360011

DURACELL INC.
NORTH TARRYTOWN, NEW YORK

TEST CLEANING
DOCUMENTATION REPORT

PROJECT #425-1
JANUARY 1987

EDER ASSOCIATES
CONSULTING ENGINEERS, P.C.
85 Forest Avenue
Locust Valley, New York 11560

eder associates
consulting engineers, p.c.

January 15, 1987
File #425-1

Mr. James Ludlam
New York State Department of
Environmental Conservation
Division of Solid and Hazardous Wastes
Room 209
50 Wolf Road
Albany, New York 12233

Dear Mr. Ludlam:

In October, 1986, Duracell, Inc. performed the test cleaning as proposed in the "Engineering Report Evaluating On-Site Residues" October, 1985 and as specified in the "Contract Documents for Test Cleaning" August 1986. The test cleaning was documented in accordance with the "Quality Assurance Program Plan for Test Cleaning at Duracell Incorporated, North Tarrytown, N.Y.", August 1986. These documents were previously submitted to the New York State Department of Environmental Conservation (DEC).

Enclosed is our "Test Cleaning Documentation Report" submitted on behalf of Duracell, Inc. which presents the test cleaning work performed and documentation of the results. Duracell is prepared to clean the remainder of the building using appropriate methods to achieve the same results. Based on the results of the test cleaning, as presented in our report, we request approval to dispose of the cleaned building demolition debris to a construction and demolition debris landfill.

Following our receipt of your approval, Duracell will submit specifications for cleaning and a quality assurance program plan for documenting the results achieved to the DEC for review and comment. After the building cleaning is completed, a documentation report will be submitted to demonstrate that the cleaned building conditions are in accordance with the results of the test cleaning.

We look forward to your review of this documentation and are available to meet with you to discuss the results of this report.

Very truly yours,

EDER ASSOCIATES CONSULTING ENGINEERS, P.C.

Gary A. Rozmus
Vice President

GAR/pm
Enc.

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SUMMARY

Duracell, Inc. had submitted an "Engineering Report Evaluating On-Site Residues" at their former North Tarrytown, New York battery manufacturing plant to the New York State Department of Environmental Conservation on October 28, 1985. One of the conclusions of the report, prepared by Eder Associates Consulting Engineers, P.C., was that residues containing metals remain on the interior surfaces of the building. Duracell proposed a remediation program which includes cleaning and demolition of the building and disposal of the debris to a landfill approved for construction and demolition (C & D) debris.

The remediation program provides for the test cleaning of one of the rooms in the building to determine the achievable level of cleanliness which will be the basis for approval to dispose of the building demolition debris to a C & D landfill. The remainder of the building would then be cleaned and the level of cleanliness would be documented so that the building debris is acceptable for disposal to a C & D landfill. This report presents the results of the test cleaning and a conceptual plan for cleaning the building.

The test cleaning, performed in a room having difficult to remove oily residues and with surface metal concentrations which were among the highest within the plant, consisted in removing and cleaning furnishings and vacuuming and power washing room surfaces. Documentation sampling showed that these cleaning procedures reduced the average surface metal concentrations to about 0.1 mg/sf except inside one small diameter duct system. The same cleaning procedures will probably be required in areas of the plant having comparable types of residues to achieve the same results. The selective application of similar cleaning procedures would be required in other areas of the plant having lesser and more easily removed residues to achieve the same results. The documentation sampling also showed that some surfaces, such as the ceiling components, underside of the roof and possibly the walls, do not require cleaning. Analysis of the data shows that cleaned building components, with the exception of ductwork, have metal contents similar to clean fill and would be acceptable for disposal to a C & D landfill.

I. INTRODUCTION

Duracell, Inc. had submitted an "Engineering Report Evaluating On-Site Residues" at their former North Tarrytown, New York battery manufacturing plant to the New York State Department of Environmental Conservation (DEC) on October 28, 1985. The report, prepared by Eder Associates Consulting Engineers, P.C. (EA), presented the results of their investigation of site conditions with respect to the potential presence and characteristics of residues resulting from prior manufacturing operations. One of the conclusions of the report was that residues containing metals remain on the interior surfaces of the building. Duracell proposed a remediation program which includes cleaning and demolition of the building and disposal of the debris to a landfill approved for construction and demolition (C & D) debris.

The remediation program provides for the test cleaning of one of the rooms in the building to evaluate cleaning methods and document the level of cleanliness which can be achieved. This performance level of cleanliness will be the basis for approval to dispose of the building demolition debris to a C & D landfill. The remainder of the building would then be cleaned using the selective application of appropriate cleaning methods similar to those used during the test cleaning and documentation would be prepared to demonstrate that the performance level of cleanliness has been achieved and that the demolition debris is acceptable for disposal to a C & D landfill. This report presents the results of the test cleaning.

The building includes a floor area of about 60,000 square feet (sf) divided into about 57 different rooms or functional areas in which a variety of manufacturing operations and administrative functions had been performed and in which a range of surface metal concentrations remain of which lead, mercury and zinc occur in the highest concentrations. The performance level of cleanliness is defined by the residual surface concentration of lead and mercury after the cleaning. Zinc has not been included in the definition of the performance level of cleanliness since it is a required trace element in the human diet and no EP toxicity standard for hazardous wastes has been established for this metal.

It had been estimated that cleaning of the building should reduce the average surface concentration of each metal to 0.1 mg/sf. This target level of performance corresponds to the minimum metal concentration presently existing on the cleanest surface of the building which had only been exposed to conditioned filtered air. The building contains about 250,000 sf of interior floor, wall and ceiling area. The anticipated quantity of any one metal remaining after cleaning if the target level of performance were achieved, would be about 25 grams (.05 lbs). For mercury, this is two to four times less than the content of a typical indoor-outdoor thermometer or mercury electrical switch. Within this range of metal concentrations, the debris resulting from demolition should be acceptable for disposal to a C & D landfill. One purpose of this test cleaning has been to verify whether this target level of performance can be achieved.

Area 4, an enclosed room of about 750 square feet, was selected for the test cleaning. This room had oily surface residues containing the highest concentration of mercury, and among the highest concentrations of lead within the plant. The level of cleanliness achieved in this worst case room should be readily achieved in other rooms and areas of the plant having lower surface metal concentrations using the same or similar methods as the test cleaning.

EA prepared "Contract Documents for Test Cleaning", August 1986, for the performance of the work and "Quality Assurance Program Plan for Test Cleaning at Duracell Incorporated, North Tarrytown, N.Y.", August 1986, which presented the sampling and analysis plan to determine the effectiveness of the Test cleaning. These documents were transmitted to the New York State Department of Environmental Conservation (DEC) on August 18 and 22, 1986 and their review did not result in comments. The contract documents were released for bidding to contractors in late August, 1986. Nine bids were received and after evaluation of contractor qualifications, Clean Venture Inc., Perth Amboy, New Jersey was awarded the contract. The work was performed between October 20th and 27th, 1986. EA performed the documentation sampling and Consolidated Technology, Inc. Irvington, New York was the primary laboratory performing analyses. Split samples were analyzed by a secondary laboratory C.T. Male Inc. Latham, New York.

II. TEST CLEANING AND DOCUMENTATION PROCEDURES

1. Description

A plan of the Duracell plant building is presented in Drawing No. 1. The test clean room, Area 4, is located along the east wall of the plant building and has a floor area of approximately 750 sf with a 14 foot ceiling height. The floor is concrete and walls are painted concrete block. A plasterboard ceiling was attached to the wood roof joists with fiberglass blanket insulation above. The joists are supported on two transverse I beams and the roof is wood decking with PVC membrane covering. Windows are located in the east wall and a double access door to the plant interior is in the west wall. One exhaust fan was mounted in the windows. Inside the room was ductwork, as indicated and designated ED-6, exhausting through a roof mounted fan. The room also included ductwork to the roof in the north east corner, approximately eight ceiling hung fluorescent light fixtures, miscellaneous piping, conduit and electrical fixtures which are not shown. A floor drain, located near the center of the room, discharges through piping below the floor to the east floor trench in the access corridor.

The floor and shelf areas at the ceiling level, such as the top surfaces of ductwork and light fixtures, had an oily residue which contains lead and mercury. The interior surfaces of ductwork system ED-6 also contained a residue with these metals. The surface concentration of the principal metals measured during the EA investigation of 1985 were:

	Surface Concentration, mg/sf		
	Floor	Shelf	Ductwork Interior
Lead	10.	4.6	1.5
Mercury	3.4	30.	1.6

The test cleaning was performed in accordance with "Contract Documents for Test Cleaning", August 1986. The work was witnessed by a representative of EA who performed documentation sampling.

The Scope of the Work included:

(1) removal of furnishings such as the window exhaust fan, two ductwork systems, pvc piping along the south wall, fluorescent light fixtures and piping, conduit and electrical fixtures in contact with the walls and ceiling;

(2) closing all window and roof openings;

(3) cleaning removed furnishings;

(4) removal of the plasterboard ceiling and insulation and packaging in drums;

(5) cleaning of room surfaces by vacuuming and washing;

(6) decontaminating equipment used in the work;

(7) removal of materials and supplies used in the work;

(8) Sampling and analysis required for the disposal of waste materials resulting from the Work; and

(9) transportation of vacuumed residues, washwater runoff, and materials and supplies used in the work to disposal facilities.

