

SCOPE

- I 1.1 This practice covers the selection, specification, design and installation of combustible and toxic vapor detection systems. This practice does not cover extractive-type vapor monitoring systems, nor personnel monitors for TLV (Threshold Limit Value) exposure monitoring.
- I 1.2 **An asterisk (*)** indicates that a decision by the Owner's Engineer is required or that additional information is furnished by the Purchaser.

SUMMARY OF ADDITIONAL REQUIREMENTS

- I 2.1 **Table 1** lists the practices which shall be used in conjunction with this practice.
- I 2.2 **Table 2** lists the standards which shall be used with this practice as specified by the Purchaser.

TABLE 1

PRACTICES			
IP 4-3-3	Shelters for Process Analyzers	IP 16-1-1	Area Classification and Related Electrical
IP 15-7-1	Electrical Power Branch Circuit Design		Design for Flammable Liquids, Gases or
	for Instrumentation		Vapors
IP 15-7-3	Alarm Systems	IP 20-1-1	Inspection of Equipment and Materials

TABLE 2

STANDARDS	
ANSI / ISA	
S12.13, Part I	Performance Requirements, Combustible Gas Detectors
RP 12.13, Part II	Installation, Operation and Maintenance of Combustible Detection Instruments
S12.15, Part I	Performance Requirements, Hydrogen Sulfide Detection Instruments
RP 12.15, Part II	Installation, Operation and Maintenance of Hydrogen Sulfide Detection Instruments
API	
TP555	Process Analyzers, Section 2.2 - Area Safety Monitors

- S 2.3 Vapor detection systems shall meet all applicable local performance, electrical, and hardware codes and regulations.
- S,O * 2.4 All vapor detection system proposals shall be reviewed by the Owner's Engineer.

DOCUMENTATION

- O,M * 3.1 The number of copies and delivery schedule of instruction manuals shall be specified by the Owner's Engineer. The manuals shall cover all components and where appropriate include the following for the system delivered:
 - a. Internal wiring diagrams.
 - b. Interconnecting diagram indicating all connections and shielding requirements. Markings for wire color coding or numbering and for terminal identification shall be identical to those actually on the equipment supplied.
 - c. Mechanical outline and mounting drawings.
 - d. Detailed installation instructions.
 - e. Operating, start up and shut down instructions.
 - f. Calibration procedure, recommended validation and calibration frequency.
 - g. Complete parts list showing, and corresponding to, the model numbers of the actual components of the vapor detection systems.
 - h. Recommended spare parts list for two year's operation.
 - i. Troubleshooting procedures.
 - j. Performance charts and factory inspection data sheets.
 - k. Warranty documentation.
 - l. Software requirements.

IP 15-8-3		Combustible and Toxic Vapor Detection Systems (This practice is appropriate for attachment to Inquiry or Purchase Document)	
Page 2 of 4			
Rev. 2	June 1999		

- S *3.2 For vapor detection systems containing radioactive sources, all details of the source shall be forwarded to the Owner's Engineer within four weeks of order placement to allow site safety and local operating permits to be obtained.

MATERIALS

- O,M 4.1 Gas detection sensors, their components or remote control units specifically intended for use in the presence of corrosive vapors or gases, or which may produce corrosive by-products as a result of oxidation or other chemical process, shall be constructed of materials resistant to corrosion and/or suitably protected against corrosion.

DESIGN

SENSOR TYPES

- I 5.1 The list below is the typical sensor technologies which shall be considered for combustible and/or toxic vapor detection systems:
- Combustible Gases**
- a. Catalytic combustion bead point source sensors.
 - b. Short path NDIR point source sensors.
 - c. Open path for line of site monitoring using NDIR, FTIR, Laser.
- Toxic Gases** for specific compounds (i.e., H₂S, HF, CO, Cl₂, Br₂, etc.).
- a. Electrochemical cell.
 - b. Metal oxide semiconductor (resistive, inductive, capacitive).
 - c. IMS (Ion Mobility Spectroscopy).
 - d. Silicon chip (HF).
 - e. Open path for line of site using FTIR, Laser diode.

DESIGN CONSIDERATIONS

- S 5.2 Combustible vapor detectors shall not be used to detect both combustibles and toxic vapors. A separate toxic vapor detection system shall be used to detect toxic vapors if present.
- O 5.3 The purpose of vapor sensors is to detect a major leak as would occur in the event of an equipment failure such as the blowout of a pump seal. The sensors shall not be installed to detect fugitive emissions as might occur around the packing of a valve stem (an exception to this is in the detection of Hydrogen Fluoride, as well as detection of combustible or toxic vapors in confined areas such as analyzer houses).
- S 5.4 The principle of measurement should be considered. Some sensors are not designed to operate in the absence of oxygen (i.e., catalytic bead, metal oxide inductive H₂S sensors).
- S 5.5 If the leak source is within a partially confined area such that the combustion or toxic vapor can accumulate before it is transported and dispersed by the wind, the use of several sensors within the confined area should be considered.

PERFORMANCE

- O *6.1 Unless specified otherwise the following performance requirements shall apply to vapor detection systems, FS corresponding to full scale:
- a. Minimum detectable limit shall be 5% of FS.
 - b. Sensitivity shall be 2.0% of span or less.
 - c. Repeatability shall be $\pm 3\%$ FS.
 - d. Linearity shall be $\pm 3\%$ FS.
 - e. Zero Drift shall be $< 5\%$ of span/year.
 - f. Response time to 90% of reading shall be less than 30 seconds. If response time is longer vendor shall specify.
- O 6.2 Sensors shall not exhibit cross interference from compounds other than the compound being measured. If there are interfering compounds these shall be identified and quantified in the vapor detection system proposal.