 ea	1 ea
		Open Bays	10	4	4
2	Basement	Open Bays	4	4	4
2	1	Offices	11	11	4
		Open Bays	2	4	4
	2	Open Bays			
		+ 1 office	4	4	4
2	3	3 Rooms	3	3	3
		Open Bays	2	4	4
2	3	Separate Rooms	1 ea	1 ea	1 ea
		Open Bays	5	4	4
	Basement	Open Bays	4	4	4
	1	Bays Plus			
		One Office	3	5	3
5	2	Room 21	2	4	1
		Open Bays	3	4	4
5	3	Separate Rooms	1 ea	1 ea	1 ea
		Open Bays	2	4	4
5	4	Open Bays	4	4	4
		Office	1	1	1
7	Basement	Open Bays	7	4	4
7	1	Open Bays	6	4	4
7	1	Open Bays	6	4	4
7	2	New Wood	4	-	-
		Center Wood	2	-	-
		Concrete	6	-	-
		Open Bay	-	4	4
		Separate Rooms	1 ea	1 ea	1 ea
		Pump Room	1	4	1
7	3	Separate Rooms	1 ea	1 ea	1 ea
		Open Bays	10	4	4
7	4	Separate Rooms	1 ea	1 ea	1 ea
		Open Bays	10	4	4
8	Basement		-no Basement-	-	-
8	1		-no first floor-	-	-
8	2	Storage Room	1	1	1
		Open Bay	1	1	1
8	3	Separate Room	1 ea	1 ea	1 ea
8	4	Open Bay	1	4	1

7.3 Field Sampling Procedures

Sealable type polyethylene bags or envelopes will be used as containers for wipe samples. Containers for air samples (if there are any taken) will be wide-mouth glass or polyethylene bottles with polyethylene or Teflon-lined lids.

Blanks and Duplicates

Wipe Samples. Field blanks of wipes and the containing plastic envelopes will be generated during field sampling at the rate of two per day during each day of field sampling. This procedure will provide a minimum of one field blank for each day of laboratory analysis.

Air Samples.* Field blanks will be generated at the rate of one blank per ten air samples and separately analyzed to check on possible contamination of sampling equipment or materials. There will be four field blanks of air sampling equipment.

Duplicates.* In the case of wipe samples, no duplicates of field samples are possible in that sampling of a surface alters the surface.

If any air samples are taken with the sampling train, three duplicate air samples will be taken and analyzed as checks on the sampling and analysis procedure.

Chain of Custody

A standard form for chain of custody record will be generated for each sample and will accompany each sample from its origin through compositing and analysis.

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*If the mercury "sniffer" is used for air sampling, the State will be provided with the opportunity to make its own measurements with such a device or to witness work in progress.

Sample Data Sheets and Maps

The preprinted sample data sheet and a mapping system will be used to record the specific location for each sample taken. Where possible the location will be designated in terms of existing plant layout, terminology, existing drawings, or physical features in the plant. The data sheet will accompany the sample and will serve as a basis for compilation of sample history through compositing and analysis.

Analytical Method

The analytical method to be used is the same as that described in NIOSH Method 175 (Mercury in Air)* and referred to as flameless atomic absorption. This method is described in Appendix D.

Sample Splitting

Wipes

Wipes samples will be split with the State of New Jersey on any basis desired, at any time when the State provides notification that such a split is desired.

Air Samples**

Due to the nature of the air sample taken with the sampling train (i.e., an absorbent cartridge), sample splits

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* "NIOSH Manual of Analytical Methods", NIOSH75-121

** If the mercury "sniffer" is used for air sampling, the State will be provided with the opportunity to make its own measurements with such a device or to witness work in progress.

are not practical. In lieu of split samples, provision will be made to provide up to a maximum of five (one per building) duplicate samples to the State of New Jersey. The State will be offered the option of designating the locations of these duplicates within buildings. If locations are not designated by the start of sampling, these duplicates will be designated on the same basis as other air sample duplicates (i.e., first installation of the day on randomly selected days).

7.4 Analytical Laboratory

At the present time, GE is planning to use a laboratory certified by the State of New Jersey for analysis of post-cleanup samples. If GE should contemplate using a laboratory for such analytical services which is not certified by the State of New Jersey, GE will supply proof to NJDEP that the laboratory is a member of the USEPA Contract Laboratory Program (CLP) as described in the current version of the "Invitation for Bid" (IFB) contract WA84-A226A267.

8.0 TIME SCHEDULE FOR IMPLEMENTATION

The following is a proposed schedule for accomplishing cleanup activities:

Event	Week Number
1. Approval of cleanup plan by New Jersey Department of Environmental Protection (NJDEP)	0
2. Issue request for proposals for cleanup activities to contractors.	1
3. Submit letter of credit to NJDEP for amount of cleanup.	2
4. Receive proposals from contractors.	4
5. Evaluate proposals and choose contractors.	5
6. Negotiate contract and provide authorizations.	5
7. Cleanup contract starts.	6
8. Cleanup completed.	16

NEWARK INTERIOR

COST ESTIMATE

Bonding	$55,000
Mobilization	86,000
Health and Safety	160,000
Administration	248,000
Sampling and Analysis	102,000
Breathing Air	3,000
Support	124,000
High-Pressure Water Cleaning	321,000
Vacuum and Hand Washing	83,000
Floor Removal	53,000
Floor Scarification	40,000
Floor Encapsulation	257,000
Ventilation Removal	98,000
Transportation and Disposal	91,000
Handling Charge Subcontractor	68,000
	$1,789,000

Revision 2
8/26/85

APPENDIX A

OCCUPATIONAL SAFETY AND HEALTH STANDARDS
SUBPART Z — TOXIC AND HAZARDOUS SUBSTANCES

(Code of Federal Regulations, Title 29, Chapter XVII, Part 1910, Subpart Z; Revised as of July 1, 1979; corrected by 44 FR 50338, August 28, 1979; amended by 44 FR 60980, October 23, 1979; corrected by 44 FR 68827, November 30, 1979; amended by 45 FR 12416, February 26, 1980; 45 FR 35212, May 23, 1980; corrected by 45 FR 54333, August 15, 1980; amended by 45 FR 67340, October 10, 1980; 46 FR 6228, January 21, 1981; 46 FR 32021, June 19, 1981; 46 FR 60775, December 11, 1981; 47 FR 51117, November 12, 1982; 48 FR 2768, January 21, 1983; corrected by 48 FR 9641, March 8, 1983; amended by 48 FR 53280, November 25, 1983; 49 FR 25796; June 22, 1984)

Subpart Z—Toxic and Hazardous Substances

Sec.:

§1910.1000 Air contaminants.

An employee's exposure to any material listed in table Z-1, Z-2, or Z-3 of this section shall be limited in accordance with the requirements of the following paragraphs of this section.

(a) Table Z-1:

(1) *Materials with names preceded by "C"—Ceiling Values.* An employee's exposure to any material in table Z-1, the name of which is preceded by a "C" (e.g., C Boron trifluoride), shall at no time exceed the ceiling value given for that material in the table.

(2) *Other materials—8-hour time weighted averages.* An employee's exposure to any material in table Z-1, the name of which is not preceded by "C", in any 8-hour work shift of a 40-hour work week, shall not exceed the 8-hour time weighted average given for that material in the table.

(b) Table Z-2:

(1) *8-hour time weighted averages.* An employee's exposure to any material listed in table Z-2, in any 8-hour work shift of a 40-hour work week, shall not exceed the 8-hour time weighted average limit given for that material in the table.

(2) *Acceptable ceiling concentrations.* An employee's exposure to a material listed in table Z-2, shall not exceed at any time during an 8-hour shift the acceptable ceiling concentration limit given for the material in the table, except for a time period, and up to a concentration not exceeding the maximum duration and concentration allowed in the column under "acceptable maximum peak above the acceptable ceiling concentration for an 8-hour shift".

(3) *Example.* During an 8-hour work shift, an employee may be exposed to a concentration of Benzene above 25 p.p.m. (but never above 50 p.p.m.) only for a maximum period of 10 minutes. Such exposure must be compensated by exposures to concentrations less than 10 p.p.m. so that the cumulative exposure for the entire 8-hour work shift does not exceed a weighted average of 10 p.p.m.

(c) Table Z-3: An employee's exposure to any material listed in table Z-3, in any 8-hour work shift of a 40-hour work week, shall not exceed the 8-hour time weighted average limit given for that material in the table.

(d) Computation formulae:

(1)(i) the cumulative exposure for an 8-hour work shift shall be computed as follows:

$$E = \frac{C_1T_1 + C_2T_2 + \ldots C_nT_n}{8}$$

where:

E is the equivalent exposure for the working shift.

C is the concentration during any period of time T where the concentration remains constant.

T is the duration in hours of the exposure at the concentration C.

The value of E shall not exceed the 8-hour time weighted average limit in table

Table Z-2

Material	8-hour time weighted average	Acceptable ceiling concentration	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hour shift. Concentration	Maximum duration
Benzene (Z37.4-1969)	10 p.p.m.	25 p.p.m.	50 p.p.m.	10 minutes.
Beryllium and beryllium compounds (Z37.29-1970)	2 μg./M³	5 μg./M³	25 μg./M³	30 minutes.
Cadmium dust (Z37.5-1970)	0.2 mg./M³	0.6 mg./M³		
Cadmium fume (Z37.5-1970)	0.1 mg./M³	0.3 mg./M³		
Carbon disulfide (Z37.3-1968)	20 p.p.m.	30 p.p.m.	100 p.p.m.	30 minutes.
Carbon tetrachloride (Z37.17-1967)	10 p.p.m.	25 p.p.m.	200 p.p.m.	5 minutes in any 4 hours.
Chromic acid and chromates (Z37.7-1971)		1 mg./10M³		
Ethylene dibromide (Z37.31-1970)	20 p.p.m.	30 p.p.m.	50 p.p.m.	5 minutes.
Ethylene dichloride (Z37.21-1969)	50 p.p.m.	100 p.p.m.	200 p.p.m.	5 minutes in any 3 hours.
Fluoride as dust (Z37.28-1969)	2.5 mg./M³			
Formaldehyde (Z37.16-1967)	3 p.p.m.	5 p.p.m.	10 p.p.m.	30 minutes.
Hydrogen fluoride (Z37.28-1969)	3 p.p.m.			
Hydrogen sulfide (Z37.2-1966)		20 p.p.m.	50 p.p.m.	10 minutes once only if no other measurable exposure occurs.
Lead and its inorganic compounds (Z 37.11-1969)	0.2 mg/m³			
Mercury (Z37.8-1971)		1 mg./10M³		
Methyl chloride (Z37.18-1969)	100 p.p.m.	300 p.p.m.	500 p.p.m.	5 minutes in any 3 hours.
Methylene Chloride (Z37.23-1969)	500 p.p.m.	1,000 p.p.m.	2,000 p.p.m.	5 minutes in any 2 hours.
Organo (alkyl) mercury (Z37.30-1969)	0.01 mg./M³	0.04 mg./M³		
Styrene (Z37.15-1969)	100 p.p.m.	200 p.p.m.	600 p.p.m.	5 minutes in any 3 hours.
Tetrachloroethylene (Z37.22-1967)	100 p.p.m.	200 p.p.m.	300 p.p.m.	5 minutes in any 3 hours.
Toluene (Z37.12-1967)	200 p.p.m.	300 p.p.m.	500 p.p.m.	10 minutes.
Trichloroethylene (Z37.19-1967)	100 p.p.m.	200 p.p.m.	300 p.p.m.	5 minutes in any 2 hours.

[Table Z-2, footnote 1 deleted by 46 FR 32021, June 19, 1981]

Table Z-3—Mineral Dusts

Substance	Mppcf*	Mg/M³
Silica:		
Crystalline:		
Quartz (respirable)	250[1]	10mg/M³ =
		%SiO₂+2
Quartz (total dust)		%SiO₂+2 30mg/M³
		%SiO₂+2
Cristobalite: Use ½ the value calculated from the count or mass formulae for quartz.		
Tridymite: Use ½ the value calculated from the formulae for quartz.		
Amorphous, including natural diatomaceous earth	20	80mg/M³
		%SiO₂
Silicates (less than 1% crystalline silica):		
Mica	20	
Soapstone	20	
Talc (non-asbestos form)	20[2]	
Talc (fibrous): Use asbestos limit.		
Tremolite (see talc, fibrous)		
Portland cement	50	
Graphite (natural)	15	
Coal dust (respirable fraction less than 5% SiO₂)		2.4mg/M³ or
For more than 5% SiO₂		10mg/M³
		%SiO₂+2
Inert or Nuisance Dust:		
Respirable fraction	15	5mg/M³
Total dust	50	15mg/M³

Note: Conversion factors - mppcf×35.3=million particles per cubic meter = particles per c.c.

* Millions of particles per cubic foot of air, based on impinger samples counted by light-field techniques.

[1] The percentage of crystalline silica in the formula is the amount determined from air-borne samples, except in those instances in which other methods have been shown to be applicable.

[2] Both concentration and percent quartz for the application of this limit are to be determined from the fraction passing a size-selector with the following characteristics:

Aerodynamic diameter (unit density sphere)	Percent passing selector
2	90
2.5	75
3.5	50
5.0	25
10	0

The measurements under this note refer to the use of an AEC instrument. If the respirable fraction of coal dust is determined with a MRE the figure corresponding to that of 2.4 Mg./M³ in the table for coal dust is 4.5 Mg/M³.

§ 1910.1001 Asbestos.

(a) *Definitions.* For the purpose of this section, (1) "Asbestos" includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite.

(2) "Asbestos fibers" means asbestos fibers longer than 5 micrometers.

(b) *Permissible exposure to airborne concentrations of asbestos fibers*—(1) *Standard effective July 7, 1972.* The 8-hour time-weighted average airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed five fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (e) of this section.

(2) *Standard effective July 1, 1976.* The 8-hour time-weighted average airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed two fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (e) of this section.

(3) *Ceiling concentration.* No employee shall be exposed at any time to airborne concentrations of asbestos fibers in excess of 10 fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (e) of this section.

(c) *Methods of compliance*—(1) *Engineering methods.* (i) *Engineering controls.* Engineering controls, such as, but not limited to, isolation, enclosure, exhaust ventilation, and dust collection, shall be used to meet the exposure limits prescribed in paragraph (b) of this section.

(ii) *Local exhaust ventilation.* (a) Local exhaust ventilation and dust collection systems shall be designed, constructed, installed, and maintained in accordance with the American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, ANSI Z9.2-1971, which is incorporated by reference herein.

(b) See § 1910.6 concerning the availability of ANSI Z9.2-1971, and the maintenance of a historic file in connection therewith. The address of the American National Standards Institute is given in § 1910.100.

(iii) *Particular tools.* All hand-operated and power-operated tools which may produce or release asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section, such as, but not limited to, saws, scorers, abrasive wheels, and drills, shall be provided with local exhaust ventilation systems in accordance with subdivision (ii) of this subparagraph.

(2) *Work practices*—(i) *Wet methods.* Insofar as practicable, asbestos shall be handled, mixed, applied, removed, cut, scored, or otherwise worked in a wet state sufficient to prevent the emission of airborne fibers in excess of the exposure limits prescribed in paragraph (b) of this section, unless the usefulness of the product would be diminished thereby.

(ii) *Particular products and operations.* No asbestos cement, mortar, coating, grout, plaster, or similar material containing asbestos shall be removed from bags, cartons, or other containers in which they are shipped, without being either wetted, or enclosed, or ventilated so as to prevent effectively the release of airborne asbestos fibers in excess of the limits prescribed in paragraph (b) of this section.

(iii) *Spraying, demolition, or removal.* Employees engaged in the spraying of asbestos, the removal, or demolition of pipes, structures, or equipment covered or insulated with asbestos, and in the removal or demolition of asbestos insulation or coverings shall be provided with respiratory equipment in accordance with paragraph (d)(2)(iii) of this section and with special clothing in accordance with paragraph (d)(3) of this section.

(d) *Personal protective equipment*—(1) Compliance with the exposure limits prescribed by paragraph (b) of this section may not be achieved by the use of respirators or shift rotation of employees, except:

(i) During the time period necessary to install the engineering controls and to institute the work practices required by paragraph (c) of this section;

(ii) In work situations in which the methods prescribed in paragraph (c) of

APPENDIX B

PROPOSED CLEANUP PLAN

for the

NEWARK LAMP PLANT
GENERAL ELECTRIC COMPANY
LIGHTING BUSINESS GROUP

January 3, 1985

BATTELLE
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

TABLE OF CONTENTS

PROPOSED CLEANUP PLAN

for the

NEWARK LAMP PLANT
GENERAL ELECTRIC COMPANY
LIGHTING BUSINESS GROUP

January 3, 1985

INTRODUCTION AND BACKGROUND

This proposed cleanup plan is submitted as one item or step of a series of actions connected with achieving compliance with the New Jersey Environmental Cleanup Responsibility Act as it applies to the closure and sale of General Electric's Newark Lamp Plant.

In brief, the Newark Lamp Plant consists of five major buildings, all four stories high, constructed in the period 1907 to 1917 to form a trapezoid (with an open central courtyard) which occupies a city block (see Figure 1). The total floor space within the plant amounts to slightly less than one-half million square feet.

A review of known historical operations, inspection and assessment of existing conditions, collection and analysis of samples, consideration of health, safety, and environmental factors, and availability of practical cleanup actions had led to the cleanup plan proposed here.

The principal problem existing at the Newark Lamp Plant has been identified as the presence of mercury concentrations judged undesirable for possible future uses of the plant. The mercury is present principally in dusts and residues on floors of certain work areas in the plant. The plan presented here provides for the removal of dusts and the cleaning, removal, or sealing of floor surfaces to prevent any impacts of mercury on human health or the environment during future use of the buildings.

The following sections of this plan deal with:

- Findings of historical research, and sampling and analysis activities
- Rationale and criteria for the approach to cleanup
- The specific cleanup measures proposed.

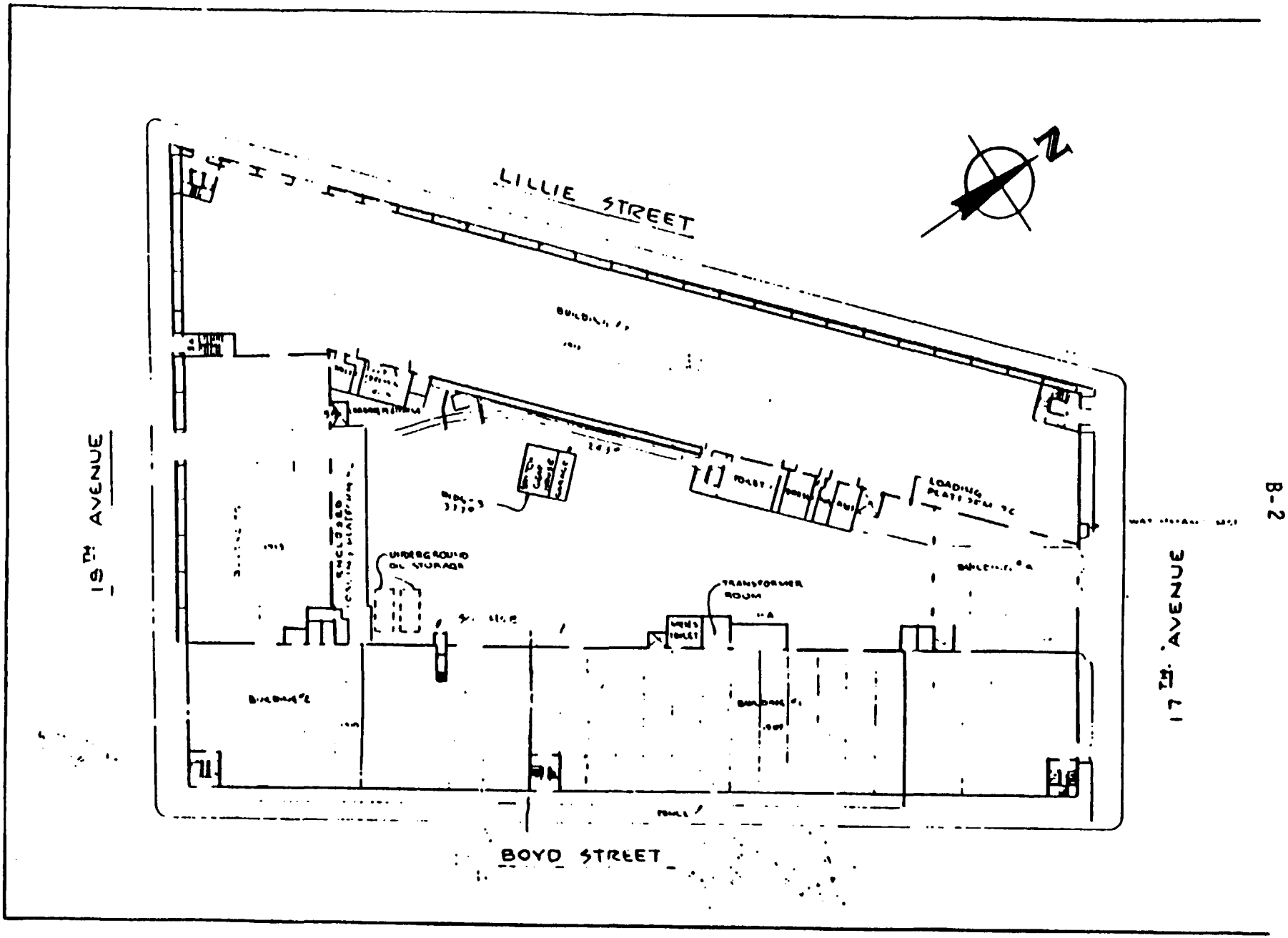


FIGURE 1. LOCATION AND GENERAL LAYOUT OF THE NEWARK LAMP PLANT

Other Submissions

This proposed cleanup plan is based in part on information contained in prior submissions of April 24, 1984 (Submittal of Initial Notification) and May 11, 1984 (Site Evaluation Submission).

It should be noted that the plan proposed here is concerned only with the cleanup of the interior of the buildings and that other activities at the plant, including those related to underground fuel-storage tanks, are the subjects of separate submissions.