2. Health and Safety

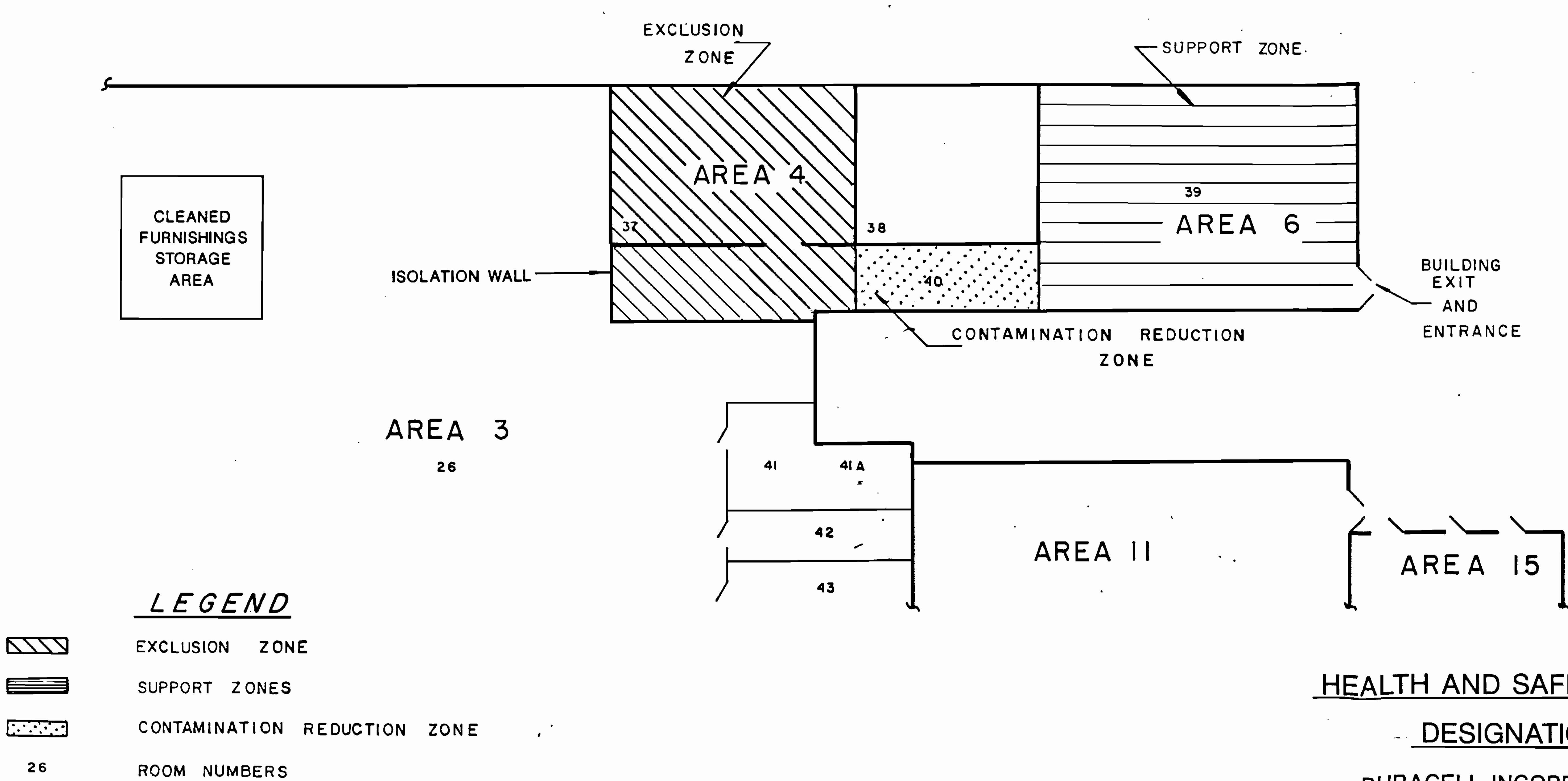
The Contract Documents included a Health and Safety Plan (HASP) which specified the minimum level of personnel protection and operating procedures to reduce contaminant migration and the risk of personnel exposure during the work. Three zones were established for the performance of the work as shown in Figure 1 in order to restrict the work area to authorized, trained and protected personnel and reduce the potential for the migration of fugitive emissions during cleaning operations.

The Exclusion Zone, consisting of the test clean room, Area 4, and part of corridor 40, was restricted to access only to protected and trained personnel. Area 6 served as a Support Zone for the storage of materials and equipment to be used in the test cleaning and as entry area where personnel would put on personal protection equipment prior to entering the Contamination Reduction and Exclusion Zones. The Contamination Reduction Zone, consisting of part of Corridor 40 from Area 6, the Support Zone, to the southwall of Area 4, provided an area for decontamination of equipment, personnel protection materials and personnel after leaving the Exclusion Zone.

Preparatory work performed by the contractor included setting up the zones. The floor and work benches of area 6 were covered by double 6 mil polyethylene sheets. The Contamination Reduction Zone was isolated by installing two curtain walls consisting of overlapping 6 mil polyethylene sheets across corridor 40. The sheets were securely attached to the ceiling and walls and overlapped at the center. The floor of the Contamination Reduction Zone was covered by double 6 mil polyethylene sheets. The Exclusion Zone was isolated from the remainder of the building by a similar curtain wall installed around the north end of Corridor 36. The curtain wall was installed without air gaps to prevent air movement.

FIGURE 1

HEALTH AND SAFETY ZONE DESIGNATION



HEALTH AND SAFETY ZONE DESIGNATION

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Level C protection, presented in Table 1, was maintained throughout the project. Personnel suited up in the Support Zone before entering the Contamination Reduction and Exclusion Zones. When leaving the Exclusion Zone, protective clothing except inner gloves and boot covers and respirators were removed in the Contamination Reduction zone and placed in drums. When exiting this zone, personnel stepped into foot baths containing a detergent solution and rinse water to remove contamination from the inner boot covers. Outside the Contamination Reduction Zone, personnel removed inner boot covers and respirators. Canisters were removed from the respirators which were washed in a detergent solution and rinsed. Finally inner gloves were removed. The inner boot covers, canisters and inner gloves were disposed in drums. The respirators were stored for future use.

A Clean Venture safety officer responsible for the implementation, enforcement and monitoring of the HASP was present during preparation and cleaning activities. The safety officer was responsible for training of all personnel, enforcing entry and decontamination procedures; maintaining a log of personnel entry and exit times to the exclusion zone; and performing air monitoring during the work, the results of which are presented in Appendix A.

3. Test Cleaning Procedures

Vacuum equipment was a Nilfisk Model GS-81 with 4 stage H.E.P.A. filtration. The power washer was Whitco, Inc., Siloam Springs, Arkansas, model 4615 GPO rated at 5.0 gpm and 1500 psi. Wash water runoff was brushed to the floor drain which discharged into a polyethylene lined sump constructed in the floor trench. The runoff was pumped into a tank for settling and reuse.

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TABLE 1

LEVEL C PROTECTION

Disposable chemical resistant Tyvek or Saranex coveralls with hood

Inner and Outer chemical resistant gloves

Steel-toed work boots

Inner and outer boot covers, chemical resistant (disposable)

Hardhat

Full-face, air purifying respirator with high efficiency particulate removal canister NIOSH/MSHA approved for use against dust, mists and fumes with a TLV of less than 0.05 mg/m^3.

A trial cleaning of two floor areas was performed first to evaluate the effectiveness of detergents. Two floor areas of about 16 square feet each which appeared to have equal residues representative of average floor conditions were selected. One area was power washed with an acidic solution of PL-998 detergent manufactured by Penetone Products, Tenafly, New Jersey maintained at a pH of 4 to 5 and 180^{o} F. The second area was power washed with a caustic solution of trisodium phosphate maintained at a pH of 12 and 180^{o}F. Acid cleaning achieved a lower remaining metal concentration and this detergent was selected to clean the furnishings and room surfaces.

Ductwork was mechanically cut above the roof line and removed to the floor. Each roof opening was securely covered with a single piece of 1/2 inch thick plywood. The window fan and pvc piping along the south wall were removed to the floor of the room. All window openings were securely covered on the inside with 4 mil polyethylene sheeting securely taped to the window frame. Fluorescent light bulbs and fixtures were removed to the floor. Piping, conduit, a loudspeaker and electrical enclosures in contact with the walls and ceiling were removed to allow subsequent removal of the ceiling and cleaning of all room surfaces.

Furnishings were manually washed in the Exclusion Zone except ductwork, exhaust fan and loudspeaker which were power washed. Cleaned furnishings were transferred to a storage area outside the decontamination zone as shown in figure 1. The area was underlain by and the cleaned furnishings were covered by polyethylene sheeting. Light bulbs were removed to the support zone and were manually broken inside a cardboard enclosure of sufficient size to contain all glass fragments during breaking. The enclosure was securely closed for off-site transportation and disposal of the breakage. Representative furnishings were sampled to document the level of cleanliness achieved.

Ceiling components were sampled prior to removal to document surface metal concentrations prior to removal. Samples of the plasterboard ceiling and insulation were taken for metal content and leachability analysis. The plasterboard ceiling and insulation were removed, manually broken into manageable pieces and were packed in 55 gallon drums which were transferred to the on-site hazardous waste storage facility. The underside of the roof was sampled to document surface metal concentration prior to cleaning.

