

DRAFT 10/17/01 @ 11:30 a.m.

AIR QUALITY: PARTICULATE MATTER

NOTE: This document was designed to assist public health officials in communicating specific air quality issues to the general public. Additional materials (e.g., fact sheets) will be supplied for public distribution.

Air Quality:

The Environmental Assessment Workgroup, comprised of the Agency for Toxic Substances and Disease Registry (ATSDR), Centers for Disease Control and Prevention (CDC), Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA), is recommending that people in New York City make an effort to reduce their exposure to air contaminants due to the fires, smoke, and dust (also known as particulate matter) created by the collapse of WTC and on-going response in Lower Manhattan. It is especially important for people with heart or respiratory disease, the elderly and young children to reduce their exposure to smoke and dust. People should consult with their physician immediately if health problems develop.

Health complaints from the area have been primarily irritant and respiratory in nature (such as coughing, irritation of the eyes, nose and throat, wheezing, difficulty in breathing and shortness of breath). Airborne compounds known to cause acute health effects include smoke, fiberglass, and inhalable dust (e.g., cement and gypsum), also collectively known as particulate matter. Certain compounds may be present that may result in chronic health problems, including respirable silica and asbestos. Efforts to measure air quality are focusing on all these compounds.

Particulate Matter:

The term "particulate matter" (PM) includes both solid particles and liquid droplets found in air. Many human activities and natural events emit PM directly or emit other pollutants that react in the air to form PM. These solid and liquid particles come in a wide range of size. Particles less than 10 micrometers in aerodynamic diameter tend to pose the greatest health concern because they can pass through the nose and throat and be deposited in the lungs. Particles less than 2.5 micrometers in diameter are referred to as "fine" particles. Sources of fine particles include all types of combustion (motor vehicles, power plants, fires, etc.) and some industrial processes. Particles with diameters between 2.5 and 10 micrometers are referred to as "coarse" particles. Sources of coarse particles include crushing and grinding operations, and dust from paved and unpaved roads. The particle mix in most U.S. cities is dominated by fine particles generated by combustion with smaller amounts of coarse dust. The coarse dust resulting from the collapse of World Trade Center (WTC) buildings and the removal of rubble likely contains particles from building materials.

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In order to address public health issues associated with PM in air, some characterization of airborne particulate is warranted to provide additional information. The likelihood for particles to produce certain health effects is also related to particle size. Larger particles are less likely to penetrate deeply into the lungs and can be deposited on mucous membranes of the eyes, nose and throat as part of the body's natural defense system. Particles deposited on these surfaces can cause irritation. As particle size decreases the likelihood for them to reach more deeply into the lungs increases. Particles depositing in the lower regions of the lungs can produce both short term effects, such as coughing and longer term effects such as changes in lung function. Specific characteristics (e.g. chemical composition) of these particles can also influence the types of health effects seen following exposure.

Based upon their ability to cause health effects, the United States EPA sets ambient (outdoor) air standards for particulate matter. Currently EPA has a set of standards, one that is set for airborne particles that are 10 micrometers in diameter or smaller (PM_{10}), and one that is set for the finer particles that are part of PM_{10} that are 2.5 micrometers or less in diameter ($PM_{2.5}$). While it has been reported that levels of fine particulate were below the federal air standards, health complaints (eye, nose and throat irritation) continue to occur. In environments where fine and coarse particles are below levels of concern, people may still experience eye, nose, and throat irritation due to the presence of other substances such as larger particles or irritating gases.

It is possible that PM from the WTC fire and collapse could have entered homes. Indoor air quality may have been affected by the WTC fire and collapse even if the windows and doors were closed since smaller particles can enter through very small openings and cracks. Additionally, settled dust can be re-suspended into the air during routine activities, and it can also be tracked inside from outdoors by people, pets, and other activities. Therefore, if dust is in the home (e.g., on the couch, floors, counter tops, etc...), people should pay particular attention to the recommendations regarding: 1) cleaning the home, 2) checking the air conditioning system, and 3) ways to prevent tracking dust indoors.

Health Effects of Particulate Matter:

1. Dust and smoke may irritate healthy people's eyes, nose, throat, and lungs, and might cause more serious problems in sensitive populations. Because dust and smoke are mixtures of different chemicals with different sizes, not everyone will experience the same effects. Most healthy adults and children will recover quickly from the symptoms short-term dust and smoke exposures and will not likely suffer long-term consequences.

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2. Certain sensitive populations, listed below, are susceptible to more serious problems, including cough, phlegm, wheezing, shortness of breath, bronchitis, increased asthma attacks, and aggravation of respiratory or cardiovascular disease.
 - **Individuals with asthma and other respiratory diseases.** Levels of pollutants that might not affect healthy people might cause breathing difficulties for people with asthma or other chronic lung diseases, especially children. Individuals with emphysema and chronic bronchitis may also experience a worsening of their conditions because of exposure to dust and smoke. Studies have linked particulate matter pollution to increased risk of hospitalizations for respiratory disease, asthma attacks, and respiratory mortality.
 - **Individuals with cardiovascular disease.** People with heart disease might also experience symptoms such as shortness of breath or chest tightness. Studies have also linked particulate pollution to increased risk of hospitalizations for cardiovascular disease and heart attacks, and cardiovascular mortality.
 - **The elderly.** The elderly are more likely to have preexisting lung and heart diseases, and therefore are more susceptible to health effects from exposure to particle pollution.
 - **Children.** Healthy children are sensitive to air pollution and more susceptible to pollution than healthy adults. Studies have shown that in children, particulate pollution is associated with increased episodes of coughing and difficulty breathing, and decreased lung function.
3. In communicating levels of concern for concentrations of particulate matter in outdoor air to the public EPA uses the Air Quality Index. The air quality index is composed of several air quality categories and EPA provides recommendations to the public about steps to reduce exposure at levels of concern for the general public and sensitive subgroups. When values are above these levels, it is recommended that members of sensitive groups reduce their exposure. Exposure to elevated concentrations of particles for periods of time less than a day are also of potential concern for sensitive groups.
 - For fine particles ($PM_{2.5}$), the level of concern is 40 micrograms per cubic meter of air ($\mu g/m^3$), for a 24-hour average exposure.
 - For fine and coarse particles combined (PM_{10}), the level of concern is 150 $\mu g/m^3$, for a 24-hour average exposure.

