



AIR MONITORING (1.1)

Developed by FF Curtis
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- NFPA 472

TASK SKILL DESCRIPTION AND DETAIL

In recent years the fire service has recognized the need for the engine company to conduct Carbon Monoxide (CO) detection. CO, a by-product of incomplete combustion, has always existed. Energy efficiency has become more important. Structures have become tighter and the potential for CO build-up has increased. Each firefighter working a CO call needs to have the ability to recognize the danger and how to properly use the air monitoring equipment.

Task # 1

Upon Arrival

- Complete a 360 of the structure if possible. Talk with the RPs to obtain their medical condition (symptoms of CO poisoning and is the structure completely evacuated).
- Rescue and patient care are the top priorities. If patients are down within the structure an immediate rescue effort with SCBAs will begin. This will be based upon a proper assessment prior to initiating a rescue. Additional resources must be requested.

Task # 2

No Immediate Rescue

- Turn on CGI and wait until start-up sequence has completed its cycle prior to entering the structure.

User guide: <V:\Fire\Training Division\LFR Training Materials\LFR Training Manual\QRAE II User Training.pdf>

- Enter the structure with an activated CGI.
- If readings exceed 50ppm, the company will immediately retreat from the structure to get SCBAs.

Task # 3

CGI Reading

- If CGI readings are 15ppm or greater, Xcel Energy will be notified.
- Xcel prefers the structure be closed up to assist them with the investigation.
- The structure will only be ventilated prior to Xcel's arrival if necessary in an effort to accommodate Xcel's procedures.



Task # 4

Locate Source

- Reasonable efforts to locate the source of the Carbon Monoxide, investigating natural gas fired appliances and checking for vehicles running in the garage/driveway.
- If Xcel's response time is greater than 30 minutes or the system Fire/Rescue resources are limited, the structure may be turned over to the RP, if the structure can remain evacuated until Xcel's arrival.

Air Monitors

ToxiRAE II

The Hydrogen Cyanide (HCN) detector is a Single Gas, personal protection monitor that continuously displays toxic gas concentrations of HCN. It's a full-featured gas monitor providing continuous, digital display of the gas concentration.

- Alarms at 10 ppm

Physical Description

Colorless or pale-blue liquid or gas (above 78°F) with a bitter, almond-like odor.

QRAE Plus Four-Gas Confined Space Gas Detector:

The QRAE Plus is a four-sensor confined space gas detector.

When testing confined space with the tubing kits lower tubing one foot then wait one to two seconds to test different reading levels as you lower. Use more than one monitor to test different levels.

Gases Detected

- Combustibles
- Oxygen
- Hydrogen sulfide
- Carbon monoxide

Combustible Gas Indicator (CGI)

- Measures percentage of lower explosive limit
- Does not measure concentration of vapors
- Only measures vapor
- Alarms at 10% of LEL



Oxygen

- Measures percentage of oxygen in air
- Alarms at 19.5%(low limit) or 23.5% (upper limit)

Hydrogen sulfide (H₂S)

Hydrogen sulfide is heavier than air and may travel along the ground. It collects in low-lying and enclosed, poorly-ventilated areas such as basements, manholes, sewer lines, underground telephone vaults and manure pits.

- Alarms at 10 ppm

Physical Description

A colorless gas with a strong odor of rotten eggs. Sense of smell becomes rapidly fatigued and cannot be relied upon to warn of the continuous presence of H₂S.

Symptoms

Irritation of the eyes, respiratory system; apnea, coma, convulsions; conjunctivitis, eye pain, lacrimation (discharge of tears), photophobia (abnormal visual intolerance to light), corneal vesiculation; dizziness, headache, lassitude (weakness, exhaustion), irritability, insomnia; gastrointestinal disturbance; liquid: frostbite

Carbon monoxide

- Measures parts per million
- 35 ppm or less acceptable

Physical Description

Tasteless, Colorless, odorless gas

Symptoms

Headache, tachypnea, nausea, lassitude (weakness, exhaustion), dizziness, confusion, hallucinations; cyanosis; depressed S-T segment of electrocardiogram, angina, syncope



Parts per million (PPM or ppm)

The ratio of the amount of one substance to the amount of another, expressed as a unit of solute dissolved in one million units of solution. It denotes the number of units of one substance relative to one million units of another substance. It may be further expressed in terms of mass-to-mass, volume-to-volume, or another relationship of units of measure.

Electronic Detectors versus Direct read Instruments

Electronic detectors are a quick way to test the hazardous air environment for several different gases. Direct read instruments are specific to the type of hazards you are test and much more accurate.

Single Gas Detectors

- Phosphine
- Ammonia
- Chlorine
- Chlorine Dioxide

Dräger Tube System

LFRA carries the Dräger Tube System which consists of a pump and gas detection tubes. The tubes are glass vials filled with a chemical reagent that reacts to a specific chemical or family of chemicals. A calibrated 100 ml sample of air is drawn through the tube with the bellows pump. If the targeted chemical(s) is present the reagent in the tube changes color and the length of the color change typically indicates the measured concentration.