Address: 55 BROADWAY aka 4 Exch. Place, 1 Exch. Place, 2 Trinity Place

Bulk Samples PLM (Yes) No

Number of Negative (≤ 1 %) Samples 5 ~~HH~~

Number of Positive (> 1%) Samples 0

Air Samples (Yes) No

PCM

Number of Samples Collected (≤ 0.01f/cc) 8 ~~HH~~ III

Number of Samples Collected (>0.01 f/cc) 0

TEM

Number of Samples Collected (≤ 70 s/mm^2) _____

Number of Samples Collected (>70 s/mm^2) _____

LEAD TESTING ALSO PERFORMED

H.

deere

Real Estate Services, Inc.

One Exchange Plaza
55 Broadway
New York, NY 10006
212-344-3450
fax 212-797-2147

FACSIMILE TRANSMITTAL SHEET

To:	R. Radhakrishnan/Asbestos Control	**From:**	Michael Milici
Fax:	(718) 595-3744	**Pages:**	20 Including Cover
Phone:	(718) 595-3682	**Date:**	2/20/2002
Re:	1 Exchange Plaza/55 Broadway	**CC:**	

☐ **Urgent** ☐ **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

Attached, please find three (3) environmental analyses conducted after 9/11. Results show that there were either no traces, or well below the OSHA PEL of asbestos or other containments.

Should you have any questions regarding this information, please call me at 344-3450.

Thank you.

The City of New York
Department of Environmental Protection
59-17 Junction Boulevard
Corona, New York
11368-5107

Joel A. Miele Sr., P.E.
Commissioner

Robert C. Avaltroni
Deputy Commissioner
Bureau of
Environmental Compliance
Tel (718) 595-4418
Fax (718) 595-4422

02-14-02P04:27 RCVD

February 12, 2002

Bank of Communications
55 Broadway
New York, NY 10006-3008

Subject: 55 BROADWAY
4 Exchange Place, 1 Exchange Plaza, 27-31 Trinity Place

Dear Sir/ Madam:

In September 2001, the New York City Department and Environmental Protection (NYC DEP) and the Department of Health (NYC DOH) advised building owners regarding building maintenance and re-occupancy issues following the collapse of the World Trade Center. The steps included the professional assessment of building contamination for possible hazardous components, including asbestos, and a retrospective filing, as required, if applicable.

The NYC DEP is hereby requesting copies of the environmental hazard assessments including bulk sample results and air monitoring results and a summary of clean-up activities at the above referenced site. Please forward the requested documents to our offices within FIVE BUSINESS DAYS. They may be faxed to (718) 595-3744 or sent to the NYC DEP Asbestos Control Program at 59-17 Junction Boulevard, 8th floor, Corona, New York 11373-5108.

Please be advised building owners are responsible for the cleaning of building exteriors, grounds, and common areas. Due to changing conditions and continued activity at Ground Zero, building owners should periodically assess the condition of building exteriors and air conditioning systems for cleanliness and may have to periodically re-clean areas. Adherence to proper cleaning methods is important for the protection of public health and the environment. DEP inspectors will be following up on this matter.

If you have any questions, you may reach the Department at (718) 595-3682 during office hours or the 24-hour Help Center at (718) DEP-HELP. DEP staff is available to provide guidance and technical assistance.

Sincerely,

R. Radhakrishnan, P.E.
Director
Asbestos Control Program

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DEP
www.nyc.gov/dep
(718) DEP-HELP

JLC ENVIRONMENTAL CONSULTANTS, INC

October 16, 2001

Deer Real Estate Services, Inc.
55 Broadway
New York, NY 10006

Attention: Mr. Howard Cohen

Reference: 55 Broadway, New York, NY

Dear Mr. Cohen:

Enclosed please find the analytical results of the building materials inspection conducted at 55 Broadway, New York, NY.

All samples were collected and analyzed by JLC Environmental Consultants, Inc. (JLC) at the request of Deer Real Estate Services, Inc..

According to procedure, samples were placed in double plastic bags at the site location and transported to the JLC laboratory. Upon arrival, the samples were individually prepared and identified as friable or non-friable and then analyzed and indexed by date of collection, receipt, and analysis, as well as location, color, total estimated percentage of asbestos, and type(s) and estimated percentage(s) of each asbestos fiber group and non-asbestos fiber groups.

The detailed protocol for friable bulk material sample preparation and analysis is discussed in detail in the five sections on the following page: Introduction, Methodology, Analytical Procedures, Polarized Light Microscopy, and Analytical Results. These sections should clarify most questions concerning the results and documentation for this project.

JLC Environmental Consultants, Inc. appreciates the opportunity to serve your organization. Please contact us with any further questions. We look forward to working with you again in the

Sincerely,

JLC Environmental Consultants, Inc.

Gulam Machhiwala
Laboratory Director
cc: File

200 Park Ave South, Suite 1001 New York, New York 10003 • Tel: (212) 420-8119 • Fax: (212) 420-6092

Deer Real Estate Services, Inc.
JLC Project # 01-2129

Bulk Building Materials Analysis and Procedure

Introduction

Polarized light microscopy with dispersion staining (PLM-DS) is the most efficient method for detecting asbestos in bulk samples. It is this method that the JLC lab uses during bulk building material analyses.

