130 Liberty Street

New York, New York

Supplemental Investigation Summary Report

Fireproofing Sampling Summary Results

Prepared for:
Lower Manhattan Development Corporation
One Liberty Plaza, 20th Floor, New York, NY 10006

LMDC
Lower Manhattan
Development Corporation

Prepared By:

TRC
Customer-Focused Solutions

TRC Environmental Corp.
1430 Broadway, 10th Floor
New York, New York 10018

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1. INTRODUCTION

TRC Environmental Corporation (TRC) was contracted and authorized by the Lower Manhattan Development Corporation (LMDC) to conduct a *Supplemental Investigation* (SI) of previously inaccessible spaces in the building located at 130 Liberty Street (the Building). The intent of the SI is to address the additional sampling recommendations presented in The Louis Berger Group, Inc. (Berger) *Initial Building Characterization Report* dated September 14, 2004. This Summary Report presents the results of the supplemental investigation and testing of fireproofing located within the Building.

1.1 Background

The Building is located across the street and south of the WTC site and is a former office building comprised of 40 stories and approximately 1.5 million square feet. The massive debris generated from the collapse of the South Tower of the WTC broke approximately 1,500 windows, curtain wall, and structural components creating a gash (Gash Area) in the Building's exterior exposing portions of the interior north side of the Building between the 7th and 24th floors. The debris demolished the plaza in front of the Building, exposing the basement and subbasement (Basement A and Basement B) areas and ruptured a diesel fuel tank in the basement, the contents of which burned. The Gash Area and broken windows exposed the interior of the Building to the elements.

As a result of the collapse of the World Trade Center (WTC) on September 11, 2001, a combination of soot, dust, dirt, debris, and contaminants settled in and on the Building. See the *Initial Building Characterization Report* for additional background information.

1.2 Scope of Work

In the *Initial Building Characterization Report*, Berger identified areas that were inaccessible during their investigation including the following locations:

- Curtain Wall Cavity
- Cell Systems within Floors
- Interstitial Spaces within Interior Walls and Column Cavities
- Inside Vertical Shafts
- Exterior Building Surfaces

In addition, Berger recommended performing preliminary waste characterization.

This supplemental investigation summary presents the results of additional inspection and

sampling performed by TRC of fireproofing within the Building. Supplemental investigations regarding curtain wall cavity, heating, ventilation, and air conditioning (HVAC) ductwork, cell systems within floors, interstitial spaces within interior walls and column cavities, exterior building surfaces, waste characterization, and visual inspection of the Building for mold and asbestos containing building materials (ACBM) are addressed in separate summaries.

As part of the supplemental investigation, TRC collected the following samples:

COPC	Asbestos	Lead	Silica	Dioxin	PAH	MMVF
Total Samples	126	106	35	55	55	27

For the fireproofing located within inaccessible areas at 130 Liberty Street, TRC collected thirteen representative surface bulk samples for lead, silica, polycyclic aromatic hydrocarbons (PAHs), and dioxins analysis and three bulk samples for man-made vitreous fibers (MMVF). Bulk sampling and analysis for asbestos was conducted as part of the *Initial Building Characterization Report*. In addition, TRC collected fifteen microvacuum samples of fireproofing for asbestos and ten microvacuum samples of fireproofing for lead. Asbestos, lead, silica, PAHs, dioxins, and MMVF make up the United States Environmental Protection Agency (USEPA) contaminants of potential concern (COPCs) list.

TRC did not utilize a tiered approach to sample analysis as was done for other SI components tested. All COPCs were analyzed and the results reviewed. Results of this study were compared to the findings in the *Initial Building Characterization Report*, benchmark, and background concentrations presented in previous environmental studies as detailed in the following sections.

1.3 Previous Environmental Studies

Several studies concerning WTC-related contaminants have been performed by, or with the review of, the federal, state, and local regulatory authorities in the aftermath of the events of September 11, 2001. In particular, the USEPA has been responsible for studies associated with the development of the EPA's list of COPCs, as discussed in this section.

The USEPA COPC Committee developed, in their *World Trade Center Indoor Air Assessment: Selecting Contaminants of Potential Concern and Setting Health Based Benchmarks, Peer Review Draft (September 2002)*, a tiered approach to evaluate the health risks posed by contaminants that might be present in an indoor environment (air

and settled dust) for residential reoccupancy. For each COPC, three levels were developed:

Tier I - Level above which, after elimination of potential indoor sources (combustion by-products, stored chemicals, etc.), aggressive clean-up action should be taken expeditiously along with follow-up sampling to confirm attainment of Tier III level.

Tier II - Range where diligent cleaning should continue, after elimination of potential indoor sources (combustion by-products, stored chemicals, etc.), with follow-up sampling to confirm attainment of Tier III level.

Tier III - Level below which the risk is negligible or consistent with the New York City background level found in the USEPA Background Study as identified below.

These levels were established for residential reoccupancy. The Tier I screening level was intended to be protective of a resident who may have been exposed to WTC-related contaminants in their residence for one year. The Tier III clearance level was intended to be protective of a resident who is exposed to WTC-related contaminants in their residence for 30 years, which was the upper-bound estimate for residency in one dwelling. For COPCs in settled dust, the tiered values are as follows:

	Settled Dust		
COPC	**Tier I**	**Tier II**	**Tier III**
Asbestos (str/cm2)	>30,000	30,000 to background	Background
Lead (ug/ft2)	>40	40 to 25 (or background)	<25 (or background)
Silica	--	Above background	Background
PAH (mg/m2)	>9	9 to 0.3 (or background)	<0.3 (or background)
MMVF (str/cm2)	>100,000	100,000 to background	Background
Dioxin (ng/m2)	>120	120 to 4 (or background)	<4 (or background)

These levels were developed to be risk-based levels for residential settings. While the USEPA residential benchmark and background concentrations relate to residential settings and are not directly applicable to a commercial deconstruction project, these studies can be used to put the results of this supplemental investigation into relative context.

