

**INDOOR AIR QUALITY INVESTIGATION
44 WALL STREET
NEW YORK, NY**

November 13, 2001

Prepared For:

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PROJECT NUMBER N3-7476

**Hillmann Environmental Group, LLC**

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NOVEMBER 13, 2001

INDOOR AIR QUALITY INVESTIGATION

PROJECT NUMBER: N3-7476

SUBJECT PROPERTY: 44 Wall Street
New York, NY

DATES OF SITE ASSESSMENT: September 15, 2001
September 21, 2001
October 4, 2001
October 5, 2001

ASSESSMENT PERSONNEL: Jennifer L. Collins, IH
Environmental Specialist
HILLMANN ENVIRONMENTAL GROUP, LLC

REPORT REVIEWED BY: _____
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SECTION 1 – EXECUTIVE SUMMARY

1.1 General

On four dates, Ms. Jennifer L. Collins, IH of Hillmann Environmental Group, LLC (Hillmann), conducted an Indoor Air Quality Investigation at 44 Wall Street, New York, New York. The investigation is designed to identify indoor air quality contaminants as well as any residual effects from the recent World Trade Center Collapse.

Hillmann's site investigator performed a visual inspection for conditions that could negatively impact indoor air quality. The investigator measured temperature, relative humidity, carbon dioxide, carbon monoxide, volatile organic compounds, hydrogen sulfide, oxygen, combustible gasses, and collected airborne asbestos fiber and bulk asbestos samples.

1.2 Findings

- On the days of the investigation, inside the building, temperature and relative humidity readings were collected. Temperatures ranged from 69°F to 78°F and relative humidities ranged from 39% to 69%. The American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE) recommends that temperatures stay within the range of 66°F to 76°F and that relative humidities stay within the range of 30% to 60%. Temperatures and relative humidities were above the recommended range in some instances.
- Carbon dioxide levels ranged from 521 ppm to 1044 ppm. ASHRAE recommends carbon dioxide levels remain below an outdoor reading plus 700 ppm. The outdoor readings ranged from 521 ppm to 535 ppm, therefore the recommended limits were 1221 ppm to 1235 ppm. Carbon dioxide levels did not exceed the recommended range.
- Observed carbon monoxide levels ranged from below the limit of detection of 1 ppm to 2 ppm. These levels are well below the recommended limits, including the Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) of 9 ppm.
- Levels of volatile organic compounds ranged from below the limit of detection of 0.1 ppm to 7.4 ppm. Hillmann recommends that levels of volatile organic compounds remain below three times the background outdoor reading. Since the outdoor readings taken during the investigations were below the limit of detection of 0.1 ppm, the recommended limit would be 0.3 ppm. The only elevated reading occurred in the penthouse area during the time roof repair was occurring. This elevated level had returned to below the recommended limit on a follow-up visit.
- Hydrogen sulfide is a colorless gas with a strong odor that can often be present during or after a fire. The Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) is 10 ppm. In the subject space, levels were found to be below the limit of detection of 1 ppm. These levels were below recommended limits.
- The normal level of oxygen in air, at sea level, is 20.9%. If oxygen levels in a space are at or below 19.5%, the space is considered oxygen deficient (by OSHA 29 CFR Part 1910.94, 30 CFR Part 11 and ANSI Standard Z88.5-1973) and is unable to safely support human occupancy. The oxygen levels ranged from 20.7% to 21.2%, and were within normal levels.

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- Levels of combustible gasses (LEL) should remain below 1% and never exceed 10% in an occupied space. Levels of combustible gasses in the subject space remained below the limit of detection of 1%.
- Levels of airborne asbestos fibers ranged from below the limit of quantification of 0.004 fibers/cc to 0.005 fibers/cc, and were well below the EPA National Emission Standard for Hazardous Air Pollutants (NESHAP) standard of 0.01 fibers/cc. Dust samples were also taken in the subject space and analyzed for asbestos structures. After cleaning the facility of debris from the World Trade Center collapse, no asbestos fibers were detected in the samples.
- Bulk samples of dust and debris were collected and analyzed for asbestos content. No asbestos was identified in the collected samples.

1.3 Recommendations

Based on these results, Hillmann finds no characteristics of the Indoor Air Quality that require immediate remediation. Elevated temperatures and relative humidities do have the potential to cause occupant discomfort. However, these elevated readings occurred when ventilation systems were not fully functioning due to outside odors. If tenant complaints occur, it is recommended that thermostats be adjusted to remain within recommended levels.

SECTION 2 - INTRODUCTION

2.1 General. Hillmann Environmental Group, LLC performed an Indoor Air Quality Investigation at the request of Mr. Joseph Rizzuto, of Cushman & Wakefield, as a result of the recent World Trade Center collapse. This survey was performed in 44 Wall Street, New York, NY.