Methodology

A chain of custody is kept for each sample to ensure proper handling and delivery to the JLC lab prior to analysis. To avoid any possible contamination, all sample and slide preparation is carried out in a ventilated, HEPA-filter hood with continuous airflow. Sample analysis is performed using PLM-DS in accordance with the USEPA , "Method for the Determination of Asbestos in Bulk Building Materials," EPA 600 R-93 116, July 1993, and NYDOH-ELAP certification manual, "Polarized Light Microscope Methods for Identifying and Quantitating Asbestos in Bulk Samples," ELAP 198.1, October 1993.

Analytical Procedures

All samples are subject to preliminary visual stereomicroscopic examination. Observation of homogeneity, fiber identification, and semi-quantitation of constituents can be made at this point. Samples lacking uniformity of composition and/or distribution of component materials then undergo homogenization. Some non-friable organically bound (NOB) samples such as floor tiles and roofing materials may require additional steps to dislodge problem matrices (i.e. ashing, extractions, and TEM).

Identification of suspect fibers is made by PLM analysis of subsamples. A microscope equipped with dual polarizing filters enables us to observe specific optical characteristics of each sample. Positive identification of asbestos requires determination of the following optical properties: morphology, color and pleochroism, refractive indices, birefringence, extinction characteristics, and signs of elongation.

Asbestos quantitation is performed by point-counting procedure, a standard technique in petrography for determining the relative areas occupied by separate minerals in rock. An ocular reticle superimposes a point or points over the microscope's field of view. The number of points positioned directly above each kind of particle or fiber is recorded. A total of 400 points must be counted over at least eight different representative subsamples to complete analysis.

Polarized Light Microscopy

JLC uses an Olympus BHT-P Polarizing Microscope complete with polarizer, analyzer, port for wave retardation plate, 360 degree graduated rotating stage, substage condenser, lamp and lamp iris, eyepiece reticle, and 25 point Chalkley Point Array. Plane polarized light allows for the determination of refraction indices relative to specific crystallographic orientations. Morphology and color can also be observed under plane polarized light. Observation of particles or fibers while oriented between polarizing filters whose privileged vibration directions are perpendicular allows for determination of isotropism/ anistropism, extinction characterisitcs of anisotropic particles, and calculation of birefringence A retardation plate may be placed in the polarized light path for verification of signs of elongation.

Analytical Results

The "Summary of Analytical Results" represents the results of analysis. Positive results mean the sample is asbestos or contains more than one percent asbestos by weight. The results are generally sufficient for identification and quantitation of major concentrations of asbestos. However, it may be found that additional techniques may be necessary. Please be aware that PLM is not consistenly reliable in detecting asbestos in floor coverings and similar NOB materials. Before the material can be considered or treated as non-asbestos containing, confirmation must be made by quantitative Transmission Electron Microscopy (TEM).

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Phone: (212) 420-8119 Fax: (212) 420-6092

Deer Real Estate Services, Inc.
55 Broadway
New York, NY 10006

ELAP Lab Code: 11029
NIOSH and AIHA Lab Code: 100273
NVLAP Lab Code: 101953

Project No.: 01-2129
Analyte: ASBESTOS
Date Received: 10/12/01
Date Analyzed: 10/16/01
Batch #: 0110B406

SUMMARY OF ANALYTICAL RESULTS - PLM

Site: 55 Broadway, New York, NY

SAMPLE # / DATE COLLECTED / LAB # / CLIENT'S SAMPLE #	DESCRIPTION / LOCATION	COLOR	ASBESTOS DETECTED?	TOTAL % OF ASBESTOS	CONSTITUENTS	
001 / 10/11/01 / 11970 / 001A	On the 15th Floor/ In the Kitchen/ Sample of Filter	BLUE	NO	0%	SYNF	100%
002 / 10/11/01 / 11971 / 002A	On the 12th Floor/ In the Kitchen/ Sample of Filter	BLUE	NO	0%	SYNF	100%
003 / 10/11/01 / 11972 / 003A	On the 11th Floor/ In the Kitchen/ Sample of Filter	BLUE	NO	0%	SYNF	100%
004 / 10/11/01 / 11973 / 004B	On the 5th Floor/ In the Kitchen/ Sample of Filter	BLUE	NO	0%	SYNF	100%

*INSUFFICIENT MATERIAL SUBMITTED **TEM RECOMMENDED ***NOT ANALYZED POSITIVE STOP

Sample Analysis by:
Polarized Light Microscopy-Dispersion Staining (PLM-DS)

Method of Sample Preparation and Analysis:
All samples were prepared and analyzed in accordance with the EPA "Method for the Determination of Asbestos in Bulk Building Materials" USEPA/ 600/ R-93/116, July 1993.

Instrumentation:
Olympus PLM, Model BH-2/VM Stereomicroscope, Model VMZ 1x-4x.

ASBESTOS CONSTITUENTS
CHRY = Chrysotile Asbestos
AMOS = Amosite Asbestos
CROC = Crocidolite Asbestos
ACTN = Actinolite Asbestos
TREM = Tremolite Asbestos
ANTH = Anthophyllite Asbestos

NON-ASBESTOS CONSTITUENTS
PAPF = Paper Fiber
MINW = Mineral Wool
FBGL = Fiberglass
SYNF = Synthetic Fibers
CELL = Cellulose
NFIB = Non-Fibrous
ORGM = Organic Material
WOLL = Wollastonite
HSHR = Horse Hair
OTHR = Other

Gulam Machhiwala
Laboratory Director

Analytical results reflect the make up of the materials only in the areas sampled. This "Summary of Analytical Results" shall not be reproduced except in full, without the written approval of JLC Laboratory, and it must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. This method is not applicable to samples containing large amounts of fine fibers below the resolution of the light microscope. The value of this method is limited to the quantitative identification of asbestos and the semi-quantitative determination of asbestos content of bulk samples, expressed as a percentage of the projected area. Quantitation of asbestos content was determined with a visual volume estimate, a calibrated visual area estimate, and/or point counting procedure. CAUTION: Other fibers with optical properties similar to asbestos may give positive interferences and will be considered asbestos under this methodology. Also, PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically-bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.