Subsequent to peer review of the September 2002 report, the USEPA COPC Committee developed, in their *World Trade Center Indoor Environmental Assessment: Selecting Health-Based Benchmarks (May 2003)* report, health based benchmarks that reflected only the Tier III levels.

The USEPA, Region 2, also developed the *World Trade Center Background Study Report (April 2003).* The objective of this study was to determine and/or estimate indoor baseline levels or background concentrations for the presence of specific contaminants in residential buildings unaffected by the WTC disaster. The average background concentrations for COPCs in settled dust on hard surfaces are summarized below.

COPC	Average Background
Asbestos (str/cm2)	6,192
Lead (ug/ft2)	1.78
Silica (ug/ft2)	79.6 (expressed as quartz)
PAH (mg/m2)	<0.29
MMVF (str/cm2)	52
Dioxin (ng/m2)	0.693

Based on the text by Millette and Hays, *Settled Asbestos Dust Sampling and Analysis*, levels of asbestos in settled dust as determined by the microvacuum techniques are considered low if less than 1,000 str/cm^2. Levels above 10,000 str/cm^2 are considered generally above background. Levels above 100,000 str/cm^2 are considered high and in the range of significant accidental release from an abatement site.

1.4 Purpose and Objectives

The objective of the SI is to provide additional information relative to the concentrations of COPCs within previously inaccessible spaces. This SI summary presents the results specifically for the fireproofing investigation.

The SI of previously inaccessible areas is intended to assist in determining what measures and protocols may be required in support of the 130 Liberty Street cleaning and deconstruction plan. In particular, the results of the SI are intended to provide reference information allowing for informed decisions to be made regarding appropriate cleaning and deconstruction methods. These decisions include the development and implementation of engineering controls to contain the work zone (i.e., to ensure no exposure to the surrounding community during the cleaning and deconstruction) and appropriate methods for the disposal or recycling of materials generated by the cleaning and deconstruction activities. Using the available characterization results, LMDC, its consultants, and the selected deconstruction contractor can develop and implement appropriate deconstruction protocols and safety precautions for the cleaning and deconstruction process to ensure the health and safety of workers and the surrounding community.

2. METHODOLOGY

This section presents the methodologies implemented for the fireproofing characterization in previously inaccessible areas within the Building. These tasks were implemented in general accordance with the *Sampling Analysis and Quality Assurance Project Plan* (SAQAPP) developed by TRC dated November 15, 2004. Fireproofing was added to the SI component list, subsequent development to the SAQAPP

TRC collected representative bulk and/or microvacuum samples for the COPCs from fireproofing located in the building. Sprayed-on fireproofing sampled included interior vertical column, ceiling deck, and perimeter column materials.

Asbestos surface microvacuum samples were collected and analyzed per methods detailed in the American Society for Testing and Materials (ASTM) standard test method D5755-03. Asbestos bulk samples were collected and analyzed per methods detailed in the New York State Environmental Laboratory Approval Program (NYS ELAP) test method 198.1.

Lead microvacuum and bulk samples were collected following ASTM standard test method E1973-99 and the United States Department of Housing and Urban Development (HUD) Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing and analyzed as per analytical method NIOSH 7082 and USEPA SW-846 7420, respectively.

Bulk silica, dioxins, MMVF, and PAHs were analyzed per methods NIOSH 7500 Issue 3, SW 846-8290, EMSL MSD 0310, and SW 846-8270C, respectively.

All samples were properly labeled as per the SAQAPP. Asbestos, lead, silica, and MMVF samples were delivered to the EMSL Analytical Inc. laboratory, an independent New York State Department of Health (NYSDOH ELAP # 10872 for asbestos and lead) and an American Industrial Hygiene Association (AIHA # 100194 for silica) certified laboratory. PAH and dioxin samples were delivered to Paradigm Analytical Labs in Wilmington, North Carolina (NYSDOH ELAP # 11685).

3. RESULTS

3.1 Asbestos

Fifteen asbestos microvacuum, two blank, and three bulk samples were collected on various floors of the Building as detailed below. Samples were divided up by Zone, as described in the *Initial Building Characterization Report*. Zones 2 and 3 apply to TRC's study and are defined as follows:

> Zone 2: Office space located at or below the 24th Floor that may have been subjected to dust entering the Building through the Gash, HVAC system (and possibly circulated through the HVAC system), vertical shafts, or broken windows.
>
> Zone 3: Office space located above the 24th Floor that may have been impacted by dust distributed through the HVAC system, vertical shafts, or broken windows.

Microvacuum sample results ranged from less than 2,990 structures per square centimeter (str/cm^2) to 2,750,000 str/cm^2. Seven of the fifteen samples exceeded the Tier I value of 30,000 str/cm^2. However, asbestos was detected in a field blank sample associated with five of the fifteen samples. The arithmetic mean concentration for the remaining ten results was 75,073 str/cm^2 using one-half the detection limit for non-detected sample results. No asbestos was detected in the three bulk samples. Sample results are provided in the attached Tables 1 and 2.