After the ceiling components were removed, windows were manually washed and covered with polyethylene sheets to prevent spray contact during subsequent room surface washing. All room surfaces were then vacuumed and power washed with the acidic detergent. After this cleaning, a visible residue remained on the walls and floors. Room surfaces were sampled to document the level of cleanliness achieved. A second power washing was then performed using the caustic detergent to determine whether the remaining residues could be removed. After the second cleaning, the walls appeared clean and only a small amount of residue remained on the floors. Room surfaces were again sampled to document the level of cleanliness achieved.

4. Sampling

The wipe sampling technique was used to determine surface metal concentrations for the purpose of documenting the test cleaning. This technique involved wiping a selected number of areas on the surface to be sampled with kimwipe tissues wetted with distilled water. Each wipe sampling area was a triangular area of six inch orthogonal sides of 0.125 sf which was thoroughly cleaned of all residues with one kimwipe. Kimwipes from all sampling areas on the surface being evaluated were placed in one new ziploc bag which was labeled with an indelible pen as follows:

- sample identification number
- number of wipes
- total area wiped
- date
- initials of person collecting the sample

Each sample bag was securely closed and placed in shipping overpaks for transportation to the laboratories.

Representative cleaned furnishings selected for wipe sampling to document the level of cleanliness achieved included six flourescent light fixtures, the window exhaust fan and the loudspeaker. The top surface of the light fixtures, which had a visible oily residue prior to cleaning were sampled. The white underside had little visible residue prior to cleaning and was not sampled. Three composite samples were collected by wipe sampling each light fixture at three random locations and placing the kimwipes in three separate ziploc bags. Each bag received six kimwipes, one from each light fixture. A composite sample of the fan and horn were collected by wipe sampling each fixture at three random locations and placing the six kimwipes in one ziploc bag. The total wipe area for each sample was 0.75 sf.

Representative sections of cleaned ductwork were selected for wipe sampling of interior surfaces. Five sections of ductwork system ED-6 and one section from the other, proportionately smaller, ductwork system were sampled. Each section was wipe sampled at a randomly selected accessible locations and the six kimwipes were placed in one ziplock bag. Total wipe sample area was 0.75 sf.

To determine metal concentrations on the surfaces of ceiling components, the room was divided into quadrants and the sampling was performed at the center of each quadrant. The exposed underside of the plasterboard ceiling was first wipe sampled at each location. Sections of the ceiling about one sf in size were cut out at the center of each quadrant and the plasterboard and insulation cutouts were carefully lowered onto plastic sheets at the floor level. The topside of each plasterboard ceiling sample and the topside of three insulation samples were wipe sampled. One insulation sample was rejected and not wipe sampled because some of the loose top residue was lost during removal. The kimwipes from each surface sampled were placed in separate ziploc bags. Total wipe sample area was 0.5 sf on the under and topside of the ceiling and 0.375 sf on the topside of the insulation. Parts of each of the four plasterboard ceiling and three insulation samples were placed in separate ziploc bags for metal content and leachability analysis.

After the ceiling components were removed, the underside of the roof was sampled at the center of each quadrant. Two wipe samples were obtained at each location, one on the side of the roof joist and one on the underside of the roof. A total of eight kimwipes were collected in one ziploc bag and the total sample area was 1. sf.

The top of the transverse I beams supporting roof joists provided a horizontal shelf area where dusty residues had accumulated. Three randomly selected locations on this surface was also wipe sampled and these kimwipes were collected in a separate ziploc bag. Total sample area was 0.375 sf.

After each powerwashing of the room, the underside of the roof, walls and floors were wipe sampled. The roof was sampled as previously described. Each of the walls were wipe sampled at two locations about 8 feet above the floor and approximately equidistant between orthogonal walls. The floor was wipe sampled at the center of each quadrant. Triplicate floor samples at adjacent locations were taken after the second cleaning. Kimwipes from the roof, wall and floor sampling were placed in separate ziploc bags. Total wipe sampling areas were 1. sf for the roof and walls and 0.5 sf for the floor.

A blank was prepared after wipe sampling of furnishings and prior to wipe sampling of the cleaned room surfaces. The blank consisted of six kimwipes dipped in distilled water. The equivalent wipe area is 0.75 sf.

The samples were delivered to Consolidated Technology on the same day that they were collected. Replicate samples were shipped to C.T. Male by overnight mail on October 27, 1986.

5. Analyses

Wipe sample and metal content analyses were performed in accordance with "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1983. The entire sample was digested in accordance with Section 200, Part 4.1.3. Leachability testing was performed in accordance with Federal Environmental Protection Agency (EPA) EP toxicity Test Procedure 40 CFR 26 Appendix II. Metal analysis procedures were:

Parameter	EPA Method	Atomic Absorption
Lead	239.1	Direct Aspiration
Mercury	245.1	Manual Cold Vapor Technique

In analyzing wipe samples, the laboratories determined the total metal content of all kimwipes in the sample bag. Sample metal contents were divided by the corresponding total sample wipe area to determine the surface metal concentration.

Both laboratories that performed the analyses followed the Quality Assurance Procedures described in "Test Methods for Evaluating Solid Waste", SW-846, United States Environmental Protection Agency, April 1984. Two sets of triplicate wipe samples were taken from light fixtures and the floor. Two of the samples were analyzed by the primary laboratory and the third by the secondary laboratory.

III. RESULTS

This section presents the results of the documentation sampling conducted during the test cleaning. The laboratory analysis reports and surface metal concentration calculations are presented in Appendix B.

The results of wipe sampling of cleaned furnishings and the interior of ductwork are presented in Table 2. During the EA investigation of 1985, wipe sampling was performed at 5 random locations on horizontal surfaces at the ceiling level including the top surface of fluorescent lights, piping and ductwork. These surfaces had not been routinely cleaned and had black deposits of residues. The composite sample analysis showed mercury and lead concentrations of 30 and 4.6 mg/sf respectively. After cleaning, metal concentrations on the top of light fixtures were reduced to 0.03 mg/sf or less, a greater than 99 percent reduction and less than the target performance level of 0.1 mg/sf. Metal concentrations remaining on mechanical equipment after cleaning were reduced to similar values.

The interior surfaces of duct system ED-6 were sampled at 5 random locations during the on-site investigation and metal concentrations were about 1.5 mg/sf. After cleaning, the interior of duct system ED-6 appeared clean but the other system still contained adhering residues which were not removed by power washing. Random sections of the two duct systems were sampled and the concentration of mercury on the interior of the ductwork was reduced below the target performance level. The lead concentration, reduced by about 70 percent, remained above the target performance level. The major contributor to this remaining lead was probably the ductwork system with residues and not ED-6.

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TABLE 2

WIPE SAMPLING OF FURNISHINGS AND DUCTWORK

Sample	Area Metal Concentrations	
	Mercury	Lead
1. Shelf Areas		
Before Cleaning*	30.	4.6
After Cleaning		
Top of Light Fixtures**	0.025	0.03
2. After Cleaning		
Exhaust Fan and Horn	0.03	0.08
3. Duct Interior		
Before Cleaning*	1.6	1.5
After Cleaning	0.09	0.43

Note: All units are mg/sf.
* On-site investigation, March 1985.
** Average of duplicate analysis.

The results of wipe sampling of ceiling components are presented in Table 3. Inspection of the ceiling components showed the presence of loose dusty residues primarily on horizontal surfaces exposed to dustfall such as the top side of insulation and shelf areas above the ceiling such as the top of roof girders. A small amount of residue was observed on the topside of the ceiling which was protected from dustfall by the insulation. Negligible amount of residues were observed on the underside of the ceiling and roof. The wipe sampling results were similar to these observations. Metal concentrations on the ceiling surfaces and underside of the roof were below the target performance level except for the lead concentration on the topside of the ceiling which was close to the target performance level. Higher concentrations were measured on the exposed top surfaces of insulation and shelf areas.

The results of the analysis of the plasterboard ceiling and insulation samples for metal content and EP toxicity are presented in Table 4. Both samples contained very low amounts of mercury and lead. Leachability of the samples were orders of magnitude below the EP toxicity standards for hazardous wastes.

The results of room surface wipe sampling after each washing are presented in Table 5. Average metal concentrations remaining after the first cleaning was close to the target performance level. No change in metal concentrations occurred on the underside of the roof which had low metal concentrations prior to cleaning. Visible residues remained on the wall after cleaning but metal concentrations were reduced to the same level as the underside of the roof. Metal concentrations on the floor were reduced by over 95 percent, but were above the target performance level. The second cleaning removed visible residues from the walls but some visible residues still remained on the floor. Metal concentrations on the floor were reduced to below target performance level.

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TABLE 3

WIPE SAMPLING OF CEILING COMPONENTS PRIOR TO CLEANING

Sample Description	Area Concentration Mercury	Lead
Underside of ceiling	0.02	N.D.
Topside of ceiling	0.02	0.12
Topside of insulation	0.12	0.31
Underside of roof	0.02	0.03
Shelf Area above ceiling	0.47	3.60

Note: All units in mg/sf.

