

253000 Integrated Automation Instrumentation & Terminal Devices

Sections Included In This Standard:

- 1.1 Building Systems Control
- 1.2 Building Automation Systems (BAS)

1.1 BUILDING SYSTEMS CONTROL

A. HVAC CONTROLS:

1. General: Temperature control zones shall not combine areas with very different heating and/or cooling loads.
2. Ductwork Accessories: Damper systems designed to modulate shall be designed for easy inspection and maintenance.
3. Air Handling Equipment: If return & supply air fans are utilized, controls shall be provided which will insure their coordination and eliminate the possibility of over or under pressurization of the mixing plenum.
4. Thermostats and Sensors:
 - a) The location of all thermostats and sensors shall be noted on the plans and as-built drawings. All thermostats/sensors shall be marked with associated VAV box, address, and room assignments. The Building Automation Database shall include information; available to the user that describes thermostat/sensors terminal unit assignment and all associated spaces.
 - b) If required, in administrative, laboratory and private offices, thermostats shall include local adjustment and shall include a warmer cooler slider that can be adjusted for minimum and maximum CLG/HTG set-point range. Minimum and maximum range shall be adjusted through the building automation system only.
 - c) Thermostats/sensors shall not be located where they are subject to drafts, direct sunlight, or heat from nearby equipment.
 - d) A zone assigned temporary override push-button/timer shall be installed for each system and/or zone.
 - e) Thermostats shall be capable of dual set point settings, whether internally or as a function of the Building Automation System (BAS). This shall consist of a heating set point, a cooling set point and a dead band between the two. Thermostats will have security measures that prevent occupants from tampering with settings, either as an internal function of the device or through the BAS.
5. Time Clocks: Time clocks are typically not an acceptable control for HVAC applications.
6. Enclosures for Building Systems Control Electronics: Provide NEMA 4 enclosure of an appropriate size and install the electronics inside the enclosure. Simple "coin turn" latch

or other mechanical latch is sufficient (lock is not required).

7. Only a building served by an emergency generator shall be included as a candidate for a BAS system equipped with UPS backup. If a building is not served by emergency backup and power is lost, the BAS system shall likewise shut down and an orderly, sequenced, self initiated re-start shall occur when power is restored.

1.2 **BUILDING AUTOMATION SYSTEM (BAS)**

A. DIRECT DIGITAL CONTROLS (DDC):

1. DDC: The BAS shall be able to communicate and be programmed over a common WEB Based server platform utilizing the University of Florida Ethernet backbone. All functions of a standard facility management workstation shall be implemented at the Client PC Work Stations located anywhere within the University WAN. The Client PC shall not require any special software to access building automation systems.
2. Acceptable manufacturers: Acceptable manufacturers shall be Johnson Controls Incorporated, Automated Logic Corporation, or Siemens Industry, Inc. Acceptable manufacturer for Chilled Water Plants is Trane Summit. No others are acceptable.
3. BAS shall be field-programmable microprocessor-based, stand-alone BAS/DDC panels installed in a conditioned space (exceptions will be looked at on a case-by-case basis, with written approval required from Assistant Director, with the capability to upgrade through modules. Programming shall utilize low-level English language and/or graphical interface. Outdoor installations of BAS/DDC panels are not permitted.
4. BAS/DDC panels shall include but not be limited to Diagnostic Functions, Serviceability Functions, Control Functions, Management Functions, Time of Day Programming, Demand Control, Automatic Restart Programming, and Alarms.
5. Control Actuation: BAS shall utilize Direct Digital Controls with electric actuation. Air handling equipment shall utilize electric actuation on all control valves. Terminal boxes shall utilize electric actuation on all control valves. Electric actuation shall be used for damper control. Health Science Center requires pneumatic actuation for control valves 2" and larger, 1 1/2" and larger for steam, and for dampers greater than 2000 CFM, and all associated devices at that location. Check with PPD on pneumatic control if system is already in place. VAV terminal actuator shall be mounted external to the box allowing easy access to equipment.
6. Naming Convention: Refer to PPD "BAS Naming Convention" standards document for all building automation short and long naming convention. Contact PPD for the latest edition.
7. Graphical Standards: Refer to PPD "BAS Graphical Standards" document for all BAS graphical interface requirements. Contact PPD for the latest edition.
8. Communications:
 - a) The automatic temperature control (ATC) system shall include an open-protocol communication scheme based on a server-client architecture, designed around a WEB Based system architecture. The basis of the Direct Digital Control Systems

