

SECTION 283500 - REFRIGERANT DETECTION AND ALARM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, 23 & 26 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes refrigerant monitors and notification appliances.

1.3 DEFINITIONS

- A. LCD: Liquid-crystal display.
- B. LED: Light-emitting diode.
- C. PIR: Photo-acoustic infrared.
- D. SCBA: Self-contained breathing apparatus.

1.4 SUBMITTALS

- A. Product Data:
 - 1. For refrigerant monitor, include refrigerant sensing range in ppm, temperature and humidity range, alarm outputs, display range, furnished specialties, installation requirements, and electric power requirement.
- B. Shop Drawings:
 - 1. Air-Sampling Tubing: Size, routing, and termination including elevation above finished floor.
 - 2. Wiring Diagrams: Power, signal, and control wiring.
- C. Coordination Drawings: Include machinery-room layout showing location of monitoring devices and air-sampling tubing with filter/inlet locations in relation to refrigerant equipment.
- D. Product Certificates: For monitoring devices, signed by product manufacturer.
- E. Field quality-control test reports.

- F. Operation and Maintenance Data: For refrigerant monitoring equipment to include in emergency, operation, and maintenance manuals.

1.5 COORDINATION

- A. Coordinate refrigerant detection and alarm system with refrigerant contained in refrigeration equipment for compatibility.

1.6 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. One calibration kit including specific refrigerant calibration gas for span calibration, minimum 103-L capacity, pressure regulator, tubing with carrying and storage case.

PART 2 - PRODUCTS

2.1 PIR REFRIGERANT MONITOR

- A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Haloguard III Monitor; Thermal Gas Systems, Inc. (Basis of Design)
 - 2. Chillgard LE Monitor; MSA; Instrument Division.
 - 3. Trane RMWD Monitor; Trane, a Division of Ingersoll Rand
- B. Description: Sensor shall be factory tested, calibrated, and certified to continuously measure and display the specific gas concentration and shall be capable of indicating, alarming, shutting down fuel-fired equipment, and automatically activating ventilation system.
- C. ASHRAE: Monitoring system shall comply with ASHRAE 15
- D. Performance:
 - 1. Refrigerant(s) to Be Monitored: R-134a.
 - 2. Range: 0 to 1000 ppm.
 - 3. Sensitivity:
 - a. Minimum Detectability: 20 ppm.
 - b. Accuracy: 0 to 99 ppm; plus or minus 1 ppm. 100 to 1000 ppm; plus or minus 10 percent of reading.
 - c. Repeatability: Maximum plus or minus 2 percent of full scale.
 - d. Response & Clearing cycle time: Maximum 150 seconds per sample.
 - e. Detection Level Set Points:
 - 1) Detection Level 1, 50 ppm.
 - 2) Detection Level 2, 250 ppm.
 - 3) Detection Level 3, 990 ppm.

4. Operating Temperature: 60 to 120 deg F.
5. Relative Humidity: 20 to 95 percent, non-condensing over the operating temperature range.

E. Input/Output Features:

1. Maximum Power Input: 120-V ac, 60 Hz, 75 W.
2. Number of Air-Sampling Points: One
3. Air-Sampling Point Inlet Filter: 0.60-micron filter element for each sampling point.
4. Alarm Relays: Minimum of Six (6) relays at minimum of 10A resistive load each.
5. Fault Relay: (Service/Fault indicator) One relay at minimum of 10A resistive load
6. Alarm Set Points: Displayed and adjustable through keypad on front of meter.
7. Alarm Manual Reset: Momentary-contact push button on the side panel of the monitor stops audible and visual notification appliances, extinguishes alarm LED, and returns monitor to detection mode at current detection levels.
8. Display: Alphanumeric LCD, LED or vacuum florescent indicating lights for each detection level; test switch mounted on front panel; alarm status LEDs and service fault/trouble LEDs.
9. Audible Output: Minimum 90 dB at 3 feet.
10. Visible Output: Strobe light.
11. Sensor Analog Output: 0- to 10-V dc into 2k ohms, or 4- to 20-mA into 1k ohms.
12. Enclosure: NEMA 250, Type 1 required for mechanical room conditions.

