Damage Assessment
130 Liberty Street Property

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Insurers' Testing Program
Interior Wall Cavities

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1.0 Summary

The World Trade Center destruction commencing on September 11, 2001 ("WTC Event") physically destroyed significant portions of the interior and exterior of the building located at 130 Liberty Street, New York, NY (the "Building"). A gash was created in the north side of the Building; the plaza in front of the Building was crushed which exposed the Level A and Level B Basement areas and the first floor; approximately 1,500 windows were broken; and the Building was exposed to the elements as well as being filled with a combination of soot, dust, dirt, debris, and contaminants. For a period of time following the WTC Event, the Building owner, Deutsche Bank Trust Company Americas (the "Bank"), was precluded by the City of New York from entering the Building. After the Bank gained access to the Building, the Bank retained the services of engineering firms to assess the physical damage. Additionally, an environmental firm was retained to conduct limited sampling for asbestos, heavy metals, and biological contaminants.

In April of 2002, RJ Lee Group was retained by the law firm of Pitney Hardin Kipp & Szuch LLP, on behalf of the Bank, to oversee and investigate the presence, type, amount, and extent of environmental contaminants in the Building and to recommend remediation strategies. The findings set forth in this report are based upon RJ Lee Group's review of the results of its own extensive set of analyses, its background, experience, and education in this area, as well as its study of recognized scientific literature.

On behalf of the insurers, Young Laboratories ("Insurers' representatives") conducted tests of the contamination levels within the Building. Insurers' representatives measured contamination levels within the partition walls and curtain walls as well as the Building's occupied spaces. The approach consisted of constructing positive-pressure enclosures to protect the areas under investigation from contamination present in the remaining portions of the Building. Details of the enclosure construction can be found in Section 1.2 of this report. The Bank never received final written protocols which detailed the sample collection and laboratory testing methods to be used by the Insurers' representatives.

1.1 Investigation

The Insurers' representatives constructed a total of 14 positive-pressure enclosures ("cells") throughout the Building that isolated the test location from the remaining portions of the Building. The protocol used by the Insurers' representatives defined procedures to enable the sampling of partition wall cavities.

After cell construction and subsequent cleaning of the exposed surfaces within the cell, a section of drywall was cut out, exposing the interior wall cavity for sampling. Samples were then collected from the interior surface of the interior wall cavity. RJ Lee Group performed its own side-by-side sampling in all cells. This report presents the results of the analysis of these samples and is produced in support of the physical damage claim of Taunus Corporation under its insurance policies.

This report refers to "Appropriate Level" for contaminants periodically. A detailed description of what constitutes the "Appropriate Level" for contaminants and the methodology as to how these levels were established can be found in Dr. Phillip Goad's "Determination of Appropriate Levels for Surfaces in the Building" report, as well as, RJ Lee Group's "Background Levels in Buildings" report. Appropriate Levels were determined as clearance standards for remediation of the Building and were selected for contaminants of concern emanating from the WTC Event by an extensive review of scientific literature, and samples taken from the Background Buildings and from the Building. For each selected contaminant, the Appropriate Level at the 95-95% upper tolerance limit[1] was established (the "Maximum Appropriate Level") and an Appropriate Level at the average was established (the "Average Appropriate Level"). To reach clearance, a surface must have no readings above the Maximum Appropriate Level and the average readings must be at or below the Average Appropriate Level.

[1] The 95-95% UTL (Upper Tolerance Limit) refers to the upper limit of the calculated range in which 95% of all values are expected to occur, calculated for a stated confidence of 95%.

1.2 Cell Design and Construction

Before construction of each cell, the Insurers' representatives removed office furniture and articles that interfered with the path to the barrier walls. Cells were constructed from wooden 2"x4" frames covered with 6 mil. polyethylene and duct tape. Foam spray was used to seal all gaps and joints within the cells, and a HEPA filtered fan unit was used to maintain a positive pressure within the cell, to minimize contamination from the Building (**Figure 1**). The cells were located in various areas throughout the Building as shown in **Table 1**. The basic layout of a typical interior wall cavity cell (IWC-cell) is shown in **Figure 1**.

