SECTION xxx – REFRIGERATION MANAGEMENT

PART 1 - GENERAL

1.01 REFERENCES

A. ASHRAE 15-2004 - Safety Code for Mechanical Refrigeration.

1.02 SCOPE

A. The purpose of this Mechanical Equipment Room (MER) Refrigerant Management System is to provide the mechanical equipment room and its occupants with safe and hygienic environmental conditions per ASHRAE 15-2004 - Safety Code for Mechanical Refrigeration. Additionally it shall help to eliminate or minimize the release of refrigerants to the atmosphere and maintain equipment operating efficiencies to minimize the environmental impact of equipment operation.

1.03 WARRANTY & TRAINING

A. All components, parts and assemblies guaranteed against defects in material and workmanship for one (1) year in accordance with General Requirements - completion and acceptance by Owner and Architect/Engineer of total system for start of guaranty period.

B. During first year, BAS Contractor provides all software improvements to programs that are part of system that BAS manufacturer may make commercially available, at no additional cost to the Owner.

C. BAS Contractor also guarantees all water piping modification, temperature control equipment, all conduit, wiring and electrical devices he installed under BAS contract.

D. Following procedures govern warranty period:

1. Within 15 days after total BAS acceptance by Owner and Architect/Engineer, BAS Contractor will initiate warranty period by transmitting to Owner and Architect/Engineer commencement notification in writing.
2. Within 30 days of end of warranty period, BAS Contractor notifies Owner that one (1) year warranty is almost complete.

3. BAS Contractor's warranty covers all service, labor and parts, incidental to contrived proper performance of BAS and devices during warranty period.

4. Normal servicing of system components not considered BAS Contractor's responsibility after one (1) year warranty period, unless contracted for by Owner.

5. Six months into warranty, BAS Contractor to include inspection and recalibration of all refrigerant monitoring points.

6. At completion of warranty, BAS Contractor furnishes list of tasks recommended, frequency of preventative maintenance and tools to perform tasks recommended.

7. One year warranty is for all parts and labor, for specified equipment and systems called for in Division 17.

8. BAS Contractor shall provide for refrigerant monitoring system start-up and for eight hours of customer training.

1.04 REGULATORY REQUIREMENTS

A. International Mechanical Code

1.05 MAINTENANCE SERVICE

A. In addition to manufacture’s warranty, provide a one year service agreement to include two system calibration visits.

1.06 SUBMITTALS

A. Provide detailed product submittals and system drawings
B. Provide a detailed wiring diagram
C. Provide a detailed room layout drawing showing call components.

PART 2 - PRODUCTS

2.01 PRODUCTS

A. Infrared Refrigerant Gas Transmitter

1. Provide an MSA model Chillgard RT capable of detecting refrigerant utilized, or per chiller as required as represented by Energy Improvement Products. Contact Steve Duerkop 847–241-5700. Acceptable alternate manufacture “OI

Analytical" Model SAM IV Max, with 8 sample points.

2. Meet the following requirements:

a. The Gas Monitoring System shall be tested, approved, and certified by UL to the standards of UL 2075, including performance testing, and shall be listed and labeled accordingly.
b. Operating Principle - The principle of operation shall be of the infrared photo-acoustic absorption type.
c. Analyzer Sensitivity - The analyzer shall be capable of monitoring over a range of 0-1000 ppm with a sensitivity of 1 ppm in the 0-100 ppm range and +10% of reading in the 100-1000 ppm range.
d. Analyzer Linearity - The analyzer shall be capable of maintaining a linear response in the range of 0-100 ppm and + 2% of full scale in the range of 100-1000 ppm.
e. Stability - The 30 day zero or span drift must be less than 1% F.S. without the aid of automatic or manual re-calibration. The system must not employ any type of auto zero techniques in order to maintain analyzer stability. Use of fresh air source or scrubber as a zero reference is not permitted.
f. Temperature - The system shall operate over the range of 32 – 122 F (or) 0 to 50 C.
g. Calibration - The system must provide a menu-driven method of checking both zero and span calibration. Any adjustments must be made through front panel keypad.
h. Maximum System Maintenance Requirements - The system shall require no periodic maintenance other than periodic checking. Periodic checking or adjustments of the unit shall be capable of being accomplished by one person at the unit location.
i. Manufacturer Capability Requirements - As a minimum, the Gas Monitoring Equipment manufacturer must meet the following requirements:
    1. be capable of supplying all equipment used to check or calibrate the unit
    2. be capable of providing on site service with factory trained personnel
    3. be capable of providing start-up assistance and training for the owner/operator
j. Output Signals - The system shall be capable of supplying a 4-20 mA isolated sourcing signal and 0-10 VDC, signal representing the gas concentration being sampled.
k. Readout Displays - A 2 line x 20 character vacuum fluorescent display shall be provided for the purpose of displaying the gas concentration, diagnostics, set-up and calibration menu.
l. Visual Alarm Indicators - All alarm indications shall be displayed on the front panel display.