Sample ID	Floor	Location	Zone
Microvacuum Samples			
ZD-001	9	SE Area FE-12	2
ZD-002	8	NW Area AB-56	2
ZD-003	7	NE Area GH-56	2
ZD-004	4	Elev. Lobby EF-56	2
ZD-005	2	SE Area EF-12	2
ZD-001	39	ED-78	3
ZD-002	35	AB-56	3
ZD-003	30	DC-67	3
ZD-004	25	EC-23	3
ZD-005	15	AB-35	2
ZD-006	9	AB-45	2
ZD-007	8	DF-56	2
ZD-008	7	FE-46	2
ZD-009	4	FE-46	2
ZD-010	2	FE-13	2
Bulk Samples			
KD-7-BULK-FIREPROOFING-ASBESTOS-001	7	Exterior wall GH-56	2

Sample ID	Floor	Location	Zone
KD-4-BULK-FIREPROOFING-ASBESTOS-002	4	Exterior wall GH-34	2
KD-20-BULK-FIREPROOFING-ASBESTOS-003	20	Exterior wall AB-34	2

A limited data validation was performed on the sample results in accordance with the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review EPA 540/R-99/008* (October 1999). In general, the data appeared to be valid as reported and may be used for decision-making purposes.

TRC reviewed the *Initial Building Characterization Report*. This report presents the results of 40 supplemental screening samples of the settled dust from porous and non-porous surfaces and analyzed for asbestos using TEM. The samples were collected from various locations within the Building, including, but not limited to carpeting, counters, vent units, and above the ceiling tiles. The results revealed detectable levels of asbestos above the residential background level of 6,192 structures/cm^2 identified in the EPA *World Trade Center Background Study Report Interim Final* (April 2003). The highest concentrations of asbestos were identified in the first and second floors, fifth floor mechanical room, and the $40^{th}/41^{st}$ floor mechanical room. Asbestos was detected in dust at concentrations in excess of 6,192 structures/cm^2 in 24 of the 31 floors sampled by TEM analysis (77%). The samples containing asbestos ranged from a minimum concentration of less than 891 structures/cm^2 (from Floors 5, 24, 25, 28, 34, and 41) to a maximum concentration of 4,879,200 structures/cm^2 (from Floor 2). These results are generally greater than but within an order of magnitude of the SI results.

TRC reviewed the *Deutsche Bank Damage Assessment report: Contamination Report Pursuant to Testing Protocol-04, Spray-On Fireproofing Data Report* by RJ Lee Group, Inc. dated May 2003. The average and maximum asbestos concentrations of samples collected in the non-gash areas of the building were 1,953,000 str/cm^2 and 605,400,000 str/cm^2, respectively. The concentrations reported in the RJ Lee report are significantly higher than the concentrations found in this SI.

3.2 Lead

Ten microvacuum, one blank and 13 lead bulk samples were collected on various floors of the Building as detailed below. Microvacuum sample results ranged from less than 4 ug/ft^2 to 100 ug/ft^2 with an arithmetic average of 24 ug/ft^2. Lead was detected in one of the 13 bulk samples with a result of 0.02% lead. Using the weight and the known surface area of the sample collected, this equates to a result of 148,490 ug/ft^2. This high

concentration result is potentially due to the steal beam mill scale that was scraped off and included with the fireproofing upon sample collection. Therefore, this anomalous result has not been included in the evaluation and comparison to surface dust loading criteria. Sample results are provided in the attached Tables 3 and 4.

Sample ID	Floor	Location	Zone
ZD-001	39	ED-78	3
ZD-002	35	AB-56	3
ZD-003	30	DC-67	3
ZD-004	25	EC-23	3
ZD-005	15	AB-35	2
ZD-006	9	AB-45	2
ZD-007	8	DF-56	2
ZD-008	7	FE-46	2
ZD-009	4	FE-46	2
ZD-010	2	FE-13	2
SR-Pb-29-Vertical Column-001	29	West Column AB-23	3
SR-Pb-20-Vertical Column-002	20	West Column AB-23	2
SR-Pb-18-Vertical Column-003	18	West Column AB-23	2
SR-Pb-15-Vertical Column-004	15	West Column AB-23	2
SR-Pb-12-Vertical Column-005	12	West Column AB-23	2
SR-Pb-11-Vertical Column-006	11	West Column AB-23	2
SR-Pb-10-Vertical Column-007	10	West Column AB-23	2
SR-Pb-9-Vertical Column-008	9	West Column AB-23	2
SR-Pb-8-Vertical Column-009	8	West Column AB-23	2
SR-Pb-7-Vertical Column-010	7	West Column AB-23	2
KD-7-BULK-EXT.FIREPROOFING-001	7	Exterior wall GH-56	2
KD-4-BULK-EXT.FIREPROOFING-002	4	Exterior wall GH-34	2
KD-20-BULK-EXT.FIREPROOFING-003	20	Exterior wall AB-34	2

A limited data validation was performed on the above microvacuum and bulk samples in accordance with the *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (July 2002). In general, the data appeared to be valid as reported and may be used for decision-making purposes.

According to the *Initial Building Characterization Report*, there was significant variation in the lead testing results collected from the Building dust samples. Lead was detected in 122 of 125 samples tested. Lead results of samples collected above the plenum ranged from 350 ug/m^2 (32.52 ug/ft^2) to 10,900 ug/m^2 (1,012.6 ug/ft^2). Lead results from samples collected below the plenum ranged from 150 ug/m^2 (13.92 ug/ft^2 - in Zone 3) to 101,000 ug/m^2 (9,383.2 ug/ft^2 - in Zone 1). These results are almost two orders of magnitude higher than the results of this SI.