Table 1. Interior Wall Cavity Cell Locations

IWC-Cell No.	Floor	Grid Overlay
1	3	22
2	7	27
3	12	15
4	17	9, 16
5	21	8, 9
6	24	6, 41, 48
7	26	46, 39
8	28	17, 9
9	30	3, 4, 5, 10
10	33	4, 11
11	34	11, 12
12	37	3, 4
13	34	18
14	37	11

Figure 1. Example of an interior wall cavity cell

1.3 Testing Protocol

The Insurers' representative and RJ Lee Group, in a side-by-side manner, collected samples in the interior wall cavities of the respective cells. The RJ Lee Group results of samples taken during the Insurers' representatives' testing protocol are summarized in the following pages.

Samples were analyzed using industry standard analytical laboratory methods as follows:

- Samples were analyzed for asbestos using transmission electron microscopy (TEM) in accordance with ASTM D-5755.
- Samples were analyzed for metals in accordance with NIOSH 7300 method, using inductively coupled argon plasma (ICP) spectrometry.
- Samples were analyzed for mercury in accordance with EPA Method SW 846 7471A, using cold vapor atomic absorption (CVAA).
- Samples were analyzed for PCBs in accordance with EPA Method SW 846 8082 using gas chromatography with electron capture detectors (GC/ECD).
- Samples were analyzed for PNAs in accordance with EPA Method SW 846 8270C using gas chromatography with mass spectrometry (GC/MS).
- Samples were analyzed for dioxins/furans in accordance with EPA Method SW 846 8290 using gas chromatography with high-resolution mass spectrometry (GC/HRMS).

- Samples were analyzed for particle characteristics using scanning electron microscopy (SEM), coupled with energy dispersive spectroscopy (EDS) techniques.

1.4 Findings

The following represent the overall major conclusions regarding the interior wall cavity cell sampling:

- The concentrations of WTC Hazardous Substances found in wall cavities during the Insurers' representatives' investigation are consistent (within an order of magnitude) with the results reported in the Interior Wall Cavities Contamination Report (CR-06), except for PNAs and PCBs.
- The concentrations of WTC Dust and WTC Hazardous Substances in the interior wall cavity far exceed the Appropriate Levels, except PNAs and PCBs.

Figure 2 shows WTC Hazardous Substances and the multiple by which the average and maximum concentrations of the WTC Hazardous Substances exceed their respective Appropriate Levels.