HISTORICAL OPERATIONS AND SAMPLING

Past Operations

The results of the review of the history of operations at the Newark Lamp Plant has been previously presented in the Site Evaluation Submission referenced above. In accordance with the findings and recommendations of that submission various separate actions were taken to dispose of equipment, surplus inventory, and existing manufacturing wastes such as waste oils, etc. Also, effort was focused on the definition of the extent and degree of potential presence of residues of mercury as suggested appropriate by the review of past manufacturing operations.

That review identified a potential for mercury contamination as associated with the manufacturing step in which air is evacuated from lamps; the process includes the use of vacuum pumps, specifically devices known as mercury vapor diffusion pumps. Thus, areas where those pumps were used or repaired, or where mercury was stored were of particular interest in terms of potential contamination. Consequently, a series of activities were undertaken which included initial inspection, sampling and analysis, evaluation of the results, subsequent sampling and analysis, the consideration of the levels of contamination, available means of cleanup, and the setting of goals for the cleanup program.

The results of these activities are summarized in the following sections of this proposal.

Summary Description of Plant

The Newark Lamp Plant, as indicated previously, consists of five major buildings ringing a city block, with an approximate total floor space of a half million square feet. The following paragraphs present some of the salient features of the plant affecting the considerations of cleanup. Additional information on the features of the plant are given in Attachment 1. In general, the plant complex was constructed over the period 1907 to 1917 with the major buildings numbered as 1, 2, 5, 7, and 8.

Building 1 consists of a brick exterior shell with wooden interior structure consisting of wood columns and all-wood floor construction; i.e., wooden columns, subfloor and finish floor, the latter of tongue-and-groove maple. Building 1 does not have a full basement, but does have a crawl space containing some piping. The other major buildings (2, 5, 7, and 8) consist of exterior brick shells with internal structures of concrete columns and concrete floor slabs. Apparently the initial floors of these four buildings consisted of the concrete slab covered with successive layers of nail-crete containing wooden "sleepers" to which was nailed the uppermost layer of tongue-and-groove maple finish flooring. Over the life of the plant, areas of wooden flooring of the four "concrete" buildings (2, 5, 7, 8) were replaced with concrete of various kinds on an intermittent basis, depending on the use and conditions at the time; these repairs and replacements also apparently skirted areas where equipment was in operation to avoid disruption of work. Thus the current floor surfaces present a varied pattern of wood, steel plate over wood, concrete, vinyl tile over concrete, or miscellaneous other combinations.

In place of a basement and first floor, Building 8 has, instead, an access-opening for vehicles from the street to the open courtyard in the center of the plant.

The interiors of the buildings are characterized by the pattern of structural support columns which are arranged in a grid with an approximate twenty-foot spacing in both directions. Thus, large portions of the plant can be characterized as currently consisting of large stretches of "open-bay-areas".

These "open-bay" areas typically exhibit an overhead network of pipes, ducts, and wiring runs hung from the ceiling, which is usually the underside of the floor above and is usually concrete except in Building 1, where the ceiling surface is that of wooden beams and subflooring of the level above. Ceiling heights generally range from 14 feet to 20 feet.

Numerous separate rooms and enclosures exist in addition to the major open areas. One complex of offices is located in the north* quarter of the second floor of Building 1 and another complex of offices occupy the south half of the first floor of Building 2. These office areas typically have hung ceilings and vinyl tiled floors. The other "separate" or enclosed areas within the plant include fenced or caged areas defining shops or special work or storage areas; special enclosures (i.e., offices) also exist in the midst or at the sides of the large open bay areas. A recent survey resulted in an estimate of about 140 separate areas including "cages", lavatories, vaults, storage areas, offices, elevator shafts, etc.

RESULTS OF INSPECTION AND SAMPLING

Sampling and Analysis for Mercury

As indicated above, sampling and analysis for mercury was performed in two stages, the second stage of work being performed after evaluation of the results of the initial work. The results of sampling and analysis are summarized in the charts on the following pages. The charts present results of the following types of activities:

Air Sampling--air samples were collected at selected locations over an 8-hour period using a hopcalite absorbent. Results are listed in units of micrograms of mercury per cubic meter of air sampled.

Overhead Dusts--samples of accumulated dusts were collected from the upper surfaces of overhead piping and ductwork near the ceilings. Results are listed in units of parts per million (by weight) of mercury in the dusts.

---

* North here is taken as the 17th Avenue side of the complex (i.e., the side with the vehicle access opening through Building 8).

TABLE 1. MERCURY CONTENTS OF AIR SAMPLES - MICROGRAMS PER CUBIC METER

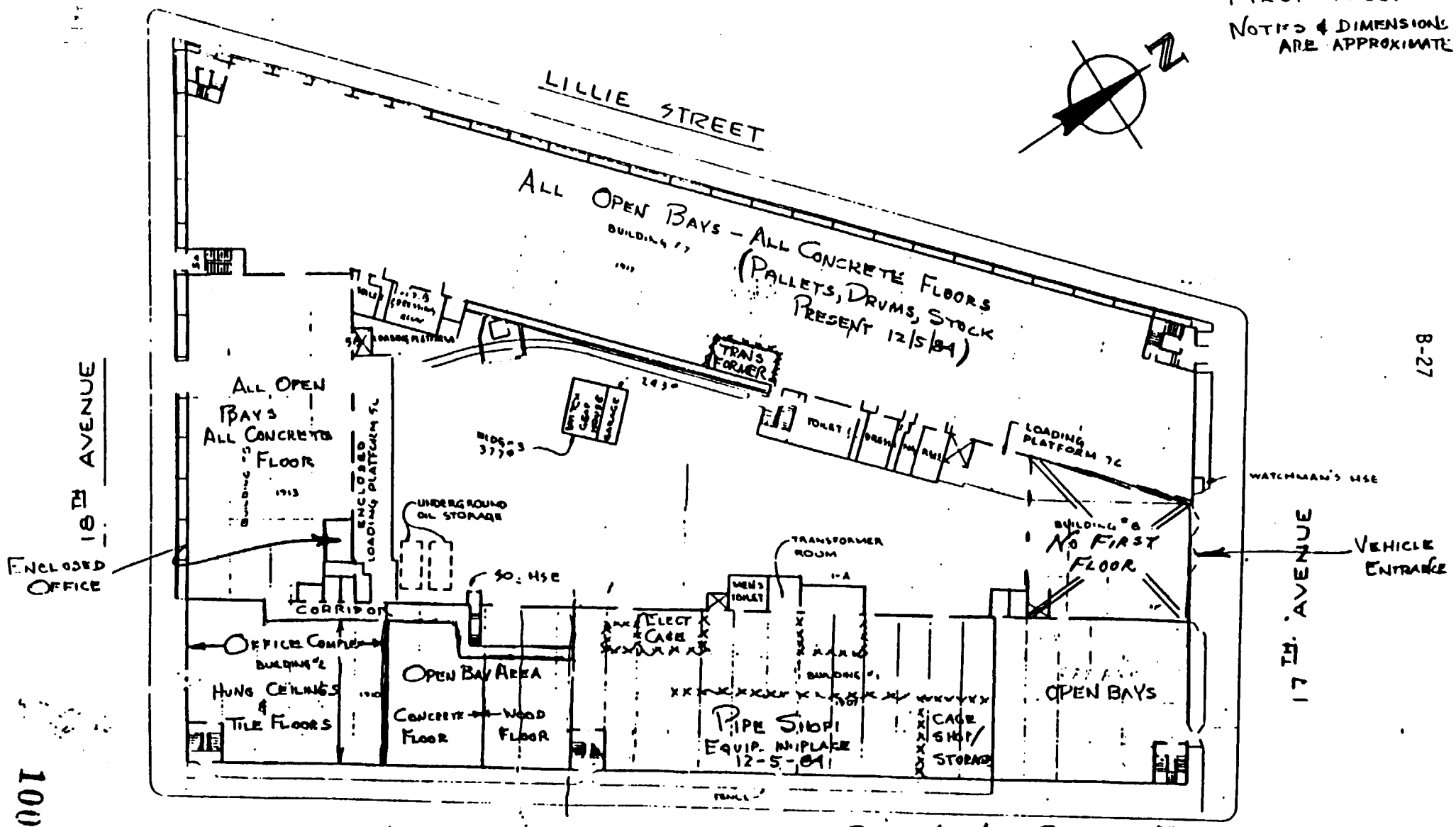
Floor/ Level	Building Number 1	2	5	7	8
	Outside on Rooftop				
4	0.06				
3	1.28	0.62		0.76	
2	0.81	0.69		0.21	
				Pump Room 2.2	
1	0.47			1.2	----
B	----				----

TABLE 2. MERCURY CONTENTS OF OVERHEAD DUSTS - PARTS PER MILLION

Floor/ Level	Building Number				
	1	2	5	7	8
4	250	11	25	12	
3	215 130	30	25	2.8	
2	12 89	20 34	52	18 23	
1	78		16	19	----
B	----	17	41	34 13	----

FIRST FLOOR

NOTES & DIMENSIONS ARE APPROXIMATE



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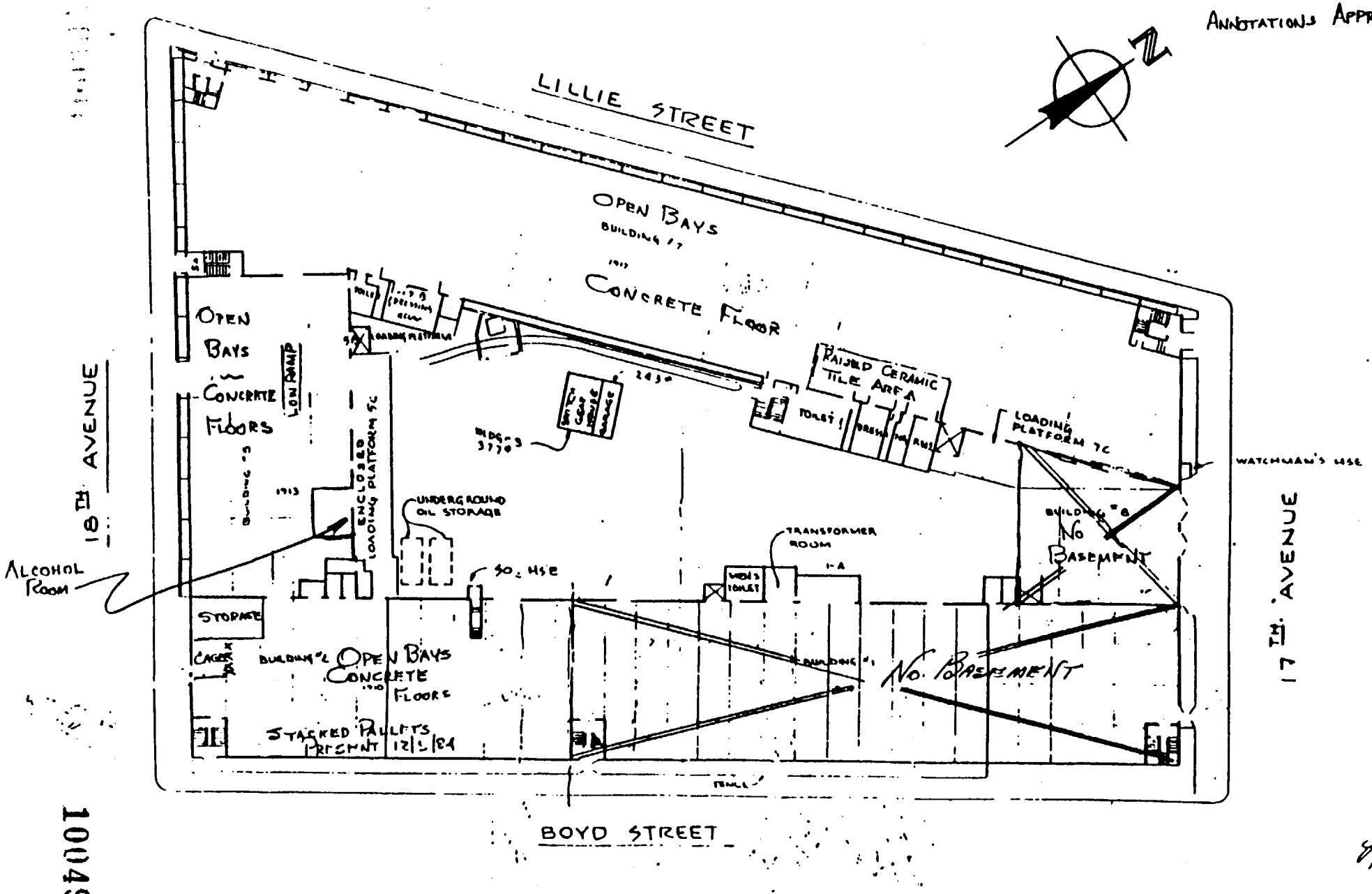
BASEMENT LEVEL
ANNOTATIONS APPROXIMATE



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ATTACHMENT B.2

BACKGROUND AND RATIONALE FOR
MERCURY CLEANUP CRITERIA

Rec'd 11/21/84 (at RDU)

B-30

DUKE UNIVERSITY MEDICAL CENTER

Occupational Health Service

November 15, 1984

Art Kaplan
General Electric Company
Incandescent Lamp Department
Nela Park, Cleveland, Ohio 44112

RE: Mercury Decontamination of Newark Site

Dear Art:

I recommend that you decontaminate your Newark facility to a level where workers in that facility would not be exposed to mercury vapor at a level greater than that which is acceptable for exposure to the general population; and decontaminate surfaces of the plant covered by mercury-contaminated dust so that any products manufactured in this facility would have no possibility of being contaminated.

The USEPA's guideline for an allowable ambient concentration of mercury vapor is 1 microgram per cubic meter (daily average). This guideline is based on the Swedish Commission on Evaluating the Toxicity of Mercury in Fish finding of an acceptable daily intake of methylmercury of 30 micrograms per day for a 70 kilogram man. USEPA derived their ambient guideline by assuming that at most 10 micrograms of mercury would be ingested each day from dietary sources leaving 20 micrograms that could be safely taken in from breathing air. They further assumed that an average man would breathe 20 cubic meters of air per day and that the toxicity of methylmercury was equivalent to mercury vapor. A review by the World Health Organization of a study of alkyl mercury poisoning in Iraq has further confirmed that an intake of 30 micrograms of mercury per day is an acceptable level. Population studies in Yugoslavia of groups exposed to ambient concentrations of mercury averaging greater than one microgram per day disclosed no significant clinical effects from exposure at this low level. The USEPA ambient guideline for mercury in air assumes that an individual will be exposed to mercury vapor for 24 hours a day, 7 days a week. However, since the Newark facility is an industrial site, the average daily exposure to any worker would be much less than one microgram per cubic meter if the facility was decontaminated to a level of one microgram per cubic meter or less, thus adding a safety factor. Ambient levels of one microgram per cubic meter or less can be achieved by removing highly contaminated materials from the site, vacuuming and washing contaminated surfaces and entombing contaminated sub-flooring.

100498

Division of Community and Occupational Medicine • Box 2914
Durham, North Carolina 27710 • Telephone (919) 684-6677

In order to assure that an ambient guideline of one microgram per cubic meter or less is met and in order to assure that materials produced or stored in this facility in the future are not contaminated significantly with mercury, a performance standard should be used during the decontamination process to remove any mercury contaminated dust or paint chips. The only applicable standard for identifying contaminated dust or paint chips is the USDA's standard for allowable mercury level in sewage sludge of 10 ppm (dry weight) or less for sludge that can be applied to agricultural fields. Preliminary studies at the Newark facility disclosed that floors or walls that are contaminated to a level of 10 parts per million in scrape samples average approximately 1 microgram of mercury per 100 cm squared of surface area. If all contaminated dust is removed by vacuuming, scrapping, sanding or washing, a residual level of this low order should offer no hazard of contamination to materials used in this facility or be a significant source of future mercury contamination of the work place air.

Sincerely,

Woodhall Stopford, M.D.

WS/wwg

APPENDIX C

DUKE UNIVERSITY MEDICAL CENTER

Occupational Health Service

December 14, 1984

Art Kaplan
General Electric Company
Incandescent Lamp Dept.
Nela Park
Cleveland, Ohio 44112

RE: Clean Up Plan For the Newark Lamp Plant

Dear Art:

I have completed my review of Battelle's plan for the clean-up of your Newark Lamp Plant and agree with the clean-up portion of this plan. I would like to expand, however, on two portions of the plan: workers protection and treatment of waste water.

Worker Protection and Monitoring

Prior to participating in this project, all workers shall have undergone, at least within one year prior to the project, a general medical examination including an occupational and medical history, physical examination, tests of kidney function, urinalysis, and pulmonary function tests. Such workers must have no demonstrable evidence of renal disease, psychosis, alcoholism, intentional tremor, or pulmonary disease that would limit their ability to wear a respirator, prior to being approved to work on this project. At the beginning of this project and prior to beginning work, this preliminary medical evaluation will be supplemented with a repeat urinalysis and urine test for mercury (first morning specimen).

During the project each worker will receive a urine mercury determination every two weeks. If urine mercury determinations exceed a value of 200 micrograms per liter on any determination, this determination will be repeated, if the second sample is also greater than 200 micrograms per liter, this individual will undergo a complete medical evaluation. For those workers who have an average urine mercury value (corrected to a specific value of 1.021) for the project of greater than 100 micrograms per liter, a complete medical evaluation will be done at the completion of this project. Assessment and evaluation will include a complete history, physical examination, and test of kidney function (creatinine and urinalysis), with more specific testing based on this evaluation.

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Durham, North Carolina 27710 • Telephone (919) 684-6677

All workers at the project will wear disposable jumpsuits, (Tyvek or equivalent), workshoes, head covers, and protective gloves. Each worker will wear a protective mask utilizing Mersorb cartridges (produced by Mine Safety Appliances Co., 201 North Braddock Ave., Pittsburg, PA. 15208). These cartridges have a life expectancy before breakthrough of 60 days when tested in a mercury atmosphere of 0.5 milligrams per cubic meter. Each cartridge has a color indicator for mercury vapor that changes color before 50% of the absorptive capacity of the cartridge for mercury is utilized.

The work environment will be monitored at least three times a day with a Jerome model 411 mercury meter, or its equivalent. When the mercury vapor levels are less than 0.5 milligrams per cubic meter, a half mask without quantitative fit testing can be utilized. When mercury vapor levels are greater than 0.5 milligrams but less than 5 milligrams per cubic meter, quantitative fit testing of such a respirator will be done. Between levels of 5 milligrams per cubic meters and 28 milligrams per cubic meter a full face mask with quantitative face mask will be worn. At levels greater than 28 milligrams per cubic meter, an air supplied respirator with quantitative fit testing will be used. At the end of each shift each respirator will be cleaned with a trisodium phosphate solution.

Treatment of Wash Waters

All wash waters utilized in this project will be treated by passing through a Calgon Disposorb Unit (available from Calgon Corp., Activated Carbon Division, P.O. Box 6768, Bridgewater, NJ 08807). At a maximum flow of 10 gpm contaminated water is brought into contact with activated carbon for a period of at least 30 minutes. During such a treatment process, water contaminated with mercury to levels as high as 60 milligrams per liter will be brought down to a concentration of 1 part per billion. Such a level is well within EPA's standards for mercury levels in drinking water and surface waters. The unit will hold approximately 20 lbs of mercury before breakthrough occurs. At the completion of the project this unit will be disposed of as hazardous waste.

Sincerely,

Woodhall Stopford, M.D.

WS/hb

DUKE UNIVERSITY MEDICAL CENTER

Occupational Health Service

January 8, 1985

Art Kaplan
General Electric Co.
Incandescent Lamp Dept.
Nela Park
Cleveland, Ohio 44112

RE: Clean-up plan for the Newark Lamp Plant

Dear Art:

This letter is to give further details concerning procedures for decontaminating the Newark Lamp Plant.

Several types of surfaces in the plant have been contaminated with mercury or mercury containing dust. Our recommendations for cleaning up various areas of the plant depend upon the characteristics of the contaminated surface. In general to limit further contamination of decontaminated surfaces, the decontamination endeavors should begin at the top floor in any one section and work downward. When dust is expected to be generated, vertical plastic baffles should be used to contain any contaminated dust in the current work area.

A. Highly contaminated wood floor with concrete subfloor or wood subfloor: In areas of the plant where mercury spills have occurred and where the subfloor is concrete or wood, the contaminated wood flooring should be removed and replaced with two layers of overlapping ½ inch plywood with a vapor barrier between the two layers. Any visible mercury droplets between the subfloor and flooring should be removed.

B. Highly contaminated wood flooring with an asbestos nailcrete subflooring: In the one are of the plant where mercury spills have occurred on a wood flooring with a subfloor containing asbestos, the current floor should be decontaminated by vacuuming and washing with a TSP solution and then covered with a new floor composed of two layers overlapping ½ inch plywood with a vapor barrier between the two layers. This type of procedure will entomb both the mercury and asbestos to prevent movement into the work environment.

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C. Highly contaminated walls and ceilings (pump room): In the pump room the surfaces that have yet to be decontaminated (upper walls and ceilings) should be scrapped to remove any paint flakes and washed with a TSP solution. The ceilings and walls of this room then should be painted with a vapor barrier paint. This room should also have a new floor composed of two layers overlapping ½ inch plywood with a vapor barrier between each layer.

D. Surfaces contaminated by mercury-containing dust: Surfaces of overhead surfaces (piping and lighting fixtures), ceilings of enclosed office spaces and floors contaminated only by mercury-containing dust will be decontaminated by vacuuming. Greasy or grimmy surfaces will be further decontaminated by washing with a TSP solution or, in severe cases by sanding.

In order to prevent contaminated dust releasing mercury vapor back into the work environment once it has been vacuumed, an industrial vacuum will be used with the filter cartridge filled with coarse iodinized activated charcoal. The exhausts from the vacuum cleaner will be monitored periodically to determine when the charcoal filter needs replacement.

Sincerely,

Woodhall Stopford, M.D.