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TABLE 4

PLASTERBOARD CEILING AND INSULATION SAMPLE ANALYSIS

Sample	Metal Content (mg/kg)		Leachable Metals (mg/l)	
	Mercury	Lead	Mercury	Lead
E.P. Toxicity Standard	---	--	0.2	5.0
Ceiling	0.04	19.6	0.0033	0.15
Insulation	0.02	14.0	0.0011	0.03

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TABLE 5

WIPE SAMPLING OF ROOM SURFACES AFTER CLEANING

Sample	Area Metal Concentrations	
	Mercury	Lead
1. Before Cleaning		
Underside of roof(1)	0.02	0.03
Floor(2)	3.4	10.
2. After Acid Cleaning		
Underside of roof	0.02	0.06
Walls	0.01	0.06
Floor	0.11	0.41
Average(3)	0.03	0.12
3. After Caustic Cleaning		
Underside of roof	0.03	N.D.
Walls	0.003	N.D.
Floor*	0.03	N.D.
Average (3)	0.02	N.D.

Note: All units in mg/sf.

* Average of duplicate sample analysis.

(1) Refer to Table 3.

(2) Refer to On-Site Investigation.

(3) Based on the following areas:

Roof	1300 SF
Wall	1800 SF
Floor	750 SF

Quality control samples included the blank and the replicate samples. The metal concentration of the blank sample was below detectable limits indicating that the sampling procedures did not result in sample cross-contamination. The results of duplicate sample analyses by the primary laboratory, presented in Table 6, show that corresponding analysis were within an acceptable range of agreement. The results of split sample analysis, presented in Table 7, show that all results were low but some differences did occur. It should be noted that samples were obtained from the same general area and not split from the same composite sample. Therefore, the results were not expected to be identical. The results from both laboratories confirm the conclusion that low metal concentrations remain after cleaning.

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TABLE 6

QUALITY ASSURANCE CONTROL DUPLICATE ANALYSIS

	Mercury		Lead	
Sample	Primary	Duplicate	Primary	Duplicate
Top of Light Fixtures After Cleaning	0.02	0.03	0.06	N.D.
Floor after Caustic Cleaning	0.03	0.03	N.D.	N.D.

Note: All units in mg/sf.

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TABLE 7

QUALITY ASSURANCE CONTROL SECONDARY LABORATORY ANALYSIS

Sample Designation	Mercury Primary Laboratory	Mercury Secondary Laboratory	Lead Primary Laboratory	Lead Secondary Laboratory
Top of Light Fixtures after Cleaning	0.025	0.002	0.03	0.05
Floor after Caustic Cleaning	0.03	0.001	N.D.	0.07

Note: Primary Laboratory results are the average of duplicate sample analysis.
All units in mg/sf.

IV. CONCLUSIONS

The test cleaning was performed in a room having oily residues on some surfaces such as floors, furnishings and ductwork which were difficult to remove. These surfaces contained metal concentrations which were among the highest within the plant. Documentation sampling showed that the test cleaning procedures reduced the average surface concentration of each metal below the target performance level of 0.1 mg/sf except inside one small diameter duct system. The same cleaning procedures will probably be required in other rooms and areas of the plant having comparable types of residues to achieve these results. The selective application of similar cleaning procedures would be required in other rooms and areas of the plant having lesser and more easily removed residues to achieve the target performance level.

The documentation sampling showed that some surfaces, such as the ceiling components, underside of the roof and possibly the walls, do not require cleaning because they contained metal concentrations which were below the target performance level. These surfaces in other rooms and areas of the plant would also not require cleaning.

Preliminary estimates indicate that if the target level of performance is achieved, the building debris would contain less than 25 grams of any one metal and would be acceptable for disposal to a C & D landfill. This section presents detailed analyses showing that building components whose surface metal concentrations are close to the target performance level have metal contents similar to clean fill and should, by analogy, be acceptable for disposal at a C & D landfill.

1. Analysis of Data

Manual cleaning of furnishings such as light fixtures and powerwashing of mechanical equipment such as exhaust fans and horns, resulted in surface metal concentrations below the target performance level of 0.1 mg/sf (see Table 2). A conservative estimate of the remaining metal content of these furnishings can be calculated by assuming that they are constructed of 22 gauge (.0269 in thickness) metal with a density of 450 lbs/cf having a surface area to mass ratio of about 2 sf/lb assuming two exposed sides. On this basis, the remaining mercury or lead content (at 0.1 mg/sf) would not exceed 0.44 mg/kg which is conservative since the remaining surface metal concentration was less than 0.1 mg/sf and the surface area to mass ratio of these furnishings is probably lower. By comparison, natural soil, contains about 0.4 mg/kg mercury and 70. mg/kg lead (reference 1). Leachate concentration based on the EP toxicity procedure can be calculated by assuming that all surface metals on a 100 gram sample would dissolve in 2 liters of solvent. The calculated leachate concentration, 0.02 mg/l, for either mercury or lead is an order of magnitude lower than the most stringent EP toxicity standard which is 0.2 mg/l of mercury. The cleaned furnishings are acceptable for disposal to a C & D landfill. They have a metal content similar to that of clean fill which is acceptable for disposal to a C & D landfill and would not exhibit the characteristic of EP toxicity.

Prior to cleaning, duct system ED-6 had interior surface metal concentrations of about 1.5 mg/sf (see Table 2). Metal concentrations on the other duct system may have been higher. Estimated metal content of duct system ED-6, calculated by assuming that it is constructed of 22 gauge sheet metal with residues on the interior side only, is about 3.3 mg/kg which is eight times higher than the mercury content of natural soils. Calculated leachate concentration based on the EP toxicity procedure, assuming that all surface metals would dissolve, is .17 mg/l which is close to the EP toxicity standard for mercury. Ductwork, if disposed without cleaning, would probably be considered a hazardous waste.

Powerwashing of ductwork resulted in average remaining interior surface mercury concentration below the target performance level but the average interior surface lead concentration exceeded the target performance level. The major contributor of these metals was probably the small ductwork system with adhering residues. Since only one of the six wipe samples were taken from this ductwork, the remaining metal concentration on its interior surface could be approximately six times greater than the average or 0.54 mg/sf mercury and 2.6 mg/sf lead. The same calculation procedures used in the previous paragraph would show that the mercury content of this ductwork is three times higher than natural soil and calculated leachate concentration would be below the EP toxicity standard for mercury. The acceptability of this ductwork for disposal at a C & D landfill cannot be demonstrated based on the available data. Other cleaning techniques such as mechanical abrasion could be tested to determine whether the residue adhering to this ductwork can be removed, but may not be feasible since they would be labor intensive, difficult to perform in small ductwork systems and may not substantially reduce the amount of residue remaining. Ductwork system ED-6 which appeared visibly cleaner may be acceptable at a C & D landfill. Power washing of ductwork produced variable results and it cannot be predicted which ductwork system in the plant would be acceptable for disposal to a C & D landfill. Since ductwork would tend to accumulate metals and considering the cost of cleaning and the uncertain results, handling and disposal of all ductwork as hazardous wastes is more feasible than cleaning and testing of each system to determine the required disposal alternative.

The documentation sampling has shown that cleaning of the underside of ceiling and roof surfaces is not necessary because the metal concentration on these surfaces prior to cleaning are at or below the target performance level (see Table 3). The topside of insulation and shelf areas above the ceiling have dusty residues containing metal concentrations higher than the target performance level. This room had among the highest surface metal concentrations measured during the EA investigation of 1985. It is probable that similar ceiling component surfaces in other rooms in which lower surface metal concentrations had been measured would show lesser amounts of dusty residues and lower metal concentrations as compared to area 4.

Metal content analysis of the plasterboard ceiling and insulation samples show a lead and mercury content below that of natural soils (see Table 4). Analysis of the metal content data, presented in Table 8, shows that the presence of mercury may be due to surface residues and the presence of lead is primarily due to the natural content of the materials. The table compares metal content analysis of the ceiling and insulation samples with the calculated surface metal content based on wipe sampling results. The surface metal content of the plasterboard ceiling accounted for all of its mercury content, but less than 1 percent of its lead content. The surface mercury content of insulation was higher than the total mercury content because loose dusty surface residues may have been lost in the sampling process. The surface lead content of insulation accounted for less than 3 percent of its lead content. Cleaning the surfaces of these materials would probably reduce the already low mercury content but would not substantially reduce their lead content. Leachability testing of the samples showed leachate metal concentrations orders of magnitude below the EP toxicity standards for hazardous wastes (see Table 4). The plasterboard ceiling and insulation materials, having a metal content lower than that of clean fill, would be acceptable for disposal to a C & D landfill without cleaning.

After one cleaning of the room, surface metal concentrations on the walls were reduced below the performance level and surface metal concentrations on the floor were reduced by over 95 percent but the target performance level was not achieved on this surface (refer to Table 5). The average room surface metal concentrations were reduced below the target performance for mercury and close to the target performance level for lead.

The metal content of the roof, walls and concrete is probably mostly associated with surface deposits. The underside of the roof

DURACELL, INC.
NORTH TARRYTOWN, NEW YORK

TABLE 8

METAL CONTENT ANALYSIS
PLASTERBOARD CEILING AND INSULATION

	Metal Content, mg/kg	
	Mercury	Lead
Natural Soil[1]	0.4	70.
Ceiling		
Total[2]	0.04	19.6
Surface[3a]	0.04	0.13
Insulation		
Total[2]	0.02	14.
Surface[3b]	0.16	0.41

(1) Reference 1.
(2) Sample analysis - Table 4.
(3) Calculated from wipe sample data - Table 3.
  (a) Based on 1/2" thickness, 50 lbs/cf and sum of underside and topside area concentrations.
  (b) Based on 4" thickness, 5 lbs/cf and topside area concentrations.

was protected from impacting metal containing particulates by the ceiling. The concrete block walls were protected by a paint layer against the migration of impacted metals. Metal migration into the solid concrete floor, which has no evidence of cracks, has probably not occurred since the dry manufacturing operations would not have resulted in spillage to leach metals into the floor.

