sierra monitor corporation

Application Data Sheet
ADS-001

Gas Sensor Placement Guidelines

Selecting the location for placement of gas sensors involves several different factors. You must first evaluate the gas risk in the facility. The risk assessment process is critical in both identifying the potential consequences of a gas leak to personnel, facilities and the environment and establishing the liability to the firm of a significant leak. Based upon the risk assessment you can decide what sensors are required. Second, you must evaluate the physical location to determine the number of sensors required and their placement.

Qualification:

The guidelines presented below are for reference only. They are not exhaustive and should not be substituted for a professional analysis of the gas risk problem. These guidelines do not address related subjects such as a comprehensive hazard assessment, data logging, system operation, system alarm response and alarm procedures at the facility.

A. Use engineering judgment

There are no complete and definitive regulations or guidelines published by ISA, NFPA, UL, FM or other agencies that tell users where or how many gas sensors to use. [1] Each gas leak possibility must be evaluated as a unique problem to assess the risk to people and property. The object of monitoring system design is to reduce the risk to people and property by responding to the gas leak.

Note 1: NFPA has published NFPA 73E Standard on Automatic Fire Detectors, Appendix A, which suggest that a diffusion sensor used for smoke detection be placed every 900 square feet of ceiling space.

B. Consider

- Probability of gas leaks (i.e. equipment or material failure, operating error, changes in composition of materials used, etc.)
- Quantity of gas that could be present
- Environmental conditions (i.e. wind speed, wind direction, blowers/fans in room, temperature, etc.
- Dilution rates and convection currents (as affected by natural diffusion, forced air ventilation procedure, etc.)
- Density of gas (heavier or lighter than air – see Chart 1)
- Interfering gases

Chart 1: Gas Weight in Relation to Air for Typical Gases

Ammonia	**Lighter**
Butane	**Heavier**
Carbon Dioxide	**Heavier**
Carbon Monoxide	**Slightly Lighter**
Methane	**Lighter**
Chlorine	**Heavier**
Ethane	**Slightly Heavier**
Ethylene	**Slightly Lighter**
Heptane	**Heavier**
Hydrogen	**Lighter**
Hydrogen Chloride	**Heavier**
Hydrogen Cyanide	**Lighter**
Hydrogen Sulfide	**Heavier**
Methyl Alcohol	**Heavier**
Nitric Oxide	**Slightly Heavier**
Nitrogen Dioxide	**Heavier**
Pentane	**Heavier**
Propane	**Heavier**
Sulfur Dioxide	**Heavier**
Toluene	**Heavier**

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C. Place sensors close to possible sources of gas leaks. This includes gas cylinders, any device using gas, valves, fittings, flanges, pump seals, pressure vessels, tubing jungles and gas infusion from the ground or other routes.

D. Place sensors for use as area monitors. Area monitors are used as backup to sensors located close to the source of a leak and to monitor sources that are not fixed such as cars in a parking garage.

E. Place sensors in areas where gas might accumulate. These areas include above false ceilings, in stairwells, gratings, storage cabinets and other locations where gases might migrate due to their density and/or might not be subject to ventilation typical of the area.

F. Place toxic gas and oxygen deficiency sensors in the "breathing zone" in addition to areas defined above. The breathing zone is typically 4-6 feet above the floor.

Other Considerations

After location is determined based upon A-F above, consider accessibility and maintenance issues. Sometimes a minor change in location of a sensor module will enhance access with no detriment to functionality.

Some gases can be both combustible and toxic. Typically, the toxic levels are much lover than the LEL levels.

The proper concentration to be monitored is **determined by the user**. For example, in a usually unmanned area, a user may want to monitor for the gas at LEL levels because of the concern of an explosion.

In some cases, the true gas risk is the displacement of oxygen rather than the presence of the toxic gas. In such cases, it is best to install an oxygen deficiency sensor module to protect the personnel.