WS/hb

CURRICULUM VITAE

Woodhall Stopford

PERSONAL DATA:

Born: Jersey City, NJ, Feb 43
Married, one child, born 16 Aug 80
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EDUCATION:

Dartmouth College, B.A., 1965
Dartmouth Medical School, B.M.S., 1967
Harvard University, M.D., 1969
University of North Carolina, M.S.P.H. (Industrial Hygiene), 1980

MEDICAL EXPERIENCE AND TRAINING:

Intern in Medicine, Duke Medical Center, 1969-70
Clinical Scholar, Duke Medical Center, 1970-71
Resident in Medicine, Indiana University Medical Center, 1971-73
Fellow, Community health Sciences, Indiana University Medical Center, 1971-73
Director, Employee Health Service, Duke University and Medical Center, 1973-76
Director, Screening Clinic, Duke Medical Center, 1973-76
Physician, Occupational Medicine Program, Duke Medical Center, 1973-
Consulting Practice in Industrial Medicine and Toxicology, 1974-

TEACHING EXPERIENCE AND APPOINTMENTS:

Associate to Clinical Assistant Professor, Department of Community & Family Medicine, Duke Medical Center, 1973-
Adjunct Assistant Professor, School of Public Health, University of North Carolina, 1976-
Consulting Staff, Watt Hospital, 1973-76
Courtesy Staff, Durham County General Hospital, 1977-
Director, Postgraduate Training Program in Industrial Medicine and Toxicology, Duke Medical Center, 1981-1983
Director, Occupational Medicine Education, Duke Medical Center, 1983-

SPECIALTY BOARD CERTIFICATION:

Diplomate, American Board of Internal Medicine, 1973
Diplomate, American Board of Preventive Medicine (Occupational Medicine), 1983

MILITARY SERVICE:

Active Reserve, U.S. Army and National Guard, 1970-76; Major, MC

MEMBERSHIPS:

American Academy of Occupational Medicine
American Occupational Medicine Association
American Industrial Hygiene Association
American Conference of Governmental Industrial Hygienists
Medichem: Occupational Health in the Chemical Industry
Durham-Orange County Medical Society
North Carolina Medical Society
American Medical Association
American Public Health Association
Royal Society of Medicine

Woodhall Stopford, M.D.

PUBLICATIONS

Stopford, W. and Goldwater, L.J. Methylmercury in the environment; a review of current understanding. Environmental Health Perspectives 12: 115-118, 1975

Stopford, W., Donovan, D.H., Abou-Donia, M.B., and Menzel, D.B. Glutathione peroxidase deficiency and mercury allergy: amelioration with selenium supplementation. In Symposium on Selenium-Tellurium in the Environment, Notre Dame, 11-13 May 76 (Pittsburgh: Industrial Health Foundation, Inc.), p. 104-112

Goldwater, L.J., and Stopford, W. Mercury and the environment. In:Lenihan, J., and Fletcher, W., Eds. Environment and Man, v. 5, the Chemical Environment. (Glasgow: Blackie), 1977

Stopford, W., and Goldwater, L.J. Routes of entry/influence on toxicology. In: Industrial Toxicology (Darien: Dunlap and Assoc., Inc.), 1977

Stopford W., and Goldwater, L.J. Toxicity of inorganic compounds. In: Industrial Toxicology (Darien: Dunlap and Assoc., Inc.), 1977

Stopford, W., and Goldwater, L.J. Toxicity of organic compounds. In: Industrial Toxicology (Darien: Dunlap and Assoc., Inc.), 1977

Stopford, W., Bundy, S.D., Goldwater, L.J., and Bittikofer, J.A. Microenvironmental exposure to mercury vapor. Am. Industr. Hygiene Assoc. J. 39: 378-384, 1978

Stopford, W. Industrial exposure to mercury. In: J.O. Nriagu, Ed. Biogeochemistry of Mercury (Amsterdam: Elsevier/North Holland), pp. 367-397, 1979

Stopford, W. Chloronaphthalenes: Human Health Effects (Cincinnati: U.S. Environmental Protection Agency), 1979

Stopford, W. Naphthalene: Human Health Effects (Cincinnati: U.S. Environmental Protection Agency), 1979

Sullivan, R.J., Estes, E.H., Stopford, W., and A.L. Lester. Adherence by physicians and physicians' extenders to explicit stategies for management of common medical conditions. Medical Care. 18: 388-399, 1980

Stopford, W. The Use of Differential Absorption for the Speciation of Mercury Vapor (Chapel Hill: University of North Carolina School of Public Health). Master's Technical Report. 1980

Stopford, W. Mercury intoxication among dental personnel. J. Am. Med. Assoc. 250: 822, 1983.

Stopford, W. Toxic Effects of Pesticides. In: P.L. Williams, Ed., Industrial Toxicology-Safety and Health Applications in the Workplace (Atlanta: Georgia Institute of Technology). Submitted.

PUBLICATIONS

Stopford, W. Toxic Effects of Organic Solvents. In: P.L. Williams, Ed., Industrial Toxicology-Safety and Health Applications in the Workplace (Atlanta: Georgia Institute of Technology). Submitted.

Stopford, W. Occupational Epidemiology. In: P.L. Williams, Ed., Industrial Toxicology-Safety and Health Applications in the Workplace (Atlanta Georgia Institute Of Technology). Submitted.

Committees, National

Member, Occupational Medicine Committee, American Industrial Hygiene Association. 1982-

Chairman, Task Force for Chronic Health Hazard Labelling, American Society for Testing and Materials. 1981-

Consulting Toxicologists To:

Matheson Gas Product, Inc.
Art and Craft Materials Institute, Inc.
Pencil makers Association, Inc.
McDermitt Mine
Robertshaw Controls, Inc.
Partlow Corp.
Chase Instruments Co.
Troy Chemical Co.
Cosan Chemical Co.

Selected Seminars and Short Courses Given:

AAOM Conference: Principles of Medical Monitoring For Multiple Toxic Exposures, 19
Occupational Seminar Series: Toxicology of Mercury, 1979
NIOSH, Morgantown: Industrial Toxicology of the Lung, 1979
NIOSH, Morgantown: Industrial Carcinogenasis, 1979
AMA Congress on Occupational Health: Clinical Evaluation of Carbon Disulfide Intoxicated Workers and Their Families, 1979
Duke Toxicology Seminar Series: Toxicology of Inorganic Mercury, 1980
Georgia Tech. Industrial Toxicology Course: Industrial Epidemiology, 1981-82
Georgia Tech. Industrial Toxicology Course: Toxicolology of Heavy Metals, 1981-82
Durham-Orange County Dental Society: Mercury Hazards in Dentistry, 1981
ERC Summer Institute: Industrial Toxicology: Basics; heavy metals; occupational pulmonary disease; toxicology of organics, 1981
NC State Univ. Short Course in Toxicology: Industrial Pulmonary Disease; Toxicology of Heavy Metals, 1981

Woodhall Stopford, M.D.

Seminars and Short Courses Given:

Environmental Resource Center Seminar: Occupational Medicine Today, 1982
Clinical Aspects of Toxicology Seminar: Pathophysiology of CNS Toxicants: Mercury , 1983
Brooklyn College Medical Geology Conference: Biogeochemistry of Mercury in the Aquatic Environment, 1984

APPENDIX D

PROPOSED PROGRAM

NO. 545-P-4766

on

POST-CLEANUP SAMPLING AND ANALYSIS FOR MERCURY AT NEWARK LAMP PLANT OF GENERAL ELECTRIC COMPANY NEWARK, NEW JERSEY

to

ENVIRONMENTAL CONTROL OPERATIONS
LIGHTING BUSINESS GROUP
NELA PARK
CLEVELAND, OHIO 44112

January 3, 1985

BATTELLE
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

PROPOSED PROGRAM

NO. 545-P-4766

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POST-CLEANUP
SAMPLING AND ANALYSIS FOR MERCURY
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NELA PARK
CLEVELAND, OHIO 44112

January 3, 1985

INTRODUCTION

This document presents a proposed Post-Cleanup Sampling and Analysis Plan for the Newark, New Jersey Lamp Plant of the Lighting Business Group of General Electric Company. This plan is an activity in the sequence of steps called out by the New Jersey Environmental Cleanup Responsibility Act and related regulations.

Background

The Newark Lamp Plant has engaged in manufacture of light bulbs and consists of a ring of five major multistory buildings around a central courtyard, occupying an entire city block. The total floor space of all buildings amounts to slightly less than 500,000 square feet. The buildings were constructed at various times over the period 1907 to 1917.

The General Electric Company, in the course of business, has undertaken to close the plant and sell the property. In the course of this action, General Electric Company has complied with the recently-enacted New Jersey

Environmental Cleanup Responsibility Act and assessed the site for the presence of hazardous substances as directed and identified in that Act. The result of that assessment was the identification of the potential presence of mercury on site. Mercury was used in mercury-vapor-diffusion vacuum pumps in a system for evacuating lamps during the manufacturing process. Further, available historical information, based on the experience of the present staff (ranging back to the 1940's), has identified potential areas of likely mercury contamination, and the presence of relatively elevated mercury concentrations in those areas has been confirmed by preliminary sampling and analysis activities.

OBJECTIVES AND SCOPE

The proposed sampling and analysis plan presented in the following sections of this document has the objective of verifying the cleanup of the mercury residues from interior surfaces of the plant, to the specified standards. This plan is designed to apply to the interiors of all buildings.

Sampling Plan Design

This sampling plan was developed after the consideration of numerous factors such as the specifics of the plant structures and history, the nature, properties, and expected behavior of mercury, the available techniques for sampling, cost-effectiveness, and the function or role of the sampling and analysis activity relative to verifying cleanup and eventual release of the property.

This sampling plan involves the use of wipe sampling applied to floors and walls, and sampling of air. The basis for selection of these methods is discussed further below.

The sampling plan takes into account the layout of the plant in terms of "open bay" areas and individual rooms. The sampling methods are discussed in following sections of this document, as is the concept of compositing of samples and the associated potential for retrospective checks.

Sampling Locations

The proposed locations of wipe sampling are indicated in terms of the entries in Table 1 and the diagram of building layout in Figure 1. The general approach to wipe sampling locations includes considerations of areas of known or suspected use or storage of mercury, the existence of both variously sized offices and rooms and relatively large "open bay" areas. Wipe samples will be composited for the purpose of analysis, as described in Table 1.

Air samples will be taken at the center of each floor/level of each building except for Building 7, where two air samples will be taken on each floor/level, and these will be located at the quarter and three-quarter points on the long axis of the building.

Sampling Methodology

The sampling methods include surface wipes and air samples.

The wipe test proposed here consists of a 10-inch diameter filter paper wet with 25 percent nitric acid and rubbed or wiped over an area of one square meter. This differs from the OSHA wipe method in that the filter and area are both larger, i.e., the OSHA method uses a filter about 2-1/2 inches in diameter and an area 10 centimeters by 10 centimeters. The larger wipe is proposed here based on experience which has established the following details: the hand and filter may be turned during wiping to avoid generation of uniform "finger-prints" or "spots" of dirt on the filter, the hand (protected with a glove) does not overlap the filter and carry dirt from one sample to another, and more material (dust) is collected for analysis. The amount of material collected is related to the compositing of samples as well as allowing sufficient materials to provide for analytical sensitivity.

The wipe procedure involves preparation (wetting the filter with nitric acid, folding, and placing in a "re-sealable" plastic envelope freezer bag) and sampling (opening, wiping, refolding with wipe side "in" and replacing in the plastic envelope). The filter may then be retrieved from the

TABLE 1. TYPES, NUMBERS, AND LOCATIONS OF SAMPLES

Building Number	Floor (Level)	Room or Area	Floor Wipes	Floor Wipe Composites	Wall Wipes	Wall Wipe Composites
1	Basement		-no Basement-		-	
1	1	Open Bays	5	1	4	1
1	2	Open Bays	8	1	4	1
		3 Offices	1 ea	1	1 ea	1
1	3	Separate Rooms	1 ea	1	1 ea	1
		Bay Areas	4	1	4	1
1	4	Separate Rooms	1 ea	1	1 ea	1
		Open Bays	10	1	4	1
2	Basement	Open Bays	4	1	4	1
2	1	Offices	11	2	11	2
		Open Bays	2	1	4	1
	2	Open Bays + 1 office	4	1	4	1
2	3	3 Rooms	3	1	3	1
		Open Bays	2	1	4	1
2	4	Separate Rooms	1 ea	1	1 ea	1
		Open Bays	5	1	4	1
	Basement	Open Bays	4	1	4	1
	1	Bays plus one office	3	1	5	1
5	2	Room 21	2	1	4	1
		Open Bays	3	1	4	1
5	3	Separate Rooms	1 ea	1	1 ea	1
		Open Bays	2	1	4	1
5	4	Open Bays	4		4	
		Office	1	1	1	1
7	Basement	Open Bays	7	1	4	1
7	1	Open Bays	6	1	4	1
7	1	Open Bays	6	1	4	1
7	2	New Wood	4	1	-	-
		Center Wood	2	1	-	-
		Concrete	6	1	-	-
		Open Bay	-	-	4	1
		Separate Rooms	1 ea	1	1 ea	1
		Pump Room	1	1	4	1
7	3	Separate Rooms	1 ea	1	1 ea	1
		Open Bays	10	1	4	1
7	4	Separate Rooms	1 ea	1	1 ea	1
		Open Bays	10	1	4	1
8	Basement		-no basement-			
8	1		-no first floor-			
8	2	Storage Room	1		1	
		Open Bay	1	1	1	1
8	3	Separate Rooms	1 ea	1	1 ea	1
8	4	Open Bay	1	1	4	1

TABLE 3. MERCURY CONTENTS OF FLOOR SCRAPINGS - PARTS PER MILLION

Floor/ Level	Building Number 1	2	5	7	8
4	81 51	52 13 0.5		14 3.4	
3	636 304 171 60 200 219 (Wood) 4/38/107 (Paper) 14/23/47	1,460 328 375 280 256		5 5	
2	36 260 1,186 48	53 17		3,150 27 4,230 18	
1			18		----
B	----			4.5	----

TABLE 4. MERCURY ANALYSES OF FLOOR WIPES-MICROGRAMS PER 100 SQUARE CENTIMETERS

Floor/ Level	Building Number 1	2	5	7	8
4		0.08	0.07	0.09	
3					0.06
2			Storage Rm 21-5.3	0.47 0.13	
1	0.30		0.88	0.23	----
B	----	0.13		0.07 0.09	----

TABLE 5. MERCURY ANALYSES OF WALL WIPES-MICROGRAMS PER 100 SQUARE CENTIMETERS

Floor/ Level	Building Number 1	2	5	7	8
4	0.44	0.01		0.27	
3	0.36, 0.13 0.03	0.03	0.02	0.004 0.006	
2	0.05	0.004	0.007	0.001 0.01 0.03 0.14 Pump Room 275	0.03
1	0.43			0.13	----
B	----				----

Floor Residues and Materials--Floor surfaces were scraped to obtain samples of accumulated residues and some variable amounts of flooring materials.

Wipe Sampling--Wipe sampling of walls and floors was performed by wiping an area of 1000 square centimeters of surface with a filter paper using nitric acid as a solvent during wiping. During analysis the entire amount of mercury retained on the filter was determined. Results of these samples are reported in terms of micrograms of mercury per 100 square centimeters of surface.

Results of Sampling and Analysis

The results of the sampling and analysis were evaluated in various ways. Internal comparisons among the sampling methods showed a general correlation among the methods: specific areas of relatively elevated or relatively low mercury content were generally indicated by all methods.

The results of the sampling and analysis effort were interpreted as showing elevated mercury concentrations in the following locations and forms:

- Building 1- second floor--residues on the floor from mercury falling through the wooden floor and sub-floor above on the third floor; this was not a former manufacturing area
- Building 1; third floor--residues on the floor and beneath the wooden flooring material; this was a former manufacturing area
- Building 2, third floor--residues on the floor and beneath the wooden flooring material; this was a former manufacturing area
- Building 5, second floor--residues on the concrete floor within an enclosed room (marked as Room 21) previously used for mercury storage
- Building 7, second floor--residues on the floor and beneath the wooden flooring materials in the main floor area; this was a former manufacturing area
- Building 7, second floor--residues on the concrete walls and floors of a separate room referred to as the "Pump Room" or "Pump Cleaning Room"; this area was used for the cleaning and repair of mercury-vapor-diffusion (vacuum) pumps.

The existence of elevated mercury concentrations in the above areas was compatible with the known history of operations in the plant.

Results of Inspection

In the course of inspection, assessment, and sampling of the plant, various sample areas of flooring materials were removed to establish the likely patterns for the nature of mercury contamination. One of the factors discovered which is relevant to this plan was the identification of a layer of "nail-crete" containing asbestos under the sections or areas of wood floor remaining in Building 2. This material, which forms a base over which the wood flooring was laid, has been identified as containing about 20 percent asbestos. This material has also been found to be limited to the wood floor sections of Building 2; inspection of other areas within the plant revealed the presence of similar layers of nail-crete under wooden flooring, but asbestos was not present. The use of nail-crete containing asbestos was concluded as being unique to Building 2, and was judged to be a result of conditions and materials availability at the time of the original construction of the building. The presence of the asbestos under certain areas of the floor in Building 2 impacts the selection of the approach to the proposed cleanup actions at the plant.

CRITERIA FOR CLEANUP ACTIONS

The results of inspection, sampling and analysis, as well as factors of structural characteristics, possible future use, and practicable courses of action was accompanied by a consideration of goals to be achieved following cleanup actions.

The criteria developed relative to mercury were based on a consideration of available existing information from two sources. The background and rationale associated with these two criteria are given in Attachment 2 to this proposed plan. In brief, these criteria set the following goals to be achieved after cleanup:

- Mercury Concentrations in Air--a maximum of one microgram per cubic meter

- Mercury Contamination Levels on Floor and Wall Surfaces--a maximum of 1 $\mu g/100\ cm^2$.

The approach to the asbestos under portions of the floors of Building 2 was based on the consideration that the asbestos is presently entirely contained beneath the floor and that removal would necessarily result in some potential exposure of the workers involved (even using available measures for worker protection) and some potential for dispersion of asbestos throughout the plant. The considered course of action selected was to leave the asbestos contained in its present location. This course of action is consistent with the actions at other plants and in many instances with approaches to containment of asbestos materials in public buildings.

This approach to the containment of potential problems from the asbestos impacts the measures applicable to cleanup of mercury residues. Whereas it was judged appropriate and practicable to remove flooring materials contaminated with mercury in other areas of the plant, the presence of the asbestos-containing nail-crete under the wood flooring in Building 2 and the presence of significant mercury residues on wood flooring on the third floor of Building 2 lead to the approach, for that specific area, of containment of both the asbestos and the mercury-contaminated wooden flooring by installation of additional layers of flooring (and vapor barrier) over the existing materials. This approach will be discussed in more detail below.

PROPOSED CLEANUP ACTIONS

The following paragraphs describe the specific cleanup actions proposed for the various specific areas and conditions within the plant. The range of actions described include the following:

- Vacuum cleaning to remove all overhead dusts, followed by wet wiping (if necessary) to remove any remaining visible grime or residues of mercury;
- Vacuum cleaning of floors to remove light residues if necessary and any dust resulting from overhead cleaning;
- Sanding and vacuuming of floors with moderate residues of mercury;
- Removal of wood flooring with heavy residues of mercury;

- Installation of flooring to seal over existing areas combining mercury-contaminated wood with asbestos-containing nail-crete (specifically the third floor of Building 2);
- Special washing and cleaning procedures for two specific areas: the pump cleaning room (Building 7, second floor) and a mercury storage area (Room 21, Building 5, second floor).

These actions are described in more detail below. Methods, equipment and safeguards are discussed in later sections of this document.

A chart indicating a summary of actions is given on the following page.

Overhead Dusts - All Buildings

In view of the mercury concentrations measured in dusts from the upper surfaces of overhead piping, ducts, and wiring, all such dusts will be removed by vacuuming and, as determined by concurrent inspection, wet wiping to remove all visible residues or to achieve a condition acceptable to later sampling and analysis (i.e., a wet-wipe sample). Vacuuming will be done with specially-modified heavy-duty industrial vacuum cleaners with modifications to control emissions of dust and mercury. Worker protection will include suitable respirators.

All overhead dusts in the entire plant (all floors/levels of all buildings) will be cleaned away. This measure will include the upper sides or "roof" surfaces of the various separate enclosed rooms scattered through the plant, where such enclosures do not reach to the full ceiling height and where accumulated dust is accessible for removal.

Building 1

The approach to cleanup of the floors in Building 1 is based on the consideration of the wooden structure of the building, the known history of the manufacturing operations on the third floor, and the results of sampling and analysis. The principal contaminated area in Building 1 is the third floor. On this floor, the finish flooring will be removed, an underlying layer of construction paper will be removed and the uncovered surface of the

TABLE 6. CHART OF CLEANUP ACTIONS

Floor/ Level	Building Number 1	2	5	7	8
4	Vacuum floor	Vacuum floor	Vacuum floor	Vacuum floor	Vacuum floor
3	Dismantle partitions (clean room) Remove finish flooring Remove Building Paper Vacuum subfloor Install 2x1/2 in. plywood with vapor barrier Vacuum underside of subfloor	Vacuum floor Cover with two layers of 1/2 plywood with vapor barrier between	Vacuum floor	Vacuum floor	Vacuum floor
2	Remove floor surface and vacuum floor	Vacuum floor	Vacuum Floor; Room 21-special (wash walls and floor)	Leave new replacement flooring; replace selected areas of wood floor; vacuum balance of floor	Vacuum floor
1	Vacuum floor	Vacuum floor	Vacuum floor	Vacuum floor	
B		Vacuum floor	Vacuum floor	Vacuum floor	

subflooring will be vacuumed. The removed materials will be treated as hazardous waste. New flooring will be installed consisting of a sequence of a layer of half-inch thick plywood with tongue-and-groove joints, a layer of 8-mil (0.008-inch) thick polyethylene or other equivalent material to act as a vapor barrier, and another layer of half-inch thick tongue-and-groove plywood. The underside of the subflooring (i.e., the ceiling of the second floor/level).

The second floor of Building 1 will be cleaned by surface removal and vacuuming. The first and fourth floors of Building 1 will be vacuumed to remove any residues from either past operations or from the cleaning away of overhead dusts.