JLC ENVIRONMENTAL CONSULTANTS, INC.
200 Park Avenue South, Suite 1001, New York, New York 10003
Phone: (212) 420-8119 Fax: (212) 420-6092

Deer Real Estate Services, Inc.
55 Broadway
New York, NY 10006

ELAP Lab Code: 11029
NIOSH and AIHA Lab Code: 100273
NVLAP Lab Code: 101953

Project No.: 01-2129
Analyte: ASBESTOS
Date Received: 10/12/01
Date Analyzed: 10/16/01
Batch #: 0110B406

SUMMARY OF ANALYTICAL RESULTS - PLM

Site: *55 Broadway, New York, NY*

SAMPLE # / DATE COLLECTED / LAB # / CLIENT'S SAMPLE #	DESCRIPTION / LOCATION	COLOR	ASBESTOS DETECTED?	TOTAL % OF ASBESTOS	CONSTITUENTS	
005 10/11/01 11974 005B	On the 9th Floor/ On the Floor Beside the Machine in the Machine Room/ Sample of Dust	BLUE	NO	0%	CELL FBGL NFIB	35% 10% 55%

*INSUFFICIENT MATERIAL SUBMITTED **TEM RECOMMENDED ***NOT ANALYZED POSITIVE STOP

Sample Analysis by:
Polarized Light Microscopy-Dispersion Staining (PLM-DS)

Method of Sample Preparation and Analysis:
All samples were prepared and analyzed in accordance with the EPA "Method for the Determination of Asbestos in Bulk Building Materials" USEPA/ 600/ R-93/116, July 1993.

Instrumentation:
Olympus PLM, Model BH-2/VM Stereomicroscope, Model VMZ 1x-4x.

ASBESTOS CONSTITUENTS
CHRY = Chrysotile Asbestos
AMOS = Amosite Asbestos
CROC = Crocidolite Asbestos
ACTN = Actinolite Asbestos
TREM = Tremolite Asbestos
ANTH = Anthophyllite Asbestos

NON-ASBESTOS CONSTITUENTS
PAPF = Paper Fiber
MINW = Mineral Wool
FBGL = Fiberglass
SYNF = Synthetic Fibers
CELL = Cellulose
NFIB = Non-Fibrous
ORGM = Organic Material
WOLL = Wollastonite
HSHR = Horse Hair
OTHR = Other

Gulam Machhiwala
Laboratory Director

Analytical results reflect the make up of the materials only in the areas sampled. This "Summary of Analytical Results" shall not be reproduced except in full, without the written approval of JLC Laboratory, and it must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. This method is not applicable to samples containing large amounts of fine fibers below the resolution of the light microscope. The value of this method is limited to the quantitative identification of asbestos and the semi-quantitative determination of asbestos content of bulk samples, expressed as a percentage of the protected area. Quantitation of asbestos content was determined with a visual volume estimate, a calibrated visual area estimate, and/or point counting procedure. CAUTION: Other fibers with optical properties similar to asbestos may give positive interferences and will be considered asbestos under this methodology. Also, PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically-bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.

JLC
ENVIRONMENTAL CONSULTANTS, INC

October 16, 2001

Deer Real Estate Services, Inc.
55 Broadway
New York, NY 10006

Attention: Mr. Howard Cohen

Reference: PCM Air Sampling Analysis for 55 Broadway, New York, NY

Dear Mr. Cohen:

Enclosed please find the analytical results for air sampling conducted at 55 Broadway, New York, NY.

All samples were collected and analyzed by JLC Environmental Consultants, Inc. (JLC) at the request of Deer Real Estate Services, Inc..

After their arrival, samples were individually prepared and tested for airborne fiber content. The detailed protocol for air sample preparation and analysis is discussed in detail in the five sections on the following page: Introduction, Methodology, Analytical Procedures, Phase Contrast Microscopy, and Analytical Results. Any questions concerning results and documentation should also be answered in these sections.

JLC Environmental Consultants, Inc. appreciates the opportunity to serve your organization. Please contact us with any questions. We hope to be of further assistance in the future.

Sincerely,

JLC Environmental Consultants, Inc.

Gulam Machhiwala
Laboratory Director
cc: File

Air Sampling Analysis and Procedure

Introduction

Air sampling is defined as the process of measuring the filter content of a known volume of air entrained on a filter membrane over a specified period of time. Each sample is cross-referenced by field designation and a JLC lab internal code to ensure proper, consistent handling through a chain of custody. Sample preparation takes place within an HEPA filter clean bench to avoid any possible contamination.

Methodology

Test procedures for these samples conform to the National Institute of Occupational Safety and Health (NIOSH) standards.

Air sampling was conducted at a level approximating the breathing zone of persons anticipated to be present in the area during normal operations. Samples collected should represent the area's typical airborne fiber concentration.

All samples were collected on fully exposed 25 millimeter, 0.8 micrometer (µm) cellulose ester membrane air sampling cassettes with conductive cowl.