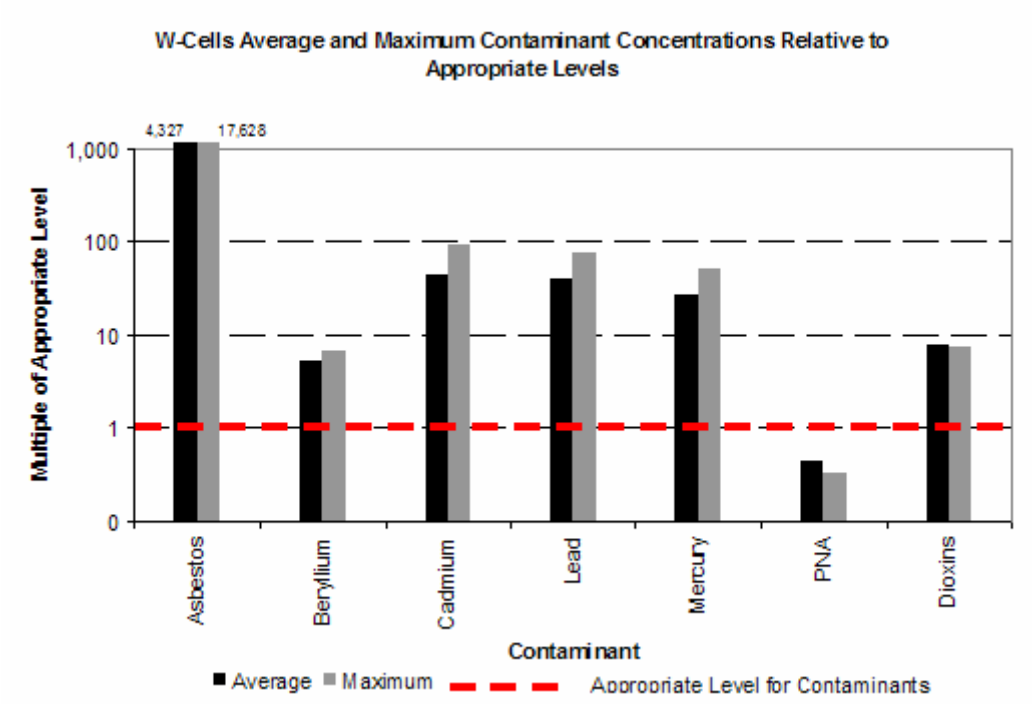

Figure 2. Comparison of WTC Dust and WTC Hazardous Substances to the Appropriate Level for Contaminants

The following represent the major analytical results from the interior wall cavity sampling:

- WTC Dust and WTC Hazardous Substances are present in the interior wall cavities of the test cells.
- The average and maximum asbestos concentrations in the interior wall cavities of the test cells are 4,327 times and 17,628 times higher than the Average and Maximum Appropriate Level, respectively.
- The average and maximum lead concentrations are 42 times and 77 times the Average and Maximum Appropriate Level, respectively.
- The average and maximum cadmium concentrations are 43 and 92 times the Average and Maximum Appropriate Level, respectively.
- The average and maximum mercury concentrations are 26.6 and 50 times the Average and Maximum Appropriate Level, respectively.
- The average and maximum dioxins/furans concentrations are 7.8 and 7.4 times the Average and Maximum Appropriate Level, respectively.
- PNAs and PCBs were below the Average and Maximum Appropriate Level. PCBs were below the detection limits of the methods used for analysis.

Figure 3 compares the WTC Dust Signature, as derived from the Interior Wall Cavities Protocol (TP-06) with the average dust compositions present within the Insurers' curtain wall cavity testing cells and within Background Buildings. There is a high correlation between CR-06 data and the testing performed within the Insurers' testing cells, indicating that the dust shares a common source, and hence, both are WTC Dust. The figure also demonstrates the substantial difference between dust from the Background Buildings unaffected by the WTC Event and the Building's interior wall cavities.

