Wayne State University

Facilities Planning and Management

Cohn Nursing Renovation
Building Automation System (BAS) Standards

4/24/2024

Ability to Self-Perform Requirements

All hardware and software must support the university's BAS team to self-perform all manner of maintenance, repairs, replacements, changes to configuration, programming, and commissioning of the system and its components. Requirements to support this include, but are not limited to, the following:

1. All components must be available for direct purchase by the university.
2. All software, licenses, communication adapters, and training used by the installing contractors must be available to the university
3. Planned BAS controller make and model line is to be disclosed with the bid
4. The name and version of the software tools needed to configure and program the field hardware devices shall be included with the bid. If the university does not already possess them, they must be provided.
5. Admin login credentials shall be provided for every controller and software installed

Acceptable Controller Manufacturers and Installers

Controls equipment shall be manufactured by one of the following:

1. Johnson Controls
2. Siemens Building Technologies
3. Automated Logic

Equipment shall be installed by one of the following:

1. Siemens Building Technologies local branch
2. Syenergy Engineering
3. Johnson Controls Inc
4. Automated Logic

Software and Licenses

Any software and licenses required to fully implement controls and graphics shall be disclosed and pricing included with the bid. This includes, but is not limited to: software plugins, drivers, point licenses, per device licenses, platform access licenses, etc. Disclosure shall include the period of time the license remain valid.

Sensor and Actuator Requirements

1. Sensors and actuators need not be of the same manufacture as controllers but shall be a domestically available brand and model.
2. Actuators shall be electrically powered and controlled by an industry-standard signal of 0-10 volts or 4-20 ma. Modbus or proprietary communication protocols are not acceptable.
3. Motors controlled by BAS shall have proof by means of current feedback from a VFD (preferred when available) or current sensor that provides an actual amperage reading. Current switches are not acceptable.
4. Return air humidity and CO2 sensors shall be provided for AHUs

5. Discharge air temperature sensors shall be installed on VAV box and fan coil units
6. Pressure transducers shall be provided for air handler return, supply air, across filters, and outdoor and indoor building static pressures
7. Temperature sensors for liquid entering and leaving air handler coils shall be provided
8. Humidifier controllers must monitor airflow to disable humidity delivery when airflow is lost. This can be done with a physical airflow sensor or by network data from the AHU controller or terminal controller serving the same final duct branch as the humidifier.

Labeling Requirements

1. Communication cables, whether ethernet, twisted pair, or other, shall be labeled on both ends with the WSU CIT network jack number or supervisory device their connectivity originates from.
2. Wiring to sensors and actuators shall be labeled on both ends with the point name
3. Sensors and actuators shall be labeled on the device or box the device is mounted in. The labels must include the point name and be visible without removing covers.
4. Low voltage power wiring to controllers must be labeled with the transformer identifier if the transformer is not adjacent to the controller (such as a transformer that serves multiple terminal controllers).
5. Transformers that serve more than one controller shall be labeled with their identifier

Wiring Requirements

1. All low voltage data installation work that connects to WSI CIT equipment should follow WSU Telecommunication Standards* by an approved low voltage vendor.
2. All low voltage data installation work that connects only through BAS equipment should follow WSU Telecommunication Standards* but may be installed by the BAS contractor.
3. An as-built network riser diagram that accurately shows each the devices connected to each field trunk must be provided with the closeout documents.

* WSU Telecommunication Standards can be found here: https://tech.wayne.edu/docs/wsu-communications-standards.pdf

Design and Configuration Requirements

1. Air handler controllers and controllers acting as supervisory devices shall use BACnet/IP to communicate over the campus-wide BAS.
2. Terminal equipment controllers (VAVs, FCUs, humidifiers, unit heaters, etc) shall be subnetworked with supervisory controllers. The subnetwork shall communicate using BACnet/IP unless MSTP or other protocol is required to support existing devices.
3. Physical safeties (temperature limits, duct static, etc) that shut down the unit shall be used and monitored by the BAS. The BAS shall be able to distinguish and indicate type of lockout (low temp, duct static, motor overcurrent, etc)
4. The bidding documents shall include an overall system narrative including B.A.S. architecture.
5. Contractor submittals must be provided to the University for concurrent review.