2.2 MONITOR ALARM SEQUENCE

- A. Detection Level 1: Notify HVAC control workstation of detection in the refrigeration equipment room on a rise or fall of refrigerant concentration to this level. Cycle local audible and strobe light on monitor control panel. Start ventilation system at low speed to allow occupancy by maintenance technicians to identify leaks.
- B. Detection Level 2: Notify the HVAC control workstation of the detection in the refrigeration equipment room on a rise or fall of refrigerant concentration to this level. Run ventilation system at high speed on a rise in concentration to this level. Operate the ventilation system at high speed for a minimum of five minutes. Cycle remote strobe lights outside the CEP.
- C. Detection Level 3: Notify the HVAC control workstation of the detection in the refrigeration equipment room on a rise or fall of refrigerant concentration to this level. Sound alarm horns and cycle strobe lights inside and outside refrigeration equipment room. Terminate operation of any combustion-process equipment located in the refrigeration equipment room. Sensor Fault/Trouble: Notify HVAC control work station of fault/trouble detection in monitor.

2.3 NOTIFICATION APPLIANCES

- A. Remote Combination Horns/Visible Alarm Devices: 120v operation for remote operation powered by Control panel. Comply with UL 464; electric-vibrating-polarized type, listed by a qualified testing agency with provision for housing the operating mechanism behind a grille. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn. Visible Alarm Devices: Comply with UL 1971; xenon strobe light flash tube.

2.4 AIR-SAMPLING TUBING

- A. Polyethylene Tubing: nonmetallic tubing rated for ambient temperature range of 10 to 150 deg F.

2.5 Required Options/Accessories

- A. Audible Alarm
- B. Battery B/U – Uninterruptable Power Supply – 90 Minute Minimum.
- C. Strobe Light on Panel.
- D. Remote Horn/Strobes. 120 Volt – 2 Required (outdoor and indoor).
- E. Analog Outputs: 0-10VDC and 4-20mA. For future connection to Colleges BMS System.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with ASHRAE 15
- B. Install air-sampling inlets in machinery room that are accessible to personnel.
- C. Wall mount air-sampling monitors with top of unit 60 inches above finished floor.
- D. Run air-sampling tubing from monitor to air-sampling point, in size as required by monitor manufacturer. Install tubing with maximum unsupported length of 36 inches, for tubing exposed to view. Terminate air-sampling tubing at sampling point with filter recommended by monitor manufacturer.
- E. Install air-sampling tubing with sufficient slack and flexible connections to allow for vibration of tubing and movement of equipment.
- F. Purge air-sampling tubing with dry, oil-free compressed air before connecting to monitor.
- G. Number-code or color-code air-sampling tubing for future identification and service of air-sampling multiple-point monitors.
- H. Place warning signs inside and outside each door to the refrigeration equipment room. Sample wording: "AUDIBLE AND VISUAL ALARM SOUNDING INDICATES REFRIGERANT DETECTION - DO NOT ENTER - ENTRY REQUIRES SCBA. Call College Security at 845-341-4710 and 911"

- I. Combination Audible/Visible Alarm-Indicating Devices: Install at each entry door to refrigeration equipment room, and position not less than 6 inches below the ceiling. Provide waterproof at exterior.

3.2 FIELD QUALITY CONTROL

- A. Installing Contractor to perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. Inspect field-assembled components, equipment installation, and electrical connections for compliance with requirements.
 - 2. Test and adjust controls and safeties.
 - 3. Test Reports: Prepare a written report to record the following:
 - a. Test procedures used.
 - b. Test results that comply with requirements.
 - c. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- C. Repair or replace malfunctioning units and retest as specified above.

3.3 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain refrigerant detection devices. Refer to requirements in Division 01.

END OF SECTION 283500