

SPECIAL SPECIFICATION

SECTION 13871S

HAZARDOUS GAS DETECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Gas detection equipment and related safety controls associated with the following:
 - 1. Low Pressure Hydrogen
 - 2. High Pressure Hydrogen
 - 3. Silane
- B. The contractor shall furnish, program, install, adjust, calibrate, and make ready all sensors, switches, relays, controllers, wiring, and accessories indicated on the drawings and as required for a complete and totally functioning Flammable Gas Detection System.

1.02 REFERENCES/PROJECT REQUIREMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Requirements of the following Project Specification Sections apply to this section:
 - 1. Section 13870S – HPM Monitoring and Control System.
 - 2. Section 16120 - Cabling and Wireways

1.03 DEFINITIONS

Not Used.

1.04 SYSTEM DESCRIPTION

- A. Hydrogen Gas Detection System Performance Requirements:
 - 1. Scanning frequency: Fully monitor each detection point less than every 2 minutes.

Hazardous Gas Detection

2. Sensitivity: Sensitive to at least 10 ppm hydrogen.
 3. Accuracy:
 - a. Plus or minus 10 ppm of reading at 100 ppm.
 - b. Plus or minus 20 ppm of reading at 1000 ppm.
 4. Alarm response: At warning/alarm levels, within 30 seconds of initiation of analysis.
 5. Interference: Interference by other chemicals should not result in an alarm condition for listed detection chemical.
 6. Acceptable technologies:
 - a. Catalytic Bead (Use hydrocarbon filters where applicable).
- B. Silane and Toxic Gases and mixtures with exceptions being Hydrogen, NF₃, and hydrocarbon based liquid chemicals:
1. Scanning frequency: Fully monitor each detection point less than every 5 minutes.
 2. Sensitivity: Minimum 25 percent of TLV of monitored gas.
 3. Accuracy:
 - a. Plus or minus 7% of reading at TLV.
 - b. Plus or minus 5% of reading at three times the TLV.
 4. Alarm response: At TLV, within 30 seconds of analysis initiation.
 5. Interference: Interference by other chemicals should not result in an alarm condition for listed detection chemical.
 6. Acceptable technologies upon approval:
 - a. Chemical cassette.
- C. System Vendor shall be responsible for providing all subcomponents and equipment to connect to the HPM Monitoring and Control System.

1.05 SUBMITTALS

- A. Submit the following in accordance with Conditions of Contract and Section 01300S.
- B. Provide calibration data and procedures for all sensors, switches, and controllers as part of submittals.
- C. The contractor will be furnished reproducible copies of all contract drawings for use in preparing his shop drawings.
- D. Provide operation and maintenance manuals for all equipment under provisions of Section 01700.

1.06 QUALITY ASSURANCE

- A. Drawings, documentation, software, programming, and configuration are for exclusive use by the owner, and may be reused as deemed necessary by the owner.
- B. Conform to control system manufacturer's hardware and software installation, operations and programming documents.

1.07 SCHEDULING

- A. Coordinate and limit down time for control systems once started. Obtain approval for system shutdowns from Owner.

1.08 WARRANTY

- A. All contractor furnished products and labor shall have a two-year warranty.
- B. During warranty, all defective products shall be repaired or replaced, and all readjustments necessary to accomplish the specified sequences of operation shall be at no cost to SNL.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All materials and components used shall be standard components, regularly manufactured for this type application and not custom designed especially for this project.

- B. All products shall be as specified on the drawings and in these specifications or approved equals.

2.02 MANUFACTURERS

A. Hydrogen Gas

1. Controller: Zellweger Analytics – System 57
2. Sensor: Zellweger Analytics – Model 705

B. Silane and Silane mixtures

1. Controller: Zellweger Analytics – CM4

2.03 EQUIPMENT

A. Field Mounted Sensing Systems:

1. Control Cabinet shall be the 16-way front access rack type.
2. Control Cards shall have four channels of control, digital and analog status indicators and provide three levels of alarm set points.
3. The system shall provide full maintenance and setup capability for each channel.
 - a. Provide independent 4-20 ma DC signals for each sample point.
 - b. Use self-interrogating system, capable of alarm via independent output signal in event of system malfunction. Provide each monitor with an individual customer interface dry (potential free) contact for general monitor malfunction. Open contact in non-normal state; open contact (alarm state) when power is removed from monitor.
 - c. Provide equipment with electronic filtration to prevent false alarms from radio frequency generated equipment.
 - d. Design hardwired relay logic to de-energize relays in alarm state, with manual reset.
 - e. Open relay contacts if power is lost.
 - f. Provide means of testing both warning and alarm levels, by signal simulation.

4. Hydrogen Sensor shall consist of an encapsulated explosion-proof.
 5. Sensors located in Class 1 Division 2 areas must meet NEC and local code requirements. See Section for 16120 for list of Class 1 Division 2 areas.
- B. Pumped Sampling Systems:
1. Control interface:
 - a. Provide independent 4-20 maDC signals for each sample point.
 - b. Provide discreet alarm outputs for Level 1 Alarm, Level 2, Alarm and a grouped output for Maintenance/Trouble condition.
 - c. Use self-interrogating system, capable of alarm via independent output signal in event of system malfunction. Provide each monitor with an individual customer interface dry (potential free) contact for general monitor malfunction. Open contact in non-normal state; open contact (alarm state) when power is removed from monitor.
 - d. Provide equipment with electronic filtration to prevent false alarms from radio frequency generated equipment.
 - e. Design hardwired relay logic to de-energize relays in alarm state, with manual reset.
 - f. Open relay contacts if power is lost.
 - g. Provide means of testing both warning and alarm levels, by signal simulation.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Provide, install, and firmly secure equipment associated with gas monitoring systems.
- B. Field Mounted Sensing Systems:
 1. Provide and install cabling recommended by monitor manufacturer and obtain approval from Owner.

2. Label detection tubing every 20 feet, at end points, and at floor and wall penetrations. Include sample point numbers and sample point identification (sample point served).
3. Provide process fittings associated with remote sensor head installations.
4. Provide and install remote sensing heads with associated cabling for sampling of gases inside ductwork and cabinetry.

C. Pumped Sampling Systems:

1. Sample tubing:

- a. Provide and install sample tubing, recommended by gas monitor manufacturer and approved by Owner.
- b. Run sample tubing, in it's entirety, in PVC conduit, or cable tray. The only exception to this will be offsets and final terminations. Do not use tee's, splices or fittings except at final terminations.
- c. Provide process fittings associated with tubing connections.
- d. Label detection tubing every 20 feet, at end points, and at floor and wall penetrations. Include sample point numbers and sample point identification (sample point served).
- e. Verify sample points by vacuum checks on each sample line.

2. Provide all expendables for a period of one year.

D. Testing:

1. Provide test gases.
2. Test each sample point using test gas which monitor/sensor was designed to sample for.
3. Verify both warning and critical alarm levels.

E. Provide and install monitoring equipment associated with gas detection points listed in Specification 13870S – HPM Monitoring and Control System, Appendix B.

3.02 ADJUSTING

- A. Make minor modifications to system controller based on Owner inputs. Include a total of 40 man-hours to cover this work.
- B. Modifications must be approved by Owner prior to the start of related work. Payment will not be made for unapproved and documented modifications.
- C. Prior to performing any modifications, submit a form to the Owner for signed approval. Include the following information in the form:
 - 1. Explanation of modifications.
 - 2. Estimated number of hours to complete modification.
 - 3. Date form was filled out.

END OF SECTION