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