The average remaining surface metal concentration on the underside of the roof, walls, and floors were below 0.12 mg/sf. A conservative estimate of the remaining metal content of these building components can be calculated by assuming that the wood roof is 1/2" thick with a density of 30 lbs/cf, the walls are constructed of one row of concrete blocks, 16" long, 8" high, and 8" thick, weighing 40 lb. each, with surface metals on both sides, and the floor is 6 inch thick concrete with a density of 150 lb/cf. On this basis, the remaining metal content would not exceed .21 mg/kg on the roof, .01 mg/kg on the walls, and .0035 mg/kg on the floor. These metal contents are below the mercury and lead content of natural soils. Leachate concentration, based on the EP toxicity procedure, can be calculated by assuming that all surface metals on a 100 gram sample would dissolve in 2 liters of solvent. The calculated leachate concentrations, 0.01 mg/l for the roof, 0.0005 mg/l for the walls and 0.0002 mg/l for the floors, are orders of magnitude lower than the most stringent EP toxicity standard of 0.2 mg/l for mercury. The cleaned building components are acceptable for disposal to a C & D landfill. They have a metal content lower than that of clean fill which is acceptable for disposal to a C & D landfill and would not exhibit the characteristics of EP toxicity.

2. <u>Conceptual Plan For Building Cleaning</u>

The EA investigation of 1985 identified residues containing lead and mercury on interior surfaces of the plant building and in ductwork, air pollution control equipment, floor trenches, interior manholes and on part of the roof. In addition, liquids remaining in some storage tanks were shown to have hazardous wastes characteristics. The engineering report summarizing the investigation proposed a program for building cleaning which includes removal of:

(1) attic insulation;
(2) loose roofing gravel from the roof above area 10;
(3) sludge and debris in floor trenches and manholes;
(4) residues remaining in baghouses and cyclones;
(5) air handling unit filters;
(6) exhaust duct systems and return air ducts; and
(7) liquids remaining in storage tanks.

Materials, which had been identified as hazardous wastes, such as items 3, 4, and 7 will be disposed in accordance with hazardous waste management regulations. Air handling unit filters would also be handled as hazardous wastes because of their high metal content. This test cleaning has shown that duct work should be handled as a hazardous waste since cleaning is not feasible. Testing of attic insulation and roof gravel will be required to determine the appropriate disposal procedures.

The program provided for cleaning of the following equipment:

(1) cyclones and baghouses,
(2) fans connected to duct systems, and
(3) air handling units,

and finally, interior surfaces of the plant building using the selective application of appropriate cleaning methods similar to those used during the test cleaning. After cleaning of the building, documentation would be prepared to demonstrate that the performance level of cleanliness, i.e. an average surface concentration of each metal of 0.1 mg/sf, has been achieved. The above ground building would then be demolished and the debris would be disposed to a C & D landfill. Removal of the building slab and below grade piping, including any potential contaminated under-slab soil, would be performed at the same time as the on-site soil remediation.

The test cleaning has shown that cleaning the underside of ceilings and roofs is not required. Ceiling components, in rooms having similar surface metal concentrations as room 4, will be removed to permit collection of loose dusty residues on shelf areas by vacuuming. Additional sampling of ceiling components is required in other rooms to verify whether removal of these components is required. Temporary isolation walls of polyethylene sheeting will be constructed around open areas prior to ceiling removal to prevent the migration of fugitive dust to other areas of the building. The walls of rooms which have no visible residues and do not require cleaning will be protected from dust by being covered with polyethylene sheeting prior to ceiling removal. Walls which require cleaning will not be protected during removal of the ceiling. After removal, the ceiling components will be cut into manageable sections and packaged in polyethylene bags to control fugitive dust emissions. These ceiling components can be disposed to a C & D landfill. Shelf areas above the ceiling level will be vacuumed to remove the dusty residues. Surface metals remaining on these shelf areas, which are a small fraction of the total room area, should not significantly contribute to the total remaining surface metals in the room. Furnishings, which provide shelf areas for the deposition of residues, will be removed and either manually cleaned or powerwashed for disposal to a C & D landfill or will be handled and disposed as a hazardous waste. The handling and disposal method will be selected based on the most cost-effective method. Rooms and areas of the plant with residues similar to that in area 4 will be cleaned using the same procedures as employed in the test cleaning. The selective application of these procedures will be used in other rooms and areas.

For the 1985 investigation of site conditions EA divided the building into 15 separate analysis areas defined by use and isolated by enclosure walls and generally served by separate air handling systems. The areas are designated on Drawing No. 1 and listed in Table 9 which also presents corresponding surface metal concentrations measured during the investigation. Floor surface metal concentrations were determined by wipe sampling each floor at locations both around the perimeter and within the area. Ceiling surface metal

DURACELL, INC.
NORTH TARRYTOWN, NEW YORK

TABLE 9

BUILDING ANALYSIS AREAS

Area	Use	Area Metal Concentration		
			Lead	Mercury
1	Offices	floor	.35	.11
		ceiling	.78	1.2
2	Offices	floor	.27	.39
		ceiling	1.2	.56
3	Manufacturing			
	Maintenance Shop	floor	8.6	1.1
	Shipping	ceiling	2.2	3.7
	Lockers and Showers			
4	Manufacturing	floor*	10.	3.4
		ceiling*	4.6	30.
5	Manufacturing	floor	220.	6.9
		ceiling	56.	.56
6	Maintenance Shop	floor	1.8	.82
		ceiling	11.	5.6

* Prior to Test Cleaning.

DURACELL, INC.
NORTH TARRYTOWN, NEW YORK

TABLE 9

BUILDING ANALYSIS AREAS
(continued . . .)

Area	Use	Area Metal Concentration	Lead	Mercury
7	Manufacturing	floor	4.5	1.2
	Laboratory	ceiling	2.2	4.5
8	Manufacturing	floor	1.7	.21
9	Manufacturing	floor	2.7	.61
10	Shipping	floor	4.0	1.9
		a.2	7.2	.64
11	Manufacturing	11.	.38	.30
		11a	.062	.076
		11b	.17	.11
		11c	1.4	2.4
12	Office	floor	1.7	.97
	Cafeteria	ceiling	.91	.35
	Laboratory			
13	Attic	floor	5.0	17.
14	Boiler Room	floor	3.1	9.3
15	Hazardous Waste Storage Facility	floor	5.5	2.6

Note: All units are mg/sf.

concentrations were determined by wipe sampling horizontal surfaces at the ceiling level including the top surface of fluorescent light fixtures, piping and ductwork. The undersides of ceiling and roofs and wall surfaces were not sampled.

The average measured surface metal concentrations (based on an area weighted average) are:

	lead (mg/sf)	mercury (mg/sf)
floor	6.1	3.2
ceiling	2.9	3.0

Analysis areas having surface metal concentrations on either floor or ceiling surfaces which exceed the average are areas 3, 5, 6, 7, 13, and 14. Analysis areas having lower than average surface metal concentrations are 1, 2, 8, 9, 10, 11, 12 and 15.

Area 5 and 6 are similar to the test clean room both in construction and past use. Manufacturing activities in these areas involved mixing, blending, and pelletizing of powders, processes which could have potentially generated fugitive emissions. Area 6, had been recently converted to use as a maintenance shop. Residues on the walls and floors in these areas are similar to that of the test clean room prior to cleaning and measured surface metal concentrations are relatively high. The same cleaning procedures used in the test cleaning will be performed in these areas.

Past manufacturing activities in area 3 involved processes which had a lesser potential for generating fugitive emissions although this open area was not isolated from the rest of the plant. Residues on some of the walls and part of the floor in this area are similar to that of the test clean room. Other wall and floor areas have little visible residue. Measured surface metal concentrations are lower than in the test clean room and can probably be reduced to the target performance level by vacuuming shelf areas, power washing those walls with visible residues and scrubbing all the floors. A floor scrubber which extracts residues by mechanical abrasion possibly with the assistance of a detergent followed by vacuuming of the loosened residues is preferable to powerwashing which results in wash water runoff which must be disposed.

