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Tech Tips

# Incident Command Post Smoke Exposure Health and Safety

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## INTRODUCTION

Personnel working in fire camps may be exposed to potentially harmful levels of inhalation irritants. Although these events are not common, the Incident Management Team (IMT) should be prepared to address these situations when they do occur.

The source of inhalation irritants may be from the fire(s) or from human activity, such as dust disturbed by vehicle and foot traffic, and exhaust from generators, camp heaters, and vehicles. Local sources of air pollution can also contribute to unhealthy air. Incident Management Teams can minimize these exposures by preplanning and taking purposeful actions. The following information and recommendations have been developed to assist IMTs in reducing the risks associated with smoke exposure:

### 1. Health and Safety Concerns

- Inhalation hazards
  - ♦ There are two primary inhalation irritants of concern in fire camps; carbon monoxide (CO) and respirable particulate matter (RPM). The primary source of CO is usually vehicle exhaust and generators. Particulates may come from the fire, from soil disturbance caused by vehicle and foot traffic in the camp, or from vehicle and generator exhaust.
  - ♦ The Wildland Firefighter Smoke Exposure Project did not find significant levels of CO in incident command posts (ICPs) or spike camps. There were brief periods of time when the level of CO showed marked increases but these levels did not present a health or safety concern. These peaks coincided with the end of the morning operational briefing when fire crews were leaving the camp. ICPs and spike camps that are in very close proximity (less than 3 miles) to active and smoldering fires may have some risk of CO exposure that should be considered.
  - ♦ Sources of respirable particulate matter can be from the fire and from vehicle traffic in and around camps, as well as foot traffic in camps. Fire smoke can result in very high concentrations of RPM when at ground level.
  - ♦ Inversions that trap smoke may exist in ICPs and/or spike camps. Extended inversions may warrant actions to monitor air quality and reduce exposure to sensitive individuals since particulate concentration can exceed hazardous levels during night time rest periods.
  - ♦ When considering the health effects of irritants, it is important to understand dose. Dose depends on the amount of irritant exposure and the duration of the exposure. Exposure to low levels of CO for brief periods of time may not create health or safety concerns, except for the most sensitive individuals. However, exposure to higher levels of CO—without the opportunity for clean air to metabolize the absorbed CO is a concern. Particulate matter exposure at high levels for short periods of time may create difficulty for sensitive individuals, but most individuals will recover from these exposures once in clean air. Sensitive individuals include: asthmatics, older adults, children, pregnant women, obese persons, diabetics, and those with heart or lung disease. Prolonged exposure to high levels of particulate matter can lead to reduction in physical capacity and potential lessened resistance to illness, such as bronchitis or “camp crud.”

### 2. Signs and Symptoms

- Exposure to CO may cause headaches, nausea, and fatigue. High levels of exposure may result in impaired decision making or even death.

- It is important to realize that other factors in the workforce, such as diet, extended work shifts, fatigue, weather, hydration, and pre-existing conditions may cause these symptoms. If CO exposure is suspected, exposure to clean air may reduce the symptoms.
- Exposure to RPM may cause similar symptoms, as well as eye irritation, coughs, and breathing difficulties.

**3. Medical Unit**

The Medical unit should be aware of the signs and symptoms of exposure to smoke, particularly CO and particulate matter. When assessing patients, it's important to give consideration to all possible causes of the primary complaint. Many of the symptoms of smoke exposure are similar to those of dehydration, asthma, colds, and other conditions. Documentation should include any pre-existing conditions and other possible causes. If qualified, an emergency medical technician or paramedic can measure the carboxyhemoglobin (COHb) and oxygen saturation (SpO2) levels in the patient. Although not a definitive measure to assess CO exposure on wildland firefighters, use these measurements as part of the diagnostic process. If the risk of CO exposure is considered significant, acquire equipment for measuring COHb and ambient CO.

- Documentation – the medical unit should maintain records of each patient to determine trends that may indicate problems associated with irritant exposure.

**4. Safety Officer**

Safety officers should be aware of potential smoke impacts, exposures, and symptoms and should discuss them at the operational briefing. Including smoke on the 215-A will assure constant vigilance. Safety officers should advise sensitive individuals to consult the medical unit leader, particularly those not screened for medical conditions, such as non-arduous positions.