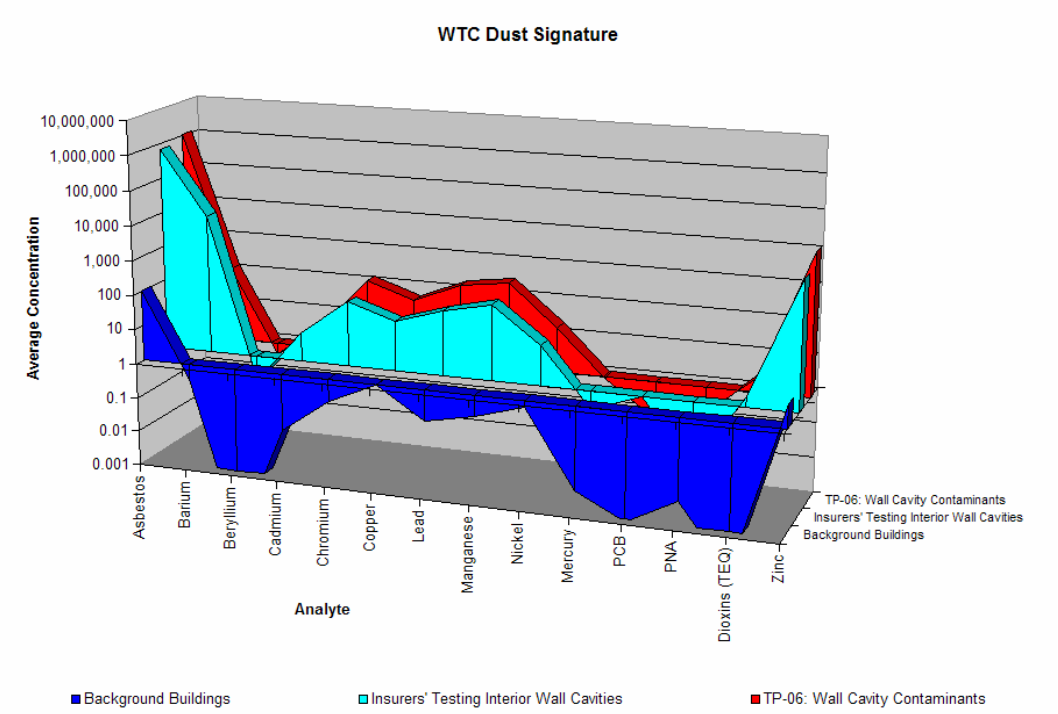

Figure 3. WTC Dust comparison of TP-06, the Insurers' interior wall cavities and Background Buildings

2.0 Levels and Distribution of Contaminants in Interior Wall Cavities from Insurers' Test Cells

All interior surfaces of the test cells were cleaned prior to the wall cavity being opened to minimize cross-contamination. Sampling for asbestos, metals, mercury, PCBs, dioxins/furans and PNAs were conducted; the results are described below.

2.1 Asbestos

A total of 28 wipe samples from interior wall cavities were analyzed for asbestos. **Table 2** presents the descriptive statistics for asbestos concentrations in interior wall cavities. The following represents the major conclusions:

- The interior wall cavities are contaminated with asbestos.
- The average concentration of asbestos in interior wall cavities of 675,000 s/cm^2 is 4,327 times above the Average Appropriate Level.
- The maximum concentration of asbestos in interior wall cavities of 14,120,000 s/cm^2 is 17,628 times above the Maximum Appropriate Level.

Table 2. Asbestos concentrations in interior wall cavities

Type of Sample	Sample Count	Concentration [s/cm^2]		
		Average	Max.	95% UTL
Interior Wall Cavity	28	675,000	14,120,000	7,723,000
Appropriate Level:		156	801	

2.2 Metals and Mercury

Fourteen interior wall samples were collected for metals analysis and 13 were collected for mercury analysis. The following presents the major conclusions:

Cadmium

The descriptive statistics for the cadmium sampling are presented in **Table 3**. The following presents the major conclusions:

- The interior wall cavities are contaminated with cadmium.
- The average concentration of cadmium within the interior wall cavities of 6.5 µg/ft^2 is 43 times above the Average Appropriate Level.

- The maximum concentration of cadmium within the interior wall cavities of 86.2 µg/ft² is approximately 92 times above the Maximum Appropriate Level.

Table 3. Cadmium concentrations in interior wall cavities

Type of Sample	Sample Count	Concentration [µg/ft²]		
		Average	Max.	95% UTL
Interior Wall Cavity	14	6.5	86.2	81.5
Appropriate Level:		0.15	0.94	

Lead

The descriptive statistics for the lead sampling are presented in **Table 4.** The following presents the major conclusions:

- The interior wall cavities are contaminated with lead.
- The average concentration of lead in interior wall cavities of 73.9 µg/ft² is 41 times above the Average Appropriate Level.
- The maximum concentration of lead in interior wall cavities of 729 µg/ft² is 77 times above the Maximum Appropriate Level.