Analytical Procedures

A section of the filter approximating twenty-five percent of the total filter was removed and placed on a pre-cleaned microscope slide and then exposed to approximately 250 microliter (µl) of acetone vapor. A single 3.0 - 3.5 µl drop of triacetin was applied and a clean #1.5 cover slip was placed upon the filter. The prepared slide was then heated on a slide heater until clarity allowed analysis to be conducted.

Analysis was accomplished utilizing a Phase Contrast Microscope in accordance with NIOSH 7400 method, counting rule "A."

Phase Contrast Microscopy

JLC Environmental's laboratory uses an Olympus BH-PC Phase Contrast Microscope, (PCM) equipped with a Walton-Beckett Graticule. Samples were analyzed by first dissolving the filter through a chemical process (described above) and then counting the fibers with PCM at 400x magnification. Phase contrast increases the light contrast between the object and the background, thus enhancing the microscopist's ability to see fibers. Normally, 100 microscopic fields or 100 fibers are counted, whichever occurs first.

Analytical Results

The "Summary of Analytical Results" represents the results of the analysis of the samples. The PCM limit of reliable quantification is less than 0.01 fibers/cubic centimeter (f/cc) of air. If final tests do not meet these requirements, the entire work site must be re-cleaned and re-tested.

JLC ENVIRONMENTAL CONSULTANTS, INC.
200 Park Avenue South, Suite 1001, New York, New York 10003
Phone: (212) 420-8119 Fax. (212) 420-6092

Deer Real Estate Services, Inc.
55 Broadway
New York, NY 10006

ELAP Lab Code: 11029
NIOSH and AIHA Lab Code: 100273
NVLAP Lab Code: 101953

Project No.: 01-2129
Analyte: FIBERS
Date Received: 10/11/01
Date Analyzed: 10/16/01
Batch #: 0110A738

SUMMARY OF ANALYTICAL RESULTS

Site: *55 Broadway, New York, NY*

SAMPLE # COLLECTED LAB #	DESCRIPTION / LOCATION	TIME(min)	VOLUME(l)	FIB/FIELD	RESULTS(f/cc)
001 11-October A 7470	Ambient/ On the 11th Floor/ At the North Section of the Office	120	1846	4/100	0.001<LOD
002 11-October A 7471	Ambient/ On the 11th Floor/ At the East Section of the Office	120	1846	5/100	0.001<LOD
003 11-October A 7472	Ambient/ On the 11th Floor/ At the West Section of the Office	120	1846	3/100	0.001<LOD
004 11-October A 7473	Ambient/ On the 11th Floor/ At the South Section of the Office	120	1846	4/100	0.001<LOD
005 11-October A 7474	FIELD BLANK			0/100	

Sample Analysis by:
Positive Phase Contrast Microscopy (PCM)

<LOD = Less than limit of detection which is 5.5 Fibers/ 100 Fields
VOID1 = H.C.P. (High Concentration of Particles)
VOID2 = Overloaded

Method of Sample Preparation and Analysis:
All samples analyzed in accordance with the NIOSH 7400 Method using "A" Counting Rules. Issue 2, August 1994

Instrumentation:
Olympus PCM Model BH-2 with Walton-Beckett Graticule (100um field diameter).

Gulam Machhiwala
Laboratory Director

Report Date: October 16, 2001

JLC is responsible for only the fiber counts within the limitations of the method described as NIOSH 7400. Among other limitations, this meth gives only an index of airborne fibers and provides only an estimate of asbestos concentration. Any and all claims arising out of JLC's analysi these samples are limited in recovery to the cost of analyzing samples. JLC accepts no other liability and the client agrees to seek no costs b the above.

JLC ENVIRONMENTAL CONSULTANTS, INC.
200 Park Avenue South, Suite 1001, New York, New York 10003
Phone: (212) 420-8119 Fax: (212) 420-6092

Deer Real Estate Services, Inc.
56 Broadway
New York, NY 10006

ELAP Lab Code: 11029
NIOSH and AIHA Lab Code: 100273
NVLAP Lab Code: 101953

Project No.: 01-2129
Analyte: FIBERS
Date Received: 10/11/01
Date Analyzed: 10/16/01
Batch #: 0110A736

SUMMARY OF ANALYTICAL RESULTS

Site: *55 Broadway, New York, NY*

SAMPLE # COLLECTED LAB #	DESCRIPTION / LOCATION	TIME(min)	VOLUME(l)	FIB/FIELD	RESULTS(f/cc)
001 11-October A 7465	Ambient/ On the 24th Floor/ At the North Section of the Office	120	1846	5/100	0.001
002 11-October A 7466	Ambient/ On the 24th Floor/ At the Entrance to the Stairwell	120	1846	3/100	0.001
003 11-October A 7467	Ambient/ On the 24th Floor/ At the East Section of the Office	120	1846	3/100	0.001
004 11-October A 7468	Ambient/ On the 24th Floor/ At the West Section of the Office	120	1846	2/100	0.001
005 11-October A 7469	FIELD BLANK			0/100	

Sample Analysis by:
Positive Phase Contrast Microscopy (PCM)

<LOD = Less than limit of detection which is 5.5 Fibers/ 100 Fields
VOID1 = H.C.P. (High Concentration of Particles)
VOID2 = Overloaded

Method of Sample Preparation and Analysis:
All samples analyzed in accordance with the NIOSH 7400 Method using "A" Counting Rules. Issue 2, August 1994

Instrumentation:
Olympus PCM Model BH-2 with Walton-Beckett Graticule (100um field diameter).

Gulam Machhiwala
Laboratory Director

Report Date: October 16, 2001

JLC is responsible for only the fiber counts within the limitations of the method described as NIOSH 7400. Among other limitations, this meth gives only an index of airborne fibers and provides only an estimate of asbestos concentration. Any and all claims arising out of JLC's analysi these samples are limited in recovery to the cost of analyzing samples. JLC accepts no other liability and the client agrees to seek no costs b the above.

JLC ENVIRONMENTAL CONSULTANTS, INC

October 16, 2001

Deer Real Estate Services, Inc.
55 Broadway
New York, NY 10006

Attention: Mr. Howard Cohen

Reference: 55 Broadway, New York, NY

Dear Mr. Cohen:

Enclosed please find the analytical results for Lead in Air sampling conducted at 55 Broadway, New York, NY.

All samples were analyzed by JLC Environmental Consultants, using an Atomic Absorption Spectrometer, equipped with an Air-Acetylene flame and background correction in accordance with the NIOSH 7082 Method. The current OHSA Permissible Exposure Limit (PEL) for lead (General Industrial) is 0.05mg/m3 (50ug/m3).

Any questions concerning results and/or documentation should be directed to Al Wallner, our laboratory director.

JLC Environmental Consultants, Inc. appreciates the opportunity to serve your organization. Please contact us with any further questions. We look forward to working with you again in the future.

Sincerely,

JLC Environmental Consultants, Inc

Gulam Machhiwala
Laboratory Director

cc:File

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200 Park Avenue South, Suite 1001, New York, New York 10003
Phone: (212) 420-8119 Fax: (212) 420-6092

Deer Real Estate Services, Inc.
55 Broadway
New York, NY 10006

ELAP Lab Code: 11029
NIOSH and AIHA Lab Code: 100273
NVLAP Lab Code: 101953

Site: 55 Broadway, New York, NY

Project No.	01-2129
Analyte:	LEAD
Date Collected:	10/11/01
Date Received:	10/12/01
Date Analyzed:	10/12/01
Lab Batch #:	0110L2121

SUMMARY OF ANALYTICAL RESULTS - AIR

Sample # / Lab # / Client's Sample #	Description/ Location	Volume (liter)	Results (ug/m3)
1 / 18027 / 01	Ambient/ Lead/ On the 24th Floor/ At the North Section of the Office	246	<16.3
2 / 18028 / 02	Ambient/ Lead/ On the 24th Floor/ At the Entrance to the Stairwell	246	<16.3
3 / 18029 / 03	Ambient/ Lead/ On the 24th Floor/ At the East Section of the Office	246	<16.3
4 / 18030 / 04	Ambient/ Lead/ On the 24th Floor/ At the West Section of the Office	246	<16.3
5 / 18031 / 05	FIELD BLANK		<4/ Filter

Sample Analysis by:
Atomic Absorption Spectrometry (AAS) with an air-acetylene burner head (Flame) and background correction (AAS-Flame).

Method of Sample Preparation and Analysis:
All Samples were prepared and analyzed in accordance with NIOSH Method 7082, February 15, 1984.

Collected By: Demean Shakespe
Analyzed By: Tamara Metelkina

Gulam Machhiwala
Laboratory Director

Minimum Dectection Limit = <4.0 ug/m3
OSHA Permissible Exposure Limit (PEL) for General Industry is 50 ug/m3.

JLC ENVIRONMENTAL CONSULTANTS, INC.
200 Park Avenue South, Suite 1001, New York, New York 10003
Phone: (212) 420-8119 Fax: (212) 420-6092

Deer Real Estate Services, Inc.

55 Broadway
New York, NY 10006

ELAP Lab Code: 11029
NIOSH and AIHA Lab Code: 100273
NVLAP Lab Code: 101953

Site: **55 Broadway, New York, NY**

Project No.	01-2129
Analyte:	LEAD
Date Collected:	10/11/01
Date Received:	10/12/01
Date Analyzed:	10/12/01
Lab Batch #:	0110L2120

SUMMARY OF ANALYTICAL RESULTS - AIR

Sample # Lab # Client's Sample #	Description/ Location	Volume (liter)	Results (ug/m3)
1 18022 01	Ambient/ Lead/ On the 11th Floor/ At the North Section of the Office	246	<16.3
2 18023 02	Ambient/ Lead/ On the 11th Floor/ At the East Section of the Office	246	<16.3
3 18024 03	Ambient/ Lead/ On the 11th Floor/ At the West Section of the Office	246	<16.3
4 18025 04	Ambient/ Lead/ On the 11th Floor/ At the South Section of the Office	246	<16.3
5 18026 05	FIELD BLANK		<4/ Filter

Sample Analysis by:
Atomic Absorption Spectrometry (AAS) with an air-acetylene burner head (Flame) and background correction (AAS-Flame).

Method of Sample Preparation and Analysis
All Samples were prepared and analyzed in accordance with NIOSH Method 7082, February 15, 1984.

Collected By: Demean Shakespe
Analyzed By: Tamara Metelkina

Gulam Machhiwala
Laboratory Director

Minimum Dectection Limit = <4.0 ug/m3
OSHA Permissible Exposure Limit (PEL) for General Industry is 50 ug/m3.

LEAD by Flame AAS 7082

Pb MW: 207.19 (Pb) CAS: 7439-92-1 (Pb) RTECS: OF7525000 (Pb)
223.19 (PbO) 1317-36-8 (PbO) OG1750000 (PbO)

METHOD: 7082, Issue 2 EVALUATION: FULL Issue 1: 15 February 1984 Issue 2: 15 August 1994

OSHA: 0.05 mg/m³
NIOSH: <0.1 mg/m³; blood Pb ≤60 µg/100 g
ACGIH: 0.05 mg/m³

PROPERTIES: soft metal; d 11.3 g/cm³; MP 327.5 °C; valences +2, +4 in salts

SYNONYMS: elemental lead and lead compounds except alkyl lead

SAMPLING

SAMPLER:	FILTER (0.8-µm cellulose ester membrane)
FLOW RATE:	1 to 4 L/min
VOL-MIN:	200 L @ 0.05 mg/m³
-MAX:	1600 L
SHIPMENT:	routine
SAMPLE STABILITY:	stable
BLANKS:	2 to 10 field blanks per set

ACCURACY

RANGE STUDIED:	0.13 to 0.4 mg/m³ [1]; 0.15 to 1.7 mg/m³ (fume) [2]
BIAS:	- 3.1%
OVERALL PRECISION($\hat{S}_{rT}$):	0.072 [1]; 0.066 (fume) [2]
ACCURACY:	± 17.6%

MEASUREMENT

TECHNIQUE:	ATOMIC ABSORPTION SPECTROPHOTOMETER, FLAME
ANALYTE:	lead
ASHING:	conc. HNO_3, 6 mL + 30% H_2O_2, 1 mL; 140 °C
FINAL SOLUTION:	10% HNO_3, 10 mL
FLAME:	air-acetylene, oxidizing
WAVELENGTH:	283.3 nm
BACKGROUND CORRECTION:	D_2 or H_2 lamp, or Zeeman
CALIBRATION:	Pb^{2+} in 10% HNO_3
RANGE	10 to 200 µg per sample [2,3]
ESTIMATED LOD:	2.6 µg per sample [4]
PRECISION($\hat{S}_r$):	0.03 [1]

APPLICABILITY: The working range is 0.05 to >1 mg/m³ for a 200-L air sample. The method is applicable to elemental lead, including Pb fume, and all other aerosols containing lead. This is an elemental analysis, not compound specific. Aliquots of the samples can be analyzed separately for additional elements.

INTERFERENCES: Use D_2 or H_2 continuum or Zeeman background correction to control flame or molecular absorption. High concentrations of calcium, sulfate, carbonate, phosphate, iodide, fluoride, or acetate can be corrected.

OTHER METHODS: This method combines and replaces P&CAM 173 [3] and 5341 [4,5] for lead. Method 7300 (ICP-AES) and 7105 (AAS/GF) are alternate analytical methods. Method 7605 is specific for lead sulfide. The following have not been revised: the dithizone method, which appears in P&CAM 102 [6] and the lead criteria document [8]; and P&CAM 191 (ASV) [7].

REAGENTS:

1. Nitric acid, conc.*
2. Nitric acid, 10% (v/v). Add 100 mL conc. HNO_3 to 600 mL water; dilute to 1 L.
3. Hydrogen peroxide, 30% H_2O_2 (w/w), reagent grade.*
4. Calibration stock solution, 1000 µg/mL Pb. Commercial standard or dissolve 1.00 g Pb metal in minimum volume of (1+1) HCl and dilute to 1 L with 1% (v/v) HCl. Store in a polyethylene bottle. Stable≥ one year.
5. Air, compressed, filtered.
6. Acetylene
7. Distilled or deionized water.

* See SPECIAL PRECAUTIONS.

EQUIPMENT:

1. Sampler: Cellulose ester filter, 0.8-µm pore size, 37-mm diameter, in cassette filter holder.
2. Personal sampling pump, 1 to 4 L/min, with flexible connecting tubing.
3. Atomic Absorption Spectrophotometer with an air-acetylene burner head and background correction.
4. Lead hollow cathode lamp or electrode dischargeless lamp.
5. Regulators, two-stage, for air and acetylene.
6. Beakers, Phillips, 125-mL, or Griffin, 50-mL with watchglass covers.**
7. Volumetric flasks, 10- and 100-mL.**
8. Assorted volumetric pipets as needed.**
9. Hotplate, surface temperature 140°C.
10. Bottles, polyethylene, 100-mL.

** Clean all glassware with conc. nitric acid and rinse thoroughly with distilled or deionized water before use.

SPECIAL PRECAUTIONS: Concentrated nitric acid is an irritant and may burn skin. Perform all acid digestions in a fume hood. Hydrogen peroxide is a strong oxidizing agent, a strong irritant, and corrosive to the skin. Wear gloves and eye protection.

SAMPLING:

1. Calibrate each personal sampling pump with a representative sampler in line.
2. Sample at an accurately known flow rate between 1 and 4 L/min for up to 8 h for a total sample size of 200 to 1500 L for TWA measurements. Do not exceed a filter loading of ca. 2 mg total dust.

SAMPLE PREPARATION:

NOTE 1: The following sample preparation gave quantitative recovery (see EVALUATION OF METHOD) [4]. Steps 4 through 9 of Method 7300 or other quantitative ashing techniques may be substituted, especially if several metals are to be determined on a single filter.

NOTE 2: The Appendix gives a microwave digestion procedure which may be necessary for complete recovery of lead from some matrices, especially epoxy-based paint.

3. Open the cassette filter holders and transfer the samples and blanks to clean beakers.
4. Add 3 mL conc. HNO_3, and 1 mL 30% H_2O_2 and cover with a watchglass. Start reagent blanks at this step.
   NOTE: If PbO_2 is not present in the sample, the 30% H_2O_2 need not be added [2,4].
5. Heat on 140 °C hotplate until volume is reduced to about 0.5 mL.
6. Repeat two more times using 2 mL conc. HNO_3 and 1 mL 30% H_2O_2 each time.
7. Heat on 140 °C hotplate until ca. 0.5 mL liquid remains.
8. When sample is dry, rinse the watchglass and walls of the beaker with 3 to 5 mL 10% HNO_3. Allow the solution to evaporate to dryness.
9. Cool each beaker and dissolve the residues in 1 mL conc. HNO_3.
10. Transfer the solution quantitatively to a 10-mL volumetric flask and dilute to volume with distilled water.

NOTE: If the concentration (M) of any of the following is expected to exceed the lead concentration (M) by 10-fold or more, add 1 mL 1 M Na$_2$EDTA to each flask before dilution to volume: CO_3^{2-}, PO_4^{3-}, I^-, F^-, CH_3COO^-. If Ca^{2+} or SO_4^{2-} are present in 10-fold or greater excess, make all standards and samples 1% (w/w) in La[3].

CALIBRATION AND QUALITY CONTROL:

11. Prepare a series of working standards covering the range 0.25 to 20 µg/mL Pb (2.5 to 200 µg Pb per sample).
    a. Add aliquots of calibration stock solution to 100-mL volumetric flasks. Dilute to volume with 10% HNO_3. Store the working standards in polyethylene bottles and prepare fresh weekly.
    b. Analyze the working standards together with the blanks and samples (steps 14 and 15).
    c. Prepare a calibration graph of absorbance vs. solution concentration (µg/mL).
12. Aspirate a standard for every 10 samples to check for instrument drift.
13. Check recoveries with at least one spiked media blank per 10 samples. Use method of standard additions occasionally to check for interferences.

MEASUREMENT:

14. Set spectrophotometer as specified by the manufacturer and to conditions on page 7082-1.
    NOTE: An alternate wavelength is 217.0 nm [8]. Analyses at 217.0 nm have slightly greater sensitivity, but poorer signal-to-noise ratio compared to 283.3 nm. Also, non-atomic absorption is significantly greater at 217.0 nm, making the use of D$_2$ or H$_2$ continuum, or Zeeman background correction mandatory at that wavelength.
15. Aspirate standards, samples, and blanks. Record absorbance readings.
    NOTE: If the absorbance values for the samples are above the linear range of the standards, dilute with 10% HNO_3, reanalyze, and apply the appropriate dilution factor in the calculations.

CALCULATIONS:

16. Using the measured absorbances, calculate the corresponding concentrations (µg/mL) of lead in the sample, C_s, and average media blank, C_b, from the calibration graph.
17. Using the solution volumes (mL) of the sample, V_s, and media blanks, V_b, calculate the concentration, C (mg/m^3), of lead in the air volume sampled, V (L):

$$C = \frac{C_s V_s - C_b V_b}{V}, \text{ mg/m}^3.$$

NOTE: µg/mL = mg/m

EVALUATION OF METHOD:

Method S341 [9] was issued on October 24, 1975, and validated over the range 0.13 to 0.4 mg/m^3 for a 180-L air sample, using generated atmospheres of lead nitrate [1]. Recovery in the range 18 to 72 µg Pb per sample was 98%, and collection efficiency of 0.8-µm mixed cellulose ester filters (Millipore Type AA) was 100% for the aerosols. Subsequent studies on analytical recovery of 200 µg Pb per sample gave the following results [2,4]:

Species	Digestion Method	Analytical Recovery, %
Pb metal	HNO_3 only	92 ± 4
Pb metal	HNO_3 + H_2O_2	103 ± 3
PbO	HNO_3 only	93 ± 4
PbS	HNO_3 only	93 ± 5
PbO_2	HNO_3 only	82 ± 3
PbO_2	HNO_3 + H_2O_2	100 ± 1
Pb in paint*	HNO_3 only	95 ± 6
Pb in paint*	HNO_3 + H_2O_2	95 ± 6

*Standard Reference Material #1579. U.S. National Institute of Standards and Technology.

Additional collection efficiency studies were also done using Gelman GN-4 filters for the collection of Pb fume, which had geometric mean diameter of 0.1 µm [2]. Mean collection efficiency for 24 sampling runs at flow rates between 0.15 and 4.0 L/min was 97 ± 2%. Overall precision, $\hat{S}_{rT}$, was 0.072 for lead nitrate aerosol [1,8] and 0.066 for Pb fume [2,4].

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METHOD REVISED BY:

Mark Millson, NIOSH/DPSE and R. DeLon Hull, Ph.D., NIOSH/DBBS; S341 originally validated under NIOSH Contract CDC-94-74-45; additional studies under NIOSH Contract 210-78-0068.

James B. Perkins, David L. Wheeler, and Keith Nicholson, Ph.D., DataChem Laboratories, Salt Lake City, UT, prepared the microwave digestion procedure in the Appendix.

APPENDIX - MICROWAVE DIGESTION FOR LEAD IN PAINT CHIPS (AND OTHER MATRICES)

This procedure is an alternative to the procedure presented in the Sample Preparation section of this method. It provides a rapid, complete acid digestion prior to analysis by flame atomic absorption (FAA), heated graphite furnace atomic absorption(HGFAA), and inductively coupled plasma spectroscopy (ICP) [10].

Apparatus and Material[11-16]

1. Microwave apparatus requirements
   a. The microwave unit provides programmable power with a minimum of 574 W and can be programmed to within ± 10 W of the required power.
   b. The microwave unit cavity is corrosion resistant as well as ventilated. All electronics are protected against corrosion for safe operation.
   c. The system requires Teflon PFA digestion vessels (120-mL capacity) capable of withstanding pressures up to 7.5 ± 0.7 atm (110 ± 10 psi) and capable of controlled pressure relief at pressures exceeding 7.5 ± 0.7 atm (110 ± 10 psi).
   d. A rotating turntable is employed to ensure homogeneous distribution of microwave radiation within the unit. The speed of the turntable should be a minimum of 3 rpm.
   e. A safety concern relates to the use of sealed containers without pressure relief valves in the unit. Temperature is the important variable controlling the reaction. Pressure is needed to attain elevated temperatures but must be safely contained [12].
   f. Polymeric volumetric ware in plastic (Teflon or polyethylene), 50- or 100-mL capacity.
   g. Disposable polypropylene filter funnel.
   h. Analytical balance, 300-g capacity, and minimum ± 0.001 g.

Reagents

1. Nitric acid, concentrated, spectroscopy grade.
2. Reagent Water. Reagent water shall be interference free. All references to water in the method refer to reagent water that meets the ASTM Type 2 standard.

Procedure

1. Calibration of Microwave Equipment
   Calibrate microwave equipment in accordance with manufacturer's instructions. If calibration instructions are not available, see EPA Method 3051 [11].
2. All digestion vessels and volumetric ware must be carefully acid washed and rinsed with reagent water. All digestion vessels should be cleaned by leaching with hot (1:1) nitric acid for a minimum of fifteen minutes, rinsed with reagent water, and dried in a clean environment.
3. Sample Digestion
   a. Tare the Teflon PFA digestion vessel.
   b. Weigh out 0.1 g paint chip sample to the nearest 0.001 g into the tared Teflon PFA sample vessel. With large paint chip samples, measure out a 2 cm² piece, weigh to the nearest 0.001 g, and quantitatively transfer it to the vessel.
   c. Add 5.0 ± 0.1 mL concentrated nitric acid to the sample vessel in a fume hood. If a vigorous reaction occurs, allow the reaction to stop before capping the vessel. Cap the vessel and torque the cap to 12 ft-lb (16 N-m) according to the manufacturer's directions. The sample vessel may be connected to an overflow vessel using Teflon PFA connecting tubes. Place the vessels in the microwave carrousel. Connect the overflow vessels to the center wall of the unit.
   d. Place the vessels evenly distributed in the turntable of the microwave unit using groups of two, six,

or 12 sample vessels. Any vessels containing 5 mL of nitric acid for reagent blank purposes are counted as sample vessels. When fewer than the recommended number of samples are to be digested, i.e., three samples plus one blank, the remaining vessels should be filled with 5 mL of nitric acid to achieve the full complement of vessels. This provides an energy balance since the microwave power absorbed is proportional to the total mass in the cavity [14]. Irradiate each group of samples to achieve a temperature of 180 °C in five minutes at a pressure of 50 psi. Continue to irradiate to achieve a temperature of 180 °C at 100 psi after 25 minutes. Continue digestion for five minutes. A sample digestion program for 12 samples is presented in the following table.

PROGRAM VARIABLES FOR PAINT CHIPS SAMPLE DIGESTION WITH NITRIC ACID

Stage	(1)	(2)	(3)
Power	90%	90%	0%
Pressure, psi	50	100	0
Run Time, min	10:00	20:00	05:00
Time @ P, min	05:00	15:00	00:00
Temperature	180°C	180°C	0°C
Fan Speed	100%	100%	100%

Number of Vessels:	12
Liquid Volume per Vessel:	5 mL
Sample Weight:	0.1 g

If the analyst wishes to digest other than two, six, or 12 samples at a time, use different values of power as long as they result in the same time and temperature conditions.

e. At the end of the microwave program, allow the vessels to cool for a minimum of five minutes before removing them from the microwave unit. If a loss of sample is detected (e.g., material in overflow collection vessel, liquid outside liner), determine the reason for the loss (e.g., loss of vessel seal integrity, use of a digestion time longer than 30 minutes, too large a sample, or improper heating conditions). Once the source of the loss has been corrected, prepare a new sample beginning at Section 2. If insufficient material is available for reanalysis, dilute remaining digestate and note that some sample loss may have occurred.

f. Uncap and vent each vessel in a fume hood. Add 20 mL reagent water, then reseal vessels and shake to mix thoroughly. Transfer the sample to an acid-cleaned polyethylene bottle. If the digested sample contains particulates which may clog nebulizers or interfere with injection of the sample into the instrument, allow the sample to settle or filter it:

Settling: Allow the sample to stand until the supernatant is clear (usually, overnight is sufficient). If it does not clear, filter the sample.

Filtering: The filtering apparatus must be thoroughly precleaned and rinsed with dilute nitric acid. Filter the sample through quantitative filter paper into a second acid-cleaned container.

The digestate is now ready for analysis for elements of interest using the appropriate method.

4. Calculations: Report the concentrations based on the actual weight of the original sample.