communications system shall be the latest edition of ANSI/ASHRAE Standard 135.... BACnet/IP protocol from the building level controller up to the WEB Based server operating system. The WEB Based system shall be capable of dynamic BBMD addressing.

- b) All building level components and controllers specified shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable. Communication protocols of building level control shall be BACnet for all new construction and major renovations. Utilize existing protocols with existing BAS- Johnson Controls N1/N2 or Siemens P1/P2.
 - c) Fiber optic cable shall be used between buildings and tested to ensure excessive loss is not present. A report shall include measurements taken.
 - d) Telephone modem communication is not acceptable, except at locations remote from campus and as approved by PPD.
9. The BAS shall include a direct connection to the level supervisory controllers, independent of the UF WAN/LAN. Building operations shall be stand alone upon loss of the UF WAN/LAN communications.

B. CHILLED WATER and HOT WATER METERING AND TOTALIZATION:

- 1. All new and renovated buildings supplied with chilled water and hot water (domestic and heating/reheating) shall be metered as outlined below.
- 2. The energy measurement system shall be built and calibrated by a single manufacturer and shall consist of a flow meter, two matched semiconductor-based temperature sensors, a BTU totalizer, temperature thermowells, and all required mechanical installation hardware. A certificate of NIST* traceable wet-calibration shall be provided with each system.
- 3. BTU Meter: The BTU meter shall provide the following points both at the integral LCD and at the building local Building Automation System: Energy Total, Energy Rate, Flow Rate, Supply Temperature and Return Temperature shall be the minimum points transmitted to the local Building Automation System. The BTU meter shall support output signals via serial network (protocol conforming to BACnet® MS/TP, BACnet Ethernet, JCI-N2 or Siemens-P1) and via individual analog and pulse outputs, but shall be compatible with the local Building Automation System. Each BTU meter shall be factory programmed for its specific application and shall be reprogrammable using the front panel keypad (no special interface device or computer required). The BTU meter shall save all totalization and programming parameters into EEPROM to prevent data loss in the event of power or communications interruption.
- 4. BTU meter shall be able to remotely read and shall be mounted on an accessible wall within the equipment room, 48"-60" a.f.f.
- 5. Flow Measurement: Electromagnetic flow meter, full bore rated for 150 psig minimum with an accuracy of plus or minus 1% of measured flow, to include converter. BAS shall also display water flow rate, and real time energy values. On new construction projects, the preference is in-line electromagnetic flow meters. In certain cases where bi-directional flow measurement is desired, turbine meters may be used upon approval.