m. Alarm Set Point Levels - Three separate alarm set point levels shall be provided. The set points shall be independently adjustable for any value for a given range. The set points shall provide drive signals to user interface relays. The alarm set points shall have the capability of providing the user a selection of latching or non-latching.

n. Relay Outputs - The alarm set point drive signals shall activate user relays as follows:
   1. Number of Relays - As a minimum, one relay for each alarm set point level shall be provided.
   2. Contact Rating - All relays shall be Form C, single pole, double throw. Dry contacts shall be rated for 8 amps resistive at 120 VAC.
   3. Contact Selection - The contacts shall be capable of being selected normally energized or non-energized, latching or non-latching.
   4. As indicated on drawing, system must be capable of a minimum of eight additional contacts via expansion panel.

o. Malfunction Indication - The readout display shall display full diagnostics when a fault exists without the use of codes.

p. Audible Alarm - An audible buzzer is included, it sounds when one of the three pre-selected alarm conditions or a trouble condition occurs.

q. Front Panel Controls - The function listed in this paragraph shall be accomplished using a keypad readily accessible on the front panel.

r. No tool or special adapters shall be used for:
   1. display of alarm set point level on the readout display
   2. resetting any alarm set point
   3. zero and span calibration adjustments

s. System Power Requirements - The system shall operate on 115 or 220 VAC. Power input not to exceed 60 watts in single channel of operation.

B. Strobe Horn

Meet the following requirements:

Provide stackable audible and visual alarm indicators inside and outside each entrance to mechanical room (per ASHRAE 15 2004). Strobe horn will be activated by the relay of the Refrigerant Monitor. Power requirement will be 120 V AC 60/60 Hz 0.35 Amps. Unit will be capable of being mounted directly onto conduit or onto a 4 inch junction box.

Unit will be capable of operating within relative humidity ranges of 0-100%and temperature ranges of -30o F to 150o F (-35o C to 66o C).

Rating of horn will be no less than 72dB at 10 feet. Intensity of light will be no less than 40Wand will flash at a frequency of 1 per second.

Unit will be certified by UL.

C. Emergency Fan Activation and Equipment Shut-Down Switch
Remote control of the mechanical equipment in the refrigerating machinery room shall be provided immediately outside the machinery room door solely for the purpose of shutting down the equipment in an emergency. Ventilation fans shall be on a separate electrical circuit and have a control switch located immediately outside the machinery room door.

D. Self Contained Breathing Apparatus with Wallmount Case

Provide SCBA inside and outside mechanical room entrance(s). 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. Provide AirHawk 2216 PSIG with nylon harness w/chest strap, Ultra Elite, Medium Hycar, rubber head harness face piece, Aluminum, 30 minute cylinder.

Wallmount 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.

Provide manufacture's Training Video Tape.

PART 3 - EXECUTION

3.01 REFRIGERANT CONCENTRATION MONITORING

A. The Mechanical Equipment Room Refrigerant Management System shall monitor the operation of each Refrigerant Concentration Monitor for control and logging as follows:

1. Initiate emergency ventilation sequence.
2. Instantaneous refrigerant concentration in Parts Per Million (ppm).
3. Activate exhaust fan/system and open make up air, yellow level of stackable strobe horns when concentration reaches TLV-Time Weighted Average/Alarm Level A as specified

by refrigerant type used.

4. Activate blue level of stackable strobe horns when concentration reaches TLV-Short Term Exposure Level/Alarm Level B as specified by refrigerant used so that all occupants unprotected can evaculate without experiencing health impairing or permanent health effects
5. Activate red level of stackable strobe horns when concentration level reaches TLV-Ceiling Concentration Level as specified by refrigerant used so that all persons can be notified of ceiling concentration levels.
6. The refrigerant detection system shall maintain data/reports of alarm conditions for operator viewing to assist in refrigerant asset management.

3.02 MECHANICAL EQUIPMENT ROOM VENTILATION

A. Normal Mode:

Insert appropriate Normal Mode Operation based on local code, project requirements and system design. I.E. - During normal operation the BAS shall control the mechanical equipment room to maintain the temperature at 85 F for operator comfort whenever the equipment room is occupied. Temperature set point shall be operator adjustable. When the room rises above 85 degrees F. (adj.), the outside air damper shall open and the single speed exhaust fan shall run. When the space temperature falls below 80 degrees F. (adj.) the damper shall close the exhaust fan shall stop.

B. Emergency Ventilation Mode:

When any concentration of refrigerant is sensed in the Mechanical Equipment Room the BAS shall go into the purge mode. The purge mode shall:

1. Provide a ventilation exhaust rate not less than that specified ASHRAE 15 - Safety Code for Mechanical Refrigeration.
2. Provide sufficient make-up air to replace air being exhausted. Make-up shall be 100% outside air.
3. The outside air fresh air damper shall open.
4. Exhaust fan shall run (highest speed).
5. All hot water and domestic boilers shall shutdown.
6. Alarm horn will sound and an alarm will report to central BAS system.

END OF SECTION