

## **Results of Air and Settled Dust Sampling at 366 Broadway**

### **Introduction**

As part of an ongoing effort to assess environmental impacts following the collapse of the World Trade Center, the New York City Department of Health and Mental Hygiene (DOHMH) and the U.S. Agency for Toxic Substances and Disease Registry (ATSDR) conducted air and surface settled dust sampling in and around 30 residential buildings in lower Manhattan between November 4 and December 12, 2001. On November 30, 2001, settled dust samples were collected from inside two residential units and from one common area. Because there was no visible dust present, no outdoor sample was collected. The samples were analyzed for fibers and minerals commonly found in building construction materials. The results of samples collected from your building, along with the results of the samples collected from comparison residential buildings above 59th Street in Manhattan, are reported below. For a more complete discussion of the results, their limitations, and their meaning we encourage you to read the enclosed Executive Summary or view the complete report on our web page at [www.nyc.gov/health](http://www.nyc.gov/health).

### **Results and Discussion**

Many people from the communities affected by the collapse of the buildings at the World Trade Center reported irritation of the skin, eyes and respiratory tract. For that reason, the air and dust sampling included analysis of substances that may be irritants. Analysis was also conducted of substances (i.e., crystalline silica and asbestos) that are associated with long-term health concerns such as lung disease and lung cancer.

The development of health effects from an exposure to a contaminant depends on how much of the contaminant may be present; how concentrated the contaminant is; how the contaminant enters the body (breathed in, eaten, skin contact); how long a person may be exposed; and the individual differences among people. Unfortunately, there is a lack of environmental exposure standards for most of the materials sampled in this study. Much of what is known about the relationship between mineral and fiber exposures and health effects comes from occupational studies where people have been exposed to varying contaminant levels and periods of time. These studies provide information about the levels at which different health effects have been noted.

Total dust in sampled areas was not measured; however, investigators noted if visible dust was none, slight, or heavy. Most visible dust in sampled areas was slight to none. Data on individual sampling areas are available in the full report. The following tables contain the results of samples collected from your building and those of comparison buildings.

### ***Crystalline Minerals***

#### ***Potential Health Effects***

Exposure to the minerals calcite, portlandite, and gypsum can result in eye, skin, nose, and throat irritation. All of these irritant effects are generally temporary and begin to resolve once exposure ceases. These minerals do not pose long-term health hazards. Exposure to large amounts of the mineral halite (rock salt) can damage tissues. Inhaled mica and crystalline silica (quartz and cristobalite) can become lodged in the lungs and over time irritate the lung tissue and cause scarring. Chronic (on-going) exposure to silica may also contribute to other respiratory illnesses such as lung cancer, emphysema, and obstructive airway disease.

### ***Crystalline Minerals in Air***

Table 1a shows the presence or absence of crystalline minerals in the air in your building. All of the crystalline minerals analyzed in this project are commonly used in building construction materials. *Quartz*, a form of crystalline *silica*, is a naturally occurring mineral and is a component of concrete. *Cristobalite* and *tridymite* are different crystalline forms of silica. *Calcite* and *portlandite* are naturally occurring, alkaline minerals used in cements and mortars. *Gypsum* is a naturally occurring mineral used in plaster, wallboard, and in some concrete. *Mica* is a group of naturally occurring minerals used in paint, joint cements, plastics, roofing, and rubber. *Halite* (also known as rock salt or sodium chloride) is used in ceramic glazes, fire extinguishers, metallurgy, highway de-icing, and table salt.

The particle size determines how deeply a particle can travel into the respiratory tract. Inhalable particles (particulate matter with a average diameter less than 100 micrometers, or PM100) include larger particles that can land in the nose and throat and cause irritation. Smaller thoracic-respirable particles (PM10-PM2.5) can travel deep inside the lungs. The method used to analyze the samples could only estimate the quantity of minerals present in air. These estimated quantities were low for all minerals. Therefore, in the tables below, results are shown as detected or not detected (see full report for estimated values).

Trace amounts of halite were detected in only a few samples and do not indicate potential for health concerns. The levels of mica found were many times lower than occupational health standards and are not likely to contribute to adverse health effects. Short-term exposures to quartz, even for a continuous year of exposure at the highest estimated level found in the air, is not expected to result in any adverse health effects.

