

PART 1 - GENERAL

- 1.1 REFERENCES
- .1 American National Standards Institute (ANSI).
    - .1 ANSI C12.7-1993(R1999), Requirements for Watthour Meter Sockets.
    - .2 ANSI/IEEE C57.13-1993, Standard Requirements for Instrument Transformers.
  - .2 American Society for Testing and Materials International, (ASTM).
    - .1 ASTM B 148-97(03), Standard Specification for Aluminum-Bronze Sand Castings.
  - .3 National Electrical Manufacturer's Association (NEMA).
    - .1 NEMA 250-03, Enclosures for Electrical Equipment (1000 Volts Maximum).
  - .4 Air Movement and Control Association, Inc. (AMCA).
    - .1 AMCA Standard 500-D-98, Laboratory Method of Testing Dampers For Rating.
  - .5 Canadian Standards Association (CSA International).
    - .1 CSA-C22.1-02, 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 Section 01 33 00 - Submittal Procedures.
  - .2 Pre-Installation Tests.
    - .1 Submit samples at random from equipment shipped, as requested by Departmental Representative, 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.
- 1.3 EXISTING CONDITIONS
- .1 Cutting and Patching: in accordance with Section 01 73 00 - Execution Requirements supplemented as specified herein.

1.3 EXISTING  
CONDITIONS  
(Cont'd)

- .2 Repair surfaces damaged during execution of Work.
- .3 Turn over to Departmental Representative existing materials removed from Work not identified for re-use.

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 watertight, shockproof, vibration-proof, heat resistant, assembly.
- .3 Operating conditions: 0 - 32 degrees C with 10 - 90 % 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 4 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 General: to be resistance or thermocouple type to following requirements:
  - .1 Thermocouples: limit to temperature range of 200 degrees C and over.
  - .2 RTD's: 100 or 1000 ohm at 0 degrees C (plus or minus 0.2 ohms) platinum element with strain minimizing construction, 3 integral anchored leadwires. Coefficient of resistivity: 0.00385 ohms/ohm degrees C.
  - .3 Sensing element: hermetically sealed.

- 2.2 TEMPERATURE SENSORS  
(Cont'd)
- .1 General: (Cont'd)
    - .4 Stem and tip construction: copper or type 304 stainless steel.
    - .5 Time constant response: less than 3 seconds to temperature change of 10 degrees C.
    - .6 Immersion wells: NPS 3/4, stainless steel spring loaded construction, with heat transfer compound compatible with sensor. Insertion length 100 150 mm as indicated.
  - .2 Outdoor air temperature sensors:
    - .1 Outside air type: complete with probe length 100 - 150 mm long, non-corroding shield to minimize solar and wind effects, threaded fitting for mating to 13 mm conduit, weatherproof construction in NEMA 4 enclosure.
- 2.3 TEMPERATURE TRANSMITTERS
- .1 Requirements:
    - .1 Input circuit: to accept 3-lead, 100 or 1000 ohm at 0 degrees C, platinum resistance detector type sensors.
    - .2 Power supply: 24 V DC into load of 575 ohms. Power supply effect less than 0.01 degrees 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 plus or minus 10 %.
    - .6 Combined non-linearity, repeatability, hysteresis effects: not to exceed plus or minus 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 degrees C.
    - .10 Long term output drift: not to exceed 0.25 % of full scale/ 6 months.
    - .11 Transmitter ranges: select narrowest range to suit application from following:
      - .1 Minus 50 degrees C to plus 50 degrees C, plus or minus 0.5 degrees C.
      - .2 0 to 100 degrees C, plus or minus 0.5 degrees C.
      - .3 0 to 50 degrees C, plus or minus 0.25 degrees C.
      - .4 0 to 25 degrees C, plus or minus 0.1 degrees C.
      - .5 10 to 35 degrees C, plus or minus 0.25 degrees C.

2.4 PRESSURE AND .1  
DIFFERENTIAL  
PRESSURE SWITCHES

Requirements:

- .1 Internal materials: suitable for continuous contact with compressed air, water, steam, etc., as applicable.
- .2 Adjustable setpoint and differential.
- .3 Switch: snap action type, rated at 120V, 15 amps AC or 24 V DC.
- .4 Switch assembly: to operate automatically and reset automatically when conditions return to normal. Over-pressure input protection to at least twice rated input pressure.
- .5 Accuracy: within 2 % repetitive switching.
- .6 Provide switches with isolation valve and snubber, where code allows, between sensor and pressure source.
- .7 Switches on steam and high temperature hot water service: provide pigtail syphon.

