



## CONFINED SPACE GAS MONITORING

There are some safety topics that are critical and need to be reinforced; confined space gas monitoring is one of them. Not only are you possibly protecting yourself by understanding how to conduct this monitoring but likely many other workers trusting your data collection and judgment. This is an update from a safety brief we prepared in 2016.

As a Hygieneering employee, you know that as a general rule, we do not enter confined spaces in our work activities. However, in some special circumstances and with site specific review and training and manager authorization, certain staff will enter confined spaces. In addition, we may assist client's review of their confined spaces by performing gas monitoring. This safety brief is designed as a general overview of confined space gas monitoring basics that you should be aware of as a well-rounded EHS consultant.

Many confined spaces are permit required and may contain a hazardous atmosphere. This requires a competent person (Entry Supervisor) to complete an entry permit and ensure the appropriate pre-entry air testing is conducted properly. The following summarizes this process:

**Entry supervisor:** the person responsible for determining if acceptable entry conditions exist at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required.

**Hazardous atmosphere:** an atmosphere that may expose employees to risks such as, death, incapacitation, impairment of ability to self-rescue, injury, or acute illness.

**Pre-entry Testing:** Before an employee enters the space, the internal atmosphere should be tested with a calibrated direct-reading instrument, for oxygen content, flammable gases and vapors, and for potential toxic air contaminants, in that order. Any employee, who enters the space, or that employee's authorized representative, shall be provided an opportunity to observe the pre-entry testing.

**Re-entry testing:** should be conducted if the confined space has been unoccupied for more than 20 minutes. This should be done in the same manner as the pre-entry testing.

Typical 4-Gas Confined Space Entry Monitor measures the following:

**O<sub>2</sub>:** Oxygen is sampled first:

- Normal atmosphere oxygen content is 20.8%;
- Oxygen deficient atmosphere is less than 19.5%;
- Oxygen enriched atmosphere is more than 23.5%.

**CO:** Carbon monoxide is a blood asphyxiant, which displaces oxygen in the blood stream and could lead to death. The PEL is 50 ppm for an 8-hr workday. Alarms are typically set at 35 (Action Level) for low, and 50 for high.

**H<sub>2</sub>S:** Hydrogen sulfide is a respiratory paralyzer. It paralyzes the part of brain that controls breathing. Alarms are typically set at 10 for the low and 20 for the high alarm.

**LEL:** The Lowest Explosive Limit is the lowest concentration of vapor in air that will ignite or explode if an ignition source is present. Alarms are usually set at 10% for low and 20% for high.



There are also some general techniques you need to employ when conducting this gas monitoring. Since we are talking about unknown gases that may be present, they may be heavier or lighter than air. Therefore, we need to understand that there may be a layering effect if there is not a lot of air movement in the confined space. We address this by measuring at several different heights starting top to bottom.

We also need to understand that confined space entry monitoring is not always just with a 4-gas meter. Based on the initial review of the space, monitoring with a PID or other instrument may also be employed.

This is only the general process, and if ever called upon to conduct confined space entry air monitoring, you will be provided with additional training on equipment and procedures.

If you would like, you may read the following article published by Hygieneering on the topic of gas monitoring in Industrial Safety & Hygiene News (ISHN):

<http://www.ishn.com/articles/102912-confined-space-entry-informed-decisions>



## CONFINED SPACE GAS MONITORING QUIZ

- 1) As a Hygieneering employee, you may enter a confined space on a job site at any time.  
 True  
 False
- 2) Collecting one gas sample in the breathing zone of the confined space is appropriate.  
 True  
 False
- 3) An Entry Supervisor is the person responsible for determining if acceptable entry conditions exist at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required.  
 True  
 False
- 4) A 4-Gas Monitor measures for Oxygen(O<sub>2</sub>), Carbon Monoxide (CO), Hydrogen Sulfide (H<sub>2</sub>S), and Lowest Explosive Limit (LEL). These are the only gases that need to be monitored to make safe entry into all permit required confined spaces.  
 True  
 False
- 5) What percentage is Oxygen considered “normal” when measuring it?
  - a) 10.9%
  - b) 17.5%
  - c) 20.8%
  - d) 23.5%

**SCORE: PASS / FAIL**

\_\_\_\_\_  
Employee Signature

\_\_\_\_\_  
Supervisor Signature

\_\_\_\_\_  
Date