Part 1 General

1.1 REFERENCES

.1 American National Standards Institute (ANSI):

.1 ANSI/IEEE C57.13, Standard Requirements for Instrument Transformers.

.2 American Society for Testing and Materials International, (ASTM):

.1 ASTM B148, Standard Specification for Aluminum-Bronze Sand Castings.

.3 National Electrical Manufacturer's Association (NEMA):

.1 NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum).

.4 Air Movement and Control Association, Inc. (AMCA):

.1 AMCA Standard 500-D-12, Laboratory Method of Testing Dampers For Rating.

.5 Canadian Standards Association (CSA International):

.1 CSA-C22.1, Canadian Electrical Code, Part 1 (19th Edition), Safety Standard for Electrical Installations.

1.2 SUBMITTALS

.1 Submit shop drawings and manufacturer's installation instructions in accordance with E3 – Shop Drawings.

.2 Pre-Installation Tests:

.1 Submit samples at random from equipment shipped, as requested by the Contract Administrator for testing before installation. Replace devices not meeting specified performance and accuracy.

.3 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions for specified equipment and devices.

Part 2 Products

2.1 GENERAL

.1 Control devices of each category to be of same type and manufacturer.

.2 External trim materials to be corrosion resistant. Internal parts to be assembled in vibration-proof and heat resistant assembly.

.3 Operating conditions: 0 - 40°C with 10 - 95% RH (non-condensing) unless otherwise specified.

.4 Terminations: use standard conduit box with slot screwdriver compression connector block unless otherwise specified.

.5 Transmitters and sensors to be unaffected by external transmitters including walkie talkies.

.6 Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.

.7 Outdoor installations: use weatherproof construction in NEMA four enclosures.

.8 Devices installed in user occupied space not exceed Noise Criteria (NC) of 35. Noise generated by any device must not be detectable above space ambient conditions.

2.2 TEMPERATURE SENSORS

.1 Room temperature sensors and display wall modules:

.1 Room temperature sensors:

.1 Wall mounting, in slotted type covers having brushed aluminum or brushed stainless steel finish.

.2 Element 10-50 mm long RTD with ceramic tube or equivalent protection or thermistor, 10,000 ohm, accuracy of plus or minus 0.2°C.

.2 Duct temperature sensors:

.1 General purpose duct type: suitable for insertion into ducts at various orientations, insertion length 460 mm.

.2 Averaging duct type: incorporates numerous sensors inside assembly which are averaged to provide one reading. Minimum insertion length 6000 mm. Bend probe at field installation time to 100 mm radius at point along probe without degradation of performance.

2.3 TEMPERATURE TRANSMITTERS

.1 Requirements:

.1 Input circuit: to accept 3-lead, 100 or 1000 ohm at 0°C, platinum resistance detector type sensors.

.2 Power supply: 24 V DC into load of 575 ohms. Power supply effect less than 0.01°C per volt change.

.3 Output signal: 4 - 20 mA into 500 ohm maximum load.

.4 Input and output short circuit and open circuit protection.

.5 Output variation: less than 0.2% of full scale for supply voltage variation of ±10%.

.6 Combined non-linearity, repeatability, hysteresis effects: not to exceed ±0.5% of full scale output.

.7 Maximum current to 100 or 1000 ohm RTD sensor: not to exceed 25 mA.

.8 Integral zero and span adjustments.

.9 Temperature effects: not to exceed plus or minus 1.0 % of full scale/ 50 C.

.10 Long term output drift: not to exceed 0.25% of full scale/ six months.

.11 Transmitter ranges: select narrowest range to suit application from following:

.1 -50°C to 50°C, ±0.5°C.

.2 0 to 100°C, ±0.5°C.

.3 0 to 50°C, ±0.25°C.

.4 0 to 25°C, ±0.1°C.

.5 10 to 35°C, ±0.25°C.

2.4 PRESSURE TRANSDUCERS

.1 Requirements:

.1 Combined sensor and transmitter measuring pressure:

.1 Internal materials: suitable for continuous contact with industrial standard instrument air, compressed air, water, steam, as applicable.

.2 Output signal: 4 - 20 mA into 500 ohm maximum load.

.3 Output variations: less than 0.2% full scale for supply voltage variations of ±10%.

.4 Combined non-linearity, repeatability, and hysteresis effects: not to exceed ±0.5% of full scale output over entire range.

.5 Temperature effects: not to exceed plus or minus 1.5% full scale/ 50°C.

.6 Over-pressure input protection to at least twice rated input pressure.

.7 Output short circuit and open circuit protection.