RJ Lee's *TP-04 Spray–On Fireproofing Summary Report* indicated average and maximum lead concentrations of samples in the non-gash areas of this report were 30.3 ug/ft^2 and 264 ug/ft^2, respectively. These results are generally consistent with the SI results.

3.3 Silica

Thirteen bulk samples were collected at the same locations where lead samples were collected as detailed in section 3.2. The silica sample results ranged from less than 5.10 g/ft^2 to 37.54 g/ft^2 with an arithmetic average of 19.67 g/ft^2. These relatively high silica results are expected since silica is commonly found in fireproofing. In fact, silica comprised 2.2% to 5% of the fireproofing material. Sample results are provided in the attached Table 5.

A limited data validation was performed on the 13 bulk samples in accordance with the *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (July 2002). In general, the data appeared to be valid as reported and may be used for decision-making purposes.

According to the *Initial Building Characterization Report*, there was significant variation in the quartz, a natural form of silica, testing results collected from the Building dust samples. Quartz was detected in 115 of the 118 samples tested. The samples containing quartz ranged from a low concentration of 500 ug/m^2 (464.5 ug/ft^2 - from Zone 2) to a maximum concentration of 10,000,000 ug/m^2 (929,030 ug/ft^2 - in Zone 1).

3.4 Dioxin

Thirteen dioxin bulk samples were collected at the same locations where lead samples were collected as detailed in Section 3.2. The dioxin sample results were converted to mass of dioxins per surface area units by using the sample weight and the surface area sampled. The World Health Organization (WHO) has established a convention whereby the results for all dioxin compounds are expressed as a toxicity equivalency concentration (TEQ). The TEQ is based upon TEF referenced to 2,3,7,8 TCDD, which is the most toxic of the dioxin compounds. The TEQ is computed by multiplying the concentration of each compound by the TEF. The products of the individual concentrations and the toxicity equivalent factors (TEFs) are then added to obtain the TEQ for that sample. For this investigation, one-half of the detection limit was used for compounds that were not detected. Results ranged from 13.5 nanograms per square meter (ng/m2) to 436 ng/m2 with an arithmetic average of 64.58 ng/m2. Sample results are provided in the attached Table 6.

A limited data validation was performed on the 13 bulk samples in accordance with the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review EPA 540/R-99/008* (October 1999). In general, the data appeared to be valid as reported and may be used for decision-making purposes.

According to the *Initial Building Characterization Report*, there was significant variation in the dioxin testing results collected from the Building dust samples. Dioxin was detected in all 124 samples tested. The samples containing dioxin ranged from a low concentration of 1 ng/m^2 (from Zone 2) to a maximum concentration of 214 ng/m^2 (in Zone 5). These results are consistent with the highly variable nature of WTC dust. Results of this study were generally consistent with the concentrations found in the SI.

RJ Lee collected 1,552 dioxin/furan samples as outlined in the *TP-04 Spray-On Fireproofing Summary Report*. The results indicated average and maximum dioxin/furan results in the non-gash areas were 2,185 pg/g and 198,201 pg/g, respectively. In the SI, the average and maximum dioxin/furan results for the fireproofing were 16.68 pg/g and 158pg/g, respectively. The concentrations reported in the RJ Lee report are at least two orders of magnitude higher than the results reported in this SI.

3.5 Polycyclic Aromatic Hydrocarbons (PAHs)

Thirteen PAH bulk samples were collected at the same locations where lead samples were collected as detailed in section 3.2. The PAH sample results were converted using the sample weight and the surface area sampled. The carcinogenic PAHs results were used to calculate the benzo(a)pyrene (BaP) equivalent to measure the relative potency. The BaP equivalent is computed by multiplying the concentration of each compound by the TEF. The products of the individual concentrations and the TEFs are then added to obtain the BaP equivalent for that sample. For this investigation, one-half of the detection limit was used for compounds that were not detected. The BaP equivalent results ranged from 54.47 micrograms per square meter (ug/m^2) to 122.48 ug/m^2 with an arithmetic average of 90 ug/m^2. Sample results are provided in the attached Table 7.

A limited data validation was performed on the 13 bulk samples in accordance with the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review EPA 540/R-99/008* (October 1999). In general, the data appeared to be valid as reported and may be used for decision-making purposes.

According to the *Initial Building Characterization Report*, there was significant variation in the PAH testing results collected from the Building dust samples. The samples containing PAH ranged from a low concentration of 3 ug/m^2 (from Zone 1) to a

maximum concentration of 11,555 ug/m^2 (in Zone 2). These results are greater than one order of magnitude above the results of the SI.

RJ Lee collected 1,502 PAH samples as outline in the *TP-04 Spray-On Fireproofing Summary Report*. The results indicated average and maximum PAH results in the non-gash areas were 189 ug/kg and 10,082 ug/kg, respectively. In this SI, the results indicated average and maximum PAH results in the interstitial spaces were 161.66 ug/kg and 241.52 ug/kg, respectively. The average and maximum BaP equivalent results in the interstitial spaces were 16 ug/kg and 45.53 ug/kg, respectively. In general, the results of the RJ Lee report were higher than the PAH concentrations found in this SI.

3.6 Man Made Vitreous Fibers (MMVF)

Three MMVF bulk samples were collected on various floors of the Building as detailed below. MMVF was expected to be detected because it is inherently part of fireproofing. Of the three samples, MMVFs were detected in two samples at 15% (4.22 grams) and 10% (2.18 grams) concentrations. Sample results summary is provided in the attached Table 8.