Building 2

The third floor of Building 2 will be handled differently from the third floor of Building 1. Because of the underlying layer of asbestos-bearing nail-crete, (as discussed above) the existing floor will be covered with the same system as used for replacement in Building 1: two layers of tongue-and-groove plywood with a polymer-sheet vapor barrier between.

The remaining floors of Building 2 will be vacuumed to remove residues (including those generated by cleanup of overhead dusts).

Building 5

In Building 5, all floors will be vacuumed to remove residues from past work and cleanup of overhead dust.

Room 21, a past mercury-storage area on the second floor of Building 5, showed evidence of mercury contamination on the floor. The floor and walls of this storage room will be scrubbed with TSP solution to remove mercury residues. Any remaining contents of the room (e.g., shelving) will be cleaned by wet scrubbing or discarded as hazardous waste, as judged appropriate at the time of cleanup.

Building 7

The principal area of contamination identified in Building 7 is a "side" room referred to as the "Pump Room" or "Pump Cleaning Room" and adjacent floor areas in what was a previous manufacturing area. The balance of the building evidences relatively low levels of mercury contamination.

The clean-up of the pump room where preliminary trials of cleanup procedures have been performed, will include the dismantling of a partitioned cubicle referred to as the "getter" room (approximately 4 feet by 6 feet in area), removal of the remains of a hung ceiling, removal of the remaining floor tile, and scraping of walls and ceiling to remove any loose flaking, or peeling paint. Overhead dusts and other debris will be vacuumed away and the walls and floors wet scrubbed with TSP solution. The walls will be sealed with epoxy paint. The remaining concrete floor will be covered with new flooring consisting of two layers of half-inch-thick tongue-and-groove plywood with a polyethylene vapor barrier between.

In the main, "open-bay" area of the second floor of Building 7, some areas of wooden flooring have been recently replaced with plywood sheet. These newly floored areas will remain as-is, but will be protected from any contamination during cleanup.

Two areas of old wooden flooring near the north (approximately 22 feet x 41 feet) and south (approximately 12 feet x 17 feet) ends of the second floor of Building 7 exhibit large surface irregularities due to poor states of repair or the presence of machine mounting plates so as to be judged suitable for replacement. The existing flooring in these areas will be removed, the areas examined for evidence of mercury contamination, vacuumed if appropriate, and restored to service using plywood flooring.

The balance of the second floor and the remaining floors of Building 7 will be vacuumed to remove any residues present (from past operations or from cleanup of overhead dusts).

Building 8

All floors (second, third, and fourth) in Building 8 will be vacuumed to remove any residues present.

WORKER HEALTH AND PROTECTION

Prior to participating in this project, all workers shall have undergone, at least within one year prior to the project, a general medical examination including an occupational and medical history, physical examination, tests of kidney function, urinalysis, and pulmonary function tests. Such workers must have no demonstrable evidence of renal disease, psychosis, alcoholism, intentional tremor, or pulmonary disease that would limit their ability to wear a respirator, prior to being approved to work on this project. At the beginning of this project and prior to beginning work, this preliminary medical evaluation will be supplemented with a repeat urinalysis and urine test for mercury (first morning specimen).

During the project each worker will receive a urine mercury determination every two weeks. If urine mercury determinations exceed a value of 200 micrograms per liter on any determination, this determination will be repeated, if the second sample is also greater than 200 micrograms per liter, this individual will undergo a complete medical evaluation. For those workers who have an average urine mercury value (corrected to a specific value of 1.0 to 1) for the project of greater than 100 micrograms per liter, a complete medical evaluation will be done at the completion of this project. Assessment and evaluation will include a complete history, physical examination, and test of kidney function (creatinine and urinalysis), with more specific testing based on this evaluation.

All workers at the project will wear disposable jumpsuits, (TVEW or equivalent), workshoes, head covers, and protective gloves. Each worker will wear a protective mask utilizing Mersorb cartridges (produced by Mine Safety Appliances Co., 201 North Braddock Ave., Pittsburg, PA 15208). These cartridges have a life expectancy before breakthrough of 60 days when tested in a mercury atmosphere of 0.5 milligrams per cubic meter. Each cartridge has

a color indicator for mercury vapor that changes color before 50 percent of the absorptive capacity of the cartridge for mercury is utilized.

The work environment will be monitored at least three times a day with a Jerome model 411 mercury meter, or its equivalent. When the mercury vapor levels are less than 0.5 milligrams per cubic meter, a half mask without quantitative fit testing can be utilized. When mercury vapor levels are greater than 0.5 milligrams but less than 5 milligrams per cubic meter, quantitative fit testing of such a respirator will be done. Between levels of 5 milligrams per cubic meters and 28 milligrams per cubic meter a full face mask with quantitative face mask will be worn. At levels greater than 28 milligrams per cubic meter, an air supplied respirator with quantitative fit testing will be used. At the end of each shift each respirator will be cleaned with a trisodium phosphate solution.

PROTECTION OF THE ENVIRONMENT

Measures which will be implemented to protect the environment during cleanup include control of emissions of mercury vapor, control of mercury-contaminated wastewater, and controlled disposal of any hazardous solid waste generated.

The vacuuming of mercury-containing dusts and residues will be performed using specially-modified industrial-type vacuum cleaners modified to provide for control of exhaust air using carbon absorption and high efficiency filters to remove mercury vapors and particulate dust. Residues (carbon, filters) generated will be disposed of in a controlled manner as hazardous waste, or, if appropriately supported and documented, as nonhazardous waste.

All wash waters utilized in this project will be treated by passing through a Calgon Disposorb Unit (available from Calgon Corp., Activated Carbon Division, P.O. Box 6768, Bridgewater, NJ 08807). At a maximum flow of 10 gpm contaminated water is brought into contact with activated carbon for a period of at least 30 minutes. During such a treatment process, water contaminated with mercury to levels as high as 60 milligrams per liter will be brought down to a concentration of 1 part per billion. Such a level is well within EPA's standards for mercury levels in drinking water and surface waters. The unit

will hold approximately 20 lbs of mercury before breakthrough occurs. At the completion of the project this unit will be disposed of as hazardous waste.

Any flooring or other materials stripped from the buildings during cleanup will also be managed as hazardous waste.

All other residues or miscellaneous materials (rags, disposable materials, filters, tools) discarded during cleanup will be disposed of in a controlled manner or as hazardous waste and disposal documented.

POST CLEANUP SAMPLING

Following cleanup and removal of all waste materials generated during cleanup, post-cleanup sampling will be conducted by a party or firm separate from the contractor performing cleanup. This sampling activity will encompass the areas cleaned and will include two types of sampling: air sampling for metallic mercury vapor and wet-wipe type sampling of overhead-type surfaces and floor surfaces. Details of the post-cleanup sampling plan are given in a separate document.

TIME SCHEDULE

(To be determined)

COST ESTIMATE

(To be determined)

ATTACHMENT B.1

INFORMATION ON PLANT CHARACTERISTICS

ATTACHMENT 1. INFORMATION ON PLANT CHARACTERISTICS

This attachment contains a listing of the square feet of floor areas and recently (12/5/84) annotated drawings to supply information on floor surfaces and various features within the plant in support of cleanup operations. The original scale of the drawings was one inch equal to fifty feet (at a page size of 11 x 17). Recent notes are approximate in location and scale.

FLOOR AREAS IN SQ. FT.

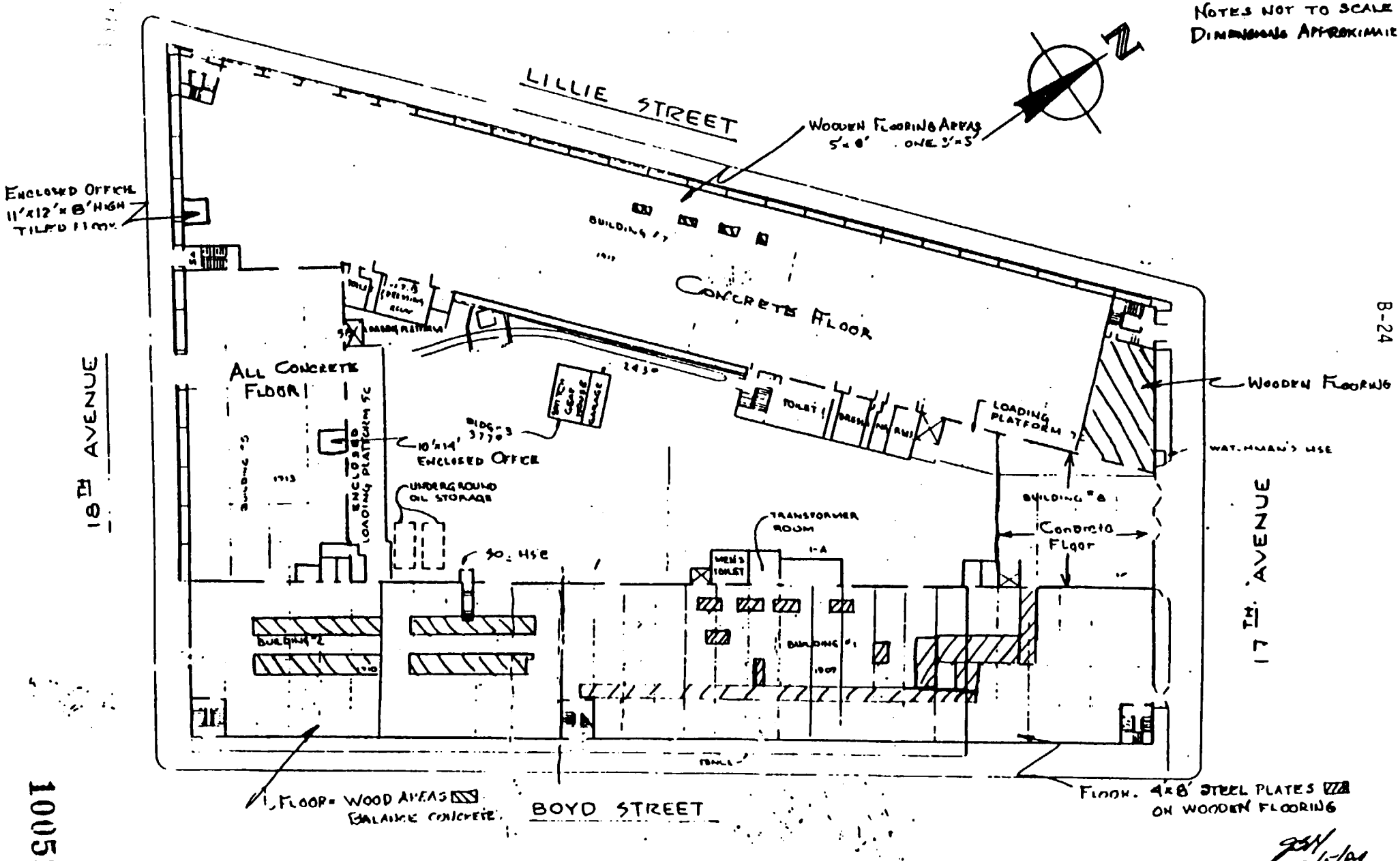
BUILDINGS	BASEMENT	1ST FLOOR	2ND FLOOR	3RD FLOOR	4TH FLOOR	TOTAL
#1		24993	24116	24116	24116	96,791
#2	11299	14498	14498	14498	14498	69291
#3		377				377
#5	12722	14777	12722	12722	12722	65665
#7	43872	45072	45072	44715	44715	223446
#8		5513	5390	5340	5390	21533
PENT HOUSES					3598	3598
TOTAL	67893	104680	101748	101391	104989	480701

18TH AVE

100528

FOURTH FLOOR/LEVEL

NOTES NOT TO SCALE
DIMENSIONS APPROXIMATE



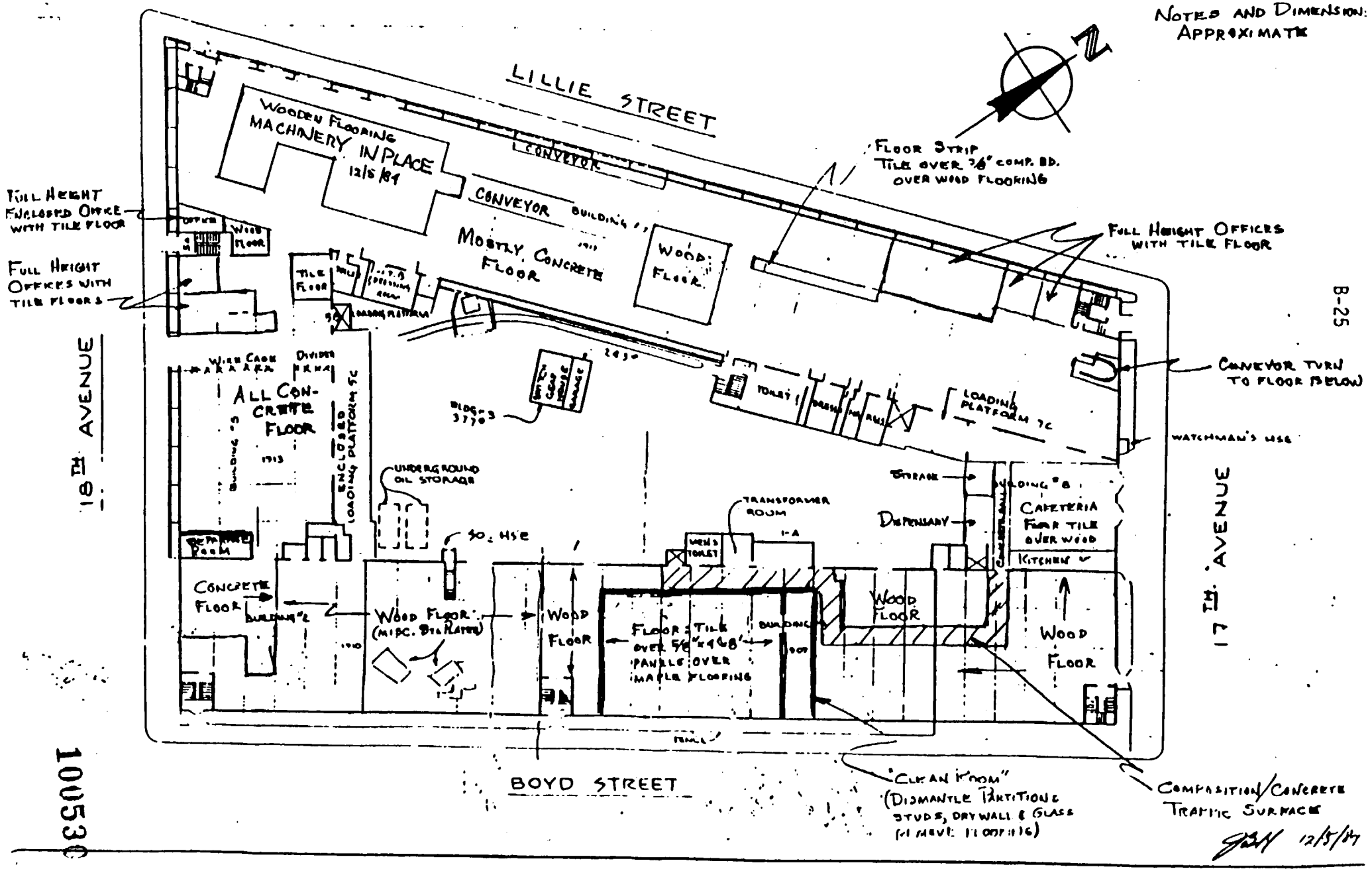
B-24

100528

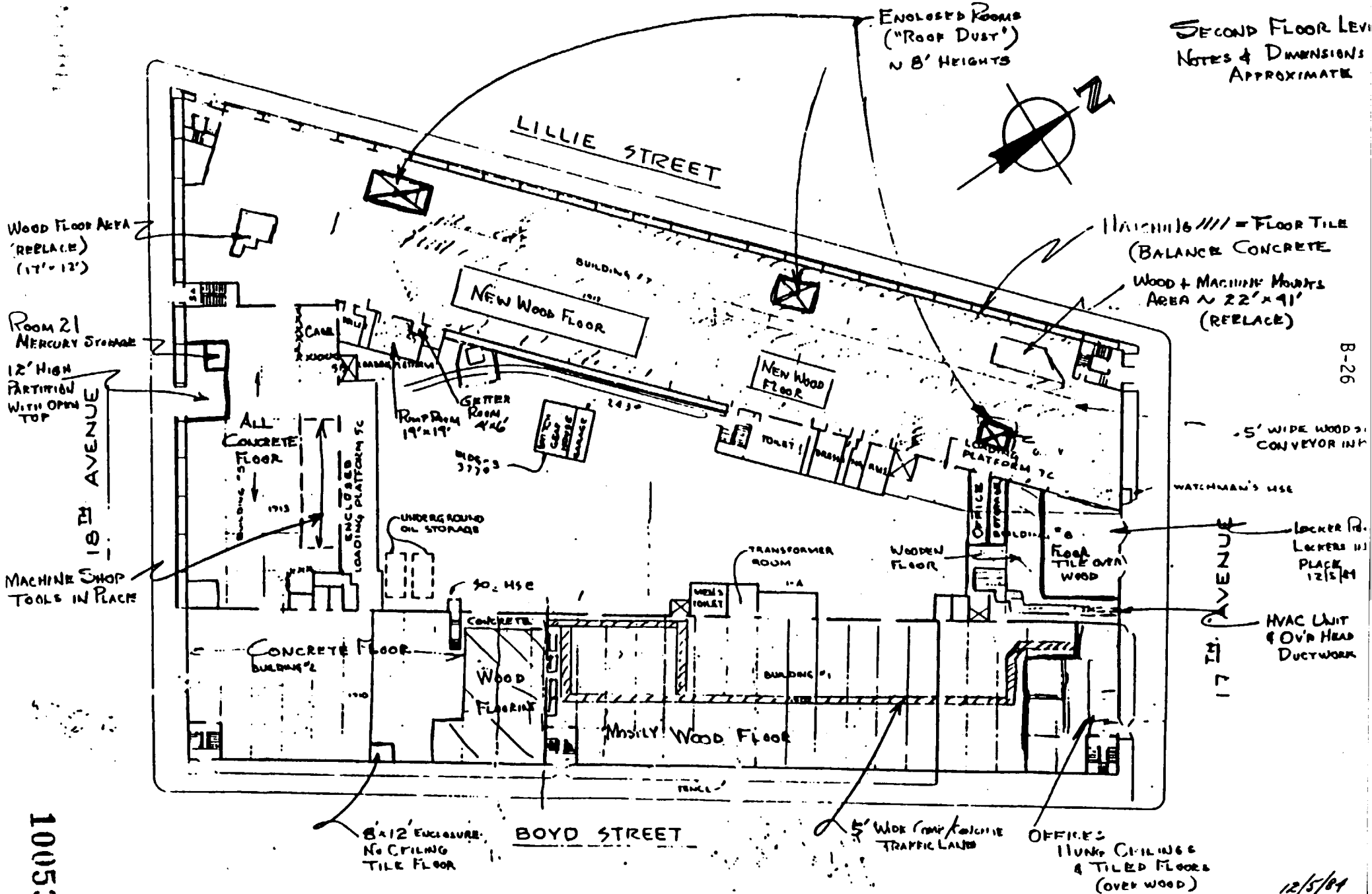
JSH 12/5/84

THIRD FLOOR/LEVEL

NOTES AND DIMENSIONS APPROXIMATE



12/5/84


SECOND FLOOR LEVEL
NOTES & DIMENSIONS APPROXIMATE
ENCLOSED ROOMS ("ROOF DUST") @ 8' HEIGHTS
N
LILLIE STREET
WOOD FLOOR AREA (REPLACE) (17' × 12')
MACHINE //// = FLOOR TILE (BALANCE CONCRETE
WOOD & MACHINE MOUNTS AREA ~ 22' × 41' (REPLACE)
NEW WOOD FLOOR
NEW WOOD FLOOR
ROOM 21 MERCURY STORAGE
12' HIGH PARTITION WITH OPEN TOP
18TH AVENUE
ALL CONCRETE FLOOR
ENCLOSED LOADING PLATFORM 5C
RAMP ROOM 19' × 19'
GETTER ROOM 4'6"
BLDG 3330
LOADING PLATFORM 7C
OFFICE
WATCHMAN'S HSE
5' WIDE WOOD CONVEYOR IN
LOCKER RM. LOCKERS IN PLACE 12/5/84
UNDERGROUND OIL STORAGE
MACHINE SHOP TOOLS IN PLACE
50 HSE
TRANSFORMER ROOM
WOODEN FLOOR
FLOOR TILE OVER WOOD
HVAC UNIT & OVER HEAD DUCTWORK
CONCRETE FLOOR
WOOD FLOORING
MOSTLY WOOD FLOOR
8' × 12' ENCLOSURE: NO CEILING TILE FLOOR
BOYD STREET
5' WIDE CHAIR/FORKLIFT TRAFFIC LANE
OFFICES: HUNG CEILINGS & TILED FLOORS (OVER WOOD)
12/5/84

B-26

100531

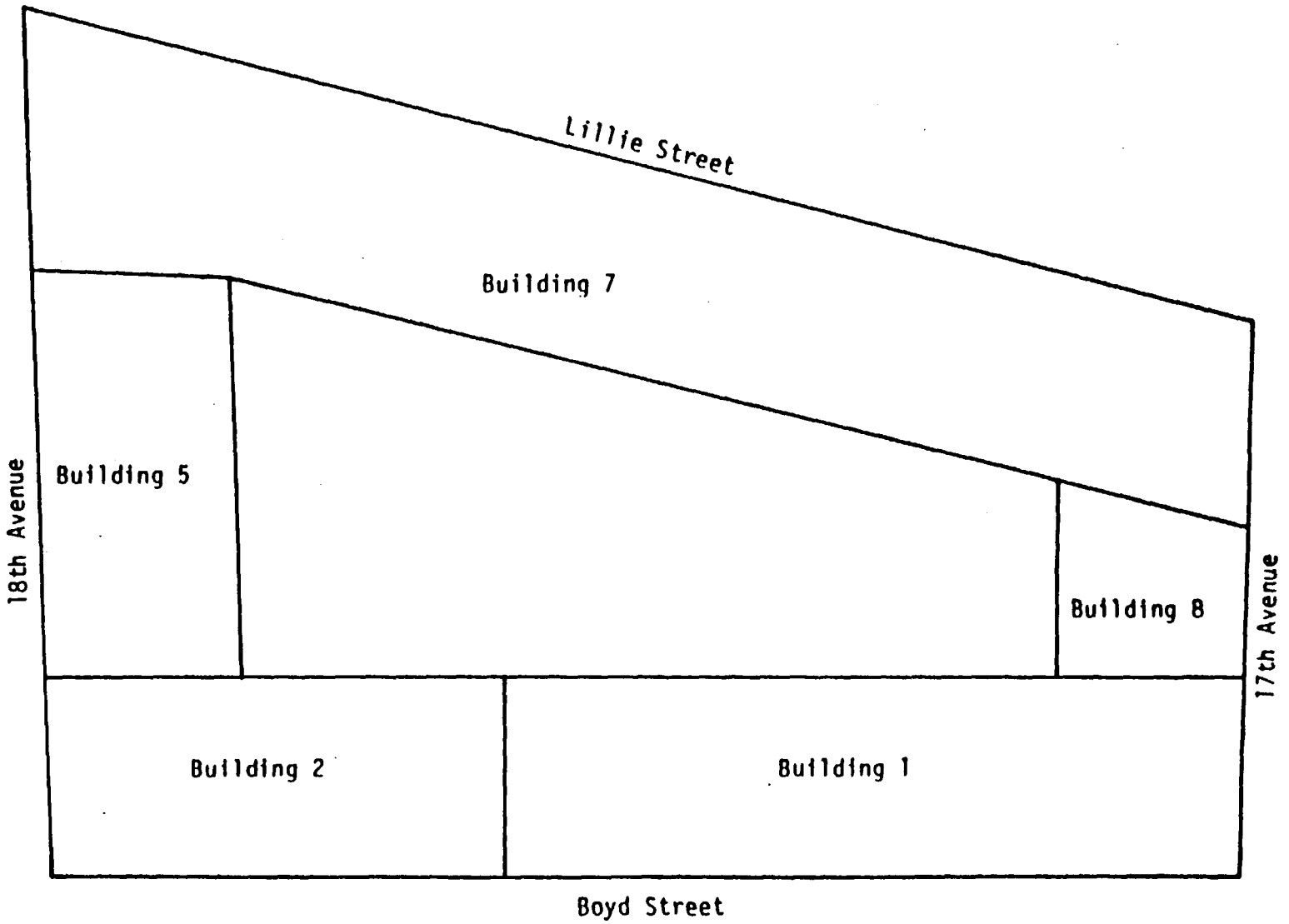


FIGURE 1. BUILDING LAYOUT - GENERAL ELECTRIC NEWARK LAMP PLANT

envelope, cut into sectors, and various sectors used as splits or composited for analysis. Compositing refers to the process of taking fractions (i.e., "pie-slices" in the case of wipes) of samples and analyzing the combined total as one sample.