Table 4. Lead concentrations in interior wall cavities

Type of Sample	Sample Count	Concentration [µg/ft²]		
		Average	Max.	95% UTL
Interior Wall Cavity	14	73.9	729	698
Appropriate Level:		1.82	9.46	

Mercury

The descriptive statistics for the mercury sampling are presented in **Table 5**. The following presents the major conclusions:

- The interior wall cavities are contaminated with mercury.
- The average concentration of mercury in interior wall cavities of 0.293 µg/ft² is 26.6 times above the Average Appropriate Level.
- The maximum concentration of mercury in interior wall cavities of 3.34 µg/ft² is 50 times above the Maximum Appropriate Level.

Table 5. Mercury concentrations in interior wall cavities

Type of Sample	Sample Count	Concentration [µg/ft^2]		
		Average	Max.	95% UTL
Interior Wall Cavity	13	0.293	3.34	3.317
Appropriate Level:		0.011	0.067	

2.3 Polychlorinated Biphenyls (PCBs)

A total of 13 wipe samples from interior wall cavities were analyzed for PCBs. The samples collected from the interior wall cavities were below the analytical detection limits for PCBs.

2.4 Polynuclear Aromatics (PNAs)

A total of 13 wipe samples from interior wall cavities were analyzed for PNAs. **Table 6** presents descriptive statistics for PNAs in interior wall cavities and the following represent the major conclusions:

- The average concentration of PNAs measured in interior wall cavities in the locations sampled in this study of 0.015 µg/100 cm^2 is below the Average Appropriate Level.
- The maximum concentration of PNAs measured in interior wall cavities in the locations sampled in this study of 0.096 µg/100 cm^2 is below the Maximum Appropriate Level.

Table 6. PNA concentrations in interior wall cavities

Type of Sample	Sample Count	Concentration [µg/100 cm^2]		
		Average	Max.	95% UTL
Interior Wall Cavities	13	0.015	0.096	0.131
Appropriate Level:		0.035	0.29	

2.5 Dioxins/Furans

A total of 13 wipe samples from interior wall cavities were analyzed for dioxins/furans. Dioxins/furans toxicity equivalent (TEQ) values were calculated for each sample using toxicity equivalent factors (Van den Berg et al., 1998). Dioxins/furans TEQ values in the interior wall cavities are presented in **Table 7** and the following represents the major conclusions:

- The interior wall cavities are contaminated with dioxins/furans.

- The average concentration of dioxins/furans in interior wall cavities of 1.95 pg/100 cm^2 is 8 times above the Average Appropriate Level.
- The maximum concentration of dioxins/furans in interior wall cavities of 13.6 pg/100 cm^2 is 7 times above the Maximum Appropriate Level.

Table 7. Dioxins/furans concentrations in interior wall cavities

Type of Sample	Sample Count	Concentration [pg/100 cm^2]		
		Average	Max.	95% UTL
Interior Wall Cavity	13	1.95	13.6	16.5
Appropriate Level:		0.25	1.83	

2.6 Dust Characterization

The identification of WTC Dust is based on the presence of certain WTC Dust Markers, which are described more fully in the RJ Lee Group "WTC Dust Signature" reports. Characterization of WTC Dust by RJ Lee Group and other groups (Chatfield and Kominsky, 2001; USEPA, 2002) shows that some of the major components of the WTC Dust include the following chemical and morphological features[2]:

- Chrysotile asbestos fibers (**Figure 4**)
- Gypsum (fine) (**Figure 5**)
- Mineral wool (**Figure 6**)
- Indicators of high temperature (e.g., spherical iron/metal/silicate and vesicular carbonaceous particles resulting from heated plastics) (**Figure 7**).

[2] The representative images of observed WTC Dust Markers in this section are taken from samples collected in the interior wall cavities of the Insurer's test cells.