**Overall, the mineral components of concrete (quartz, calcite, and portlandite) and wallboard (gypsum, mica, and halite) were sometimes detected in air samples at higher estimated levels in lower Manhattan residential areas than in samples taken at comparison residential areas, where only gypsum was detected. Although sometimes higher than comparison buildings, these levels are still low and do not pose potential health hazards (see Conclusions/Recommendations).**

**Table 1a      Crystalline Minerals in Air for 366 Broadway and the upper Manhattan Comparison Area**

| Minerals in Air | 366 Broadway      |                                   | Comparison Area   |                                    |
|-----------------|-------------------|-----------------------------------|-------------------|------------------------------------|
|                 | Inhalable (PM100) | Thoracic - Respirable (PM4-PM2.5) | Inhalable (PM100) | Thoracic - Respirable (PM10-PM2.5) |
| Quartz          | ND                | ND                                | ND                | ND                                 |
| Cristobalite    | ND                | ND                                | ND                | ND                                 |
| Tridymite       | NA                | NA                                | NA                | NA                                 |
| Calcite         | ND                | ND                                | ND                | ND                                 |
| Portlandite     | ND                | ND                                | ND                | ND                                 |
| Gypsum          | <b>Detected</b>   | <b>Detected</b>                   | <b>Detected</b>   | <b>Detected</b>                    |
| Mica            | ND                | ND                                | ND                | ND                                 |
| Halite          | ND                | ND                                | ND                | ND                                 |

NA = not analyzed      ND = not detected

### ***Crystalline Minerals in Settled Dust***

Table 1b shows the estimated percentages of minerals in settled dust samples that were collected inside your building and when possible in the near vicinity outside of your building. Generally, levels in and around lower Manhattan residences were higher than comparison locations. These findings point to the continued need for frequent cleaning with HEPA vacuums and damp cloths/mops to reduce the potential for exposure.

**Table 1b Crystalline Minerals in Settled Dust for 366 Broadway and the upper Manhattan Comparison Area (percent of mineral in sample)**

| Minerals in Settled Dust | 366 Broadway* |         |              |              | Comparison Area* |         |            |
|--------------------------|---------------|---------|--------------|--------------|------------------|---------|------------|
|                          | Common Area   | Outdoor | Residence #1 | Residence #2 | Common Area      | Outdoor | Residences |
| Quartz                   | ND            | NS      | ND           | ND           | 1                | NS      | 2          |
| Cristobalite             | ND            | NS      | ND           | ND           | ND               | NS      | ND         |
| Tridymite                | ND            | NS      | ND           | ND           | ND               | NS      | ND         |
| Calcite                  | ND            | NS      | ND           | ND           | 0.4              | NS      | 0.9        |
| Portlandite              | ND            | NS      | ND           | ND           | 0.05             | NS      | 0.08       |
| Gypsum                   | 2             | NS      | ND           | 2            | 3                | NS      | 4          |
| Mica                     | ND            | NS      | ND           | ND           | ND               | NS      | 0.08       |
| Halite                   | ND            | NS      | ND           | ND           | ND               | NS      | 0.4        |

\*Results are maximum values found in location

NS = not sampled ND = not detected

### ***Fibers: Asbestos and Synthetic Vitreous Fibers***

#### ***Potential Health Effects***

Exposure to airborne asbestos is known to increase lung cancer and other diseases mostly among occupational groups in the construction, shipyard, and some manufacturing industries. Risk for disease increases as the level of asbestos exposure and the length of time of exposure increase. Although low level, brief exposures to asbestos are very unlikely to result in disease, it is advisable to avoid any exposure. Synthetic vitreous fibers, such as fiberglass, are manmade materials. The primary short-term health effects of exposure to synthetic vitreous fibers (SVF) are skin, upper respiratory tract and eye irritation. Textile and cellulose fibers were also detected in some of the samples. These fibers can also be irritants at very high levels.

#### ***Fibers in Air***

Table 2a describes the results of air sampling for fibers at your building. Phase contrast microscopy (PCM) is used to identify fibers based on size and shape. This technique cannot identify the specific type of fiber. Therefore, the fibers seen by PCM include asbestos fibers as well as other fibers, such as textiles, fiberglass, and cellulose, which might be present. If the results were above the comparison background level using the PCM methodology, additional analysis was performed to determine whether any of the fibers were asbestos (TEM methodology) or synthetic vitreous fibers (SEM methodology).

Overall, when elevated air levels of fibers were found in lower Manhattan (in six areas) the additional analysis showed that the elevations were more likely due to cellulose, textiles, and other fibers rather than asbestos or fibrous glass. Upper respiratory tract irritation due to inhaled fibers has been reported in instances when fiber concentrations were far greater than any of the amounts found in the results of this investigation.