.8 Accuracy: ±1% of Full Scale.

2.5 STATIC PRESSURE TRANSMITTERS

.1 Requirements:

.1 Output signal: 4 - 20 mA linear into 500 ohm maximum load.

.2 Calibrated span: not to exceed 150% of duct static pressure at maximum flow.

.3 Accuracy: 0.4% of span.

.4 Repeatability: within 0.5 % of output.

.5 Linearity: within 1.5% of span.

.6 Deadband or hysteresis: 0.1 % of span.

.7 External exposed zero and span adjustment.

.8 Unit to have 12.5 mm N.P.T. conduit connection. Enclosure to be integral part of unit.

2.6 SOLID STATE RELAYS

.1 General:

.1 Relays to be socket or rail mounted.

.2 Relays to have LED Indicator.

.3 Input and output Barrier Strips to accept 14 to 28 AWG wire.

.4 Operating temperature range to be -20°C to 70°C.

.5 Relays to be CSA Certified.

.6 Input/Output Isolation Voltage to be 4000 VAC at 25°C for one second maximum duration.

.7 Operational frequency range, 45 to 65 Hz.

.2 Input:

.1 Control voltage, 3 to 32 VDC.

.2 Drop out voltage, 1.2 VDC.

.3 Maximum input current to match AO (Analog Output) board.

.3 Output:

.1 AC or DC Output Model to suit application.

2.7 CONTROL DAMPERS

.1 Refer to Section 23 33 15 – Dampers - Operating

2.8 ELECTRONIC CONTROL DAMPER ACTUATORS

.1 Requirements:

.1 Direct mount proportional type as indicated.

.2 Spring return for "fail-safe" in Normally Open or Normally Closed position as indicated.

.3 Operator: size to control dampers against maximum pressure and dynamic closing/opening pressure, whichever is greater.

.4 Power requirements: 5 VA maximum at 120 V AC.

.5 Damper actuator to drive damper from full open to full closed in less than 120 seconds.

2.9 WIRING

.1 In accordance with Section 26 27 26 - Wiring Devices.

.2 For wiring under 70 volts use FT6 rated wiring where wiring is not run in conduit. Other cases use FT4 wiring.

.3 Wiring must be continuous without joints.

.4 Sizes:

.1 Field wiring to digital device: #18AWG or 20AWG stranded twisted pair.

.2 Analog input and output: shielded #18 minimum solid copper #20 minimum stranded twisted pair.

Part 3 Execution

3.1 INSTALLATION

.1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after start-up is complete.

.2 Install field control devices in accordance with manufacturers recommended methods, procedures and instructions.

.3 Temperature transmitters, controllers, relays: install in NEMA I enclosure or as required for specific applications. Provide for electrolytic isolation in cases when dissimilar metals make contact.

.4 Support field-mounted panels, transmitters and sensors on pipe stands or channel brackets.

.5 Electrical:

.1 Complete installation in accordance with Section Division 26.

.2 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.

.3 Install communication wiring in conduit:

.1 Provide complete conduit system to link Building Controllers, field panels and OWS(s).

.2 Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems.

.3 Maximum conduits fill not to exceed 40%.

.4 Design drawings do not show conduit layout.

.4 Do not run exposed conduits in normally occupied spaces unless otherwise indicated or unless impossible to do otherwise. Contract Administrator to review before starting work. Wiring in mechanical rooms, wiring in service rooms and exposed wiring must be in conduit.

3.2 TEMPERATURE SENSORS

.1 Stabilize to ensure minimum field adjustments or calibrations.

.2 Readily accessible and adaptable to each type of application to allow for quick easy replacement and servicing without special tools or skills.

.3 Outdoor installation:

.1 Protect from solar radiation and wind effects by non-corroding shields.

.2 Install in NEMA four enclosures.

.4 Duct installations:

.1 Do not mount in dead air space.

.2 Locate within sensor vibration and velocity limits.

.3 Securely mount extended surface sensor used to sense average temperature.

.4 Thermally isolate elements from brackets and supports to respond to air temperature only.

.5 Support sensor element separately from coils, filter racks.

.5 Averaging duct type temperature sensors:

.1 Install averaging element horizontally across the ductwork starting 300 mm from top of ductwork. Each additional horizontal run to be no more than 300 mm from one above it. Continue until complete cross sectional area of ductwork is covered. Use multiple sensors where single sensor does not meet required coverage.

.2 Wire multiple sensors in series for low temperature protection applications.

.3 Wire multiple sensors separately for temperature measurement.

.4 Use software averaging algorithm to derive overall average for control purposes.