**5. Air Resource Advisor (Technical Specialist)**

- A new technical specialist position available to IMTs is the air resource advisor (ARA). The ARA assists in addressing the health and safety impacts of smoke from a fire on the public and fire personnel. An ARA can help with items including:
  - ♦ Monitoring and forecasting air quality in the ICP, spike camps, and roads (duration and severity).
  - ♦ Providing recommendations for ICP location with regard to potential smoke impacts.
  - ♦ Addressing communication and mitigation strategies for impacted areas.
  - ♦ Projecting smoke impacts on operations as well as on the general public and fire personnel.

**6. Incident Meteorologist**

- The incident meteorologist (IMET) can help determine if meteorological conditions will allow smoke to impact fire camps. They can modify their forecasts to predict the arrival and duration of smoke in camps due to wind speed and direction and/or inversions. The duration of these events is critical in determining the potential effects of the smoke. Prolonged inversions are of key importance and can also influence fire operations. The meteorological forecasts can help identify alternate locations for the camp and determine mitigation strategies for specific individuals who may be susceptible to smoke exposure.

**7. Logistics Section Chief and Camp Manager**

- When positioning the ICP and spike camps, consideration should be given to avoid areas that could be impacted directly by smoke from the fire. If no reasonable or safe alternative site is available and smoke is continuously present in the ICP or spike camps, consider mitigation tactics (for more information see the NWCG draft "Wildland Fire Personnel Smoke Exposure Guidebook," PMS 420-2, NFES 1279).

**8. Air Quality Assessment**

- Air quality may be monitored utilizing the existing network of monitors placed by State, tribal, and local air quality agencies and compiled on the Environmental Protection Agency's AirNow Web site. Air quality is forecasted in a general manner on that site as well. However, site specific air quality data for ICPs and spike camps requires specific placement of monitoring equipment. An ARA is trained in deployment and interpretation of air quality data. While at this time, there is no monitoring protocol for measuring CO for specific sites, tracking symptoms is an important strategy. All of these tools will enable IMTs to determine the potential for high levels of smoke in ICPs.

**9. Mitigation strategies**

In the majority of ICPs and spike camps located in clean air, there is little need to address impacts of smoke. However, preplanning and a few basic steps can often limit the presence of smoke in camp and reduce the need for additional mitigations. Items to consider are:

- Camp location
  - ♦ When choosing the location for ICPs and base camps, consider the potential for smoke incursions in parallel with logistical and safety considerations. This is the most important and best approach to reducing smoke impacts in fire camps. Local knowledge of smoke movement and inversions can be useful in determining the best location to maximize fresh air.
  - ♦ Alternate camp locations – in the event of heavy smoke impacts in ICPs for an extended period, consider relocating the ICP to a different location with less smoke, or rotate crews and incident personnel to clean air camps.
- Sleeping/working locations
  - ♦ Locate sleeping and work areas away from all travel corridors as much as is practical. Minimize dust generated by vehicle and foot traffic by separating traffic from work/sleep areas.
- Dust control
  - ♦ Utilize best practices in minimizing dust from vehicle traffic by wetting roadways. Use bark chips in walking areas to reduce dust. Where work tents or yurts are used for ICPs, install plastic flooring to reduce dust.
- Generators and heaters
  - ♦ Locate generators as far as possible from work/sleep/eating areas to minimize particulate/CO/noise exposure.
  - ♦ Utilize heaters that minimize the impact on air quality.
  - ♦ Do not use small, personal propane heaters in enclosed spaces.
- At this time, it is not recommended to use face masks that are marketed for wildland firefighters (Whiffs, Hot Shields). These masks will not protect wildland firefighters from the harmful gases present in vegetative smoke.

## Resources

An IMT should access these Web sites to see current and predicted levels of air quality.

Wildland Fire Decision Support System, Wildland Fire Air Quality Tools: <http://firesmoke.us/wfdss/>.

US Environmental Protection Agency, AirNow: <http://www.airnow.gov/>.

**For additional information on smoke exposure:**

Wildland Fire Safety Training (WFSTAR): Smoke Exposure Module & Guidebook: <http://www.nifc.gov/wfstar/library_medical.html>.

Wildland Firefighter Smoke Exposure: <http://www.fs.fed.us/eng/php/library_card.php?p_num=1351%201803>.

NWCG SmoC Committee: <http://www.nwcg.gov/branches/ppm/smoc/index.htm>.

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