Air sampling will be accomplished with a mercury "sniffer", or with a sampling train using a hopcalite absorbent to collect mercury vapor.

Sample recovery and analysis will be by the OSHA procedure (nitric acid digestion and flameless atomic absorption).

Field Sampling Procedures

Containers

Containers for wipe samples will be commercially available Zip-Loc polyethylene bags/envelopes. Although no preparation or cleaning will be performed on these containers, past experience has shown that these bags, intended for use in food storage, have never presented problems of heavy metal contamination or interference with chemical analysis. Field blanks will provide insurance against such interference.

Containers for air samples (if there are any taken) will be wide-mouth glass or polyethylene bottles with polyethylene or Teflon-lined lids. Preparation will consist of a dilute nitric acid wash, distilled water rinse, and air dry.

Blanks and Duplicates

Wipe Samples. Field blanks of wipes and the containing plastic envelopes will be generated during field sampling at the rate of two per day during the 10 days of field sampling for a total of twenty field blanks. This procedure will provide a minimum of one field blank for each day of laboratory analysis, which is estimated to require a maximum of 20 days.

Air Samples.* Field blanks will be generated at the rate of one blank per ten air samples and separately analyzed to check on possible contamination of sampling equipment or materials. There will be four field blanks of air sampling equipment.

Duplicates.* In the case of wipe samples, no duplicates of field samples are possible in that sampling of a surface alters the surface.

In view of the role and nature of air samples in this program, if any air samples are taken with the sampling train, three duplicate air samples will be taken and analyzed as checks on the sampling and analysis procedure. For these duplicates, two pumps and sampling tubes will be placed side-by-side with the intake tubes immediately adjacent and operated over the same period of time. Days in which duplicate air samples are to be generated will be designated in advance by a random choice of days and will be the first installation on the chosen day.

Chain of Custody

A standard form for chain of custody record will be generated for each sample and will accompany each sample from its origin through compositing or analysis. Additional forms will necessarily be generated at the compositing stage as this step creates new samples and sample numbers. An example of the chain of custody form is given on the following page.

Sample Data Sheets and Maps

The preprinted sample data sheet and a mapping system will be used to record the specific location for each sample taken. To the extent possible the location will be designated in terms of existing plant layout, terminology, existing drawings, or physical features in the plant, so as to be

* If the mercury "sniffer" is used for air sampling, the State will be provided with the opportunity to make its own measurements with such a device or to witness work in progress.

readily applied at a later date. The data sheet will accompany the sample and will serve as a basis for compilation of sample history through compositing and analysis.

Analytical Method

The analytical method to be used is the same as that described in NIOSH Method 175 (Mercury in Air)* and referred to as flameless atomic absorbtion. The sample is digested in nitric acid or other suitable media, diluted to known volume and an aliquot taken and placed in a columnar "purge" vessel. Nitrogen is bubbled through the solution and mercury vapor is thus transported through a chamber containing silver "wool" which absorbs all the mercury. The chamber is then heated at a rapid rate to desorb the mercury in a controlled manner, after which the desorbed mercury is carried by the nitrogen through the U.V. absorbtion chamber. The thermal desorbtion step in this method results in increased sensitivity relative to methods in which the "cold" vapor is routed directly to the U.V. absorbtion chamber. The detection limit for this method is 10 nanograms of mercury.

Analysis will be performed at: Battelle
Columbus Laboratories
505 King Avenue
Columbus, Ohio

Sample Splitting

Wipes

Wipe samples will be split with the State of New Jersey on any basis desired, e.g., individual wipes or composites, provided the desired split is indicated prior to the slicing and compositing of wipes for analysis.

---

* "NIOSH Manual of Analytical Methods", NIOSH75-121

Sample Data/Custody Sheet

Contractor _____

Date _____

Location _____

Plant _____

Building Number _____

Floor/Level _____

Location _____

Type of Sample	Floor	Wall
Wipe	Floor Material	Air
Overhead	Composite	Other
Field		

Sample Field Review/Approval _____ _____

Composite Sample Number _____

Analyst _____

Date _____

Lab Sample Number _____

Custody Records/Transfers

From (Given by)		To (Received by)		
Individual	Date	Individual	Date	Reason

Air Samples*

Due to the nature of the air sample taken with the sampling train, i.e. an absorbent cartridge, sample splits are not practical. In lieu of split samples, provision is made to provide up to a maximum of five (one per building) duplicate samples to the State of New Jersey. The State is offered the option of designating the locations of these duplicates within the buildings; if locations are not otherwise designated by the start of sampling, these duplicates will be designated on the same basis as other air sample duplicates, i.e., first installation of the day on randomly selected days.

* If the mercury "sniffer" is used for air sampling, the State will be provided with the opportunity to make its own measurements with such a device or to witness work in progress.

QUALITY ASSURANCE PROJECT PLAN

for

SAMPLING AND ANALYSIS FOR MERCURY AT NEWARK LAMP PLANT OF GENERAL ELECTRIC COMPANY

to

GENERAL ELECTRIC COMPANY
NELA PARK, CLEVELAND, OHIO

October 11, 1984

BATTELLE
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

APPROVALS

BCL Project Leader	_____	Date _____
BCL QA Officer	_____	Date _____
BCL Project QA Manager	_____	Date _____
GE Project Manager	_____	Date _____
NJ QA Officer	_____	Date _____

QUALITY ASSURANCE PLAN DISTRIBUTION

BATTELLE-COLUMBUS LABORATORIES

J. B. Hallowell

S. J. Anderson

W. C. Baytos

D. L. Sgontz

GENERAL ELECTRIC COMPANY, LIGHTING BUSINESS GROUP

A. L. Kaplan

STATE OF NEW JERSEY

CONTENTS

Section No. 1.0
Revision No. _____
Date _____
Page _____ of _____

1.0 Project Description

This document presents a Project Quality Control Plan for a proposed Sampling and Analysis Plan for the Newark, New Jersey Lamp Plant of the Lighting Business Group of General Electric Company. This Plan is an activity in the sequency of steps called out by the New Jersey Environmental Clean-up Responsibility Act and related regulations.

1.1 Background

The Newark Lamp Plant has engaged in manufacture of light-bulbs and consists of a ring of five major multistory buildings around a central courtyard, occupying an entire city block. The total floor space of all buildings amounts to slightly less than 500,000 square feet. The buildings were constructed at various times over the period 1907 to 1917.

The General Electric Company, in the course of business, has undertaken to close the plant and sell the property. In the course of this action, General Electric Company has complied with the recently-enacted New Jersey Environmental Cleanup Responsibility Act and assessed the site for the presence of hazardous substances as directed and identified in that Act. The result of that assessment was the identification of the potential presence of mercury on site. Mercury was used in mercury-vapor diffusion vacuum pumps in a system for evacuating lamps during the manufacturing process. Further, available historical information based on the experience of the present staff (ranging back to the 1940's) has identified potential areas of likely mercury contamination, and the presence of relatively elevated mercury concentrations in those areas has been confirmed by preliminary sampling and analysis activities.

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1.2 Objectives and Scope

The sampling and analysis plan in the following sections of this document has the objectives of

- identifying any areas within the plant buildings which exhibit relatively elevated mercury concentrations
- measuring mercury concentrations in air, surface residues, and structural materials
- furnishing information for possible use in a cleanup plan.

The sampling plan as proposed here is designed to apply to the interiors of all buildings.

1.3 Project Schedule

The proposed sampling, analysis, and reporting activities are estimated to require a total elapsed time of 10 weeks. The estimated schedule for the various activities is given in the following listing.

Week	Activities
1	Preparation of Materials and Equipment
2	Preparation of Materials and Equipment
3	Field Sampling
4	Compositing, Analysis
5	Analysis, Data Management
6	Analysis, Data Management, Report Compilation
7	Report Preparation
8	Report Production

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2.0 PROJECT ORGANIZATION

The primary responsibility for this program will be in the Environmental Technology Section of the Chemistry Department of Battelle-Columbus. The Project Leader will be Mr. John B. Hallowell who will have responsibility for performance of all aspects of the program. His performance will be monitored by Mr. David A. Sharp, the cognizant Battelle line manager. William C. Baytos will coordinate and be involved in all aspects of field sampling from materials preparation and equipment calibration to the completion of sampling. During field sampling, Mr. Baytos will be assisted by Mr. R. N. Smith. The other members of the field team will include two senior technicians and two junior technicians/trainees.

Ms. S. J. Anderson is the designated Quality Control Officer for the Chemistry Department of Battelle Columbus reporting directly to Mr. Poirier, the Department Manager, in all matters of Quality Control. Ms. Anderson will review and audit field sampling, laboratory analysis, and data management activities and provide a written assessment of all findings.

The QC/QA responsibilities are designated as follows among the project staff.

J. B. Hallowell - implementation of all quality control measures
W. C. Baytos - field sampling
D. L. Sgontz - analysis
S. J. Anderson - project quality officer

Mr. A. L. Kaplan of General Electric and an authorized designee of the State of New Jersey are provided the opportunity of witnessing and/or auditing any portion of the proposed work for purposes of Quality Control/Quality Assurance.

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3.0 QUALITY ASSURANCE OBJECTIVES

The quality assurance objectives for the single analytical technique (flameless atomic absorption analysis of mercury) are as follows

Analysis: Mercury
Method: Flameless Atomic Absorption
Detection Limit: 10 nanograms
% Accuracy: ± 10%
% Precision: ± 10%
% Completeness: 95%

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4.0 SAMPLING PROCEDURE

The general approach to sampling locations includes considerations of areas of known or suspected use or storage of mercury, the existence of both variously sized offices and rooms and relatively large "open bay" areas.

Wipe sampling of floors and walls will be done in the areas of the plant buildings as described in Table 1. The basis for the selection of wipe sampling locations are initial mercury contamination levels and cleanup activities in each area of each building.

Air samples will be taken at the center of each floor/level of each building except for Building 7, where two air samples will be taken on each floor/level, and these will be located at the quarter and three-quarter points on the long axis of the building.

Sampling Methodology

The sampling methods include surface wipes and air samples.

The wipe test proposed here consists of a 10-inch-diameter filter paper wet with 25 percent nitric acid and rubbed or wiped over an area of one square meter. This differs from the OSHA wipe method in that the filter and area are both larger, i.e., the OSHA method uses a filter about 2-1/2 inches in diameter and an area 10 centimeters by 10 centimeters. The larger wipe is proposed here based on experience which has established the following details: the hand and filter may be turned during wiping to avoid generation of "finger-prints" or "spots" of dirt on the filter, the hand (protected with a glove) does not overlap the filter and carry dirt from one sample to another, and more material (dust) is collected for analysis. The amount of material collected is related to the compositing of samples as well as allowing sufficient materials to provide for analytical sensitivity.

The wipe procedure involves preparation (wetting the filter with nitric acid, folding, and placing in a "re-sealable" plastic envelope freezer bag) and sampling (opening, wiping, refolding with wipe side "in", and

replacing in the plastic envelope). The filter may then be retrieved from the envelope, cut into sectors and various sectors used as splits or composited for analysis. Compositing refers to the process of taking fractions (i.e., "pie-slices" in the case of wipes) of samples and analyzing the combined total as one sample.

Wipe tests are proposed to be used on floor surfaces and wall surfaces.

Air sampling will be accomplished with a mercury "sniffer" or with a sampling train using a hopcalite absorbent to collect mercury vapor.

Containers. Containers for wipe samples will be commercially available zip-loc polyethylene bags/envelopes. Although no preparation or cleaning will be performed on these containers, past experience has shown that these bags, intended for use in food storage, have never presented problems of heavy metal contamination or interference with chemical analysis. Field blanks will provide insurance against such interference.

Containers for air samples (if taken using a sampling train), will be wide mouth glass or polyethylene bottles with polyethylene or teflon-lined lids. Preparation will consist of a dilute nitric acid wash, distilled water rinse, and air dry.

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5.0 ANALYTICAL PROCEDURES

The analytical method to be used is the same as that described in NIOSH Method 175 (Mercury in Air)* and referred to as flameless atomic absorbtion. The sample is digested in nitric acid or other suitable media, diluted to known volume and an aliquot taken and placed in a columnar "purge" vessel. Nitrogen is bubbled through the solution and mercury vapor is thus transported through a chamber containing silver "wool" which absorbs all the mercury. The chamber is then heated at a rapid rate to desorb the mercury in a controlled manner, after which the desorbed mercury is carried by the nitrogen through the U.V. absorbtion chamber. The thermal desorbtion step in this method results in increased sensitivity relative to methods in which the "cold" vapor is routed directly to the U.V. absorbtion chamber. The detection limit for this method is 10 nanograms of mercury.

* "NIOSH Manual of Analytical Methods", NIOSH75-121

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6.0 CALIBRATION PROCEDURES AND FREQUENCY

6.1 Flameless Atomic Absorption Equipment

Calibration of the AA equipment will be performed at the start of each day, at intervals of every 5 to 7 samples, and at the end of each day.

6.2 Air Sampling Pumps

The sampling pumps will be calibrated with the manufacturer's calibrator system. The calibrator system consists of a 500 cc bubble tube and a Magnehelic flow meter to measure flow rate and a Magnehelic pressure gauge and a needle valve to introduce a flow resistance to check the constant flow performance of the pumps.

Calibration of the pumps will performed twice each sampling day; in the morning before the start of the sampling period and in the evening after termination of sampling. During the morning calibration, the pumps will be checked to determine that the battery is fully charged, that constant flow is maintained at a 254 mm Hg pressure drop and that the low flow indicator functions properly.

6.3 Mercury "Sniffers"

The mercury "sniffer" will be calibrated before use and in the field according to the manufacturer's specifications and procedures described in the operations manual for the instrument.

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7.0 SAMPLE CUSTODY

7.1 Custodial Responsibilities

Sample custody will be the responsibility of Battelle's Columbus Laboratories (BCL) personnel from the time of sample acquisition to the completion of the analytical work. Mr. W. C. Baytos will have the responsibility for custody of samples during the field operations and during shipment to BCL for laboratory analysis. Mr. W. C. Baytos or Mr. D. L. Sgontz will maintain custody of all samples throughout the laboratory analysis work.

7.2 Field Sampling Custody Procedures

After collection, samples will be immediately transferred to appropriate containers (see Section 4.1) which are labeled with the following information:

Site _____
Date _____ Time _____
Sampling Location _____
Sample wt/vol _____ Taken by _____
Description _____
Sample ID No. _____

Each sample will be assigned a unique number according to the codes developed specifically for this project. Each sample will be accompanied by a data/custody form as illustrated on the following page. All other sample acquisition data will be entered into a BCD Laboratory Record Book which will be used only to record field data for this program. During field operations, all samples will be stored in ice chests in a controlled access area.

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Sample Data/Custody Sheet

Contractor _____
Date _____
Location _____
Plant _____
Building Number _____
Floor/Level _____
Location _____

Type of Sample	Floor	Wall
Wipe	Floor Material	Air
Overhead	Composite	Other
Field		

Sample Field Review Approval

Composite Sample Number _____
Analyst _____
Date _____
Lab Sample Number _____

Custody Records/Transfers

From (Given by)		To (Received by)		
Individual	Date	Individual	Date	Reason

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After collection of the field samples, samples will be returned to BCL for analysis. Completed copies of the form shown herewith will serve as a sample shipment record. Receipt of the samples submitted for analysis at BCL will be shown on the form by the recipient's signature. Those samples that will be split for interlaboratory analysis will be so indicated on the form.

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8.0 DATA REDUCTION, VALIDATION, AND REPORTING

Wipes

Data from wipes will be reduced to units of micrograms of mercury per square meter using the following calculation:

$$\frac{\text{mass of mercury analyzed}}{\text{fraction of wipes used for analysis} \quad \text{number of samples per composites}}$$

The area of one square meter will be incorporated in the calculation by virtue of the field sampling technique of wiping a measured area of one square meter. The fraction of the wipes taken for analysis will be determined on an area basis.

8.2 Air Samples

Data on air samples will be reduced to terms of micrograms per cubic meter. The calculation will be made as

$$\frac{\text{mass of mercury analyzed}}{\text{volume of air sampled}}$$

8.4 Data Validation

Data validation will be principally performed by the individual performing the data management function defined for this program. The data management function will include the compilation and mapping of all sample numbers and analytical results with access to all raw data and calculation sheets and individuals originating data. The data manager's principal function will be to search for variations in mercury concentrations within the plant. This function will naturally include the function of inspecting the data for artifacts attributable to time periods, samples, analysts, or particular pieces of analytical apparatus.

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9.0 INTERNAL QUALITY CONTROL CHECK

The following internal quality control checks will be performed as a part of the quality assurance plan for this study.

9.1 Analytical Quality Control

9.1.1 Analytical Blanks

Analytical blanks will contain all reagents included in the sample lab preparation and one blank will be analyzed for each day of analysis. The analytical procedure for both blanks and samples will be identical.

9.1.2 Spiked Samples

Where applicable, known concentrations of species being determined will be added to one field sample per day of analysis. Analytical procedures for spiked and field samples will be identical and will be performed within the same day's work.

9.1.3 Duplicate Analyses

One field sample will be analyzed for each day of analysis in duplicate by preparing two identical aliquots at some point in the recovery procedure. Both will then be submitted to identical analytical procedures.

9.1.4 Reproducibility of Weighing Procedures

One of every 25 samples prepared for gravimetric analysis will be reweighed twice within a normal working day to serve as an internal standard of the weighing process and balance precision.

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9.2 Field Blanks

Filter blanks subjected to field conditions but not used for sample collection will be submitted for analysis at the rate of one for each day of analysis. Filter field blanks will be transported, stored, and returned unused with each set of actual samples.

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10.0 PERFORMANCE AND SYSTEM AUDITS

10.1 System Audits

The field sampling components will be subjected to an internal system audit at Battelle's Columbus Laboratories by S. J. Anderson, BCL Chemistry Department QA Officer. A working knowledge of field sampling procedures and equipment will be demonstrated by the field team. Sampling equipment and accessories will be checked by the QA Officer.

Laboratory procedures will be internally audited by the QA Officer once samples have been submitted for analysis. Laboratory personnel will be responsible for compliance with this document in sample preparation, analysis, data reporting and validation, and instrument performance.

An external system audit, e.g., by General Electric or New Jersey, has not been scheduled for this study. However, such an audit may be conducted at the discretion of either party.

10.2 Performance Audit

The project QA Officer will visit the sampling site once during the sampling campaign.

10.3 Audit Reports

Procedures out of compliance with this document in either field sampling preparation or laboratory performance will be promptly described in a memo to J. B. Hallowell, BCL Project Leader, and R. H. Poirier, Manager of the BCL Chemistry Department.

Section No. 11.0
Revision No. _____
Date _____
Page _____ of _____

11.0 PREVENTATIVE MAINTENANCE

11.1 Atomic Absorbtion Apparatus

This apparatus is in nearly continual use and is maintained on an as-needed basis as determined from continuing performance checks on standards. Recent maintenance history shows intermitent requirements for electrical/electronic functions in recorders.

11.2 Air Sampling Pumps

If used on battery power, low-volume pumps require availability of space batteries or battery-chargers, depending on field sampling circumstances. For the planned sampling period of two weeks, no other maintenance is anticipated. Any major malfunction of a pump will be responded to by replacement with another pump.