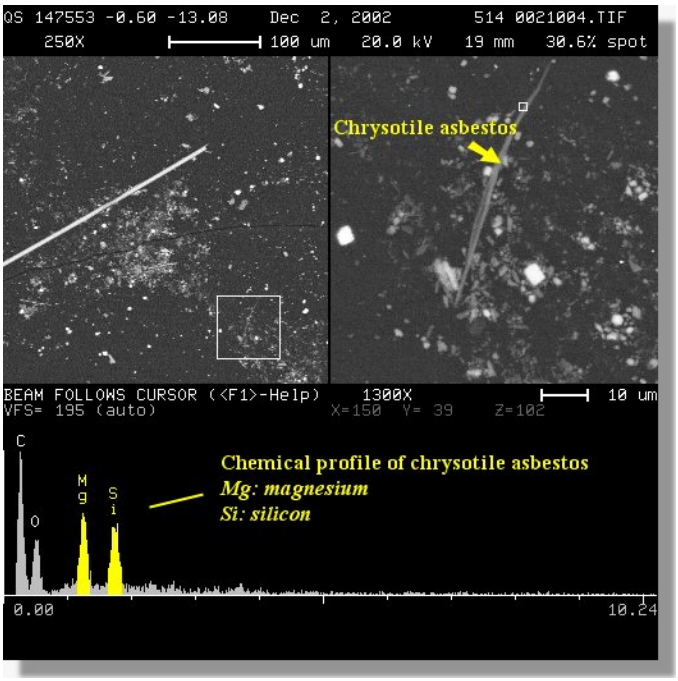

Figure 4. SEM image and EDS of chrysotile asbestos

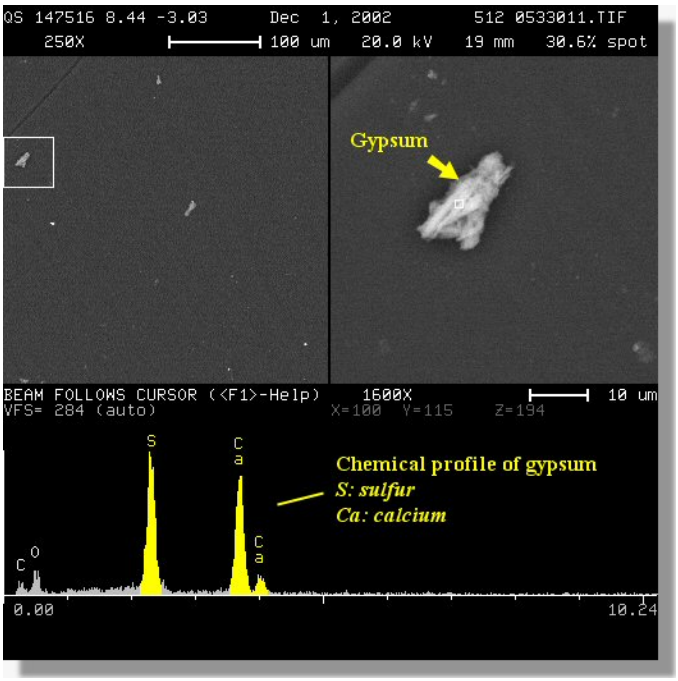

Figure 5. SEM image and EDS of gypsum

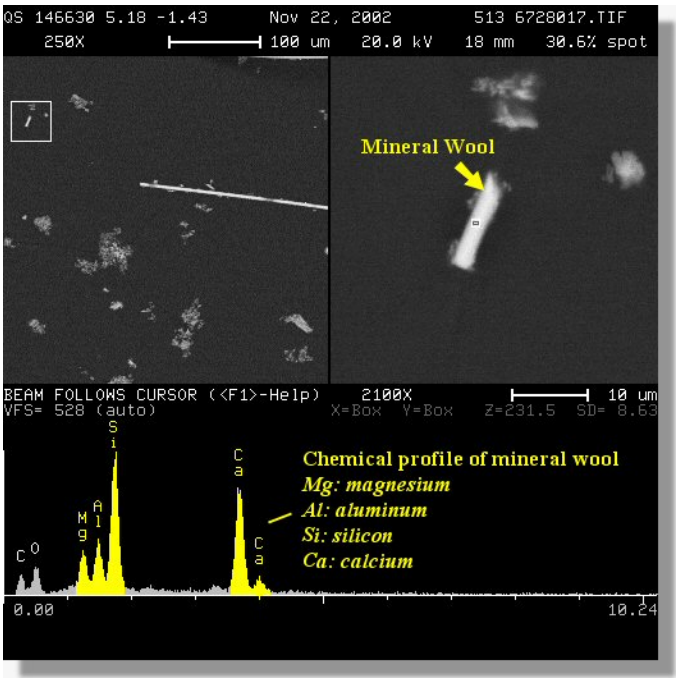

Figure 6. SEM image and EDS of mineral wool

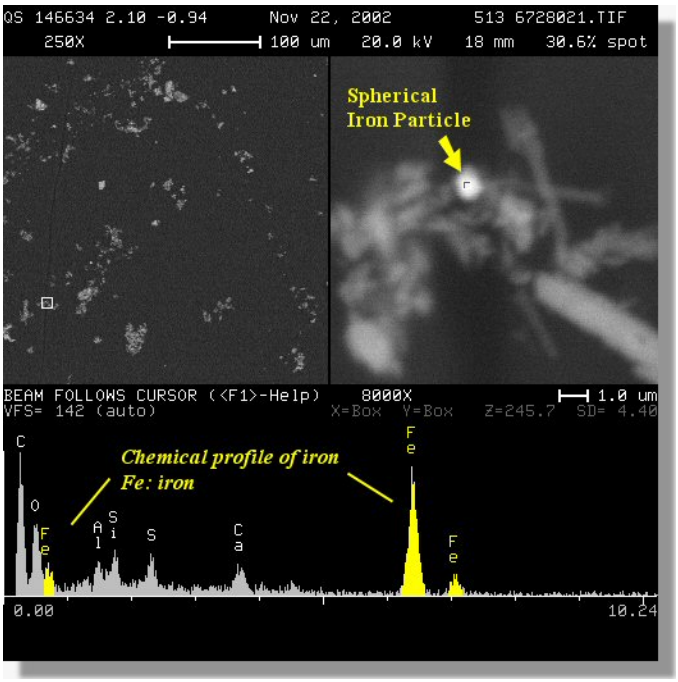

Figure 7. SEM image and EDS of spherical iron particle

WTC Dust Markers were observed in 67% of interior wall cavity samples (**Table 8)**. The percent of positive observations of WTC Dust Markers in the Insurers' test cells is similar to the percent of positive observations in the interior wall cavities under TP-06 (67% versus 86.5%).

Table 8. WTC Dust Markers in interior wall cavities

Location	Count	% of Samples
Interior Wall Cavities of Cells	24	67
Interior Wall Cavities of TP-06	207	86.5

3.0 Sampling Procedures

Prior to entering the Test Cells, sampling kits containing sampling media, containers, and labels were assembled (**Figure 8**).

Figure 8. Sampling kit, bagged to prevent contamination

3.1 Sample Analysis

Samples were analyzed using industry standard analytical laboratory methods as described below.

- Samples were analyzed for asbestos using transmission electron microscopy (TEM) in accordance with ASTM 5755.
- Samples were analyzed for metals in accordance with NIOSH 7300 method, using inductively coupled argon plasma (ICP) spectrometry.
- Samples were analyzed for mercury in accordance with EPA Method SW 846 7471A, using cold vapor atomic absorption (CVAA).
- Samples were analyzed for PCBs in accordance with EPA Method SW 846 8082 using gas chromatography with electron capture detectors (GC/ECD).
- Samples were analyzed for PNAs in accordance with EPA Method SW 846 8270C using gas chromatography with mass spectrometry (GC/MS).
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- Samples were analyzed for particle characteristics using scanning electron microscopy (SEM), coupled with energy dispersive spectroscopy (EDS) techniques