On four dates, Hillmann's site investigator, Jennifer L. Collins, IH, performed a visual inspection and conducted air sampling of the subject space to identify conditions that could negatively impact indoor air quality. Sampling was conducted on September 15th, 21st and October 4th and 5th, 2001.

Indoor air quality problems are caused by the combination of many factors and contaminants, including temperature, relative humidity, carbon dioxide, carbon monoxide, dust, microorganism growth, formaldehyde, ozone, nitrous oxides and hydrogen sulfide.

The inspection and sampling are performed by trained industrial hygienists using Environmental Protection Agency (EPA) and National Institute for Occupational Safety and Health (NIOSH) sampling techniques. Samples are analyzed at an appropriately accredited laboratory. These samples, representative of a narrow time frame, are for screening purposes only and are not intended to represent definitive exposure levels.

2.2 Sampling Parameters and Methodology. The chosen sampling parameters were temperature, relative humidity, carbon dioxide, carbon monoxide, volatile organic compounds, hydrogen sulfide, oxygen, combustible gasses and airborne asbestos. Hillmann selected the sampling parameters based on consultations with the client, the laboratories performing the analysis and our in-house experts. The inspection is a general screening to identify if potential hazards exist.

The industrial hygienist employed a sampling scheme that is representative of the average working environment and accounts for the entire subject space. Sampling parameters were based on common indoor air pollutants.

I. Temperature, relative humidity (RH), carbon dioxide (CO₂) and carbon monoxide (CO) levels are measured using a TSI Q-Track 8551 direct reading monitor. The monitor measures CO₂ from 0 ppm to 5000 ppm in 1 ppm increments and CO from 0 ppm to 500 ppm in 1 ppm increments.

II. Volatile Organic Compound Levels were measured by using a direct reading Rae Systems Mini Rae 2000 Photo Ionization Detector (P.I.D.). The P.I.D. has a range of 0 to 2000 mg/m³ and an accuracy of ± 2 mg/m³ or 10% of the reading. The P.I.D. semi-quantifies volatile organic compound levels by ionizing these compounds using an electrodeless 10.6 eV ultraviolet discharge lamp. The ionized compounds give off an electrical signal that is translated into a reading. The investigator compares the readings taken within the subject space to a background reading, taken outside. The limit of detection of the P.I.D. is 0.1 mg/m³.

III. Hydrogen Sulfide (H₂S) concentrations were analyzed utilizing a Rae Systems Multi-Rae Four Gas meter. The range and limits of detection for this meter depends on the gasses being tested for. The Hydrogen Sulfide range is 0-100 ppm and a 1.0 ppm limit of detection.

IV. Oxygen (O₂) levels were measured using a Multi-Rae Four Gas meter with a limit of detection of 0.1%.

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V. Combustible Gasses (LEL) concentrations were analyzed using a Rae Systems Multi-Rae Four Gas meter that has a 0-100% range and a limit of detection of 1.0%.

VI. Airborne Asbestos concentrations are determined by drawing air through a 25 mm TEM cassette, for a minimum of 1300 Liters. The samples are then analyzed by Transmission Electron Microscopy, conducted by an appropriately accredited laboratory, in accordance with NIOSH Method 7402. 10% of the samples analyzed by PCM are also analyzed by TEM. The 10% are selected at random.

VII. Bulk samples were collected following EPA recommended sample collection procedures.

SECTION 3 - RESULTS

3.1 Temperature, Relative Humidity, Carbon Dioxide, Carbon Monoxide, Volatile Organic Compounds, Hydrogen Sulfide, Oxygen and Combustible Gasses.

Investigation Date: September 15, 2001*

Location	Time	Temp (°F)	RH	CO ₂ (ppm)	CO (ppm)	VOCs (ppm)	H ₂ S (ppm)	O ₂ (%)	LEL (%)
Target Range		66 ⁰ to 76 ⁰	30% to 60%	<1235	<9.0	<0.3	<10	>19.5	<0.1
Lobby	12:02	69°	39%	521	1	LOD	LOD	20.7	LOD

Investigation Date: September 21, 2001

Location	Time	Temp (°F)	RH	CO ₂ (ppm)	CO (ppm)	VOCs (ppm)	H ₂ S (ppm)	O ₂ (%)	LEL (%)
Target Range		66 ⁰ to 76 ⁰	30% to 60%	<1221	<9.0	<0.3	<10	>19.5	<0.1
24 th Floor	12:04	78°	54%	950	1	7.4**	LOD	20.8	LOD
17 th Floor, Near Freight	12:08	77°	53%	1044	2	LOD	LOD	21.1	LOD
17 th Floor, Capstone Space	12:11	76°	51%	1007	2	LOD	LOD	21.1	LOD
11 th Floor, Reception of Costello, Shea & Gaffney	12:14	78°	69%	878	2	LOD	LOD	21.1	LOD
5 th Floor, Empty Space	12:16	76°	61%	771	2	LOD	LOD	21.1	LOD

