Part 1 General

Scope of Work:
Provide all labor, materials, products, equipment and service to supply and install a refrigerant detection and control system indicated on the drawing and specified in this section.
Reference standards:
Units shall be certified to UL and CSA requirements.

Part 2 Products

Provide a Honeywell Analytics model 301-EM-US3 Control Panel
Provide a Honeywell Analytics model 301-EMRP Annunciator Panel
Provide a Honeywell Analytics model S301-IRF-**** Series Refrigerant Gas Transmitters

Control panel

Control panel must be capable of communicating digitally through two RS-485 communication buses with the networked transmitters. Each communication bus must be capable of accepting up to 16 addressable transmitters at a maximum distance of 2000 feet. One power supply (bringing either 17-27 Vac or 24-38 Vdc) will be sufficient to power the entire gas detection network: controller and sensors.
Control panel will activate two internal DPDT relays at fully programmable alarm levels (and within programmable time delays) and be capable of activating up to 32 relay modules of 8 relays each. Relay rating will be no lower than 5 A, 30 Vdc or 250Vac (resistive load).
Control panel will be capable of communicating with an annunciator panel that can serve as a dummy controller within a secondary control room.
The control panel will indicate the exact concentration of gas, the gas detected and the location of the sensor by sweeping through the network and displaying the detected levels at each point on an alphanumeric display. The display will indicate two alarm levels for each sensing point. LED will also provide visual feedback in the following manner:

Normal operation:	Green LED
Alarm level 1:	Red LED
Alarm level 2:	Red LED
Failure:	Yellow LED

The standard 2 high/low alarm levels will be complemented with an optional third level that can be programmed into the panel at a later date.
Panel will have an incorporated audible alarm, rated at no less than 65 dBA at 3 feet, that will be activate at fully programmable levels.
Control panel will leave the factory fully programmed and will be adjustable in the field by keying instructions on the keypad.
Three levels of continuous self diagnostics will verify the reading of each transmitter for abnormal sensing behavior, loss of communication with the transmitters and program corruption analysis.
Unit will be manufactured to UL 1244 label and CSA 22.2.

Annunciator Panel

General

Panel will be powered by the controller or be powered by an external power supply rated at 17-27 Vac or 24-38 Vdc. Annunciator panel must be capable of communicating digitally with controller through an RS-485 communication port.

The panel will indicate the exact concentration of gas, the gas detected and the location of the sensor by sweeping through the network and displaying the detected of each transmitter on the LCD display. The display will indicate two alarm levels for each transmitter (up to 32 transmitters). LED will also provide visual feedback in the following manner:

Normal operation:	Green LED
Alarm level 1:	Red LED
Alarm level 2:	Red LED
Failure:	Yellow LED

Annunciator will have three alarm levels (or 2 alarm levels with a fault alarm) Each alarm level will be attached to a DPDT relay. Relay rating will be no lower than 5A, 30 Vdc or 250 Vac (resistive load). Annunciator panel's audible alarm will also be activated at fully programmable alarm levels (and within programmable time delays) by the control panel. The rating of the audible alarm will be no less than 65 dBA at 3 feet.

Unit will be manufactured to UL1244 and CSA 22.2

Gas Sensors

Infrared refrigerant transmitter will be powered by the control panel's power output or be powered by an external power supply rated at no less than 17-27 Vac or 24-38 Vdc. Fully addressable infrared refrigerant transmitter must be capable of communicating digitally with control panel through an RS-485 communication port. Gas transmitters must be installed in a true daisy chain with an end of the line resistor on the last transmitter.

Refrigerant will enter the infrared gas detection chamber through diffusion principle. Unit will perform the detection of refrigerant within the area the gas will be present. Refrigerant will be detected by the sensing of the absorption rate of a specific bandwidth of light. The transmitter will have resolution levels of 1 ppm with a minimum range of 0-1000 ppm. Temperature and relative humidity variations will have no effect on the unit's accuracy.

Transmitter will be capable of operating within relative humidity ranges of 5-90% and temperature ranges of 32^{o} F to 100^{o} F (0^{o} C to 40^{o} C).

Unit will be equipped with an impact resistant housing equivalent to a metal Nema 2 rating.

Unit will be manufactured to UL 1244 label and CSA 22.2.

Sensor alarm levels and unit to be installed to the following parameters:

TOXIC GASES	FIRST ALARM SETPOINT (TLV-TWA)	SECOND ALARM SETPOINT (TLV-STEL)	SENSOR LOCATION	RADIUS OF COVERAGE
R-11 (CCl_3F)	250 ppm	500 ppm	1 ft above the floor	20 feet
R-12 (CCl_2F)	250 ppm	500 ppm	1 ft above the floor	20 feet
R-22 ($CHClF_2$)	250 ppm	500 ppm	1 ft above the floor	20 feet
R-123 ($CHClFCClF_2$)	30 ppm	600 ppm	1 ft above the floor	20 feet
R-134a (CF_3CH_2F)	250 ppm	500 ppm	1 ft above the floor	20 feet

Other Refrigerants not listed above are available: R514A, R410A, R404A, R407C, R507A

Strobe Horn

Meet the following requirements:
A Red Strobe and Horn will be activated by the relay number 2 of the Control panel or the Annunciator panel. Power requirement will be 24Vac or 120 V AC 60/60 Hz 0.35 Amps.
Unit will be capable of operating within relative humidity ranges of 0-100%and temperature ranges of -30° F to 150° F (-35° C to 66° C).
Rating of horn will be no less than 72dB at 10 feet. Intensity of light will be no less than 40W and will flash at a frequency of 1 per second.

Additional strobes can be added per design requirements: A blue strobe for sensor network fault indication and yellow strobe for low level alarm and exhaust fan active status.

Self Contained Breathing Apparatus

Meet the following requirements:
SCBA must include one positive pressure second stage regulator, one first stage pressure reducing valve, one cylinder connector assembly, one shoulder mounted combined pressure indicator, one warning whistle, one positive pressure facemask fitted with optically clear polycarbonate visors, one backplate and harness assembly and one 30-minute aluminum cylinder.

Wall mount case must have convenient external latch and lightweight design to allow fast and easy installation. Durable ABS construction resists corrosion for long service life. Window provides view of the cases contents for faster inspections and better emergency location. Case must measure:
32 1/2 " H X 20" W X 13" D exterior, 28"H X 18"W X 10" D interior and weight no more than 10 lbs.

Part 3 Activation Sequence

Set up the following operation mode:

A. Activate one exhaust fan and one make-up zone when concentration reaches Alarm Level A as indicated in the above table
B. Activate audible and visual alarms (located on the controller and the external strobe horn) when concentration reaches Alarm Level B as indicated in the above table. Activate relay for Chiller shutdown. Activate relay for Combustion Equipment shutdown for any equipment located within the mechanical room.
C. Optional Yellow strobe should be activated when alarm level A is reached, and exhaust fans are active. Optional blue strobe should be activated when a sensor fault is detected.