**Table 2a      Fibers in Air for 366 Broadway and the upper Manhattan Comparison Area**  
(fibers per cubic centimeter of air)

| Fibers in Air      | 366 Broadway* |         |              |              | Comparison Area* |         |            |
|--------------------|---------------|---------|--------------|--------------|------------------|---------|------------|
|                    | Common Area   | Outdoor | Residence #1 | Residence #2 | Common Area      | Outdoor | Residences |
| Total Fibers (PCM) | <0.001        | <0.001  | <0.001       | 0.001        | 0.002            | 0.001   | 0.003      |
| Asbestos (TEM)     | NA            | NA      | NA           | NA           | NA               | NA      | NA         |
| SVF (SEM)          | NA            | NA      | NA           | NA           | 0.00004          | 0.00004 | 0.00009    |

\*Results are maximum values found in location

PCM = phase contrast microscopy      TEM = transmission electron microscopy

SEM = scanning electron microscopy      NA = not analyzed      SVF = synthetic vitreous fibers

### ***Fibers in Settled Dust***

Table 2b describes the sampling results for fibers in settled dust at your building. Low levels of asbestos were found in some settled dust samples in Lower Manhattan, primarily below Chambers Street. Polarized light microscopy (PLM), a method that can distinguish between fiber types, was used to determine the presence of synthetic vitreous fibers (SVF) and asbestos. If the presence of asbestos was found at levels of less than 1%, a more sensitive method (TEM methodology) was used to determine the presence of asbestos. Occasionally it was not possible to analyze the material by TEM methodology (e.g. not enough material present). The presence of SVF (primarily fiberglass) was identified in many of the samples collected in lower Manhattan. No SVF or asbestos was detected in the settled dust in comparison areas.

Although the airborne levels of asbestos and SVF did not present a health concern (see Conclusions/Recommendations), the presence of these materials in the settled dust in some locations indicates the need for continued frequent cleaning with HEPA vacuums and damp cloths/mops to reduce the potential for exposure.

**Table 2b      Fibers in Settled Dust for 366 Broadway and the upper Manhattan Comparison Area (percent of fibers in sample)**

| Fibers<br>In Dust | 366 Broadway*  |         |                 |                 | Comparison Area* |         |            |
|-------------------|----------------|---------|-----------------|-----------------|------------------|---------|------------|
|                   | Common<br>Area | Outdoor | Residence<br>#1 | Residence<br>#2 | Common<br>Area   | Outdoor | Residences |
| Asbestos<br>(PLM) | ND             | NS      | ND              | ND              | ND               | NS      | ND         |
| Asbestos<br>(TEM) | ND             | NS      | ND              | ND              | ND               | NS      | ND         |
| SVF<br>(PLM)      | 5              | NS      | 5               | ND              | ND               | NS      | ND         |

\*Results are maximum values found in location

PLM = polarized light microscopy

TEM = transmission electron microscopy

NS = not sampled

ND = not detected

SVF = synthetic vitreous fibers

## Conclusions/Recommendations

The results of air and settled dust samples were compared to a variety of health-based standards and guidelines. Theoretical exposure scenarios were also developed to determine potential impacts. The results of air sampling in your building, and for all of the buildings that were sampled in lower Manhattan, did not show the presence of a public health hazard. However, based on unlikely worst-case assumptions, it is not possible to rule out adverse health effects from chronic, 30 year, exposures to crystalline silica and asbestos.

More asbestos, SVF (primarily fiberglass), mineral components of concrete (quartz, calcite, and portlandite), and mineral components of building wallboard (gypsum, mica, and halite) were found in settled surface dust in many lower Manhattan residential areas when compared to comparison residential areas. The DOHMH and ATSDR, therefore, recommend that people living in lower Manhattan continue frequent cleaning with HEPA vacuums and damp cloths/mops to reduce the potential for exposure. These cleaning methods can prevent substances from becoming airborne and lower the possibility of exposure and long-term health effects.

Lower Manhattan residents concerned about possible World Trade Center-related dust in their residences can request information, cleaning, and/or testing from the U.S. Environmental Protection Agency (EPA) on the agency's World Trade Center web page at [www.epa.gov/wtc](http://www.epa.gov/wtc) and from the EPA hotline, 1-(877)-796-5471.

For a more complete discussion of the results, their limitations, and their meaning we encourage you to read the enclosed Executive Summary or view the complete report on our web page at [www.nyc.gov/health](http://www.nyc.gov/health).