**PURPOSE**

To establish a guideline for monitoring the atmosphere for fire gases including Carbon Monoxide (CO) and Hydrogen Cyanide (HCN) at structure fires.

**PROCEDURE**

1. **All structure fires are to be monitored after knockdown, prior to beginning overhaul.**
   
   A. The Hazardous Materials Unit (HM4) Driver will be tasked with performing the monitoring at structure fires at the direction of the IC.
   
   B. SCBA is **not** to be removed until the atmosphere can be monitored and deemed safe.
   
   C. Monitoring will normally take place once knock down is declared and prior to beginning overhaul.
   
   D. Monitoring specifically for HCN and CO will be performed in the area where crews will be operating.
   
   E. The HCN and CO levels are to be communicated to the Incident Commander who will record the readings on the Structure Fire Atmospheric Monitoring Form.
   
   F. If the readings are below the safe levels listed on the form, the Incident Commander will announce that overhaul may proceed without SCBA’s.
   
   G. At any time an Officer inside the structure feels conditions warrant the wearing of the SCBA, the Officer will order a member working inside to don their SCBA’s and inform the IC.
   
   H. The following conditions will **not** warrant atmospheric monitoring:
      1. Vehicle fires in the open atmosphere.
      2. When a burning odor is detected and there is no smoke visible or only light haze.

2. **Action Levels**
   
   A. Hydrogen Cyanide is twenty-four times more dangerous than carbon monoxide. Because of this the action level for HCN is lower than CO.
   
   B. The action level in order to operate without SCBA in an environment where HCN is is **5ppm** (4.7ppm). This is the Short Term Exposure Limit (STEL) for HCN as recommended by NIOSH. The action level for carbon monoxide is **35ppm**.
      
      1. STEL as defined by NIOSH is a 15-minute TWA (Time-Weighted Average) exposure that should not be exceeded at any time during a workday.
      2. Immediately Dangerous to Life and Health (IDLH) for HCN is 50 ppm.
      3. The atmosphere must meet both the action level for HCN and CO in order for personnel to operate without SCBA.

3. **Decontamination**
   
   A. Personnel should practice good personal hygiene by washing hands prior to drinking and eating in rehab.
   
   B. Once incident is placed under control a random selection of personnel known to have been operating in the structure should have their PPE monitored.
   
   C. If turnout gear has a reading higher than 5 ppm (Toxic sensor) a hose line is to be used to
decontaminate the gear.
1. Briefly rinse with a soft fog pattern to prevent saturation.
2. All personnel operating inside the structure should be decontaminated.
3. Gear should be washed as soon as possible in an approved washing machine.
   a. Turnout gear, flash hood, and helmet ear flaps should be washed in accordance with NFPA 1851 (*Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*).
   b. Gloves should be washed by hand with hose or in sink.
   c. If a washing machine is unavailable, then a garden hose and a brush can be used.

4. **Reporting**
   A. The officer completing the fire report will be responsible for recording any significant exposures during a structure fire.
   B. The following information will be supplied in the narrative:
      1. The HCN and CO levels during the time of operation.
      2. Areas monitored with corresponding reading.
      3. How long personnel operated in the atmosphere.
      4. The personnel operating in the hazardous atmosphere (listed on unit report).
      5. Specifics concerning the call i.e. major materials that burned or were greatly heated.

5. **Exposure**
   A. 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. Sources report that 270 ppm is fatal after 6 to 8 minutes, 181 ppm after 10 minutes and 135 ppm after 30 minutes [Hathaway et al. 1991]. These levels are not uncommon during routine structure fire as documented in a recent Columbia Fire Department study.
   
   B. Acute exposure symptoms including weakness, headache, confusion, vertigo, fatigue, anxiety, dyspnea, and occasionally nausea and vomiting. Respiratory rate and depth are usually increased initially and at later stages become slow and gasping. Coma and convulsions occur in some cases. If cyanosis is present, it usually indicates that respiration has either ceased or has been inadequate for a few minutes. If large amounts of Cyanide have been absorbed, collapse is usually instantaneous; unconsciousness; often with convulsions, is followed almost immediately by death.
   
   C. If personnel are found to have been operating in an IDLH atmosphere or experiencing severe health effects it is strongly recommended they be transported for advanced medical evaluation.
      1. HCN has a half-life of one hour, therefore it is imperative that the exposed personnel be given immediate medical attention to include a blood work and tested for HCN levels in the blood.
      2. Because this is somewhat new information it is likely test results will be delayed, but personnel will still be treated and monitored by advanced medical personnel.
      3. It is important that when transported to the hospital, advise medical personnel that the
A firefighter was operating in a known hazardous environment containing Hydrogen Cyanide.

**KEY CONSIDERATIONS**
- Hydrogen Cyanide (HCN) is a deadly gas and bi-product of combustion at nearly every structure fire. The symptoms closely mirror those of Carbon monoxide exposure.
- Action levels are as follows:
  - 5 ppm HCN
  - 35 ppm CO