



Wildland Fire Smoke - Employee Exposure and Health

The health effects of smoke have been a topic of interest for firefighters and fire managers for decades. The largest concerns came after the Northern California Fires of 1987, and 2008 along with the Yellowstone fires of 1988. In 1989, the National Wildfire Coordinating Group (NWCG) tasked the Missoula Technology and Development Center to lead the health hazards of smoke studies that were completed in 1997. Since then, new exposure studies have been conducted, new questions have arisen, and new technology has been developed for studying the health hazards of smoke, exposure monitoring, and exposure protection. The NWCG Risk Management Committee has formed the Smoke Exposure Task Group (SETG) to investigate the subject further and provide recommendations. A web site is being created as a central location for information regarding employee wildland smoke exposure and other related information. The website is: (<http://www.nwcg.gov/branches/pre/rmc/setg/index.htm>)

The following information is provided by the SETG and will also be available on their website:

- What we know and don't know about health effects
 - Data are still lacking in critical areas. Leading scientists across the country identified a lack of any long-term employee data regarding the health effects of wildland smoke. Short-term studies have been conducted. Many of the short-term effects are transient in nature, but the lack of long term monitoring and follow up has prevented further analysis. Further complicating the issue is that wildland firefighting is seasonal and employees typically fight fire only for a portion of their career.

- What NWCG is doing to gain new knowledge
 - The Smoke Exposure Task Group plans to continue monitoring wildland firefighter smoke exposure during the 2010 fire season. The San Dimas Technology & Development Center will be collecting smoke exposure (carbon monoxide and particulate matter) data on the fire lines and at fire camps to help better understand the levels of smoke exposure to firefighters and the wildfire suppression tasks that are most prone to high levels of smoke exposure.

- Respiratory protection
 - Personal protective equipment, including respiratory protection, should only be implemented once engineering and administrative controls are exhausted. The need for respiratory protection during wildland firefighting operations must be determined by each agency. The requirements for respirator use are found in 29 CFR Part 1910.134.

 - If a respiratory protection program is implemented, only NIOSH-approved respirators should be used. Several respiratory-type products are marketed to wildland firefighters but are not NIOSH approved (e.g. shrouds with filtration devices). CO monitoring should also be implemented simultaneously to assure that employees are not over-exposed to CO. Note: employees must be clean shaven to wear a respirator.

- NFPA wildland respirator standard
 - The National Fire Protection Association (NFPA) will be publishing a new standard titled *NFPA 1984, Respirators for Wildland Fire Fighting Operations, 2011 Edition*. This new standard is a performance-based product standard for air purifying respirators (APRs) and powered APRs, and does not require the use of respirators for wildland firefighting. Again, the need for respiratory protection must be determined by each agency.

- Recommended mitigations for employee smoke exposure:
 - Include smoke mitigation in operational planning. This includes exposure awareness (signs and symptoms) and techniques for mitigation. Smoke exposure needs to be part of the risk management continuum, along with other hazards.

- Risk management assessment considerations at the planning, strategic and tactical level.
 - Site-specific hazards and mitigations identified prior to operational shifts to reduce firefighter exposure to smoke.

- Different individuals will have different responses to the same levels of exposure. Here are some general signs and symptoms and associated levels of CO exposure:

CO in atmosphere (ppm)	COHb in blood (%)	Signs and symptoms
10	2	Asymptomatic
70	10	No appreciable effect, except shortness of breath on vigorous exertion; possible tightness across the forehead; dilation of cutaneous (along skin) blood vessels.
120	20	Shortness of breath on moderate exertion; occasional headache with throbbing in the temples
220	30	Headache; irritable; easily fatigued; judgment disturbed; possible dizziness; dimness of vision.
350-520	40-50	Headache, confusion; collapse; fainting on exertion
800-1,220	60-70	Unconsciousness; intermittent convulsion; respiratory failure, death if exposure is long continued
1,950	80	Rapidly fatal

Source: Winter and Miller (1976), Ellenhorn and Barceloux, 1998

If you have questions regarding smoke exposure or respiratory protection, contact your agency's NWCG Risk Management Committee representative:

<http://www.nwcg.gov/branches/pre/rmc/contactus.htm>