Investigation Date: October 4, 2001

Location	Time	Temp (°F)	RH	CO ₂ (ppm)	CO (ppm)	VOCs (ppm)	H ₂ S (ppm)	O ₂ (%)	LEL (%)
Target Range		66 ⁰ to 76 ⁰	30% to 60%	<1232	<9.0	<0.3	<10	>19.5	<0.1
Lobby	14:20	77°	50%	766	LOD	LOD	LOD	21.1	LOD
Penthouse	14:26	75°	51%	902	LOD	LOD	LOD	20.9	LOD
17 th Floor, Capstone Group	14:32	77°	50%	777	LOD	LOD	LOD	21.1	LOD
16 th Floor	14:35	77°	49%	870	LOD	LOD	LOD	21.1	LOD
9 th Floor	14:39	75°	48%	835	LOD	LOD	LOD	21.1	LOD
6 th Floor	14:42	75°	50%	794	LOD	LOD	LOD	21.2	LOD

LOD= Measurement was below the Limit of Detection for the method used.

*= Building floors remained closed due to power outages.

**= Elevated reading can be attributed to adjacent roofing activities.

3.2 Outside & Supply Measurements**Investigation Date: September 15, 2001**

TIME	TEMP. (°F)	RH	CO ₂ (ppm)	CO (ppm)	VOCs (ppm)
12:06	71°	38%	535	2	LOD

Investigation Date: September 21, 2001

TIME	TEMP. (°F)	RH	CO ₂ (ppm)	CO (ppm)	VOCs (ppm)
12:20	73°	42%	521	LOD	LOD

Investigation Date: October 4, 2001

TIME	TEMP. (°F)	RH	CO ₂ (ppm)	CO (ppm)	VOCs (ppm)
14:55	68°	39%	532	LOD	LOD

3.3 Airborne Asbestos Fiber Sample Results

Location	Date Sampled	Asbestos by TEM (struct/cc)
Recommended Limit		0.01
Mezzanine, Back Area	9/21	0.003
Mezzanine, Adjacent to Elevator	9/21	<0.002
Penthouse Level, Large Meeting Room	9/21	<0.002
Penthouse Level, Adjacent to Entrance	9/21	<0.002
Elevator Lobby	9/21	<0.002
Lobby, Adjacent to Entrance	9/21	<0.002
A Level/ Adjacent to D Stairwell	9/21	<0.002
6 th Floor, West Main Area	9/21	<0.002
9 th Floor, Middle of Main Area	9/21	<0.002
22 nd Floor, West Area	9/21	<0.002
Stairwell A, by 16 th Floor	9/21	<0.002
18 th Floor, East	9/21	<0.002
Penthouse, Adjacent to Fireplace	10/4	0.002

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Location	Date Sampled	Asbestos by TEM (struct/cc)
Lobby, Rear	10/4	0.002
Basement, Elevator Pit	10/5	0.005
24 th Floor, Machine Room	10/5	<0.004
Charles Schwaab Space	10/5	<0.004
Wall Street Rarities	10/5	<0.004

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Bulk Sample Results

Location	Contents	Percent
Basement, Elevator Pit	No Asbestos Detected	--
24 th Floor, Machine Room	No Asbestos Detected	--
24 th Floor, Penthouse	No Asbestos Detected	--
Charles Schwaab Space	No Asbestos Detected	--
Wall Street Rarities	No Asbestos Detected	--
Lobby	No Asbestos Detected	--
9 th Floor, Window Ledge	No Asbestos Detected	--

SECTION 4 – DISCUSSION

While on site, Hillmann performed various types of air sampling and observed work conditions.

4.1 Temperature

The American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE) recommends temperatures be kept between 66°F and 76°F. In the occupied space, temperatures ranged from 69°F to 78°F, and were above the recommended range in many areas.

4.2 Relative Humidity

ASHRAE recommends relative humidity range between 39% to 69%. Relative humidity levels in the subject space ranged from 39% to 64% and were above the recommended range in some areas.

4.3 Carbon Dioxide

ASHRAE recommends carbon dioxide levels remain below an outdoor reading plus 700 ppm. The outdoor readings ranged from 521 ppm to 535 ppm, therefore the recommended limits were 1221 ppm to 1235 ppm. Carbon dioxide levels ranged from 521 ppm to 1044 ppm. Carbon dioxide levels did not exceed the recommended range.