Asbestos Sample ID	Floor	Location	Zone
KD-7-Bulk-MMVF-FP-001	7	Exterior wall GH-56	2
KD-7-Bulk-MMVF-FP-002	4	Exterior wall GH-34	2
KD-7-Bulk-MMVF-FP-003	20	Exterior wall AB-34	2

A limited data validation was performed on the three bulk samples in accordance with the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review EPA 540/R-99/008* (October 1999). In general, the data appeared to be valid as reported and may be used for decision-making purposes.

4. FINDINGS

Sample results were compared to criteria provided in Section 1.2 and 1.3 and identified on the bottom of each table as well as the result of previous studies.

This SI has identified average asbestos concentrations on fireproofing surfaces that exceed the benchmark criteria provided in the May 2003 and September 2002 USEPA WTC Indoor Environmental Assessment studies, April 2003 Background Study, and are generally consistent with (although generally lower than) the concentrations identified in the *Initial Building Characterization Report.*

Lead was identified in the fireproofing in concentrations less than the USEPA risk based criteria and the Initial Building Characterization Report. Silica and MMVF were detected in high concentrations as expected, as they are inherent to fireproofing. SI fireproofing dioxin TEQ results were found to be generally consistent with concentrations found in the Initial Building Characterization Report, but below the September 2002 Tier I levels, which represent a one-year risk-based residential value. SI fireproofing PAH BaP equivalent results were found to be less than the *Initial Building Characterization Report* and USEPA risk-based concentrations.

While the USEPA residential benchmark and background concentrations relate to residential settings and are not directly applicable to a commercial deconstruction project, these studies can be used to put the results of this supplemental investigation into relative context.

5. CONCLUSIONS AND RECOMMENDATIONS

COPCs were found within the dust on the surfaces of the fireproofing located within the Building. Concentrations were generally lower than the COPC levels found on the exposed surfaces as discussed in the *Initial Building Characterization Report*, however multiple samples and some arithmetic average results exceeded the USEPA residential health-based benchmark and background criteria. The results of the sampling and testing performed for this Supplemental Investigation revealed levels of contaminants that should be considered in connection with the deconstruction of the Building. Therefore, TRC recommends review of the results by federal, state, and local regulators and the fireproofing be handled in a manner that complies with applicable laws.

6. REFERENCES

Damage Assessment, 130 Liberty Street Property, Contamination Report Pursuant to Testing Protocol-04, Spray-On Fireproofing, Summary Report. RJ Lee Group, Inc., May 2003.

Initial Building Characterization Study Report, 130 Liberty Street, New York, New York. The Louis Berger Group, Inc., September 14, 2004.

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Sampling, Analysis, and Quality Assurance Project Plan, Supplement Investigation of 130 Liberty Street, New York, New York. TRC Environmental Corp., November 15, 2004.

Settled Asbestos Dust Sampling and Analysis. James R. Millette, Steven M. Hays, 1994.

World Trade Center Indoor Environment Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks. Contaminants of Potential Concern (COPC) Committee. United States Environmental Protection Agency, May 2003.

World Trade Center Indoor Air Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks. Contaminants of Potential Concern (COPC) Committee of the World Trade Center Indoor Air Taskforce Working Group. Peer Review Draft, September 2002.

World Trade Center Background Study Report, Interim Final. United States Environmental Protection Agency, Region 2, April 2003.

Fireproofing Samples
LMDC
130 Liberty Street
New York
February 10, 2004

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Table 1
Fireproofing - Asbestos Surface Dust Sampling Results
Asbestos Microvacuum (ASTM D5755-03)

Fireproofing Samples
LMDC
130 Liberty Street
February 10, 2004

Sample ID	Lab Sample ID	Sample Date	Sample Type	Floor	Zone	Location	ASBESTOS (structures/cm^2)
ZD-001	030423955-0001	12/3/2004	Microvacuum	9	2	SE Area FE-12	<6270
ZD-002	030423955-0002	12/3/2004	Microvacuum	8	2	NW Area AB-56	23,300
ZD-003	030423955-0003	12/3/2004	Microvacuum	7	2	NE Area GH-56	126,000
ZD-004	030423955-0004	12/3/2004	Microvacuum	4	2	Elev. Lobby EF-56	2,750,000
ZD-005	030423955-0005	12/3/2004	Microvacuum	2	2	SE Area EF-12	72,200
ZD-006	030423955-000	12/3/2004	Microvacuum			Blank	19 Structures
ZD-001	030425020-0001	12/15/2004	Microvacuum	39	3	ED-78	44,200
ZD-002	030425020-0002	12/15/2004	Microvacuum	35	3	AB-56	22,800
ZD-003	030425020-0003	12/15/2004	Microvacuum	30	3	DC-67	5,920
ZD-004	030425020-0004	12/15/2004	Microvacuum	25	3	EC-23	4,650
ZD-005	030425020-0005	12/15/2004	Microvacuum	15	2	AB-35	<2,990
ZD-006	030425020-0006	12/15/2004	Microvacuum	9	2	AB-45	95,700
ZD-007	030425020-0007	12/15/2004	Microvacuum	8	2	DF-56	7,980
ZD-008	030425020-0008	12/15/2004	Microvacuum	7	2	FE-46	6,980
ZD-009	030425020-0009	12/15/2004	Microvacuum	4	2	FE-46	298,000
ZD-010	030425020-0010	12/15/2004	Microvacuum	2	2	FE-13	263,000
ZD-011	030425020-0011	12/15/2004	Microvacuum			Blank	Blank

	str/cm2
Arithmetic Mean (ND=1/2)*	75,073
May 2003 Benchmark[1]	n/a
April 2003 Background Assessment[2]	6,192
September 2002 WTC Indoor Assessment[3]	
Tier I	>30,000
Tier II	>30,000 to background
Tier III	Background

* Averages only done for samples collected on 12/15/04 due to asbestos detected in blank for samples collected on 12/3/04.