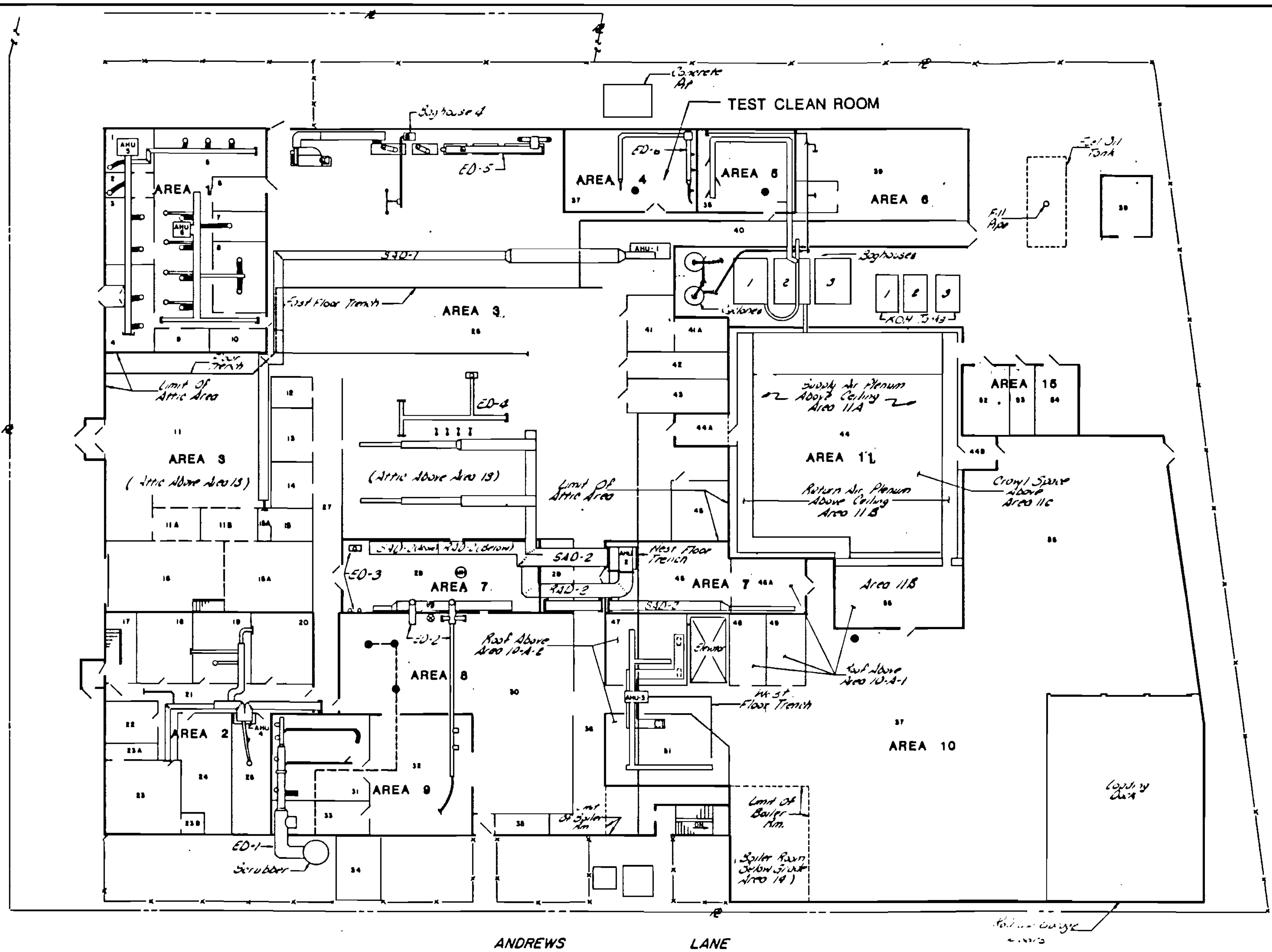
Past manufacturing activities in area 7 also involved processes having a lesser potential for generating fugitive emissions. This area, having only a few access doors, is relatively isolated from the rest of the plant. Walls and floors appear relatively clean. Visible residues remain on shelf areas which have not been regularly cleaned and measured surface metal concentrations exceed the average only on these shelf areas. The target performance level can probably be achieved by vacuuming shelf areas and scrubbing the floors.

Areas 13 and 14, the attic and boiler room, have not been regularly cleaned and have accumulated visible residues with higher than average mercury content. Residues in the attic are dusty and can probably be removed by vacuuming the floors after the insulation is removed to achieve the target performance level. The boiler room has oily residues on walls, floors, piping and equipment. This room would require power washing to reduce surface metal concentrations to the target performance level.

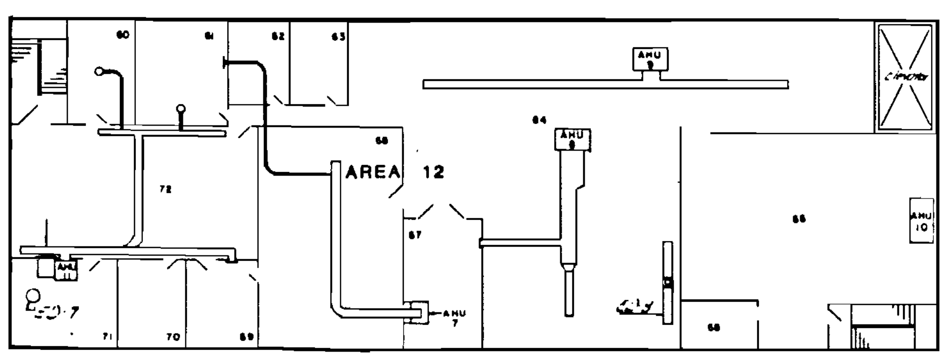
Past activities in other manufacturing areas such as areas 8 and 9 involved enclosed processes having a negligible potential for generating fugitive emissions. These areas have considerable shelf area on ceiling piping which would be difficult to manually clean or vacuum. Power washing to clean these areas is probably the most cost-effective alternative. Other areas such as areas 1, 2, 10, and 12 were used for non-manufacturing activities. Little visible residues remain on the walls and floors of those area and surface metal concentrations are below average. The target performance level can probably be achieved by vacuuming shelf areas and scrubbing the floors.

Area 11 is an isolated temperature and humidity controlled room constructed within the building. Recent manufacturing activities inside the room had a negligible potential for generating fugitive emissions and the interior surfaces of the room, designated 11, 11a, and 11b have low surface metal concentrations. Scrubbing of the floors would probably reduce the surface metal concentration below the target performance level. Past manufacturing activities, prior to construction of the room, involved activities which did have the potential to generate fugitive emissions. The interior roof of the room, designated 11C, has dusty metal containing residues. Probably there are similar residues in the space between the walls of the room and building. These residues can be removed by vacuuming. The room must be dismantled to allow vacuuming of the wall space.

Area 15, the Hazardous Waste Management Storage Facility will be cleaned in accordance with the methods specified in "Hazardous Waste Storage Facility Closure Plan" October, 1985.



FIRST FLOOR PLAN



SECOND FLOOR PLAN

LEGEND

◍	Floor Drain
⊖	Manhole
⊗	Capped Pipe
----	Below Grade Drain
AHU	Air Handling Unit
28	Room Number
SAD	Supply Air Duct
RAD	Return Air Duct
ED	Exhaust Duct

0 4 8 16 32

SCALE

Nº	REVISIONS	DATE	BY

TEST CLEANING

DURACELL INTERNATIONAL, INC.

NORTH TARRYTOWN, NEW YORK

eder associates consulting engineers, p.c.

PROJECT
TEST CLEANING
DURACELL INTERNATIONAL, INC.
NORTH TARRYTOWN, NEW YORK

TITLE
BUILDING PLAN

eder associates consulting engineers, p.c.
85 FOREST AVENUE, LOCUST VALLEY, NEW YORK, 11560

DRAWN BY FJD	SCALE 1/16" = 1'-0"
DESIGNED BY JSW	PROJECT Nº 435-1
APPROVED BY JJK	DWG. Nº 1
DATE December 1986	

REFERENCES

1. "Trace Elements in Soils and Plants" by
Alina Kabata-Pendias, Ph.D., D.Sc. and Henryk Pendias, Ph.D.;
CRC Press, Inc. Boca Raton, Florida 1984

APPENDIX A

AIR MONITORING

Air monitoring was conducted during the various phases of the test cleaning to monitor the health and safety of all persons involved in the work and the public. The air was monitored in the Exclusion Zone, Contamination Reduction Zone, Support Zone, and at locations inside and outside the plant building adjacent to the Exclusion Zone. The air was monitored for mercury vapor, lead dust/fumes and stibine. The latter compound was monitored because antimony, a possible impurity present in lead used for battery manufacturing, can react in an acidic environment to form stibine (antimony trihydride).

The contractor performed air monitoring daily for mercury vapors using a Drager Gas Detector to measure ceiling concentrations and passive dosimeters to measure time weighted eight hour average concentrations. The drager tube apparatus includes a hand-operated bellows pump which supplies 100 cm^3 of air with each stroke and factory calibrated detector tubes from which the mercury concentration can be determined by the extent of color change. For each reading, the pump was operated for 40 strokes. Passive dosimeters were placed in selected locations for the selected period to obtain time weighted average readings by color change.

Eder Associates (EA) periodically performed air monitoring for mercury vapors, lead dust/fumes and stibine. The air monitoring was performed with a Samplair Pump, Model A as manufactured by MSA of Pittsburgh, Pennsylvania to measure ceiling concentrations using factory calibrated detector tubes and a hand-operated suction pump capable of supplying 100 cm^3 of air with each pump stroke. Air samples for mercury and lead were collected with 8 pump strokes, and for stibine with 10 pump strokes.

The results of the air monitoring performed by the contractor and EA are presented in Tables 1A, 2A, 3A and 4A.

Applicable air quality limits for unprotected exposure is:

Mercury
OSHA Standard: ceiling concentration - 0.1 mg/m^3.
NIOSH Recommended Limit: Average 10 hour exposure - 0.05 mg/m^3.
ACGIH Recommended Limit: Average 8 hour exposure - 0.05 mg/m^3.

Lead
OSHA Standard: Average 8 hour exposure - 0.05 mg/m^3.
NIOSH Recommended Limit: Average 10 hour exposure - 0.1 mg/m^3.
ACGIH Recommended Limit: Average 8 hour exposure - 0.15 mg/m^3.