Although total suspended particulate (TSP) is not included in the Air Quality Index, New York State estimates a level of concern to be approximately 250 $\mu g/m^3$, for a 24-hour average exposure.

While there are State and Federal standards for selected particles in outdoor air and workplace air, there are no standards for particles in residential settings, nor do we have a good characterization of what a "background" or average concentration would be. This is because there are many human and household factors that can dramatically influence air concentrations

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of particles in the home. The range of activities that introduce particles into the air (e.g. smoking, cooking, candle and incense burning, and cleaning) coupled with a home's ventilation status (which could remove or introduce particles) will determine airborne particle concentrations in a home at a specific time.

Recommendations:

The Environmental Assessment Workgroup is providing the following recommendations to help people reduce their exposure to particulate matter and make well-informed decisions about their health.

1. People with respiratory or heart disease, the elderly and young children, should avoid prolonged exposure to dust and suspended particles.
 - When dust and smoke are present outdoors, limit time outdoors.
 - Avoid physical exertion, indoors or outdoors, when dust or smoke levels are high.
 - Consult with your physician to determine if you should be cleaning up any dust from the WTC that may have entered your home.
 - If you have symptoms of heart or lung disease, including shortness of breath, chest tightness, chest pain, palpitations or unusual fatigue, contact your physician.
 - If you have asthma, bronchitis or other lung diseases, or cardiovascular disease make sure you have adequate medication on hand. In addition, if you have asthma, follow your asthma management plan.
2. People having symptoms (including those who have not been diagnosed with respiratory or heart disease), such as shortness of breath, wheezing, difficulty taking a full breath, painful breathing or persistent cough, should contact a physician. Be aware that onset of symptoms can appear even 24 to 48 hours after exposure.
3. In the home, car and workplace, keep windows and doors closed during hazy days or if dust is on the streets or entrances and/or smoke is in the air. Keep air conditioning turned on and use the recycle/recirculate mode on your air conditioner. Inspect and change air filters and air conditioning filters as needed. When the air quality improves, you should open up and air out your homes.
4. If your home has dust or suspended particles as a result of the WTC collapse, you should consider steps to minimize your exposure. If you decide to clean the dust yourself, the following suggestions can help to reduce the opportunities for dust to re-enter the air.
 - A regular vacuum cleaner will clean dusty areas, furniture, and carpeting but small particles will pass through the vacuum and re-enter the air. Alternatively, using a High Efficiency Particulate Arresting (HEPA) vacuum without a beater bar is an

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effective method to clean and minimize resuspension of dust.

- Moisten dusty and sooty, non-porous surfaces prior to wiping them. This will reduce the amount of particulate becoming airborne. Some porous materials may be damaged by water and may require specialized cleaning techniques. Avoid breathing the dust if any is stirred-up by wiping, and make sure surfaces are dry once the dust is removed.
 - Clean roof-top and building air conditioning systems before use and assess duct work for signs of contamination.
 - Replace or clean dirty air conditioner filters and set the air conditioner to re-circulate if indoor air is relatively dust-free.
 - Wash plants and furnishings prior to moving them indoors.
5. In dusty areas, minimize dust entering the home by leaving shoes outside, using a door mat and wiping pets feet at the doorway.

Air Quality Index:

Health Comparison Guideline Table for Ambient PM*

24 Hour Levels ($\mu\text{g}/\text{m}^3$) PM_{2.5}**	24 Hour Levels ($\mu\text{g}/\text{m}^3$) PM₁₀**	Air Quality	Cautionary Statements
0-15	0-55	Good	None
>15-40	>55-155	Moderate	None
>40-65	>155-255	Unhealthy for Sensitive Groups	People with respiratory or heart disease, the elderly, and children, should limit prolonged exertion.
>65-150	>255-355	Unhealthy Sensitive groups may experience more serious health effects.	People with respiratory or heart disease, the elderly and children, should avoid prolonged exertion; everyone else should limit prolonged exertion.

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>150-250	>355-425	Very Unhealthy Everyone may experience more serious health effects.	People with respiratory or heart disease, the elderly and children, should avoid any outdoor activity; everyone else should avoid prolonged exertion.
>250	>425	Hazardous The entire population could be affected.	Everyone should avoid any outdoor exertion; people with respiratory or heart disease, the elderly and children, should remain indoors.

* Developed from EPA's Air Quality Index: A Guide to Air Quality and Your Health, EPA-454/R-00-005, June 2000 and EPA Guideline for Reporting of Daily Air Quality - Air Quality Index (AQI), EPA-454/R-99-010, July 1999 (at: <http://www.epa.gov/airnow/publications.html>).

** These comparison levels are guidelines to make public health decisions. Detected concentrations of PM above specific guideline levels does not mean that adverse health effects will occur.