6. Alarms on critical points, components, and systems are an important feature and require review and concurrence by the University during the design development phase of the B.A.S.
7. Upon the completion of work, as-built documents for full B.A.S. installation, including all drawings, tables, point identifications, operating sequences, set-points, final copies of all program files (PPCL, .CAF, etc), application type or application number, etc. shall be provided with project closeout documents.
8. All systems shall be integrated into the Wayne State University campus wide BACnet network. All designs shall incorporate all hardware, software, conversion devices, etc. necessary to affect a fully functional system.
9. All IP devices shall be configured to use the IP address that will be provided by the university
10. All BACnet devices shall be configured with the BACnet instance ID provided by the university for that specific device
11. All device networks created shall be configured with a network ID provided by the university
12. To facilitate the previous two requirements, a spreadsheet of all BACnet and IP devices shall be provided to the university. The spreadsheet must include the following information:
    a. Device name or identifier (VAV box number, etc)
    b. Device location
    c. Device model number
    d. Device MAC address
    e. Which controller supervises the device
    f. The equipment that serves the VAV box or FCU (Which air handler)
    g. The space the device serves (room number, etc)

Graphics Requirements

Fully functioning graphics for monitoring and operating equipment controlled by the BAS shall be provided on one of WSU existing front-end platforms, which include:

1. Desigo CC
2. Metasys
3. WebCTRL

A fully licensed copy of any software(s) needed to make program and graphics changes that the university does not already own shall be provided.
Site-specific training on the implemented BAS equipment and graphics interface shall be provided, including operations and making changes to the graphics.

Graphics Features

1. Graphics acceptable to the University shall be provided for all mechanical and electrical systems and components which are controlled or monitored by the B.A.S.
2. Graphics must accurately represent the system; examples include but are not limited to:
    a. Area or equipment served
    b. The number and type of fans, dampers, and coils
    c. The location of sensors relative to filters, coils, etc
    d. Correctly oriented pumps, fans, flow arrows
    e. Where one output signal from the controller controls multiple devices, it shall be clearly indicated in the graphics (return, outside air, and exhaust dampers are a common example).

i. If the same is accomplished by a single software point that manipulates separate physical outputs, all points and their relationship shall be indicated on the graphics

3. All terminal device graphics should contain locations such as room numbers the device is serving. It should also notate what air handler feeds the device. It should show room set point, room temperature, discharge temperature, damper command, damper position, cfm set point, cfm the unit is putting out, valve command, valve position and mode heat or cool and occupancy or vacancy.
4. Any abbreviations shall be listed in a legend on the same page OR the full, descriptive name shall display on click or mouseover
5. The "as built" sequence of operations shall be available in the graphical platform by link on the equipment's graphics page

Programming Features

1) Programming shall include optimized start/stop for appropriate mechanical and electrical systems.
2) Point descriptors shall include upper/lower case characters. System or point names such as AHU #1; FEEDWATER PUMP #2; etc shall be all upper case. For example, "CIRCULATING PUMP #1 - Mechanical Room 235"
3) Point descriptors including room numbers shall represent the University's assigned nomenclature instead of construction document numbers, if different.
4) Security levels and password access shall be incorporated in accordance with university requirements.
5) AHUs of greater than 5 tons of cooling capacity with fresh air/make-up air supplies shall incorporate enthalpy control strategy.
6) Devices shall be programmed such that a return to normal operation is automatic upon startup. Defaults values for parameters and setpoints shall assure desirable conditions.
7) Humidifier output must be set to disabled upon loss of proof of airflow. See "Sensor and Actuator Requirements" for acceptable means of monitoring.
8) The following devices, when present shall be monitored:
    a) Building Alarms – (non-security)
    b) Refrigerant Leak Detectors
    c) Water and Other Fluid Leak Detectors
    d) Sump Pump High Level Alarms
    e) Sewage Ejector High Level Alarms
    f) Jockey Pump Motor Starters
    g) Fire Pump Motor Starters
    h) Boiler Alarm contacts
    i) Others as identified
    j) Emergency Generators shall be monitored for a running condition, fuel storage tank level, ambient temperature for exterior mounted equipment, and high and low engine operating temperature.