Stibine
OSHA Standard: Average 8 hour exposure - 0.5 mg/m^3.
ACGIH Recommended Limit: Average 8 hour exposure - 0.5 mg/m^3.

note: OSHA - Occupational Safety and Health Standards (29 CFR 1910)
NIOSH - National Institute For Occupational Safety and Health
ACGIH - American Conferernce of Governmental Industrial Hygienists

Mercury vapors were detected in the health and safety zones and plant interior during cleaning of the furnishings and room. Mercury vapors were not detected outside the building. Air quality limits for ceiling and time weighted average concentrations were exceeded in the exclusion zone during room cleaning. The limits apply to unprotected exposures. All personnel in the exclusion zone were protected by respirators. Time weighted average concentration in the support zone and plant interior, where respirators were not worn, were below the applicable air quality limits.

Ceiling concentrations of lead and stibine were taken in the Support Zone, plant interior and outside the building. None of the measurements detected any lead or stibine.

DURACELL, INC.

NORTH TARRYTOWN, NEW YORK

TABLE 1A

CEILING MERCURY CONCENTRATION MEASUREMENTS

		Exclusion Zone		Support Zone		Plant Interior		Outside Building	
Date	Cleaning Operation	No. of Tests	Measurement range (mg/m^3)	No. of Tests	Measurement range (mg/m^3)	No. of Tests	Measurement range (mg/m^3)	No. of Tests	Measurement range (mg/m^3)
10/20	Set-up and Trial Cleaning	3	0	1	0	--	--	--	--
10/21	Remove Furnishings	2	0	2*	0	--	--	--	--
10/22	Remove Furnishings and Ceiling Components	3	BDL - 0.05	3*	0	--	--	--	--
10/23	First Room Cleaning	3*	0 - 0.14	2*	0	1*	0	1*	0
10/24	Second Room Cleaning	1	0.15	2	0	1*	0	--	--
10/27	Demobilize	1	0	1	0	--	--	--	--

* One by EA.

BDL below detectable limits, 0.05 mg/m^3.

DURACELL, INC.
NORTH TARRYTOWN, NEW YORK

TABLE 2A

EIGHT HOUR AVERAGE MERCURY CONCENTRATION MEASUREMENTS

		Exclusion Zone		Contamination Zone Reduction		Support Zone		Plant Interior		Outside Building	
Date	Cleaning Operation	No. of Tests	Measurement range (mg/m^3)	No. of Tests	Measurement range (mg/m^3)	No. of Tests	Measurement range (mg/m^3)	No. of Tests	Measurement range (mg/m^3)	No. of Tests	Measurement range (mg/m^3)
10/21	Remove Furnishings	2	0.01 - 0.05	2	< 0.01 - 0.03	1	0	--	--	--	--
10/22	Remove Furnishings and Ceiling Components	1	0.05	--	--	1	0.028	--	--	1	0
10/23	First Room Cleaning	2	0.054 - 0.058	--	--	1	< 0.01	1	0.018	--	--
10/24	Second Room Cleaning	1	< 0.01	--	--	1	< 0.01	1	< 0.01	--	--

DURACELL, INC.

NORTH TARRYTOWN, NEW YORK

TABLE 3A

CEILING LEAD CONCENTRATION MEASUREMENTS

Date	Cleaning Operation	Support Zone		Plant Interior		Outside Building	
		No. of Tests	Measurement range (mg/m^3)	No. of Tests	Measurement range (mg/m^3)	No. of Tests	Measurement range (mg/m^3)
10/21	Remove Furnishings	1	0	1	0	--	--
10/22	Remove Furnishings and Ceiling Components	1	0	1	0	1	0
10/23	First Room Cleaning	1	0	1	0	1	0

DURACELL, INC.

NORTH TARRYTOWN, NEW YORK

TABLE 4A

CEILING STIBINE CONCENTRATION MEASUREMENTS

		Support Zone		Plant Interior		Outside Building	
Date	Cleaning Operation	No. of Tests	Measurement range (mg/m^3)	No. of Tests	Measurement range (mg/m^3)	No. of Tests	Measurement range (mg/m^3)
10/22	Remove Furnishings and Ceiling Components	1	0	--	--	--	--
10/23	First Room Cleaning	1	0	1	0	1	0

APPENDIX B

LABORATORY RESULTS

LABORATORY RESULTS

This appendix presents the results of laboratory analysis performed by Consolidated Technology, Inc., the primary laboratory and C.T. Male Associates, the secondary laboratory who analyzed split samples. Two laboratory reports were prepared by Consolidated Technology, Inc. dated October 22, 1986 and November 22, 1986. C.T. Male Associates prepared one report dated November 17, 1986. Explanatory notes explaining the results are presented after each report where required. Other analysis are presented in the laboratory reports which should be disregarded since they are not pertinent to this project.

The laboratories reported the results as total metal content of each sample. The surface concentration of lead and mercury was calculated by dividing this value by the total wipe area. Tables 1B through 5B present the surface metal concentration calculations.

Table 1B presents the surface metal concentration calculations for trial cleaning to select detergents. Each of the two 16 square foot trial clean areas was divided into quadrants which were wipe sampled at the center before and after washing. Total wipe area for each sample was 0.5 SF. Tables 2B through 5B present the calculations for surface metal concentration presented in Tables 2, 3, 5, 6 and 7 of Section III.

Consolidated Technology, Inc.
P. O. BOX 261 · MT. KISCO, NEW YORK 10549 · (914) 591-9010

Oct. 22, 1986

Mr. Joseph Helman, P. E.
Eder Associates, P. C.
85 Forest Avenue
Locust Valley, New York 11560

REC... A... OC...
FILE
LJE___
SJO___ GAP
___
OTHER _

Re: Duracell Results on 9/4-10/86
Quality Control Data

Dear Joe:

Presented herewith are the results of tests performed on samples of soil and wipes received on October 20 11:30 am & 5:40 pm from Duracell project, Tarrytown, NY.

If there are any questions, please call. Thankyou, looking forward to being of further services.

Very truly yours,
Consolidated Technology, Inc.

Ling L. Chu

LLC:pl
cc: Mr. Gregory Rorech

RECEIVED
AT EA
OCT 23 1986
FILE NO.______
LJE_____ FHI_____
SJO__ __ GAP
OTHER G. Rorech

Consolidated Technology, Inc.
P. O. BOX 261 · MT. KISCO, NEW YORK 10549 · (914) 591-9010

Job: Eder-Duracell
Sample Date: 9/4-10/20/86
Date Received: 10/20/86
11:30am & 5:40pm

Sample ID	Lead T.Pb mg/kg wet	Mercury T.Hg mg/kg wet
I. Results:		
S207C (no date)	485	15.1
9/5 S223B	170	9.4
" S224B	222	3.7
S234B(no date)	1209	2.0
9/4 S236B	324	2.2
" S237B	77	2.1
" S242B	372	1.4
10/20 wipe samples:		
" PCT - 1 mg/0.5 ft^2	8.1	1.4
" PCT - 2 "	12.4	400
" TC - 3 "	0.97	0.25
" TC - 4 "	1.45	2.2
II. Quality Control Data:		
A. Duplicate Data;		
S242B	372	1.4
Duplicate S242B	377	5.7
B. EPA 386-1	112.9 µg/l (82.8-116 ")	6.29 µg/l (3.38-6.42 ")

EXPLANATORY NOTES

Consolidated Technologies, Inc.
Report of October 22, 1986

1. Wipe sample results should have been reported as mg instead of mg/0.5 ft^2.

Consolidated Technology, Inc.
P. O. BOX 261 · MT. KISCO, NEW YORK 10549 · (914) 591-9010

Nov. 26, 1986

Mr. Joseph Hellman, P. E.
Eder Associats, P. C.
85 Locust Valley, N. Y. 11560

Re: Duracell Test Results

Dear Joe:

Presented herewith are the results of tests performed on wiped & soil samples from the Duracell project received November 7, 1986.

Please do not hesitate to call if there are any questions. Thankyou and looking forward to be of further services.

Very truly yours,
for Consolidated Technology, Inc.

Ling L. Chu

Ling L. Chu

LLC:pl
encl.