4.4 Carbon Monoxide

Carbon monoxide, a colorless, odorless gas, is a by-product of incomplete combustion. Carbon monoxide combines with hemoglobin in the blood to cause carboxyhemoglobin poisoning. Carbon monoxide can be released by many different sources such as: motor vehicle exhaust (intakes for the ventilation system located near a loading dock), tobacco smoke, and cracked exchangers on gas-fired heating appliances. The standards for Carbon Monoxide are the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) of 35 ppm, the Occupational Safety and Health Administration (OSHA) Permissible Exposure Level (PEL) of 35 ppm, and the Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) of 9 ppm. Carbon monoxide levels measured in the occupied areas ranged from below the limit of detection of 1 ppm to 2 ppm, and were below the recommended limits.

4.5 Volatile Organic Compounds

Volatile organic compounds are carbon-containing compounds that boil at temperatures low enough that they can become gasses under normal conditions. They are frequently used as solvents and cleaners and can be given off by such materials as plastics and wiring insulation, especially if these materials are heated. Volatile organic compounds were measured by Photo Ionization Detector (P.I.D.). Hillmann recommends that levels detected by P.I.D. remain below three times the outdoor reading. Since the outdoor reading was below the limit of detection of 0.1 ppm, the recommended limit would be 0.3 ppm. In the subject space, levels were found to range from below the limit of detection of 0.1 ppm to 7.4 ppm. Levels measured by P.I.D. remained below this limit except for one reading in the Penthouse. However, this elevated reading can be attributed to adjacent roofing work that was occurring at the time of the investigation. A follow-up reading showed that levels had returned to normal.

4.6 Hydrogen Sulfide

Hydrogen sulfide is a colorless gas with a strong odor. This gas can be found during or after fires, and can cause varying complaints from headaches to nausea. The OSHA Permissible Exposure Limit (PEL) is 10 ppm. Levels of hydrogen sulfide in the subject space remained below the limit of detection of 1 ppm on all investigated days, and therefore below the recommended limits.

4.7 Oxygen

Oxygen is a normal and vital constituent of our atmosphere. The normal level of oxygen in air, at sea level, is 20.9%. If oxygen levels in a space are at or below 19.5%, the space is considered oxygen deficient (by OSHA 29 CFR Part 1910.94, 30 CFR Part 11 and ANSI Standard Z88.5-1973) and is unable to safely support human occupancy. The oxygen levels ranged from 20.7% to 21.2% in the subject space, and were within the recommended range.

4.8 Combustible Gasses

Combustible gasses are combustible, explosive and present a danger as such, especially when contained in a structure. Levels should mostly be below 1% and never exceed 10% in an occupied area. The LEL levels were below the limit of detection of 1.0% in the subject space at all times during the investigation.

4.9 Airborne Asbestos Fibers

Levels of airborne asbestos fibers ranged from below the limit of quantification to 0.005 fibers/cc. The EPA NESHAP standard is 0.01 fibers/cc. Observed levels were well below this limit. Bulk dust samples were also taken from various areas in the subject space to ensure cleaning procedures were effective after the World Trade Center collapse. Asbestos fibers were not detected in any of these samples.

4.10 Bulk Asbestos Samples

The U.S. EPA and NYSDEP define Asbestos Containing Materials (ACM) as any material containing greater than 1% asbestos. No asbestos was identified in the samples collected.

SECTION 5 – CONCLUSIONS AND RECOMMENDATION**5.1 Conclusions**

Hillmann found no characteristics of the Indoor Air Quality that could be anticipated to cause occupant illness or require immediate remediation. Elevated temperatures and relative humidities do have the potential to cause occupant complaints. However, these levels were mostly due to outside conditions, and precautions taken with ventilation systems due to the World Trade Center collapse.

5.2 Recommendations

Based on these results, we have not identified any characteristics of the Indoor Air Quality that would require immediate remediation. Thermostats should be adjusted to remain within the recommended levels.

SECTION 6 – APPENDICES

6.1 List of Abbreviations

AIHA	American Industrial Hygiene Association
ACGIH	American Conference of Governmental Industrial Hygienists
ASHRAE	American Society of Heating, Refrigeration and Air-conditioning Engineers
CDC	Centers for Disease Control
EPA	Environmental Protection Agency
NAAQS	National Ambient Air Quality Standard
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
CFU/m ³	Colony forming units per cubic meter of air
F/cc	Fibrous dust per cubic centimeter of air
HVAC	Heating, ventilation & air-conditioning
mg/m ³	Milligrams per cubic meter of air
PEL	Permissible exposure level. This is the enforceable standard.
pCi/L	Picocuries per liter of air
ppm	Parts per million
TLV	Threshold limit value
TWA	Time weighted average

6.2 References

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