Section No. 12.0
Revision No. _____
Date _____
Page _____ of _____

12.0 PROCEDURES FOR ASSESSMENT OF DATA ACCURACY, PRECISION, AND COMPLETENESS

The quality assurance activities implemented in this study will provide a basis for assessing the accuracy and precision of the mercury concentrations. The generalized form of the equations that will be used to calculate accuracy and precision are given below:

12.1 Accuracy

$$\text{Percent Accuracy} = \frac{(X-T)\ 100}{T} \qquad (12\text{-}1)$$

where X is the experimentally determined value and T is the true or reference value of the specie being measured.

12.2 Precision

$$\text{Standard deviation (S)} = \frac{\sum_{i=1}^{n} (x_i-\bar{x})^2}{n-1} \qquad (12\text{-}2)$$

where x_i is the experimentally determined value for the ith measurement, n is the number of measurements performed, and $\bar{x}$ is the mean of the experimentally determined values. The standard deviation is frequently expressed as the relative standard deviation (RDS) or coefficient of variation which is the variation about the mean experimentally determined value, $\bar{x}$, expressed as a percentage.

$$\text{RDS, \%} = \frac{100}{\bar{x}} \qquad (12\text{-}3)$$

where S is the standard deviation calculated according to Equation 12-2.

Accuracy values will be derived from experimental (X) and known (T) values of standards and spikes generated in adherence to this document. Precision estimates will be calculated on the basis of replicate analyses of sample and standard concentrations and the number of times those analyses are performed.

In calculating the standard deviation (Equation 12-2), x_i will be the experimentally determined spike or sample value for the ith determination, $\bar{x}$, the mean of the replicate spike or sample determinations, and n, the number of determinations performed.

12.3 Completeness

Completeness in meeting the data recovery objectives will be assessed by the following equation:

$$\text{Completeness, } \% = \frac{D_r 100}{D_C}$$

where D_r is the number of samples for which valid results are reported and D_C is the number of samples which are scheduled to be collected and analyzed during the study.

Section No. 13.0
Revision No. _____
Date _____
Page _____ of _____

13.0 CORRECTIVE ACTION

Despite all precautions taken to ensure that instruments are functioning properly and that sampling and analytical procedures are being performed within quality assurance parameters, circumstances within any program may arise that will negatively affect data quality. Many times these circumstances are unexpected and unpredictable. Within limits, however, there are indicators of sudden or gradual changes that can alert those involved with project operations that responses are necessary to provide corrective actions.

Field operations personnel are those most qualified to detect changes in on-site sampling performance. To this end, the responsibility for initiating corrective action based on equipment malfunctions or procedural inefficiency is that of the field sampling supervisor, W. C. Baytos. When the particular corrective action has been taken, it is also Mr. Baytos' responsibility to notify the Project QA Office of this action(s) so that intensified quality assurance monitoring can be undertaken if necessary. Laboratory procedures and analyses are subject to close scrutiny to ensure operation within the expressed precision and accuracy statements in Sections 9 and 12. When it appears that instrument drift, standard alteration or problems of that type are occurring in laboratory procedures, it will be the duty of the laboratory supervisor to recognize those situations and to initiate corrective action. For this study, Mr. D. L. Sgontz will provide that authority.

The Project QA Officer, data manager, and person responsible for data validation provide the second level of recognizing need(s) for corrective action. System audits and data validation can indicate the need for this action. Mr. D. L. Sgontz will be responsible for the initiation of corrective action within QA parameters and he will notify both the Project Leader, J. B. Hallowell, and Mr. W. C. Baytos, immediately. Appropriate corrective action will then be instituted by Mr. Hallowell and Mr. Baytos.

Establishment of specific operating limits for all sampling and analysis systems beyond which corrective action will be initiated is an impossible task. Ultimately, such decisions must be vested with the personnel performing and checking the sampling and analysis procedures and results. In

order to reach the proper decision each individual must understand the program objectives and data quality required to meet these objectives. Data quality objectives for this program are presented in Section 3.0. All personnel involved in the program will receive an approved copy of this QA Plan and, thus, will be informed of these objectives. Each individual will have a responsibility to notify the respective field sampling or laboratory operations supervisor whenever a measurement system is not yielding data within these objectives.

Section No. 14.0
Revision No. _____
Date _____
Page _____ of _____

14.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The results of activities to assess the quality of the data generated during the program will be reported to the Project Quality Officer, W. C. Baytos and the Project Leader, J. B. Hallowell, by the Chemistry Department QA Officer, S. J. Anderson. The report will be in the form of a formal memorandum which summarizes the results of quality assurance data obtained during the report period. This memorandum will serve to identify significant problems encountered and corrective action(s) taken to resolve the problem.

All quality assurance procedures employed and results obtained will be included as a separate section of the final report on the study.

APPENDIX E

ANALYSES OF DRUM SAMPLES

Clayton Environmental Consultants, Inc.
Raritan Center, 160 Fieldcrest Ave., Edison, New Jersey 08837, Telephone (201) 225-6040

March 27, 1985

Mr. A. L. Kaplan #1350
GENERAL ELECTRIC
Lighting Research & Technical
Services Operation (1350)
Nela Park
Cleveland, Ohio 44112

Clayton Job Number 9863-47

Dear Mr. Kaplan:

The samples which were submitted to us on December 26, 1984, have been analyzed as requested; the results are reported in the attached table.

It is a pleasure to be of assistance to you. Please contact us if you have questions concerning any aspects of this report.

Very truly yours,

Kirit H. Vora, Manager
New Jersey Office and Laboratory

KHV:dc
Attachment

Revision 1
4/15/85

100562

Clayton Environmental Consultants, Inc.

Results of Analyses

for

General Electric Company

Clayton Job No. 9863-47

Lab Number	Sample Description	PCB's (ug/gram)	(ug/gram)
28666	Drum #1	<5.0	
28667	Drum #2	<5.0	
28668	Drum #3	<5.0	
28669	Drum #4	<5.0	
28670	Drum #5	<5.0	
28671	Drum #6	<5.0	
28672	Drum #7	6.9 *	11.9 **
28673	Drum #8	<5.0	
28674	Drum #9	<5.0	
28675	Drum #10	<5.0	
28676	Drum #11	<5.0	
28677	Drum #12	1680 *	

Analytical Method: GC/ECD

Limit of Detection: 5.0 µg/gram of oil

Drums 1, 2, 3, 5, 6 were layered; only the oil layer was analyzed.

* Arochlor 1016

** Arochlor 1254

Revision 1
4/15/85

APPENDIX F: INVESTIGATION REPORT*

GENERAL ELECTRIC COMPANY
NEWARK LAMP PLANT

December 1984

A. Analytical Results

Kirit H. Vora - Manager, New Jersey & Laboratory
Clayton Environmental Consultants, Inc.
Raritan Center
160 Fieldcrest Ave.
Edison, New Jersey 08837
(201) 225-6040

Job Number 9863-47
Analytical Method - GC/ECO

a) Drums 1 thru 6 - less than 5 µg/gram (detection limit)
b) Drum 7 - 6.9 µg/gram Arochlor 1016
11.9 µg/gram Arochlor 1254
c) Drum 8 thru 11 - less than 5 µg/gram (detection limit)
d) Drum 12 - 1,680 µg/gram Arochlor 1016

B. Results of Investigative Study to Determine Source of PCB Contaminant.

Potential Source of Contamination	Investigative Outcome
1. Transformer Fluid	General Electric Company manufactured transformers utilize Arochlor solvent 1242 and 1254. Arochlor solvent 1016 cannot be attributed to this source.
2. Power Factor Correction Capacitors	Since 1950 General Electric Company manufactured capacitors have utilized Arochlor solvents 1242 (1955-70) and 1254 (1950-55). Power factor correction capacitors are not in use at this facility and by recollection have never been either on equipment or facility power. Since capacitors are not currently in use at this location, none manufactured between 1970-78 have been evaluated. Arochlor 1016 cannot be attributed to this source.

*Revision 1
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3. Waste Oil - Compressors and Vacuum Pumps	Termination of manufacturing and the eventual disassembly of equipment for transfer to other GE locations has resulted in the generation of the vast majority of the twelve drums of oil. Included in this quantity of oil is the oil that was drained from lines that serviced the equipment from a centralized location. If PCB were a contaminant of either the virgin oil or even an additive of oils previously used within this equipment, the level would have been more uniform throughout all drums and probably lower. Since the Arochlor solvent is only concentrated in one drum and fairly pure in nature, it has been concluded that it did not result from either the manufacturing equipment or the services (pipe lines) supplied to it.
4. Immersion Fluids	Cargille manufacturing - source (? - 1978). Fluid #5042 represents their material which has incorporated PCBs. In rare instances a fluid containing Arochlor solvent 1254 was manufactured. Arochlor 1016 cannot be attributed to this material.
5. Samples	As a result of termination of manufacturing activities/plant cleanup, all samples of chemicals were collected and consolidated in Building #7, first floor. Like materials were

co-mingled and consolidated into 55-gallon drums for disposal. Likely two (2) drums of oils resulted from this accumulation. Arochlor 1016 most likely was the result of this activity. Samples included many materials that were not manufacturing materials.

APPENDIX G*

ANALYSES OF FLOOR SCRAPE SAMPLES PCB'S

Clayton Environmental Consultants, Inc.

Raritan Center • 160 Fieldcrest Ave. • Edison, New Jersey 08837 • Telephone (201) 225-6040

January 10, 1985

Mr. A.L. Kaplan #1350
GENERAL ELECTRIC
Lighting Research and Technical
Services Operation (1300)
Nela Park
Cleveland, Ohio 44112

Clayton Job Number 10046-47

Dear Mr. Kaplan:

The samples which you submitted to us on December 26, 1984, have been analyzed as requested; the results are reported in the attached table.

It is a pleasure to be of assistance to you. Please contact us if you have questions concerning any aspects of this report.

Very truly yours,

Kirit H. Vora, Manager
New Jersey Office and Laboratory

KHV:rm
Attachment

*Revision 1
4/15/85

100567

Clayton Environmental Consultants, Inc.

Results of Analyses
for
General Electric

Clayton Job Number 10046-47

Lab Number	Sample Description	Polychlorinated Biphenyl (PCB) Arochlor #1016 (µg/g)	Arochlor #1254 (µg/g)
30770	1	4.9	5.1
30771	2	3.0	1.9
30772	3	2.8	2.8
30773	4	6.6	3.9
30774	5	1.6	1.8
30775	6	50.2	487.1
30776	7	<0.7	18.8
30777	8	3.2	6.4
30778	9	<1.0	28.2
30779	10	3.2	6.2
30780	11	<0.8	<0.8
30781	12	2.3	5.4
30782	13	8.1	1.6
30783	14	4.9	5.9
30784	15	3.0	5.0
30785	16	<0.8	5.9
30786	17	1.1	15.8
30787	18	9.1	15.2
30788	19	18.7	12.0
30789	20	<0.3	8.9

Analytical Method (NIOSH): P&CAM 253

Limit of Detection: 0.5 micrograms per gram based on 10 gram sample

Revision 1
4/15/85

APPENDIX H

MERCURY WIPE SAMPLING & ANALYSIS METHODS

H.1 Sampling Procedure

1. The contractor, at predetermined locations on the floors, walls, etc., will measure out an area equal to 1000 cm^2. These areas will be measured out and bordered with 2-inch masking tape before being sampled. All sampling locations will be reviewed and pre-approved by owner's engineer prior to any sample taking. These sampling locations will be representative of the total subject surface area that has been cleaned. For example, floors with both wood and concrete will be sampled in accordance with the distribution of wood-versus-concrete floor space as follows.
2. The contractor, wearing a clean pair of disposable sample gloves, will fold an 11 cm GF/A glass fiber filter paper in half two times.
3. Utilize Teflon-coated forceps (pre-rinsed with 25 percent nitric acid solution) placing them onto the GF/A filter approximately 1 cm away and parallel to the twice folded edge of the filter.
4. The filter paper will then be saturated with 25 percent nitric acid solution from the rinse bottle.
5. The sample surface area will be wiped once horizontally and once vertically using the saturated filter paper.
   - In order to prevent sample loss and maintain the integrity of the filter paper, use as many filter papers as necessary to complete the surface sample area.

6. After the surface area has been wiped, any torn fragments (resulting from rough surfaces) from the filter paper will be dabbed from the sample surface with the filter to prevent loss of recovery from the sample area.

7. Sampled surface areas will be categorized by the contractor in accordance with the sample plan outlined in Table 7.1 as floors, walls, and overhead structures. These samples shall then be analyzed individually and reported in total µg of mercury.

8. The filter paper(s) will be deposited into an 8-ounce glass container, rinsing the forceps with the 25 percent nitric acid solution into the container. The container will then be sealed with a Teflon-lined screw-on cap.

9. The contractor will then immediately label the container with pertinent information such as sample number, time, date, sample location, description, and samplers and witnesses initials.

10. The contractor then will record above information in a fluid sample log book.

11. The contractor will have the samples analyzed by a state of New Jersey certified laboratory, utilizing proper chain-of-custody procedures.

H.1.1 Quality Control Requirements for Sampling

The contractor shall perform quality control samples to ensure cross de-contamination has not taken place during the sampling task. This will be performed in the manner of field blank samples. A field blank sample will be taken after every ten (10) samples. The procedure the contractor will follow is outlined on the next page.

1. The contractor, wearing a clean pair of sample gloves, folds a 11 cm GF/A glass fiber filter into halves two time.
2. Placing the pre-rinsed Teflon-coated forceps onto the filter appropriately.
3. One cm away from and parallel to the twice folded edge of the filter.
4. The contractor will saturate the filter with 25 percent nitric acid solution.

   The filter will then be deposited into an 8-ounce glass container.
5. The contractor will rinse the forceps with 25 percent nitric acid solution again into the 8-ounce glass container. Then, seal the container with a Teflon-lined screw on cap.
6. The contractor will immediately label the container with pertinent information such as sample number, time, date, locations, sampler and witness initials. The sample description will be labeled "Field Blank." These samples will be recorded in the field sample log book and follow the proper chain-of-custody procedures.
7. Additional samples will be taken as directed by the owner's engineer for analysis and will be compensated for at the unit price stipulated in the bid.

H.2 Analysis for Mercury

The analysis of the wipe samples shall be performed by a State of New Jersey certified laboratory according to "EPA Method F4F1," Mercury in solid or semi-solid waste (Manual cold vapor technique),

Test Methods for Evaluating Solid Waste, SW 846, 1982 or any updated version of this EPA-approved procedure.

The laboratory shall perform QA/QC analysis in accordance with the above mentioned method. The laboratory will analyze "lab blank and lab spike samples" for every 10 samples received from the contractor.

These guidelines will be followed to determine if any contamin ation or memory effects is occurring. These results will be reported along with the sample results to the contractor.

Analytical results will be reported as µg/100 cm^2 of surface area by using the following conversion formula:

$$\frac{A}{1000} \times \frac{B}{10} = \mu g/100\ cm^2$$

A = µg/l concentration determined by AA spectrophotometer

B = ml in final volume of digestate

APPENDIX I

VAPORIZATION OF SURFACE MERCURY CONTAMINATION

The efficacy of a uniform surface contamination level of 1 μg/100 cm^2 of mercury remaining throughout the building, from a health/safety standpoint, can be determined on the basis of its potential contribution to the level of mercury vapor airborne throughout the interior of the facility. Calculations of this potential contribution as shown below.

Surface contamination of mercury has remained in various locations inside the facility for at least twenty years after cessation of manufacturing activities involving mercury. Nevertheless, the airborne mercury level inside the facility that would be generated if all of this mercury were to be vaporized instantaneously provides an upper limit to its potential for generating airborne mercury levels in the facility.

Table I.1 shows the breakdown of surface areas in the facility by flow number and type (floor, ceiling, etc.). The total surface area in the building, as seen from Table I.1 is about 1.552×10^6 $ft.^2$ or 1.44×10^9 cm^2. Thus, for a uniform surface level of 1 μg/100 cm^2, the total mass M of mercury on these surfaces would amount to about 1.442×10^7 μg or 14.42 grams.

The height of the ceiling above the floor everywhere in the facility is about 16 feet. With a total floor area of about 432,000 ft^2, as seen in Table I.1, the total volume of air in the building is about 6,912,000 ft^3 or about 196,000 m^3.

Revision 1
4/15/85

TABLE I.1

INTERIOR SURFACE AREAS IN THE NEWARK LAMP PLANT

Floor Number Areas (A^2)	4	3	2	1	Basement	Total
Ceilings	101,359	64,037	86,384	90,212	72,534	414,526
Overheads	45,610	58,722	66,763	111,274	56,138	338,507
Floors	84,282	74,831	86,282	88,118	97,869	431,382
Walls	56,454	60,474	78,560	69,796	30,150	295,434
Columns	14,387	13,727	12,228	12,987	4,330	57,719
Miscellaneous	-------	3,038	3,935	5,730	1,214	13,917
Total Area(s)(ft^2)	302,092	274,829	334,212	378,117	262,235	1,515,485

Revision 1
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Thus, the instantaneous vaporization of all the mercury surface contamination throughout the interior of the building, for a uniform level of 1 µg/100 cm^2, would result in an airborne mercury level L of

$$L = \frac{M}{V} = \frac{1.442 \times 10^7 \text{ µg}}{1.960 \times 10^5 \text{ m}^3} = 73.6 \text{ µg/m}^3$$

Note that this level is less than the occupational limit of 100 $\mu g/m^3$ for airborne mercury level in the workplace. This theoretical situation poses the absolute worst case situation. Therefore, any change in the rate of vaporization or amount of mercury vaporized would result in a significantly lower level of mercury vapor.

This situation also does not consider the effect of natural general ventilation. In a factory building of this construction, a natural general ventilation rate of 2 to 6 air changes per hour occurs according to Patty's Industrial Hygiene and Toxicology, Volume 1, Page 287.

Using the following formula, one can calculate the time required to achieve a certain final concentration in a building of known volume and air change rate.

$$\text{LOG} \frac{C^2}{C^1} = -\frac{Q}{V} \Delta T$$

Where:

C_2 = Final concentration

C_1 = Initial Concentration

V = Volume of Building

ΔT = Time in Hours

Q = Volume of air changed per hour

If a final concentration level of 1 $\mu g/m^3$, and 1 air change per hour are assumed, the time required to achieve that level would be 4.3 hours.

Revision 1
4/15/85

It can, therefore, be concluded that a surface concentration level of 1 µg/100 cm^2 in this facility would not result in airborne mercury vapor levels capable of posing a potential threat to anyone occupying this facility.

APPENDIX J

PROPOSED FLOOR

ENCAPSULATION SPECIFICATION

On the third floor of Building 2, there is approximately 10,900 square feet of wood floor applied over nailcrete which contains asbestos. This wood flooring is contaminated with mercury, as shown by the analysis of five surface scrapings in areas where mercury was known to have been used. Sample results averaged 540 PPM. There also exists some trace amounts of PCB's in some oil-stained areas with maximum concentration of 7.7 PPM.

Typical means used to remediate this type of situation consist of floor removal and replacement or sealing of the floor[1]. Due to the existence of asbestos containing concrete below the wood floor, any mechanical dismantling operations would unnecessarily create a risk of exposing workers and the environment to the release of asbestos fibers. Therefore, sealing (encapsulation) of the floor has been chosen as it is the most practicable solution for insuring against minor releases of mercury vapor (air concentration at floor .62 $\mu g/M^3$) to the workplace environment.

[1]"Accident Prevention Manual for Industrial Operations", Seventh Edition, pp. 1153, 1154.

Revision 2
8/26/85

1. A 1/2-inch layer of CDX grade plywood will be nailed over the old wood flooring.
2. A penetrating primer sealer (product #1300, Worldwide Mastic Coatings, Inc. or equivalent) will be applied by roller at an application rate of 100 square foot per gallon. This will seal all exposed plywood surface.
3. A water-based asphaltic emulsion (product #E750, Worldwide Mastic Coatings, Inc. or equivalent) will then be spray applied at the rate of 40 square feet per gallon to obtain a thickness of 20-25 mils. This will provide additional sealing and filling of imperfections as well as providing protection for the sealer.
4. A second course of 1/2-inch thick plywood will be applied by nailing. Nail penetrations will be self-sealing due to the previously applied asphaltic emulsion. The second layer of plywood will have its joints staggered from those of the first layer.
5. Plywood edges adjoining brick walls or other surfaces shall be caulked with a butyl rubber sealant (Product #707, Protective Treatments, Inc. or equivalent).

Expected life of the sealing products in this application has been stated as "forever" by the manufacturer. The deed to the property will include a description of this area, the contaminants encapsulated, and precautions to be taken should the need arise to remove any portion of the encapsulation.

Revision 2
8/26/85

ard, and severe injuries and deaths have occurred from ignition of powdered magnesium in the clothing of workers who have done hand grinding on magnesium alloys. Also, fires and dust explosions have occurred in exhaust systems carrying powdered magnesium from grinding operations.

Exhaust systems should go as directly as possible to a dust separator which will remove the magnesium powder and trap it under water without permitting it to get into the main exhaust system. The wet powder from these dust collectors and turning-chips that are wet with coolant should be removed from the plant as soon as they are taken from the collecting equipment.

Workers in magnesium-grinding operations should be provided with and required to wear flame-resistant clothing.

Massive pieces of magnesium in the form of castings or machined work are not a severe fire hazard because they are hard to ignite. When once ignited, however, the metal in the massive forms will burn vigorously.

Malathion (O,O-dimethyl dithiophosphate of diethyl mercaptosuccinate) is one of the organic phosphate insecticides. Like the others of its class, its principal toxic action on warm-blooded animals is its inhibition of acetylcholinesterase. It seems to be one of the least toxic of this type of insecticide. Inhalation of 5 ppm (56 mg/cu m) by dogs and guinea pigs produced no effects except tears and a slight decrease in the plasma cholinesterase activity.

Maleic anhydride is an irritant to the skin and mucous membranes, especially in the presence of moisture. Maleic anhydride does not usually cause an immediate burning sensation upon contact with the skin, especially if the skin is dry. If not removed by washing, it will cause reddening and, occasionally, blistering, if the exposure is prolonged and severe. Maleic anhydride dust and vapors are exceedingly irritating and severe acute exposures are not voluntarily tolerated. Upon inhalation of dust or vapors, coughing and wheezing, together with burning and irritation of the throat may occur. The eyes are particularly sensitive to the dust and vapors. Maleic anhydride is not a serious industrial hazard provided workers are adequately instructed and effectively supervised in the proper handling of the chemical. Employees should be instructed to report any signs of irritation or burning of skin, eyes, or mucous membranes.

