



SOUTH LYON FIRE DEPARTMENT

Manual of Procedures 433

AIR MONITORING AT STRUCTURE FIRES

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Revised:

Approved: Chief Mike Kennedy

I. PURPOSE

The purpose of this policy is to establish a procedure for air monitoring and the detection of hydrogen cyanide and carbon monoxide at structure fires.

II. POLICY

Fire smoke and its many bi-products of combustion present a serious health risk to responders. Hydrogen Cyanide (HCN) and Carbon Monoxide (CO) are deadly gases that can pose immediate and long term health effects to emergency responders if proper respiratory protection is not utilized. Safety of responders is the first priority, therefore Self Contained Breathing Apparatus (SCBA) are required to be worn when conducting interior structural fighting fire, overhaul; investigation, or any other interior activity until a safe atmosphere can be determined by the use of quantitative air monitoring equipment.

III. RESPONSIBILITY

All company officers have the responsibility to comply with and ensure that the personnel under their command are adequately trained, fully understand, and comply with this policy. All firefighters have the responsibility to learn and follow this policy.

IV. INFORMATION

HCN is produced when materials such as insulation or synthetic materials are burned or heated. The symptoms closely mirror those of carbon monoxide exposure; therefore personnel must be cognizant of its presence.

Vehicle fires and trash fires also generate high levels of HCN and CO, but because they normally occur in an open environment the products of combustion dissipate quickly into the atmosphere. However, when smoke is present the need for SCBA is vital for responder protection.

V. SELF CONTAINED BREATHING APPARATUS

- A. SCBA is required on all structure fires that present a smoke condition, to include kitchen and cooking fires, until air monitoring has taken place.
- B. SCBA is required on all vehicle fires until completely extinguished and all smoke has dissipated, or monitoring has taken place.
- C. SCBA is required on all large trash receptacle fires until completely extinguished and all smoke has dissipated.



SOUTH LYON FIRE DEPARTMENT

Manual of Procedures 433

VI. STRUCTURAL TURNOUT GEAR

- A. Turnout gear helps protect personnel from absorbing smoke, including HCN and CO through the skin, which is a secondary route of exposure.
- B. Personnel are to wash turnout gear following structure fires that heavily soil and saturate gear with products of combustion.
- C. If a second set of turnout gear is available, personnel should switch gear as soon as possible.

VII. AIR MONITORING

- A. All structure fires are to be monitored by utilizing HCN gas detector and CO detectors. SLFD Engine 2 is equipped with the ToxiRAE II HCN gas detector and 4-gas monitor with CO detector.
- B. If inside an IDLH environment or a suspected IDLH environment, SCBA are not to be removed until the atmosphere can be monitored and deemed safe.

VIII. ACTION LEVELS

- A. Hydrogen Cyanide (HCN)
The Permissible Exposure Level (PEL) for HCN is 10 ppm. SLFD will limit exposure to no more than 4.7 ppm which is the OSHA Recommended Exposure Level for an 8-hour work day. In order to operate without SCBA, readings of HCN must be below **4 ppm**. Immediately Dangerous to Life and Health (IDLH) for HCN is 50 ppm.
- B. Carbon Monoxide (CO)
Per SLFD Manual of Procedure 416 - Carbon Monoxide, SCBA is required for CO readings exceeding **200 ppm**.
- C. Toxic Twins
SCBA shall be worn until readings are below 4 ppm HCN and 200 ppm CO and only after authorization by the Incident Commander.

IX. DECONTAMINATION

Personnel should practice good personal hygiene by washing hands prior to drinking and eating in rehab or back at the station. If air monitoring results within two (2) inches of soiled turnout gear has a reading higher than 5 ppm of HCN decontaminate the gear utilizing the routine cleaning procedures.

X. EXPOSURE

The following three indicators are to be used to determine if a person has been exposed to HCN:

- A. Exposed to fire or smoke in an enclosed area
- B. Soot found around the mouth and nose
- C. Altered mental status

Hydrogen cyanide can cause rapid death due to metabolic asphyxiation. Death can occur within seconds or minutes of the inhalation of high concentrations of hydrogen cyanide.



SOUTH LYON FIRE DEPARTMENT

Manual of Procedures 433

- A. Acute exposure symptoms including weakness, headache, confusion, vertigo, fatigue, anxiety, dyspnea, and occasionally nausea and vomiting.
- B. Respiratory rate and depth are usually increased initially and at later stages become slow and gasping.
- C. Coma and convulsions occur in some cases.
- D. If cyanosis is present, it usually indicates that respiration has either ceased or has been inadequate for a few minutes.
- E. If large amounts of cyanide have been absorbed, collapse can be instantaneous; unconsciousness; often with convulsions, is followed almost immediately by death
- F. If personnel are found to have been operating in an IDLH atmospheres or experiencing severe health effects it is strongly recommended they be transported for advanced medical evaluation.

The following information needs to be reported to the hospital:

- A. HCN has a half-life of one hour, therefore it is imperative that the exposed personnel be given immediate medical attention to include blood work and tested for HCN levels in the blood.
- B. It is important that when transported, the hospital be advised that the firefighter was operating in a known hazardous environment containing **hydrogen cyanide**.

XI. REPORTING

The IC will be responsible for recording any significant exposures during a structure fire. The following information will be supplied in the narrative of the incident report:

- A. Verification the HCN and CO levels are below the REL during the time of operation without SCBA.
- B. Exposure reporting: Anytime personnel are operating outside the safe range without SCBA a notation is to be made in the Firehouse (NFIRS) report under the Fire Personnel Casualty section

Chief Mike Kennedy

Approved by