6. Flow meter shall be remotely read on an accessible wall within the equipment room mounted 48" - 60" a.f.f.
7. Flow Meter Sizing: Sizing of flow meters shall be based on existing load or expected load, (not line size). Meter should be sized to operate at 90% of span under design load conditions. This will ensure maximum turn down and give the builder a target for meter sizing.
8. For Meter Sizes 3" and larger with adequate available straight run per manufacturers installation recommendations: Provide an Insertion Electromagnetic Flow Meter, complete with all installation hardware necessary to enable insertion and removal of the meter without system shutdown. The flow meter shall be hand-insertable. Materials of construction for wetted metal components shall be 316 SS or better. Each flow meter shall be individually wet-calibrated against a primary volumetric standard that is accurate to within 0.1% and traceable to NIST*. A certificate of calibration shall be provided with each flow meter. Accuracy shall be within $\pm 1.0\%$ of rate from 2-20 ft/s. Overall turndown shall exceed 80:1 from 0.25-20 ft/s. Output signals shall be completely isolated.
9. For Meter Sizes under 3" or installation locations without adequate straight run for Insertion Electromagnetic Flow Meter; Provide a full bore Electromagnetic flow meter, rated for 150 psig minimum with an accuracy of plus or minus 0.4% of measured flow, to include converter.
10. Flow meter reading shall be in GPM.
11. Flow Meter Output: Output shall be high resolution frequency, 0-10V DC, or 4-20 ma signal and the output shall be isolated.
12. Totalization: A stand-alone non-resettable totalizing register shall be used. Totalization of Tonnage data is to be presented in Kilo Ton Hours (KTNH) and totalization of Hot Water is to be presented Kilo pounds of steam equivalent (Klbs).
13. Acceptable Flow Measurement Manufacturers: Yokogawa, Onicon.
14. Temperature Measurement: Temperature sensors shall be loop-powered current based (mA) sensors and shall be bath-calibrated and matched (NIST* traceable) for the specific temperature range for each application. The calculated differential temperature used in the energy calculation shall be accurate to within $+0.15^{\circ}\text{F}$ (including the error from individual temperature sensors, sensor matching, input offsets, and calculations).
15. A pressure/temperature test port (Pete's Plug) shall be installed adjacent to each sensor to allow for verification.
16. Provide an in-line measuring device or configured measurement location to be used for verification of the electronic flow meter. Shall use Venturi or Orifice plate sized for 75% of anticipated load or Circuit Balancing Valve in return branch location. Provide minimum 1" fully ported gate valve tap location for portable insertion meter.

C. STEAM MEASUREMENT AND TOTALIZATION:

1. All new and renovated buildings supplied with steam (direct/process) that cannot be measured utilizing the Hot Water BTU meter, shall be metered as outlined below.
 2. Flow Measurement: Steam meters shall be in-line type, vortex flow meter. Install meters inside building only on high-pressure (80 psig) line. Flow straighteners shall be used when piping conditions dictate. Secure to prevent tampering with readings or program. Provide separate pressure/temperature/compensated flow/uncompensated flow reading information to BAS. Steam meter shall be pressure and temperature compensated to assure accuracy when pressure and temperature fluctuate.
 3. Acceptable Manufacturers: Yokagawa, ~~Foxboro~~, Onicon.
 4. Flow meter shall be remotely read on an accessible wall within the equipment room mounted 48" - 60" a.f.f.
 5. Campus BAS Network: Units installed in buildings that are on the Campus BAS network shall be connected to the BAS.
 6. Flow Meter Sizing: Sizing of flow meters shall be based on existing load or expected load, (not line size). Meter should be sized to operate at 90% of span under design load conditions. This will ensure maximum turn down and give the builder a target for meter sizing.
 7. Flow meter reading shall be in lb/hr.
 8. Flow meter output signal shall be high resolution frequency, 4-20 ma, or 0-10 V DC, and the output shall be isolated.
 9. Totalization: A stand-alone non-resettable totalizing register KLB (Kilo Pound) totalizer shall be used. The totalizer needs to communicate flow, pounds, supply temperature, and pressure on a real time or near real time basis with the building BAS.
 10. BTU Meter: The BTU meter shall provide the following points both at the integral LCD and at the building local Building Automation System: Energy Total, Energy Rate, Flow Rate, Supply Temperature and Pressure shall be the minimum points transmitted to the local Building Automation System. The BTU meter shall support output signals via serial network (protocol conforming to BACnet® MS/TP, BACnet Ethernet, JCI-N2 or Siemens-P1) and via individual analog and pulse outputs but shall be compatible with the local Building Automation System. Each BTU meter shall be factory programmed for its specific application and shall be re-programmable using the front panel keypad (no special interface device or computer required). The BTU meter shall save all totalization and programming parameters into EEPROM to prevent data loss in the event of power or communications interruption.
- D. Appropriate surge protection shall be installed at all direct digital control panels (DDCP) and on communications buses (N2, P1, MSTP, etc) where cabling enters and leaves the building.
- E. WARRANTY: The warranty period for Energy Management and Conservation Systems shall not begin until Substantial Completion and shall not be less than 2 years for parts and not less

than 1 year for parts/labor.

END OF SECTION