Because maleic anhydride is a combustible solid having a flash point of 215 F, care must be exercised in handling and storage to keep it away from flame or sparks. Dust and the vapors from the molten product are also flammable.

Manganese is found in a wide variety of minerals. The dioxide is its most common inorganic compound and is used as a chemical intermediate, enamel additive, and drier.

The probability of contracting manganese poisoning is low, but the effects are severe—total disablement may result from a few months' exposure to high concentrations. This effect, however, is more likely to occur after prolonged and repeated exposures above 30 mg/cu m.

The main hazard is usually from the inhalation of manganese dioxide, which may produce neurological lesions. The symptoms are many and are similar to Parkinson's syndrome. Symptoms include: weakness, instability, difficulty in walking, immobility of facial expression, monotonous and intermittent speech, spasmodic laughter, and other grotesque signs. Exposures to finely divided dusts of manganese dioxide may produce pneumonitis.

Mercury and its compounds are not nearly so widely used as are lead compounds and consequently mercury poisoning is not so well known nor so often seen as is lead poisoning.

Mercury metal is a liquid at room temperature with a vapor pressure high enough to produce poisoning if a considerable area of the metal surface is exposed to air. If mercury gets into the cracks of a wood or tile floor or into the pores of a concrete floor, the contamination may become so great as to necessitate replacement or sealing of the floor before the plant or laboratory can be safely used again. Although it cannot be removed, mercury can be sealed into such floors by covering them completely with an asphalt mastic, preferably after the vapor pressure of the mercury has been reduced by flooding

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the whole area with a lime sulfur spray.

To prevent such inconvenience, metallic mercury should be handled over impervious tables or containers with the surfaces depressed and arranged to drain to a central point. Spilled mercury can then be collected and returned to stock.

A number of volatile mercury compounds are used in seed disinfection. Examples are ethyl mercury chloride and phosphate and the corresponding phenyl mercury compounds. These materials are highly toxic. When used without adequate enclosure and dust control, they can rapidly produce severe mercurial intoxication. These seed-treating compounds are also strong primary skin irritants and will cause itching, burning, and blistering on direct contact. Such irritations heal slowly.

The type of mercury intoxication common to industry is characterized by a tremor of the hands, irritation of the mucous membranes of the mouth, excessive flow of saliva, and changes in the personality. Poisoning by one of the volatile compounds may be more rapid so that personality changes are not so likely to be seen.

Inhalation of mercury vapor, usually in very high concentrations, may produce metal fume fever, which may disappear with no other apparent symptoms, or may be followed by a pneumonitis or other symptoms of mercuralism.

The ordinary toxic dust respirator does not protect against intoxication by metallic mercury or by the volatile seed-treating compounds, since they are in the form of vapor rather than dust. A gas mask offers some protection, but if enclosure and local exhaust are not possible, the only effective protection is a supplied air respirator.

Mesityl oxide is a high-boiling, unsaturated ketone which is thought to be somewhat more toxic than the ketones of lower molecular weights.

Metal hydrides (primary types) are compounds of hydrogen and the alkali metals: sodium, potassium, lithium, magnesium, calcium, and strontium. Information on the health hazards of metal hydrides is limited. Since they react with water to form caustic hydroxides, they are irritating to the eyes, skin, and mucous membranes. They also release a large amount of heat on reaction with the moisture of the skin.

Methanol (methyl alcohol) poisoning is usually produced by swallowing the liquid or inhaling high concentrations of vapor in an enclosed place such as a tank. The signs of poisoning include headache, nausea, vomiting, violent abdominal pains, aimless and erratic movements, dilated pupils, sometimes delirium, and such eye symptoms as pain, tenderness on pressure, and occasionally blindness. Direct action of the liquid or the vapor on the skin and mucous membranes may produce an irritation and inflammation.

One of the peculiarities of methanol poisoning is its exceptionally severe action on the optic nerve. About one-half of all the serious cases of methanol poisoning result in some impairment of vision, which is usually permanent and may vary from dimness or blind spots scattered through the visual field to total blindness.

Methoxychlor (2,2-di[p-methoxyphenyl]-1,-1,1-trichloroethane) is a synthetic insecticide which is closely related to DDT in its action. It is, however, about ⅛ to ⅒ as toxic as DDT. Consequently, the hazard from inhalation of the dust or mist of sprays of this insecticide is remote.

Methoxychlor is not absorbed through the intact skin in significant amounts, and does not seem to have any effect on the central nervous system. In animal experiments, continued feeding of diets containing methoxychlor in toxic concentration leads to loss of weight in the animals by their voluntary restriction of food intake and also to fatty infiltration of the liver in the manner of the chlorinated hydrocarbons.

Methyl acetate is widely used as a low-boiling solvent in the perfume, cosmetic and paint industries. It is irritating to the mucous membranes of the eyes and the respiratory passage.

Animal studies indicate that there may be general poisoning and long-lasting aftereffects when methyl acetate is inhaled in concentrations below that which produces narcosis. If exposure is serious, pulmonary edema and

APPENDIX K

DUKE UNIVERSITY MEDICAL CENTER

Occupational Health Service

August 21, 1985

Mr. Art Caplan
General Electric Company
Incandescent Lamp Department
Mela Park
Cleveland, OH 44112

RE: HEALTH RISKS FROM LOW LEVEL MERCURY CONTAMINATION OF SURFACES

Dear Art:

Your plan for decontaminating surfaces of the Newark Lamp Plant incorporates decontaminating the surfaces with a solution of Trisodium Phosphate and detergent and eliminating all visible dust. I would expect that such a decontamination procedure will effectively eliminate significant surface contamination of mercury. In actual trials, one treatment with a PSP/detergent solution decreased mercury contamination of a surface to levels less than 1 mcg per 100 cm2 (greater than 1000 fold decreased from pretreatment levels).

I would expect that such a decontamination procedure will effectively protect the health of any future workers in this plant or individuals using products manufactured or stored in this plant. By removing all surface contamination, there will be no risk of contaminating the breathing zone of workers with mercury-contaminated dust or of contaminating manufactured or stored articles with mercury contaminated dust. Furthermore, surface decontamination will effectively prevent significant mercury vapor evaporation into the work place. In this plant, essentially all mercury vapor levels have been measured at levels less than one microgram per cubic meter, even when significant surface contamination is present. This is as I would expect. When there is surface contamination, mercury present on the surface is oxidized and the potential for vapor release is decreased. Only when the surface is scuffed or disturbed will mercury vapor be released. If superficial mercury is removed, a paint film will prevent the disturbance of any mercury deeper in surfaces such that mercury vapor can be generated.

Revision 2
8/26/85

Division of Community and Occupational Medicine • Box 2914
Durham, North Carolina 27710 • Telephone (919) 684-6677

100581

I would expect that decontamination of surfaces to a level of 1 mcg per 100 cm2 will present no acute or chronic health hazards to users of this building. If one assumes that by contamination of hands on such a decontaminated surface, individuals can ingest up to 2 micrograms of mercury a day, then a risk assessment can be made. Mercury intake at this level can be compared with mercury intake from various food sources. Goldwater (1972) found that the following types of foods would have greater than 2 micrograms of mercury per 100 gram serving:

Radishes	Various grains
Coconut Oil	Palm Oil
Peanut Oil	Liver
Kidney	Milk
Fresh Water Fish	Salt Water Fish
Chicken	Bacon
Kosher Salami	Broiled Beef
Liver Sausage	Raw Carrots
Cheese	Butter
Macaroni	Apples
Bananas	Brazil Nuts
Filberts	Walnuts
Cashews	Coffee
Mustard	Margarine
Egg Yolk	

Based on an analysis of foods eaten at a student mess, the intake of mercury from foods can average up to 5 micrograms per day. The World Health Organization has recommended that intake of toxic forms of mercury be limited to 30 micrograms per day.

Surfaces contaminated with low levels of mercury (less than 1 mcg per 100 cm2) would be expected to elaborate low levels of mercury. In this particular situation, the levels would be considerably less than 1 mcg per m3. Such exposures would not be expected to offer any risk of ill health. In a large study of individuals with moderate environmental exposures to metallic vapor (averaging up to 9.5 mcg per m3), USEPA was unable to find any clinically significant problems associated with such an exposure.

In summary, decontamination of surfaces of the Newark plant to a level of 1 mcg of mercury per 100 cm2 or less will protect workers and users of goods of that factory by a wide margin.

Sincerely,

Woodhall Stopford

Woodhall Stopford, M.D., MSPH
Consulting Toxicologist

WS/tfw

REFERENCES

Goldwater, L. J. (1972) Mercury. A History of Quicksilver. Baltimore: York Press

Fugas, M. and F. Valic (1978) Biological Significance of Some Metals as Air Pollutants. Part II: Mercury. EPA-600/1-78-002

APPENDIX L

ANALYSES OF PCB'S IN OIL DRAINED FROM EQUIPMENT

Raritan Center, 160 Fieldcrest Ave., Edison, New Jersey 08837, Telephone (201) 225-6040

May 22, 1985

Mr. Dennis O. Correia
Program Manager
Health, Safety and Environmental
GENERAL ELECTRIC COMPANY
Nela Park #3456.18
Cleveland, OH 44112

Clayton Job No. 10457-47
P.O. No. 3456.18-28

Dear Mr. Correia:

The samples which you submitted to us on April 29, 1985 have been analyzed as requested; the results are reported in the attached table.

It is a pleasure to be of assistance to you. Please contact us if you have questions concerning any aspects of this report.

Very truly yours,

Kirit H. Vora

Kirit H. Vora, Manager
New Jersey Office and Laboratory

KHV:ss

Attachment

Revision 2
8/26/85

100584

Main Office: 25711 Southfield Road, Southfield, Michigan 48075, Telephone (313) 424-8860
A Marsh & McLennan Company

Clayton Environmental Consultants, Inc.

Results of Analyses

for

General Electric Company

Clayton Job No. 10457-47 KHU

Lab Number	Sample Description	Polychlorinated Biphenyls Arochlor #1016 (µg/g)	Arochlor #1232 (µg/g)	Arochlor #1262 (µg/g)
35072	Sample #1	4.90	< 0.97	< 0.97
35073	Sample #2	4.27	< 0.96	< 0.96
35074	Sample #3	< 0.97	< 0.97	< 0.97
35075	Sample #4	1.84	< 0.96	< 0.96
35076	Sample #5	9.69	< 0.97	< 0.97
35077	Sample #6	< 0.95	< 0.95	< 0.95
35078	Sample #7	3.83	< 0.96	< 0.96
35079	Sample #8	< 0.99	8.52	< 0.99
35080	Sample #9	< 0.98	< 0.98	< 0.98
35081	Sample #10	< 0.97	< 0.97	< 0.97
35082	Sample #11	< 0.97	24.23	35.74
35083	Sample #12	4.74	< 0.96	< 0.96
35084	Sample #13	< 0.95	< 0.95	< 0.95
35085	Sample #14	3.86	< 0.95	< 0.95
35086	Sample #15	26.27	< 0.97	< 0.97
35087	Sample #16	12.22	< 0.94	< 0.94
35088	Sample #17	9.34	< 0.95	< 0.95
35089	Sample #18	< 0.97	< 0.97	< 0.97

Analytical Method: GC/ECD
Limit of Detection: 1.0 µg based on 1 gram of sample

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100585

OIL SAMPLES FROM EQUIPMENT FOR PCB'S

Sample Number	Equipment Description
1	#25 Index Sealex
2	#25 Sealex
3	#25 Stem Cam Bank
4	#25 H30
5	#25 Stem
6	Index Cam LB10S
7	B10 Index A301
8	LB10 Mount Oil Pan
9	Worm Drive LB10S
10	#4 Cement Mixer Motor
11	Worm Drive LBGS
12	Index Cam LBGS
13	LBG Oil Pan
14	Index Cam LB10B
15	LBG Mount Index T7
16	#3 Unit Cement Mixer
17	Index Cam LBGB
18	B10 Index T7

Revision 2
8/26/85

APPENDIX M

PROPOSED PCB CLEANUP PLAN AND SAMPLING PLAN

M.1 Wood Floor Areas

Many of the areas where oil stains exist are in locations scheduled for either floor removal, scarification, or encapsulation (vapor barrier) as remediation for the mercury contamination. These same methods, as agreed to by N.J.D.E.P., will be employed for other oil-stained wood floor areas to remediate the potential PCB contamination which may exist. (Not every oil-stained area was sampled; however, all oil stains will be treated as PCB contaminated.)

M.2 Concrete Floor Areas

As indicated by analyses of concrete dust and core samples taken in oil-stained areas (Appendix N & P), the PCB contamination exists primarily on the surface. Pilot cleanings were conducted and found to be effective as indicated by post-core sampling analyses results in Appendix P.

The cleaning procedure consists of first scraping any buildup of dirt and oil from the surface to be cleaned. The second step is soaking and scrubbing the oil-stained area with a high alkaline detergent solution. The final step is high-pressure washing with a TSP solution. (Not every oil-stained area was sampled; however, all oil stains will be treated as PCB contaminated.)

Revision 2
8/16/85

M.3 Post Cleanup Sampling

Table M.1
Numbers and Locations of Samples

Bldg. No.	Floor (Level)	Room or Area	Floor PCB Concrete	Floor PCB Wood
1	Basement			
1	1	Open Bays	2	0
1	2	Open Bays	0	2
		3 Offices	0	1
1	3	Separate Rooms	0	1
		Bay Areas	0	0
1	4	Separate Rooms	0	0
		Open Bays	0	2
2	Basement	Open Bays	2	
2	1	Offices	0	1
		Open Bays	2	
2	2	Open Bays + 1 Office		5
2	3	3 Rooms	0	1
		Open Bays	2	0
2	3	Separate Rooms	0	1
		Open Bays	2	0
5	Basement	Open Bays	2	0
5	1	Bays Plus		
5		One Office	2	0
5	2	Room 21	0	0
		Open Bays	2	0
5	3	Separate Rooms	0	0
		Open Bays	2	0
5	4	Open Bays	2	0
		Office	0	0
7	Basement	Open Bays	4	-
7	1	Open Bays	4	-
7	1	Open Bays		
7	2	New Wood	0	0
		Center Wood	0	0
		Concrete		
		Open Bay	5	0
		Separate Rooms	2	
		Pump Room	0	1
7	3	Separate Rooms	0	0
		Open Bays	5	1
7	4	Separate Rooms	0	0
		Open Bays	4	
8	Basement		-	-
8	1		-	-
8	2	Storage Room	0	1
		Open Bay	0	3
8	3	Separate Room	1	0
8	4	Open Bay	1	0

Revision 2
8/26/85

M.3.1 Sampling and Analysis Requirements

Post cleanup requirements will include the sampling and analysis of the concrete and wood for PCBs. The contractor will be required to sample and provide analysis for those number of locations designated in Table M.1 for both concrete and wood.

M.3.1.1 Sampling of Concrete

PCB sampling in the concrete shall be performed with a core driller to the depth of 1-1/2 inch. The samples shall be placed in labeled 8-ounce jars for analysis. This core shall then be broken at the surface to 1/2 inch level. The balance of the core sample shall be saved for analysis if required. The core driller shall be de-contaminated between each sample with a double solvent rinse. Sample blanks of clean concrete will be required one every ten samples to maintain quality assurances.

M.3.1.2 Sampling of Wood

Scrape samples shall be taken on wood flooring surfaces for PCB analysis. No samples will be taken in areas where new flooring is installed. Scrape samples will be taken from the surface of a one square foot to provide sufficient volume for analysis. The number of samples for PCB analysis of wood flooring is shown in Table M.1.

Equipment such as chisels or paint scrapers must be de-contaminated between sample site with double solvent rinse. One blank sample per ten floor samples shall be taken as quality control.

M.3.1.3 Analysis

The 0-1/2 inch concrete sample shall be pulverized and weighed in preparation of analysis. The extraction, cleanup, and GC analysis shall be in accordance with Method 8080 of SW-846, Second Edition, July 1982, and performed by a N.J.D.E.P. certified laboratory.

APPENDIX N

ADDITIONAL PCB FLOOR SAMPLES

Bldg.	Floor	Sample Date	Sample No.	PCB Concentration PPM	Comments
1	2nd	1-8-85	24	10	Oil Stain
1	2nd	1-8-85	25	20	Oil Stain
1	2nd	4-25-85	7	2.76	Clean Area
1	3rd	1-8-85	23	13	Oil Stain
1	3rd	4-25-85	4	.69	Clean Area
1	4th	6-28-85	100	4	Clean Area
2	1st	4-25-85	11	4.61	Clean Area
2	1st	6-28-85	107	50	Oil Stain
2	2nd	4-25-85	8	2.09	Clean Area
2	2nd	6-28-85	108	1	Beneath Stained Finish Flooring Flare Area
2	2nd	6-28-85	109	4	Beneath Stained Finish Flooring Flare Area
2	3rd	4-25-85	5	.18	Clean Area
2	4th	6-28-85	102	.5	Clean Area
7	2nd	1-8-85	26	40	Oil Stain
7	2nd	4-25-85	9	221.88	Waxed Clean Area
7	2nd	4-25-85	10	82.69	Waxed Clean Area
7	2nd	4-25-85	12	.15	Oil Stained Concrete Dust
7	2nd	4-25-85	13	5.01	Oil Stained Grime on Concrete
7	2nd	4-25-85	14	8.65	Oil Stained Concrete Dust
7	2nd	4-25-85	15	4.74	Oil Stained Concrete Dust
7	2nd	4-25-85	16	63.27	Oil Stained Concrete Dust
7	2nd	4-25-85	17	.29	Clean Concrete Dust
7	2nd	4-25-85	18	.69	Oil Stained Concrete Dust
7	2nd	4-25-85	19	2.03	Oil Stained Concrete Dust
7	2nd	4-25-85	20	3.34	Oil Stained Concrete Dust
7	2nd	6-28-85	103	104	Waxed Clean Area
7	2nd	6-28-85	104	91	Waxed Clean Area
7	3rd	1-8-85	21	.5	Oil Stain
7	3rd	1-8-85	22	9	Oil Stain
7	3rd	4-25-85	1	.48	Clean Area
7	3rd	4-25-85	2	3.99	Clean Area

Revision 2
8/26/86

APPENDIX N (Con't.)

ADDITIONAL PCB FLOOR SAMPLES

Bldg.	Floor	Sample Date	Sample No.	PCB Concentration PPM	Comments
7	3rd	4-25-85	3	1.08	Clean Area
7	4th	6-28-85	101	3	Clean Area
8	2nd	4-25-85	6	367.53	Waxed Clean Area
8	2nd	6-28-85	105	490	Waxed Clean Area
8	2nd	6-28-85	106	4800	Waxed Clean Area

Revision 2
8/26/85

Clayton Environmental Consultants, Inc.
Raritan Center, 160 Fieldcrest Ave., Edison, New Jersey 08837, Telephone (201) 225-6040

May 22, 1985

Mr. Dennis O. Correia
Program Manager
Health, Safety and Environmental
GENERAL ELECTRIC COMPANY
Nela Park
Cleveland, OH 44112

Clayton Job No. 10463-47
P.O. No. 3445-2184

Dear Mr. Correia:

The samples which you submitted to us on April 26, 1985 have been analyzed as requested; the results are reported in the attached table.

It is a pleasure to be of assistance to you. Please contact us if you have questions concerning any aspects of this report.

Very truly yours,

Kirit H. Vora

Kirit H. Vora, Manager
New Jersey Office and Laboratory

KHV:ss

Attachment

100593

Clayton Environmental Consultants, Inc.

Results of Analyses

for

General Electric Company

Clayton Job No. 10463-47 EMV

FLOOR SEPARATES

Lab Number	Sample Description	Polychlorinated Biphenyls				
		Arochlor #1016 (µg/g)	Arochlor #1242 (µg/g)	Arochlor #1254 (µg/g)	Arochlor #1260 (µg/g)	Arochlor #1262 (µg/g)
35090	Sample #1	< 0.48	< 0.48	< 0.48	< 0.48	< 0.48
35091	Sample #2	< 0.70	< 0.70	3.99	< 0.70	< 0.70
35092	Sample #3	< 0.75	< 0.75	1.08	< 0.75	< 0.75
35093	Sample #4	< 0.46	< 0.46	< 0.46	< 0.46	0.69
35094	Sample #5	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18
35095	Sample #6	< 0.23	< 0.23	< 0.23	< 0.23	367.53
35096	Sample #7	< 0.23	< 0.23	2.76	< 0.23	< 0.23
35097	Sample #8	< 0.18	< 0.19	< 0.18	< 0.18	2.09
35098	Sample #9	< 0.18	< 0.18	221.88	< 0.18	< 0.18
35099	Sample #10	< 0.09	< 0.09	< 0.09	< 0.09	82.69
35100	Sample #11	1.20	< 0.38	3.41	< 0.38	< 0.38
35101	Sample #12	< 0.04	0.15	< 0.04	< 0.04	< 0.04
35102	Sample #13	< 0.41	< 0.41	< 0.41	5.01	< 0.41
35103	Sample #14	< 0.06	< 0.06	< 0.06	< 0.06	8.65
35104	Sample #15	< 0.32	< 0.32	< 0.32	< 0.32	4.74
35105	Sample #16	< 0.09	< 0.09	< 0.09	< 0.09	63.27
35106	Sample #17	< 0.12	< 0.12	< 0.12	< 0.12	0.29
35107	Sample #18	< 0.13	< 0.13	< 0.13	< 0.13	0.69
35108	Sample #19	< 0.18	< 0.18	2.03	< 0.18	< 0.18
35109	Sample #20	< 0.23	< 0.23	3.34	< 0.23	< 0.23

Analytical Method: GC/ECD
Limit of Detection: 1.0 µg/g based on 1 gram of sample

FEB 15, 1985

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors - GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
G5682	GENERAL ELECTRIC COMPANY	GELBGCLPCB	21	850109		

Compound	Results		QC Replicate		QC Blank and Spiked Blank			QC Matrix Spike		
	Sample Concen. mg/kg	MDL mg/kg[a]	First mg/kg	Second mg/kg	Blank Data mg/kg	Concen. Added mg/kg	% Recov [b]	Unspiked Sample mg/kg	Concen. Added mg/kg	% Recov
Aroclor 1242	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1254	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1260	ND	5	ND	ND	ND	0	-	ND	10	95
Aroclor 1248	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1232	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1221	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1016	ND	5	ND	ND	ND	0	-	ND	0	-

[a] MDL calculated for each sample matrix.