2.5 LEVEL SWITCHES .1

Requirements:

- .1 Multi-point liquid level activated switch suitable for domestic water service with levels as indicated.
- .2 Complete with floats and wiring as required.
- .3 N.O./N.C. Contacts rated as required for application. CSA approval for up to 250 volt 10 amps AC.

2.6 .1  
ELECTROMECHANICAL  
RELAYS

Requirements:

- .1 Double voltage, DPDT, plug-in type with termination base.
- .2 Coils: rated for 120V AC or 24V DC. Other voltage: provide transformer.
- .3 Contacts: rated at 5 amps at 120 V AC.
- .4 Relay to have visual status indication

2.7 SOLID STATE .1  
RELAYS

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 degrees C to 70 degrees C.
- .5 Relays to be CSA Certified.

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- 2.7 SOLID STATE RELAYS  
(Cont'd)
- .1 General: (Cont'd)
    - .6 Input/output Isolation Voltage to be 4000 VAC at 25 degrees C for 1 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.
- 2.8 CURRENT SENSING RELAYS
- .1 Requirements:
    - .1 Suitable to detect belt loss or motor failure.
    - .2 Trip point adjustment, output status LED.
    - .3 Split core for easy mounting.
    - .4 Induced sensor power.
    - .5 Relay contacts: capable of handling 0.5 amps at 30 VAC / DC. Output to be NO solid state.
    - .6 Suitable for single or 3 phase monitoring. For 3-Phase applications: provide for discrimination between phases.
    - .7 Adjustable latch level.
- 2.9 WIRING
- .1 For wiring under 70 volts use FT6 rated wiring where wiring is not run in conduit. Other cases use FT4 wiring.
  - .2 Wiring must be continuous without joints.
  - .3 Sizes:
    - .1 Field wiring to digital device: #18AWG.
    - .2 Analog input and output: shielded #18 minimum solid copper.
- 2.10 SOLENOID CONTROL VALVES
- .1 Coil: 120 VAC or 24V DC, as required.
  - .2 Size as indicated.
  - .3 Construction:
    - .1 Body: Brass or stainless steel.
    - .2 Seats: NBR or PTFE.
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- 2.10 SOLENOID CONTROL VALVES (Cont'd)
- .3 Construction: (Cont'd)
    - .3 Disc Holder: PA.
    - .4 Core Tube: Stainless steel.
    - .5 Core and Plugnut: Stainless steel.
    - .6 Springs: Stainless steel.
    - .7 Shading Coil: Brass or stainless steel.

PART 3 - EXECUTION

- 3.1 INSTALLATION
- .1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.
  - .2 Install field control devices in accordance with manufacturers recommended methods, procedures and instructions.
  - .3 Temperature transmitters, humidity transmitters, current-to-pneumatic transducers, solenoid air valves, 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 26 05 00 - Common Work Results - Electrical.
    - .2 Modify existing starters to provide for EMCS as indicated in I/O Summaries and as indicated.
    - .3 Refer to electrical control schematics included as part of control design schematics on drawings. Trace existing control wiring installation and provide updated wiring schematics including additions, deletions to control circuits for review by Departmental Representative before beginning Work.
    - .4 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.
    - .5 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.

- 3.1 INSTALLATION (Cont'd) .5 Electrical: (Cont'd)
- .5 (Cont'd)
- .3 Maximum conduit fill not to exceed 40%.
- .4 Design drawings do not show conduit layout.
- .6 Do not run exposed conduits in normally occupied spaces unless otherwise indicated or unless impossible to do otherwise. Departmental Representative to review before starting Work. Wiring in mechanical rooms, wiring in service rooms and exposed wiring must be in conduit.
- 3.2 TEMPERATURE AND HUMIDITY 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 4 enclosures.
- .4 Thermowells: install for piping installations.
- .1 Locate well in elbow where pipe diameter is less than well insertion length.
- .2 Thermowell to restrict flow by less than 30%.
- .3 Use thermal conducting paste inside wells.
- 3.3 PANELS .1 Arrange for conduit and tubing entry from top, bottom or either side.
- .2 Wiring and tubing within panels: locate in trays or individually clipped to back of panel.
- .3 Identify wiring and conduit clearly.

- 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 FLOAT SWITCH .1 Install as per manufacturer's recommendations.
- 3.6 TESTING AND COMMISSIONING .1 Calibrate and test field devices for accuracy and performance in accordance with the drawings and specifications.