References:

[1] *World Trade Center Indoor Environment Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks.* Contaminants of Potential Concern (COPC) Committee. United States Environmental Protection Agency, May 2003.

[2] *World Trade Center Background Study Report, Interim Final*. United States Environmental Protection Agency, Region 2, April 2003.

[3] *World Trade Center Indoor Air Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks.* Contaminants of Potential Concern (COPC) Committee of the World Trade Center Indoor Air Taskforce Working Group. Peer Review Draft, September 2002.

Table 2
Fireproofing - Asbestos Bulk Sampling Results
Asbestos Bulk (ELAP 198.1)

Fireproofing Samples
LMDC
130 Liberty Street
February 10, 2004

Sample ID	Lab Sample ID	Sample Date	Sample Type	Floor	Location	% Asbestos
KD-7-BULK-FIREPROOFING-ASBESTOS-001	040423812-0001	12/2/2004	Bulk	7	Exterior wall GH-56	NAD
KD-4-BULK-FIREPROOFING-ASBESTOS-002	040423812-0002	12/2/2004	Bulk	4	Exterior wall GH-34	NAD
KD-20-BULK-FIREPROOFING-ASBESTOS-003	040423812-0003	12/2/2004	Bulk	20	Exterior wall AB-34	NAD

NAD - No asbestos detected.

Table 3
Fireproofing - Lead Surface Dust Sampling Results
Lead Microvacuum (NIOSH 7082)

Fireproofing Samples
LMDC
130 Liberty Street
February 10, 2004

Sample ID	Lab Sample ID	Sample Date	Sample Type	Floor	Zone	Location	Lead (ug/ft^2)	Lead (ug/m^2)
ZD-001	030425032-0001	12/15/2004	Microvacuum	39	3	ED-78	11	118
ZD-002	030425032-0002	12/15/2004	Microvacuum	35	3	AB-56	<4	<43
ZD-003	030425032-0003	12/15/2004	Microvacuum	30	3	DC-67	11	118
ZD-004	030425032-0004	12/15/2004	Microvacuum	25	3	EC-23	18	194
ZD-005	030425032-0005	12/15/2004	Microvacuum	15	2	AB-35	20	215
ZD-006	030425032-0006	12/15/2004	Microvacuum	9	2	AB-45	31	334
ZD-007	030425032-0007	12/15/2004	Microvacuum	8	2	DF-56	13	140
ZD-008	030425032-0008	12/15/2004	Microvacuum	7	2	FE-46	16	172
ZD-009	030425032-0009	12/15/2004	Microvacuum	4	2	FE-46	100	1,076
ZD-010	030425032-0010	12/15/2004	Microvacuum	2	2	FE-13	15	161
ZD-011	030425032-0011	12/15/2004	Microvacuum			Blank	<4	<43

	ug/ft2
Arithmetic Mean (ND=1/2)	24
May 2003 Benchmark[1]	25
April 2003 Background Assessment[2]	1.78
September 2002 WTC Indoor Assessment[3]	
Tier I	>40
Tier II	40 to 25 (or background)
Tier III	<25 (or background)

References:

[1] *World Trade Center Indoor Environment Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks.* Contaminants of Potential Concern (COPC) Committee. United States Environmental Protection Agency, May 2003.

[2] *World Trade Center Background Study Report, Interim Final*. United States Environmental Protection Agency, Region 2, April 2003.

[3] *World Trade Center Indoor Air Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks.* Contaminants of Potential Concern (COPC) Committee of the World Trade Center Indoor Air Taskforce Working Group. Peer Review Draft, September 2002.

Table 4
Fireproofing - Lead Bulk Sampling Results
Lead (SW 846, 7420)

Fireproofing Samples
LMDC
130 Liberty Street
February 10, 2004

Sample ID	Lab Sample ID	Sample Date	Sample Type	Floor	Location	Lead (ug/ft2)	Sample weight (grams)	Percent Lead by Weight
SR-Pb-29-Vertical Column-001	030422954-0001	11/19/2004	Bulk	29	West Column AB-23	148,490	742.45	0.02
SR-Pb-20-Vertical Column-002	030422954-0002	11/19/2004	Bulk	20	West Column AB-23	<0.075	753.21	<0.01
SR-Pb-18-Vertical Column-003	030422954-0003	11/19/2004	Bulk	18	West Column AB-23	<0.089	898.14	<0.01
SR-Pb-15-Vertical Column-004	030422954-0004	11/19/2004	Bulk	15	West Column AB-23	<0.073	729.83	<0.01
SR-Pb-12-Vertical Column-005	030422954-0005	11/19/2004	Bulk	12	West Column AB-23	<0.057	566.11	<0.01
SR-Pb-11-Vertical Column-006	030422954-0006	11/19/2004	Bulk	11	West Column AB-23	<0.069	689.51	<0.01
SR-Pb-10-Vertical Column-007	030422954-0007	11/19/2004	Bulk	10	West Column AB-23	<0.067	674.21	<0.01
SR-Pb-9-Vertical Column-008	030422954-0008	11/19/2004	Bulk	9	West Column AB-23	<0.067	670.06	<0.01
SR-Pb-8-Vertical Column-009	030422954-0009	11/19/2004	Bulk	8	West Column AB-23	<0.089	893.91	<0.01
SR-Pb-7-Vertical Column-010	030422954-0010	11/19/2004	Bulk	7	West Column AB-23	<0.091	915.36	<0.01
KD-7-BULK-EXT.FIREPROOFING-001	030423847-0001	12/2/2004	Bulk	7	Exterior wall GH-56	<0.014	138.6	<0.01
KD-4-BULK-EXT.FIREPROOFING-002	030423847-0002	12/2/2004	Bulk	4	Exterior wall GH-34	<0.008	77.8	<0.01
KD-20-BULK-EXT.FIREPROOFING-003	030423847-0003	12/2/2004	Bulk	20	Exterior wall AB-34	<0.008	79.1	<0.01