[b] Percent Blank, Spiked Blank cannot be performed for this sample matrix.

100587

ETC ENVIRONMENTAL TESTING and CERTIFICATION

FEB 15, 1985

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors - GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
G5683	GENERAL ELECTRIC COMPANY	GELBGCLPCB	22	850109		

Compound	Results		QC Replicate		QC Blank and Spiked Blank			QC Matrix Spike		
	Sample Concen. mg/kg	MDL mg/kg[a]	First mg/kg	Second mg/kg	Blank Data mg/kg	Concen. Added mg/kg	% Recov [b]	Unspiked Sample mg/kg	Concen. Added mg/kg	% Recov
Aroclor 1242	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1254	9.00	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1260	BMDL	5	ND	ND	ND	0	-	ND	10	95
Aroclor 1248	BMDL	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1232	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1221	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1016	ND	5	ND	ND	ND	0	-	ND	0	-

[a] MDL calculated for each sample matrix.

[b] Reagent Blank, Spiked Blank cannot be performed for this sample matrix.

IN-O

1005596

FEB 15, 1985

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors - GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
G5684	GENERAL ELECTRIC COMPANY	GELBGCLPCB	23	850109		

Compound	Results		QC Replicate		QC Blank and Spiked Blank			QC Matrix Spike		
	Sample Concen. mg/kg	MDL mg/kg[a]	First mg/kg	Second mg/kg	Blank Data mg/kg	Concen. Added mg/kg	% Recov [b]	Unspiked Sample mg/kg	Concen. Added mg/kg	% Recov
Aroclor 1242	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1254	13	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1260	BMDL	5	ND	ND	ND	0	-	ND	10	95
Aroclor 1248	BMDL	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1232	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1221	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1016	ND	5	ND	ND	ND	0	-	ND	0	-

[a] MDL calculated for each sample matrix.

[b] Reagent Blank. Spiked Blank cannot be performed for this sample matrix.

100597

ETC ENVIRONMENTAL TESTING and CERTIFICATION

FEB 15, 1985

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors - GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
G5685	GENERAL ELECTRIC COMPANY	GELBGCLPCB	24	850109		

Compound	Results		QC Replicate		QC Blank and Spiked Blank			QC Matrix Spike		
	Sample Concen. mg/kg	MDL mg/kg[a]	First mg/kg	Second mg/kg	Blank Data mg/kg	Concen. Added mg/kg	% Recov [b]	Unspiked Sample mg/kg	Concen. Added mg/kg	% Recov
Aroclor 1242	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1254	10	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1260	BMDL	5	ND	ND	ND	0	-	ND	10	95
Aroclor 1248	BMDL	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1232	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1221	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1016	ND	5	ND	ND	ND	0	-	ND	0	-

[a] MDL calculated for each sample matrix.

[b] Percent Blank. Spiked Blank cannot be performed for this sample matrix.

100596

N-8

FEB 15, 1985

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors - GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
G5686	GENERAL ELECTRIC COMPANY	GELBGCLPCB	25	850109		

Compound	Results		QC Replicate		QC Blank and Spiked Blank			QC Matrix Spike		
	Sample Concen. mg/kg	MDL mg/kg[a]	First mg/kg	Second mg/kg	Blank Data mg/kg	Concen. Added mg/kg	% Recov s	Unspiked Sample mg/kg	Concen. Added mg/kg	% Recov
Aroclor 1242	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1254	15	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1260	BMDL	5	ND	ND	ND	0	-	ND	10	95
Aroclor 1248	5.00	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1232	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1221	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1016	ND	5	ND	ND	ND	0	-	ND	0	-

[a] MDL calculated for each sample matrix.

[b] Reagent Blank. Spiked Blank cannot be performed for this sample matrix.

100593

ETC ENVIRONMENTAL TESTING and CERTIFICATION

FEB 15, 1985

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors - GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
G5687	GENERAL ELECTRIC COMPANY	GELBGCLPCB	26	850109		

Compound	Results		QC Replicate		QC Blank and Spiked Blank			QC Matrix Spike		
	Sample Concen. mg/kg	MDL mg/kg[a]	First mg/kg	Second mg/kg	Blank Data mg/kg	Concen. Added mg/kg	% Recov [a]	Unspiked Sample mg/kg	Concen. Added mg/kg	% Recov
Aroclor 1242	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1254	20	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1260	BMDL	5	ND	ND	ND	0	-	ND	10	95
Aroclor 1248	20	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1232	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1221	ND	5	ND	ND	ND	0	-	ND	0	-
Aroclor 1016	ND	5	ND	ND	ND	0	-	ND	0	-

[a] MDL calculated for each sample matrix.

[b] Reagent Blank. Spiked Blank cannot be performed for this sample matrix.

100900

Clayton Environmental Consultants, Inc.

Raritan Center, 160 Fieldcrest Ave., Edison, New Jersey 08837, Telephone (201) 225-6040

July 19, 1985

Mr. Scott Brunson
O.H. MATERIALS CO.
P.O. Box 551
Findlay, Ohio 45840

Clayton Project No. 10691-47
P.O. No. 2668-48228

Dear Mr. Brunson:

The samples which you submitted to us on June 28, 1985 have been anaylzed as requested; the results are reported in the attached table.

It is a pleasure to be of assistance to you. Please contact us if you have questions concerning any aspects of this report.

Very truly yours,

Kirit H. Vora, Manager
New Jersey Office and Laboratory

KHV:ss

Attachment

Clayton Environmental Consultants, Inc.

Results of Analyses

for

O.H. Materials Company

Clayton Project No. 10691-47

Lab Number	Sample Description	Polychlorinated Biphenyls (Arochlor 1254) (µg/gram)
36739	100	4
36740	101	3
36741	102	< .5
36742	103	140
36743	104	91
36744	105	490
36745	106	4800
36746	107	50
36747	108	1
36748	109	4
36749	Blank	< .5

Analytical Method: GC/ECD
Limit of Detection: .5 µg/gram based on 10 gram sample size

APPENDIX O

PILOT CLEANING OPERATIONS FOR MERCURY CONTAMINATED AREAS

Introduction

The results of initial dust and wipe samples taken throughout the buildings on various types of surfaces indicated that dust and grime on horizontal overhead surfaces presented the highest levels of surface contamination (see Section 4). Other vertical surfaces were shown to be essentially clean with less than 1 $\mu g/100\ cm^2$ of mercury present.

The cleaning problem, therefore, consisted of removal of the dust and or grime containing mercury without redistribution of the contaminated dust to other clean surfaces.

Vacuum cleaning with specially designed equipment with activated charcoal filters was tried on small areas of overhead pipes, duct work, and light fixtures. The results were visually noticeable with essentially the entire dust blanket being removed. However, a grimy residue remained on some surfaces which retained a small amount of mercury contamination.

A second step was added to the vacuuming procedure to include a two-pass hand wipe of the grimy area with a cloth wet with a solution of trisodium phosphate and water. Wipe sampling results indicated a simple two-pass wipe would not remove all the grime. It was, therefore, concluded that extensive hand scrubbing of all overhead surfaces would not be a practicable method of production cleaning.

Several other wet methods of cleaning were tried on small areas including: pene-tone soak and steam cleaning, high-pressure water, and high-pressure water with TSP. The high-pressure water with TSP showed

the most promise as a practicable cleaning method. However, the actual procedure for use of this method needed to be refined to insure that a consistent level of contaminant removal would be achieved in all areas.

A series of pilot cleanings were conducted in three areas of the facility. Two of these areas were located in manufacturing areas where mercury was known to have been present in the manufacturing equipment, and initial sampling indicated the highest levels of contamination existed. Another area of low contamination was included for use as a comparison and to determine if one specified method of cleaning could be used successfully in both low and high contamination areas. Each test area consisted of approximately 1000 square feet total floor, wall, overhead, and ceiling surface.

The high-pressure water method employed utilizes a precise set of controls on: water pressure, water temperature, TSP concentration, application distance and procedure, and rate of surface area cleaned per unit of time. Control of spent cleaning solutions is accomplished by the use of polyethlene film to contain wash waters which are simultaneously vacuumed up and containerized for treatment.

Wipe sampling was used to measure the effectiveness of the cleaning. A modified procedure utilizing a 25 percent nitric acid saturated 11 cm dia. alhatman FG/A filter paper wiped over an area of 1000 cm^2 to insure the highest degree of removal of any remaining mercury from the sampled surface.

The following types of surfaces were evaluated: brick, concrete floors, walls, columns, and ceilings; tile floors; fluorescent light fixtures; wood ceilings, columns, windows, pipes.

The sampling indicated all surfaces were cleaned to a level of less than 1 μg of mercury per 100 cm^2 of surface. The actual range of

levels measured was from .01 to .34 µg/100 cm^2. The average of the 23 total samples taken after cleaning was .06 µg/100 cm^2.

Pilot Cleaning Building 7 Second Floor

A pilot cleaning was conducted in one bay of this building along the west wall near the room used for cleaning mercury pumps and in the exact location where the most recent use of mercury using equipment was located. This is the area where the wood floor was removed and traces of mercury were found and removed by vacuuming, and a plywood floor installed.

The following were the highest levels of contamination measured in this area prior to cleaning: overhead wipe 205 µg/100 cm^2, wall wipe .189 µg/100 cm^2, floor scraping 4230 PPM, ceiling wipe .48 µg/100 cm^2.

The area to be cleaned (380 sq. ft. ceiling, 380 sq. ft. of floor, and 240 sq. ft. wall) was first enclosed with polyethylene film for purposes of containing wash waters and preventing further contamination of other areas. Existing duct work in this area which was contaminated on the interior to a level exceeding 1 µg/100 cm^2 and, therefore, scheduled for removal and disposal, was first vacuumed with a specially equipped vacuum cleaner to remove exterior dust accumulated on the top of the duct work. The section of duct work in the test area was then removed and wrapped in poly film for future testing to determine the method of disposal. The following specifications were maintained during the high pressure wash procedure:

1) A TSP solution of 5% was used.
2) Water temperature was maintainewd at 80°F.
3) Water pressure was maintained at 3000 PSI at the tip of the applying wand.

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4) Maximum application distance (wand tip to surface) was 24" .

5) Rate of cleaning was held to 30 sq. ft. per minute.

High-pressure water cleaning was begun by carefully pre-wetting heavily contaminated areas with a light misting of TSP solution to minimize dust dispersion. High-pressure washing of overhead piping, conduit and light fixtures was then performed. Ceilings and walls were then washed and all surfaces were then rinsed. Concrete and tile floors were then high-pressure washed.

All wash waters were wet vacuumed into 55 gallon drums for subsequent analysis, treatment, and disposal. After removal of wash waters, the test area was allowed to air dry.

Wipe sampling was then performed with the following results indicated:

Brick Wall	.024 $\mu g/100\ cm^2$
Concrete Floor	.064 $\mu g/100\ cm^2$
Tile Floor	.033 $\mu g/100\ cm^2$
Concrete Wall	.02 $\mu g/100\ cm^2$
Concrete Column	.011 $\mu g/100\ cm^2$
Ceiling	.023 $\mu g/100\ cm^2$
Light Fixture Top	.024 $\mu g/100\ cm^2$

These results demonstrate the effectiveness of the high-pressure washing method in reducing the level of mercury contamination to significantly less than 1 $\mu g/100\ cm^2$.

Pilot Cleaning Building 1, Third Floor

A pilot cleaning was conducted in one bay of this building in the northeast corner of the building near the entrance to Building 8. This

is the only other section of the building where mercury-using production equipment was located.

The following were the highest levels of contamination measured in this area prior to cleaning: overhead dust 215 PPM, overhead wipe 126 µg/100 cm^2, wall wipe .13µg/100 cm^2, floor scraping 636 PPM.

The wood flooring in this area is scheduled for disposal due to the known existence of small spills of mercury in this area approximately 20 years ago when it was an active manufacturing area. Therefore, the pilot cleaning included the removal of flooring in the test area (360 square feet) to access the effect of this operation in increasing the existing contamination on walls and overhead due to the dust generated. Employees performing this work were required to wear full protective clothing with tank-supplied breathing air.

The area to be cleaned (360 square feet of ceiling and overhead and 216 square feet of wall) were then enclosed with polyethylene film. The wood sub-floor was also protected against contamination by covering with polyethylene film.

Duct work was removed following the same procedure used in the pilot cleaning conducted in Building 7. The high-pressure water clenaing was conducted in the same sequence and with the same controls (temperature, pressure, application) as were used in the Building 7 test cleaning, wash waters were similarly collected and containerized.

Wipe sampling was then performed with the following results indicated:

Concrete Wall	.074 µg/100 cm^2
Brick Wall	.15 µg/100 cm^2
Wood Ceiling	.12 µg/200 cm^2
Wood Column	.14 µg/100 cm^2

These results demonstrate the effectiveness of the high-pressure washing method in reducing the level of mercury contamination to significantly less than 1 $\mu g/100\ cm^2$.

Pilot Cleaning Building 7, Third Floor

A pilot cleaning was conducted in one bay of this building approximately midway along the west wall. This area never contained mercury using production equipment and was test cleaned using the same methods as were used in Building 7, Second Floor, and Building 1, Third Floor. This cleaning was conducted as a back up for possible evaluation of the method used in the more significantly contaminated areas. Should that method have failed in those areas, it may have been considered for use in lesser contaminated areas.

The following were the highest levels of contamination measured in this area prior to cleaning: overhead dust 2.8 PPM, wall wipe <.01, overhead wipe 9 $\mu g/100\ cm^2$, floor scraping 5 PPM.

Wipe sampling after cleaning indicated the following results:

Overhead Pipe	<.01 $\mu g/100\ cm^2$
Brick Wall	<.01 $\mu g/100\ cm^2$
Concrete Floor	.011 $\mu g/100\ cm^2$
Concrete Ceiling	<.01 $\mu g/100\ cm^2$
Window	.06 $\mu g/100\ cm^2$
Light Fixture Top	.026 $\mu g/100\ cm^2$
Concrete Wall	.34 $\mu g/100\ cm^2$

These results demonstrate the effectiveness of the high-pressure washing method in reducing the levels of mercury contamination to significantly less than 1 $\mu g/100\ cm^2$.

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Clayton Environmental Consultants, Inc.

Raritan Center, 160 Fieldcrest Ave., Edison, New Jersey 08837, Telephone (201) 225-6040

August 23, 1985

Mr. John R. Hitchings
O.H. MATERIALS CO.
P.O. Box 551
Findlay, Ohio 45839-0551

Clayton Project No. 10867-47

Dear Mr. Hitchings:

The samples which you submitted to us on August 14, 1985 have been analyzed as requested; the results are reported in the attached tables.

It is a pleasure to be of assistance to you. Please contact us if you have questions concerning any aspects of this report.

Very truly yours,

Kirit H. Vora

Kirit H. Vora, Manager
New Jersey Office and Laboratory

KHV:ss

Attachments

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Clayton Environmental Consultants, Inc.

Results of Analyses

for

O.H. Materials Co.

Clayton Project No. 10867-47 KW

Lab Number	Sample Description	Mercury (ug/sample)
39799	2668-01	2.5
39800	2668-02	7.1
39801	2668-03	2.6
39802	2668-04	1.3
39803	2668-05	1.3
39804	2668-06	0.73
39805	2668-07	2.1
39806	2668-08	0.86
39807	2668-09	0.24
39808	2668-10	0.64
39809	2668-11	0.33
39810	2668-12	0.20
39811	2668-13	0.11
39812	2668-14	0.23
39813	2668-15	0.24
39814	2668-16	0.46
39815	2668-17	2.3
39816	2668-18	2.2
39817	2668-19	< 0.10

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100610

Clayton Environmental Consultants, Inc.

Results of Analyses

for

O.H. Materials Co.

Clayton Project No. 10867-47 MW

Lab Number	Sample Description	Mercury (ug/sample)
39818	2668-20	< 0.10
39819	2668-21	0.17
39820	2668-22	< 0.10
39821	2668-23	2.5
39822	2668-24	< 0.10
39823	2668-25	< 0.10
39824	2668-26	1.3
39825	2668-27	< 0.10
39826	2668-28	9.9
39827	2668-29	0.11
39828	2668-30	3.4
39829	2668-31	0.11
39830	2668-32	< 0.10
39831	2668-33	0.26
39832	2668-34	< 0.10
39833	2668-35	< 0.10
39834	2668-36	0.64
39835	2668-37	< 0.10
39836	2668-38	< 0.10

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100611

Clayton Environmental Consultants, Inc.

Results of Analyses

for

O.H. Materials Co.

Clayton Project No. 10867-47 KMW

Lab Number	Sample Description	Mercury (ug/sample)
39837	2668-39	< 0.10
39838	2668-40	6.8
39839	2668-41	2.6
39840	2668-42	1.5
39841	2668-43	14
39842	2668-44	3.4
39843	2668-45	3.8
39844	2668-46	1.2
39845	2668-47	2.5
39846	2668-48	1.5
39847	2668-49	0.66
39848	2668-50	0.74
39849	2668-51	1.4
39850	2668-52	0.13

Analytical Method: Nitric Acid Digestion/Mercury Hydride Generator-A.A.

Limit of Detection: 0.10 ug/sample

Results have not been recovery or blank corrected. Internal Quality Control samples spiked at 10 ug's/filter using 37 mm glass fiber filters produced an average recovery of 93%.

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100612

PILOT CLEANING - MERCURY

SAMPLE DESCRIPTIONS

Sample No.	Building	Floor	Surface	Pre-Cleaning	Post Cleaning
1	7	2nd	Brick Wall	X	
2	7	2nd	Concrete Floor	X	
3	7	2nd	Tile Floor	X	
4	7	2nd	Concrete Wall	X	
5	7	2nd	Column	X	
6	7	2nd	Ceiling	X	
7	7	2nd	Ceiling	X	
8	7	2nd	Light Fixture	X	
9	7	2nd	Brick Wall		X
10	7	2nd	Concrete Floor		X
11	7	2nd	Tile Floor		X
12	7	2nd	Concrete Wall		X
13	7	2nd	Column		X
14	7	2nd	Ceiling		X
15	7	2nd	Light Fixture		X
16	1	3rd	Concrete Block	X	
17	1	3rd	Brick Wall	X	
18	1	3rd	Ceiling	X	
19	1	3rd	Column	X	
20		Field Blank			
21	7	3rd	Pipe	X	
22	7	3rd	Brick Wall	X	
23	7	3rd	Concrete Floor	X	
24	7	3rd	Ceiling	X	
25	7	3rd	Window Glass	X	
26	7	3rd	Light Fixture	X	
27	7	3rd	Concrete Wall	X	
28	Roof Air Vent (Inside)			X	
29	7	3rd	Concrete Wall		X
30	7	3rd	Concrete Wall		X
31	7	3rd	Concrete Wall		X
32	7	3rd	Ceiling		X
33	7	3rd	Light Fixture		X
34	7	3rd	Pipe		X
35	7	3rd	Window Glass		X
36	7	3rd	Window Glass		X
37	7	3rd	Brick Wall		X
38	7	3rd	Brick Wall		X
39		Field Blank			
40	1	4th	Wood Floor	X	
41	1	4th	Wood Floor		X
42	1	4th	Wood Floor		X

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Sample No.	Building	Floor	Surface	Pre-Cleaning	Post Cleaning
43	1	2nd	Concrete Floor	X	
44	1	2nd	Concrete Floor		X
45	1	2nd	Concrete Floor		X
46	1	3rd	Ceiling		X
47	1	3rd	Brick Wall		X
48	1	3rd	Brick Wall		X
49	1	3rd	Concrete Block		X
50	1	3rd	Concrete Block		X
51	1	3rd	Column		X
52		Field Blank			

APPENDIX P

PILOT CLEANING OPERATIONS

FOR PCB CONTAMINATED AREAS

Introduction

PCB contamination exists solely in the form of oil stains on wood and concrete floors. The majority of oil-stained wood floors are scheduled to be removed and replaced or encapsulated. The only other area of PCB contamination on wood floors was Building 8, Second Floor. This area is contaminated only on the surface from a wax suspected of containing PCB's. The area will be scarified to remove the top 1/32 of an inch of wood. Due to this limited amount of wood floor to be treated, a pilot scarification was not judged as cost effective. Post-cleanup sampling will be conducted in this area as stated in Appendix M.

Initial sampling of oil-stained concrete areas was by scraping or chipping the concrete and analyzing the pulverized concrete. This sampling indicated levels from .15 PPM to 63.27 PPM. However, these were not quantifiable as to depth of penetration.

A pilot cleaning operation was conducted on oil-stained concrete areas in Building 5, Building 7, and the garage.

The cleaning procedure for all three areas was as follows:

1) Scraping surface to remove any build up of dirt and oil from the surface.
2) The stained area was then soaked with a high alkaline detergent solution and scrubbed.
3) The final step was high-pressure washing with a TSP solution.

All wash water solutions were vacuumed up and containerized to be analyzed prior to determining method of disposal.

Concrete core samples were then taken to a depth of 1-1/2 inch. The first (top) 1/2 inch section of each core was then analyzed, with the following results indicated:

Building 5	.2 PPM
Building 7	1.0 PPM
Garage	<.1 PPM

The second half inch (1/2" to 1") results were as follows:

Building 5	.8 PPM
Building 7	.4 PPM
Garage	<.1 PPM

The third half inch (1" to 1-1/2") results were as follows:

Building 5	<.1 PPM
Building 7	.4 PPM
Garage	7.0 PPM

These results demonstrate the effectiveness of the soaking and high-pressure wash method in reducing the level of PCB contamination in the top 1" of concrete to less than 5 PPM.

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