

# **Structural Fires: Selected Guidance from NYS Department of Health**

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## **New York State Department of Health**

(downloaded, [https://www.health.ny.gov/environmental/outdoors/air/what\\_to\\_know.htm](https://www.health.ny.gov/environmental/outdoors/air/what_to_know.htm), 4/15/14)

### **What You Should Know about Fires**

- About Smoke from Fires and Exposure
- About Fire Response
- About Environmental Testing During and After a Fire
- What to Expect and Do During and After a Fire
- More Information

### **About Smoke from Fires and Exposure**

All smoke is hazardous to breathe. Smoke is a mix of particles and chemicals produced by incomplete burning of carbon-containing materials. The same pollutants that are found in smoke from fires are commonly found in the air from sources such as vehicles, power plants, factories, incinerators, restaurants, and wood stoves. A major difference between pollutants released to air from these sources and smoke from fires is that smoke from fires is often more concentrated and poses more of an immediate, short-term health concern to someone breathing it.

### **About Fire Response**

First responders, such as fire departments, have the expertise to put out fires and, when necessary, to direct people to take actions to reduce exposures from fire and smoke. Health departments usually don't have a role in putting out fires, although they do routinely advise people to avoid breathing smoke from any kind of fire. When there are unique concerns about chemicals or other substances on the site of the fire, health departments may be called upon to advise first responders and the general public about potential public health hazards and actions that can be taken to reduce people's exposures. Health Departments also advise people who think they may be experiencing health symptoms from smoke exposure to contact their primary health care provider.

### **About Environmental Testing During and After a Fire**

People sometimes have questions about what chemicals are being released to the air during a fire and what might be in the soot and ash after a fire. These questions often lead to requests for testing (e.g., air, water, soil sampling).

In most cases, the chemicals released by any fire are very similar. For example, virtually any fire will result in the release of large amounts of particulate matter and carbon monoxide, as well as varying amounts of volatile organic chemicals (such as benzene), polycyclic aromatic hydrocarbons, metals and other chemicals. Testing to look for the presence of these chemicals or their levels is not necessary. Results from environmental

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tests are rarely needed to inform the actions people should take to avoid being exposed to smoke because smoke is known to be toxic and people should avoid breathing it. Also, environmental testing is rarely needed to help to direct cleanup efforts or to determine whether a building may be reoccupied. Proper clean-up of smoke and soot residue will remove fire-related compounds so that continuing exposures would no longer be an issue. Environmental testing of chemicals in smoke is also not likely to help to determine appropriate medical treatment for people who experience health symptoms caused by breathing smoke.

However, there are some unique situations where environmental testing might be warranted. In these cases, first responders, health and environmental agencies, and others would identify information needed, objectives, and testing methods to provide clear, meaningful results. For example:

- Air sampling with real-time instruments may be performed by fire fighters to help guide urgent decisions, such as where to establish evacuation boundaries or what personal protective equipment should be worn by fire fighters.
- Air sampling during long-duration fires (e.g., fires lasting days to weeks) may help to understand the significance of health risks from the longer-term exposures people may experience, and where those exposures may be occurring.
- Sampling of air and other media after fires that cause the release of large amounts of specific chemicals may help to guide any necessary post-fire cleanup decisions.

When environmental testing is necessary, it is usually done for specific, fire-related chemicals and a comprehensive sampling plan is developed so that results are reliable and informative. Any environmental samples must be analyzed by a laboratory certified by the New York State Department of Health Environmental Laboratory Approval Program (ELAP). Collecting just a few environmental "grab" samples without having a sampling plan often produces uncertain results that don't help decision-making.

### **What to Expect and Do During and After a Fire**

- People might experience health symptoms from smoke, heat, fire and odors associated with the fire, even when visible smoke may not be present.
- People near the fire should follow the advice of first responders. In some cases, evacuation boundaries will be announced and people will be given instructions on where to go during the event. In other cases, people may be advised to "shelter in place" (i.e., remain at home and keep doors and windows closed).
- People should also take actions to reduce their exposure to smoke. For example, during a fire, the doors and windows of nearby residences and other buildings should remain closed to prevent smoke from entering, and air conditioners should be turned off.
- After a fire is completely put out, buildings affected by smoke should be ventilated with fresh air to reduce odors. This may be a slow process depending on how much of the building was affected by smoke. If smoke damage was substantial, carpeting

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and other porous building materials can continue to off-gas residual smoke chemicals for some time. Buildings damaged by fire and smoke will also likely have significant damage from water used to extinguish the fire. In most cases, efforts to clean and repair these buildings should be performed by professional fire restoration companies.