Table 5
Fireproofing- Silica
Bulk Materials (NIOSH 7500, Issue 3)

Fireproofing Samples
LMDC
130 Liberty Street
February 10, 2004

Sample ID	Lab Sample ID	Sample Date	Sample Type	Floor	Location	Silica (grams/ft2)	Sample Weight (grams)
SR-SI-29-Vertical Column-001	040423150-0001	11/19/2004	Bulk	29	West Column AB-23	37.54	756.77
SR-SI-20-Vertical Column-002	040423150-0002	11/19/2004	Bulk	20	West Column AB-23	16.43	606.59
SR-SI-18-Vertical Column-003	040423150-0003	11/19/2004	Bulk	18	West Column AB-23	16.75	753.53
SR-SI-15-Vertical Column-004	040423150-0004	11/19/2004	Bulk	15	West Column AB-23	22.61	730.52
SR-SI-12-Vertical Column-005	040423150-0005	11/19/2004	Bulk	12	West Column AB-23	23.02	701.86
SR-SI-11-Vertical Column-006	040423150-0006	11/19/2004	Bulk	11	West Column AB-23	25.66	785.59
SR-SI-10-Vertical Column-007	040423150-0007	11/19/2004	Bulk	10	West Column AB-23	22.12	714.71
SR-SI-9-Vertical Column-008	040423150-0008	11/19/2004	Bulk	9	West Column AB-23	22.39	668.99
SR-SI-8-Vertical Column-009	040423150-0009	11/19/2004	Bulk	8	West Column AB-23	23.12	809.03
SR-SI-7-Vertical Column-010	040423150-0010	11/19/2004	Bulk	7	West Column AB-23	23.82	1063.34
KD-7-SILICA-BULK-EXT-F.P.-001	040423812-0001	12/2/2004	Bulk	7	Exterior wall GH-56	11.60	179.66
KD-4-SILICA-BULK-EXT-F.P.-002	040423812-0002	12/2/2004	Bulk	4	Exterior wall GH-34	5.10	63.4
KD-20-SILICA-BULK-EXT-F.P.-003	040423812-0003	12/2/2004	Bulk	20	Exterior wall AB-34	5.50	91.97

	g/ft2
Arithmetic Mean	19.67
May 2003 Benchmark[1]	n/a
April 2003 Background Assessment[2]	>0.0000796 (expressed as quartz)
September 2002 WTC Indoor Assessment[3]	
Tier I	--
Tier II	above background
Tier III	background

References:

[1] *World Trade Center Indoor Environment Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks.* Contaminants of Potential Concern (COPC) Committee. United States Environmental Protection Agency, May 2003.

[2] *World Trade Center Background Study Report, Interim Final*. United States Environmental Protection Agency, Region 2, April 2003.

[3] *World Trade Center Indoor Air Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks.* Contaminants of Potential Concern (COPC) Committee of the World Trade Center Indoor Air Taskforce Working Group. Peer Review Draft, September 2002.

Table 6
Fireproofing - Dioxin
Dioxin (SW 846-8290)

Fireproofing Samples
LMDC
130 Liberty Street
February 10, 2004

Sample ID	Lab Sample ID	Sample Date	Sample Type	Floor	Location	WHO TEQ (ND=1/2; ng/m2)
SR-Dioxin-29-Vertical Column-001	G220-19-1B	11/19/2004	Bulk	29	West Column AB-23	38.6
SR-Dioxin-20-Vertical Column-002	G220-19-2B	11/19/2004	Bulk	20	West Column AB-23	40.0
SR-Dioxin-18-Vertical Column-003	G220-19-3B	11/19/2004	Bulk	18	West Column AB-23	49.8
SR-Dioxin-15-Vertical Column-004	G220-19-4B	11/19/2004	Bulk	15	West Column AB-23	43.7
SR-Dioxin-12-Vertical Column-005	G220-19-5B	11/19/2004	Bulk	12	West Column AB-23	27.7
SR-Dioxin-11-Vertical Column-006	G220-19-6B	11/19/2004	Bulk	11	West Column AB-23	27.0
SR-Dioxin-10-Vertical Column-007	G220-19-7B	11/19/2004	Bulk	10	West Column AB-23	41.1
SR-Dioxin-9-Vertical Column-008	G220-19-8B	11/19/2004	Bulk	9	West Column AB-23	24.7
SR-Dioxin-8-Vertical Column-009	G220-19-9B	11/19/2004	Bulk	8	West Column AB-23	34.3
SR-Dioxin-7-Vertical Column-010	G220-19-10B	11/19/2004	Bulk	7	West Column AB-23	49.6
KD-7-Bulk-Diox-FP-Ext.Wall-001	G220-26-1B	12/2/2004	Bulk	7	Exterior wall GH-56	436
KD-4-Bulk-Diox0FP-Ext.Wall-002	G220-26-2B	12/2/2004	Bulk	4	Exterior wall GH-34	13.5
KD-20-Bulk-Diox-FP-ExtWall-003	G220-26-3B	12/2/2004	Bulk	20	Exterior wall AB-34	13.5

	ng/m2
Arithmetic Mean	64.58
May 2003 Benchmark[1]	2.0
April 2003 Background Assessment[2]	0.693
September 2002 WTC Indoor Assessment[3]	
Tier I	>120
Tier II	120 to 4 (or background)
Tier III	<4 (or background)

References:

[1]*World Trade Center Indoor Environment Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks.* Contaminants of Potential Concern (COPC) Committee. United States Environmental Protection Agency, May 2003.

