

Air Monitoring in Confined Spaces

OSHA's Confined Space Standard

- Found in 29 CFR 1910.146
- Defines confined space as:
 - Large enough to enter
 - Not intended to be occupied
 - Difficult to enter and exit



Permit Requirement

- Employer must implement a permit system for entry if hazards are present
- Hazardous atmosphere:
 - $> 10\%$ LEL of gas or vapor
 - $>$ LEL of dust
 - $< 19.5\%$ or $> 23.5\%$ oxygen
 - Permissible Exposure Limit (PEL)
 - Immediately Dangerous to Life or Health (IDLH)



Monitoring Requirements

- Pre-entry testing to evaluate the space for the permit
- Testing must be in this order:
 - 1) oxygen level
 - 2) combustible gases and vapors
 - 3) toxic gases and vapors
- Multigas monitors meet this order

Instrument Response Time

- Sensors take some time to react to change in oxygen level
- Remote sampling with pump and tubing adds “travel time”
- Don't move too quickly while monitoring

Stratified Atmospheres

- Different gases with different vapor densities may settle in layers
- Air currents and dead spaces
- Sewers and large spaces
- Monitor 4 feet ahead and to the sides as the worker progresses in such spaces

Emergencies in Confined Spaces

- Consult the permit to identify the hazard
- Don't trust the previous readings
- If entrant is overexposed, always use SCBA for rescue



Oxygen Meters

- Electrochemical sensor – oxygen reacts with chemical in sensor to produce an electrical current
- Readings are % oxygen by volume
- Normal oxygen is 20.7%



MSA Passport Personal Alarm

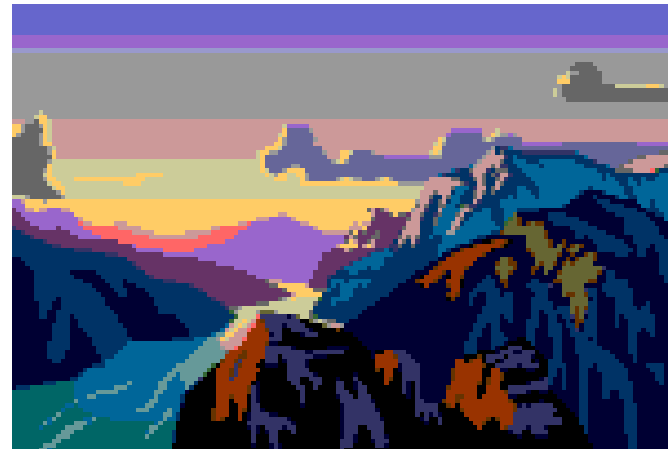


Rae MultiRae Monitor



Oxygen Meter Considerations

- Sensors have service life of 1-2 years
- Acid gases can neutralize the sensor
- Don't breathe into the meter – carbon dioxide neutralizes the sensor
- Change in altitude can affect readings



Slightly Low Oxygen

- Oxygen level of 19.7% is 1% below normal, not "deficient"
- Oxygen is 1/5 of total air, so
- 1% drop means air may contain 5% chemical
- 1% = 10,000 parts per million (ppm)
- May be 50,000 ppm of chemical in the air!

Datalogging

- Newer instruments can store readings in memory
- Readings are recorded at time intervals
- Data can be downloaded to a computer or to a printer



Datalogging

Instrument: Multi-gas Monitor (PGM50-5P) Serial Number: 503459
User ID: 00000001 Site ID: 00000001
Data Points: 15 Data Type: Avg Sample Period: 15 sec
Last Calibration Time: 02/22/2001 15:21

Gas Type:	CO(ppm)	VOC(ppm)	H2S(ppm)	LEL(%)	OXY(%)
High Alarm Levels:	200.0	100.0	20.0	20.0	23.5
Low Alarm Levels:	35.0	50.0	10.0	10.0	19.5

Line#	Date	Time	CO(ppm)	Alarm	VOC(ppm)	Alarm	H2S(ppm)	Alarm	LEL(%)	Alarm	OXY(%)	Alarm
1	03/16/2001	07:24	0.0		0.0		0.7		0.0		20.8	
2	03/16/2001	07:24	0.0		0.0		0.7		0.0		20.7	
3	03/16/2001	07:24	0.5		0.0		1.1		0.0		19.9	
4	03/16/2001	07:24	0.4		0.0		0.9		0.0		20.3	
5	03/16/2001	07:25	0.4		0.0		0.8		0.0		20.5	
6	03/16/2001	07:25	0.5		0.0		1.0		0.0		19.7	
7	03/16/2001	07:25	0.8		0.0		0.9		0.0		20.7	
8	03/16/2001	07:25	0.0		0.0		0.6		0.0		20.7	
9	03/16/2001	07:26	0.0		0.0		0.6		0.0		20.7	
10	03/16/2001	07:26	0.0		0.0		0.6		0.0		20.8	
11	03/16/2001	07:26	0.0		0.0		0.6		0.0		20.8	
12	03/16/2001	07:26	0.0		0.0		0.8		0.0		20.8	
13	03/16/2001	07:27	0.0		0.0		0.6		0.0		20.8	
14	03/16/2001	07:27	0.0		0.0		0.7		0.0		20.8	
15	03/16/2001	07:27	0.0		0.0		0.7		0.0		20.7	