RECEIVED
AT EA
DEC 01 1986
FILE NO. 425-1
LJE____ FHI____
SJO____ GAR____
____ WJC____
OTHER J. Hellmann

Consolidated Technology, Inc.
P. O. BOX 261 · MT. KISCO, NEW YORK 10549 · (914) 591-9010

Job: Eder-Duracell Project
Sample Date: 10/24 & 9/5-10/86
Date Received: 10/24 & 11/7/86 3:30pm

Sample ID	Total Lead T. Pb mg/kg wet
S207D	279
S209B	563
S209D	380
S210B	864
S210D	154
S211B	394
S211D	359
S212B	572
S212D	31.5
S213B	309
S213D	13.8
S218B	318
S223D	59.5
S227D	36.3
S243B	199
S249B	133
S251B	262
S252B	822

Job: Eder-Duracell cont'
Sample Date: 10/24 & 9/5-10/86
Date Received: 10/24 & 11/7/86

Sample ID	Lead T.Pb mg/kg wet	Mercury T.Hg mg/l/tot.wipes
S255B	42.0	-
S256B	142	-
S257D	34.3	-
S203B	513	25.4mg/kg wet
S231D	1116	17.4mg/kg wet

Date	Sample ID	Lead T. Pb mg/l/total wipes	Mercury mg/l/total wipes
10/22/86	C-1	0.97	0.244
	C-4A	ND	0.009
	C-4B	0.059	0.008
	C-4C	0.118	0.044
	C-4F	0.029	0.018
	C-4G	1.35	0.177
10/24/86	AA-4B	ND	ND
	AA-4 Duct	0.323	0.065
	AA-4C	0.059	0.023
	AA-4F	0.206	0.055
	AA-4EF	0.059	0.022
	AA-4LF	0.044	0.014

Job: Eder-Duracell cont'
Date Received: 11/7/86

Sample ID		Lead mg/l/total wipes	Mercury mg/l/total wipes
10/24/86	AA-4LEF	ND	0.021
	AA-4W	0.059	0.013
	AB-4C	ND	0.025
	AB-4F	ND	0.014
	AB-4FF	ND	0.013
	AB-4W	ND	0.003

Quality Control Data:

A. Duplicates:

S231D	1116 mg/kg wet	17.4 mg/kg wet
S231D duplicates	626 "	13.9 "
S231D "	1258 "	
S213B	309 "	
S213B Duplicate	177 "	
S257D	34.3 "	
S257D duplicate	42.0 "	

B. Spiked Results:

Spiked AB-4W (0.882/0.952 mg/l Pb; 0.0494/0.0555 " Hg)	92.6% Recovery	89.0% R

Job: Eder-Duracell cont'

Sample ID	Lead T. Pb mg/kg wet	Mercury T. Hg mg/kg wet
C-4D	14.9	0.02
C-4E	19.6	0.04
E. P. Toxicity:		
C-4D	0.03 mg/l	0.0011 mg/l
C-4E	0.15 "	0.0033 "

EXPLANATORY NOTES

Consolidated Technology, Inc.
Report of November 26, 1986

1. Pages 2 and 3
   Wipe sample results should have been reported as mg instead of mg/l/total wipes.

2. Page 3
   Sample designated AA-4LEF should have been AA-4LFF.

C.T. Male Associates, P.C.
Laboratory Analysis Report
NOVEMBER 17, 1986

EDER ASSOCIATES, P. C.
85 FOREST AVENUE
LOCUST VALLEY NY 11560

CTM PROJECT #: 86.01949
No. samples analyzed: 2

CTM Task #: 861028D

Attention: MR. GREGORY RORECH

Purchase Order Number:
Date Sampled: 10/24/86 Time: 00:00
Sampled By : RORECH, G
Sample Id: AA-4LF
Location : DURACELL EQUIPMENT/6 WIPES

CTM Sample No: 1028 86D 01
Date Received: 10/28/86
Collection Method:
Matrix: WIPES

Parameters and Standard Methodology Used		Results		Analyst Reference
TRACE METALS ON AIR FILTERS	NIOSH METHOD #7082	MP19		JP 10/29
LEAD	EPA METHODS, 1979.239.1	37	UG	DB C:54
MERCURY DIGESTION (AQUEOUS)	EPA METHODS, 1979.245.1	HG1		JP 10/30
MERCURY ANALYSIS METHOD	EPA METHODS,1979.245.1	1.6	UG	JP B:136

AUTHORIZED FOR RELEASE: Tom Mikulka PhD

PHONE: 518-785-0976

C.T. Male Associates, P.C.
Laboratory Analysis Report
NOVEMBER 17, 1986

425-1

EDER ASSOCIATES, P. C.
85 FOREST AVENUE
LOCUST VALLEY NY 11560

Attention: MR. GREGORY RORECH

CTM PROJECT #: 86.01949
No. samples analyzed: 2

CTM Task #: 861028D

Purchase Order Number:
Date Sampled: 10/24/86 Time: 00:00
Sampled By : RORECH, G
Sample Id: AB-4F
Location : DURACELL AREA 4/4 WIPES

CTM Sample No: 1028 86D 02
Date Received: 10/28/86
Collection Method:
Matrix: WIPE

Parameters and Standard Methodology Used		Results		Analyst Reference
TRACE METALS ON AIR FILTERS	NIOSH METHOD #7082	MP19		JP 10/29
LEAD	EPA METHODS, 1979.239.1	34	UG	DB C:54
MERCURY DIGESTION (AQUEOUS)	EPA METHODS, 1979.245.1	HG1		JP 10/30
MERCURY ANALYSIS METHOD	EPA METHODS,1979.245.1	0.7	UG	JP B:136

AUTHORIZED FOR RELEASE:

PHONE: 518-785-0976

Tom Mikulka PhD

DURACELL, INC.

NORTH TARRYTOWN, NEW YORK

TABLE 1B

CALCULATIONS OF SURFACE METAL CONCENTRATIONS

TRIAL CLEANING OF FLOOR AREAS

		Wipe		Lead		Mercury	
Sample Description	Sample Identification	Number	Area (sf)	Total (mg)	Concentration (mg/sf)	Total (mg)	Concentration (mg/sf)
Before Acid Cleaning	PTC-1	4	0.5	8.1	16.2	1.4	2.8
After Acid Cleaning	TC-3	4	0.5	0.97	1.9	0.25	0.5
Before Caustic Cleaning	PTC-2	4	0.5	12.4	24.8	400.	800.
After Caustic Cleaning	TC-4	4	0.5	1.45	3.9	2.2	4.4

DURACELL, INC.
NORTH TARRYTOWN, NEW YORK

TABLE 2B

CALCULATION OF SURFACE METAL CONCENTRATIONS
WIPE SAMPLING OF FURNISHINGS AND DUCTWORK

Sample Description	Sample Identification	Wipe Number	Wipe Area (sf)	Lead Total (mg)	Lead Concentration (mg/sf)	Mercury Total (mg)	Mercury Concentration (mg/sf)
After Cleaning Top of Light Fixtures	AA-4LF* AA-4LFF	6	0.75	< 0.022*	< 0.03	0.018*	0.025
After Cleaning Exhaust Fan and Horn	AA-4EF	6	0.75	0.059	0.08	0.022	0.03
Duct Interior After Cleaning	AA-4Duct	6	0.75	0.323	0.43	0.065	0.09

Note * Average of duplicate wipe samples.

DURACELL, INC.

NORTH TARRYTOWN, NEW YORK

TABLE 3B

CALCULATION OF SURFACE METAL CONCENTRATIONS
WIPE SAMPLING OF CEILING COMPONENTS PRIOR
TO CLEANING

		Wipe		Lead		Mercury	
Sample Description	Sample Identification	Number	Area (sf)	Total (mg)	Concentration (mg/sf)	Total (mg)	Concentration (mg/sf)
Underside of Ceiling	C-4A	4	0.5	N.D.	N.D.	0.009	0.02
Topside of Ceiling	C-4B	4	0.5	0.059	0.12	0.008	0.02
Topside of Insulation	C-4C	3	0.375	0.118	0.31	0.044	0.12
Underside of Roof	C-4F	8	1.0	0.029	0.03	0.018	0.02
Shelf Area Above Ceiling	C-4G	3	0.375	1.35	3.60	0.177	0.47

DURACELL, INC.

NORTH TARRYTOWN, NEW YORK

TABLE 4B

CALCULATION OF SURFACE METAL CONCENTRATIONS
WIPE SAMPLING OF ROOM SURFACES AFTER CLEANING

Sample Description	Sample Identification	Wipe		Lead		Mercury	
		Number	Area (sf)	Total (mg)	Concentration (mg/sf)	Total (mg)	Concentration (mg/sf)
After Acid Cleaning							
Underside of Roof	AA-4C	8	1.0	0.059	0.06	0.023	0.02
Walls	AA-4W	8	1.0	0.059	0.06	0.013	0.01
Floors	AA-4F	4	0.5	0.206	0.41	0.055	0.11
After Caustic Cleaning							
Underside of Roof	AB-4C	8	1.0	N.D.	N.D.	0.025	0.03
Walls	AB-4W	8	1.0	N.D.	N.D.	0.003	0.003
Floor	AB-4F	4	0.5	N.D.*	N.D.	0.014*	0.03
	AB-4FF						

Note: * Average of duplicate wipe samples.

DURACELL, INC.
NORTH TARRYTOWN, NEW YORK

TABLE 5B

CALCULATION OF SURFACE METAL CONCENTRATIONS FOR QUALITY ASSURANCE CONTROL SAMPLES

Sample Description	Sample Identification	Wipe		Lead		Mercury	
		Number	Area (sf)	Total (mg)	Concentration (mg/sf)	Total (mg)	Concentration (mg/sf)
After Cleaning Top of Light Fixtures	AA-4LF	6	0.75	0.044	0.06	0.014	0.02
After Cleaning Top of Light Fixtures	AA-4LF*	6	0.75	0.037	0.05	0.0016	0.002
After Cleaning Top of Light Fixtures	AA-4LFF	6	0.75	N.D.	N.D.	0.021	0.03
Floor After Caustic Cleaning	AB-4F	4	0.50	N.D.	N.D.	0.014	0.03
Floor After Caustic Cleaning	AB-4F*	4	0.50	0.034	0.07	0.0007	0.001
Floor After Caustic Cleaning	AB-4FF	4	0.50	N.D.	N.D.	0.013	0.03
Blank	AA-4B	6	0.75	N.D.	N.D.	N.D.	N.D.

Note: *Analysis performed by C.T. Male Associates
All other samples analyzed by Consolidated Technologies, Inc.