[2]*World Trade Center Background Study Report, Interim Final*. United States Environmental Protection Agency, Region 2, April 2003.

[3]*World Trade Center Indoor Air Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks.* Contaminants of Potential Concern (COPC) Committee of the World Trade Center Indoor Air Taskforce Working Group. Peer Review Draft, September 2002.

Table 7
Fireproofing - Polycyclic Aromatic Hydrocarbons (PAH)
PAH Wipe (SW 846, 8270C)

Fireproofing Samples
LMDC
130 Liberty Street
February 10, 2004

Sample ID	Lab Sample ID	Sample Date	Sample Type	Floor	Location	PAH (ug/m2)	Benzo(a)Pyrene Equivalent (ug/m2)
SR-PAH-29-Vertical Column-001	G220-20-1B	11/19/2004	Bulk	29	West Column AB-23	2,185.00	115.12
SR-PAH-20-Vertical Column-002	G220-20-2B	11/19/2004	Bulk	20	West Column AB-23	2,003.60	90.90
SR-PAH-18-Vertical Column-003	G220-20-3B	11/19/2004	Bulk	18	West Column AB-23	1,757.00	85.68
SR-PAH-15-Vertical Column-004	G220-20-4B	11/19/2004	Bulk	15	West Column AB-23	1,875.00	93.01
SR-PAH-12-Vertical Column-005	G220-20-5B	11/19/2004	Bulk	12	West Column AB-23	1,200.20	54.47
SR-PAH-11-Vertical Column-006	G220-20-6B	11/19/2004	Bulk	11	West Column AB-23	2,071.80	63.84
SR-PAH-10-Vertical Column-007	G220-20-7B	11/19/2004	Bulk	10	West Column AB-23	1,650.70	70.66
SR-PAH-9-Vertical Column-008	G220-20-8B	11/19/2004	Bulk	9	West Column AB-23	2,501.00	80.28
SR-PAH-8-Vertical Column-009	G220-20-9B	11/19/2004	Bulk	8	West Column AB-23	2,012.00	80.26
SR-PAH-7-Vertical Column-010	G220-20-10B	11/19/2004	Bulk	7	West Column AB-23	1,954.00	102.74
KD-7-BULK-EXT.FIREPROOFING-001	G220-25-1B	12/2/2004	Bulk	7	Exterior wall GH-56	226.90	105.03
KD-4-BULK-EXT.FIREPROOFING-002	G220-25-2B	12/2/2004	Bulk	4	Exterior wall GH-34	283.30	108.96
KD-20-BULK-EXT.FIREPROOFING-003	G220-25-3B	12/2/2004	Bulk	20	Exterior wall AB-34	373.00	122.48

Benzo(a)Pyrene Equivalent determined using 1/2 the detection limit.

	ug/m2 - BaP Equivalent
BaP Arithmetic Mean (ND=1/2)	90
May 2003 Benchmark[1]	150
April 2003 Background Assessment[2]	--
September 2002 WTC Indoor Assessment[3]	
Tier I	>9,000
Tier II	9,000 to 300 (or background)
Tier III	<300 (or background)

References:

[1]*World Trade Center Indoor Environment Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks.* Contaminants of Potential Concern (COPC) Committee. United States Environmental Protection Agency, May 2003.

[2]*World Trade Center Background Study Report, Interim Final*. United States Environmental Protection Agency, Region 2, April 2003.

[3]*World Trade Center Indoor Air Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks.* Contaminants of Potential Concern (COPC) Committee of the World Trade Center Indoor Air Taskforce Working Group. Peer Review Draft, September 2002.

Table 8
Fireproofing - Man Made Vitreous Fibers (MMVF)
MMVF Bulk (EMSL MSD 0310)

Fireproofing Samples
LMDC
130 Liberty Street
February 10, 2004

Sample ID	Lab Sample ID	Sample Date	Sample Type	Floor	Zone	MMVF (Percent)	Sample Weight (grams)	MMVF (grams)
Curtain wall								
KD-7-Bulk-MMVF-FP-001	360401087-0001	12/3/2004	Wipe	7	2	15.00	28.13	4.22
KD-7-Bulk-MMVF-FP-002	360401087-0002	12/3/2004	Wipe	7	2	<0.1	25.21	<0.03
KD-7-Bulk-MMVF-FP-003	360401087-0003	12/3/2004	Wipe	7	2	10.00	21.76	2.18

	str/cm2
Arithmetic Mean (ND=1/2)	2.14
May 2003 Benchmark[1]	n/a
April 2003 Background Assessment[2]	--
September 2002 WTC Indoor Assessment[3]	
Tier I	>100,000
Tier II	100,000 to background
Tier III	background

References:

[1] *World Trade Center Indoor Environment Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks.* Contaminants of Potential Concern (COPC) Committee. United States Environmental Protection Agency, May 2003.

[2] *World Trade Center Background Study Report, Interim Final*. United States Environmental Protection Agency, Region 2, April 2003.

[3] *World Trade Center Indoor Air Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks.* Contaminants of Potential Concern (COPC) Committee of the World Trade Center Indoor Air Taskforce Working Group. Peer Review Draft, September 2002.