- Buildings where a fire occurred will be subject to inspection by local fire and building code officials after the fire is controlled and extinguished. Nearby buildings also may need to be inspected by local fire and building code officials. These officials will evaluate the affected buildings' structural integrity and whether they may be reoccupied.

### **More Information**

- New York State Department of Health
  - Exposure to Smoke from Fires
  - Fact Sheet: Carbon Monoxide
  - Fine Particles Q&A
- Federal Agencies
  - Health and Environmental Effects of Particulate Matter, US Environmental Protection Agency

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### Exposure to Smoke from Fires

The smoke released by any type of fire (forest, brush, crop, structure, tires, waste or wood burning) is a mixture of particles and chemicals produced by incomplete burning of carbon-containing materials. All smoke contains carbon monoxide, carbon dioxide and particulate matter (PM or soot). Smoke can contain many different chemicals, including aldehydes, acid gases, sulfur dioxide, nitrogen oxides, polycyclic aromatic hydrocarbons (PAHs), benzene, toluene, styrene, metals and dioxins. The type and amount of particles and chemicals in smoke varies depending on what is burning, how much oxygen is available, and the burn temperature.

Exposure to high levels of smoke should be avoided. Individuals are advised to limit their physical exertion if exposure to high levels of smoke cannot be avoided. Individuals with cardiovascular or respiratory conditions (e.g., asthma), fetuses, infants, young children, and the elderly may be more vulnerable to the health effects of smoke exposure.

Inhaling smoke for a short time can cause immediate (acute) effects. Smoke is irritating to the eyes, nose, and throat, and its odor may be nauseating. Studies have shown that some people exposed to heavy smoke have temporary changes in lung function, which makes breathing more difficult. Two of the major agents in smoke that can cause health effects are carbon monoxide gas and very small particles (fine particles, or PM<sub>2.5</sub>). These particles are two and one half (2.5) microns or less in size (25,400 microns equal an inch) and individual particles are too small to be seen with the naked eye.

Inhaling carbon monoxide decreases the body's oxygen supply. This can cause headaches, reduce alertness, and aggravate a heart condition known as angina. Fine particles are able to travel deeply into the respiratory tract, reaching the lungs. Inhaling fine particles can cause a variety of health effects, including respiratory irritation and shortness of breath, and can worsen medical conditions such as asthma and heart disease. During increased physical exertion, cardiovascular effects can be worsened by exposure to carbon monoxide and particulate matter. Once exposure stops, symptoms from inhaling carbon monoxide or fine particles generally diminish, but may last for a couple of days.

Avoiding smoky situations is the best way to avoid exposure. If your age or health status places you at greater risk from smoke exposure you should speak with your doctor about alternative steps you can take when encountering smoky situations. Anyone with persisting or frequent symptoms that they think are associated with smoke exposure should see their health care provider. Additional information on carbon monoxide and fine particles can be found at the web addresses listed at the end of this fact sheet.

There is also the potential for chronic health effects from exposure to the components of smoke. Long term exposure to ambient air containing fine particles has been associated

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with increases in cardiovascular disease and mortality in populations living in areas with higher fine particulate air pollution. Frequent exposure to smoke for brief periods may also cause long-term health effects. Firefighters, who are exposed frequently to smoke, have been examined for long-term health effects (for example, cancer, lung disease, and cardiovascular disease) of repeated smoke exposures. The findings from these studies are not consistent or conclusive. Some studies show an increased frequency of these diseases among firefighters compared to similar male reference populations (e.g., male policemen, white males in the general population), while others do not.

When it is necessary to work in heavy smoke, use appropriate respiratory protection to reduce exposure to the particles and gases in smoke. However, understand the limitations and cautions associated with respirator use before you use one. Important information on respirators is available at the web address listed at the end of this fact sheet.

### **Additional Information Sources**

1. Federal Agencies
  - Respirator Fact Sheet, Centers for Disease Control
  - Health and Environmental Effects of Particulate Matter, U.S. Environmental Protection Agency
2. New York State Department of Health
  - What You Should Know about Fires
  - Fact Sheet: Carbon Monoxide
  - Fine Particles Q&A
  - Does Burning Trash Make it Disappear?
  - Secondhand Smoke - It Takes Your Breath Away
  - How to Use a Disposable Respirator