3.3 MAGNEHELIC PRESSURE INDICATORS

.1 Install adjacent to fan system static pressure sensor and duct system velocity pressure sensor as reviewed by Contract Administrator.

.2 Locations: across filter sections.

3.4 PRESSURE AND DIFFERENTIAL PRESSURE SWITCHES AND SENSORS

.1 Install isolation valve and snubber on sensors between sensor and pressure source where code allows:

.1 Protect sensing elements on steam and high temperature hot water service with pigtail syphon between valve and sensor.

3.5 IDENTIFICATION

.1 Identify field devices in accordance with Division 26.

3.6 TESTING AND CALIBRATION

.1 Calibrate and test field devices for accuracy and performance.

END OF SECTION

Part 1 General

1.1 OFFICE AREA VENTILATION AND FREE COOLING

.1 System Description:

.1 The system consists of an energy recovery ventilator complete with a supply fan and an exhaust fan.

.2 System Setpoints:

.1 Free cooling setpoint: first stage of cooling PTAC thermostats, initially set to 23°C (73°F).

.2 Outside Air Temperature Free Cooling Setpoint: 15°C (60°F).

.3 System Start/Stop:

.1 The supply and exhaust fans will normally be energized by a stand-alone controller and operate to provide ventilation to the HHW building office area in occupied mode. For some free cooling, the ventilator will run to maintain a set temperature for cooling.

.2 Occupied Mode: On a signal from the stand-alone controller initiated by turning on the corridor light switch, the ventilator will be energized to operate.

.3 Free Cooling Mode: On a signal from the stand-alone controller initiated by one of the PTAC wall thermostats and the outside temperature sensor (below setpoint), the ventilator changeover damper will de-energize. Once the changeover damper has been confirmed to be de-energized, the supply and exhaust fans will then be energized and to maintain the free cooling setpoint.

.4 Shutdown: On a signal from the standalone controller (via the light switch) the supply and exhaust fans will be de-energized as well as the changeover damper.

1.2 HHW AREA VENTILATION

.1 System Description:

.1 The system consists of a supply fan with an electric duct heater and an exhaust fan. Both fans have associated two-position motorized dampers. The speeds of both fans are controlled simultaneously by variable speed drives.

.2 System Setpoints:

.1 Tempering of supply air at 10°C (50°F).

.2 Free Cooling Thermostat: 26°C (79°F).

.3 System Start/Stop:

.1 The supply and exhaust fans will normally be energized by a stand-alone controller and operate on 25% speed to provide ventilation to the HHW building in occupied mode. In the event of a hazardous waste spill, the fans can be run at 100% speed for a set time period in flush mode. For free cooling in the summer months, the fans will run to maintain a set temperature for cooling.

.2 Occupied Mode: On a signal from the stand-alone controller initiated by turning on either one of the HHW area light switches, the normally closed supply air damper and the normally closed exhaust air damper will open. Once the dampers have been confirmed to be in the open position by their limit switches, the supply and exhaust fans will then be energized to run at 25% speed.

.3 Flush Mode: On a signal from the stand-alone controller via a push-button or spring-back timer, the normally closed supply air damper and the normally closed exhaust air damper will open. Once the dampers have been confirmed to be in the open position by their limit switches, the supply and exhaust fans will then be energized to run at 100% speed for 15 minutes.

.4 Free Cooling Mode: On a signal from the stand-alone controller initiated by the free cooling wall thermostat, the normally closed supply air damper and the normally closed exhaust air damper will open. Once the dampers have been confirmed to be in the open position by their limit switches, the supply and exhaust fans will then be energized and their speeds will be simultaneously modulated to maintain the free cooling setpoint.

.5 Shutdown: On a signal from the standalone controller (via the light switch, push button or thermostat) the supply and exhaust fans will be de-energized and the motorized dampers will return to their normal closed state.

.4 Tempering Mode:

.1 The tempering mode will be activated when the supply temperature, as sensed by the temperature sensor, drops below the tempering setpoint by 1°C (2°F) and the fans are operating in Occupied Mode.

.2 The tempering mode will be deactivated when the supply temperature, as sensed by the temperature sensor, drops above the tempering setpoint by 1°C (2°F) and the fans are operating in Occupied Mode.

.3 The heating coil will modulate as required to satisfy the supply air temperature setpoint after the airflow proving switch has been closed.

1.3 HHW AREA HEATING

.1 System Description

.1 The HHW area heating system consists of four electric unit heaters located throughout the HHW building as indicated. The unit heaters will each have a remote line-voltage thermostat to control its operation. The temperature of the unit heaters shall be set at 10°C.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION