

SECTION 25 50 00

INTELLIGENT BUILDING AUTOMATION SYSTEM

PART 1 GENERAL

1.01 RELATED SECTIONS

- A. Section 25 00 00 – Controls.
- B. Section 25 90 00 – Sequence of Operation and Point/Data List.
- C. Other division 21-28 sections that specify the Subsystems to be integrated to the IBAS.

1.02 RELATED WORK

- A. This section along with those for the integrated Subsystems are responsible for joint efforts in integrating the Subsystems to the IBAS.
- B. The Controls Contractor and Contractor for other integration Division 21-28 Subsystems shall set up the Subsystems to communicate the specified data with the IBAS. Subsystems that are BTL-listed shall be set up to use BACnet Alarm and Event services for alarm reporting and BACnet Schedule/Calendar objects for scheduling.
- C. Communications address and device/object instance numbering are the responsibility of each Subsystem's Contractor.
- D. All modifications to the IBAS for representing/controlling data from the Subsystems (e.g., graphics, alarm reporting, trend data presentation, schedule viewing/changes, etc.) are the responsibility of this section's Contractor.
- E. This sections' Contractor shall review the sections for all integrated Subsystems to determine the scope of the communicated data and operator interface functions for the IBAS.
- F. See Part 3 of this section for more information.

1.03 SUBMITTALS

- A. Prior to commencement of the work submit:
 - 1. Graphic Screens and Reports:
 - a. Meet with the DPS Controls Application Engineer and the Subsystem contractors prior to developing the following submittals to determine the graphic screen design, any communicated point/data list additions/choices, the point/data naming convention, the alarming/trending requirements (including alarm priority levels), the schedules required, and/or any other items listed below regardless of their level of definition in the design.
 - b. Submit for approval a list of the graphic/report screens to be provided; and, for each screen, provide a conceptual layout of the screen and data, including those linkages to other pages/screens. Details on the required graphics/reports are in Part 3 of the specification.
 - 1) All Subsystem data shall be represented or listed.
 - 2) The point/data naming convention to be used.
 - 3) All operator interface functions required by the specification shall be represented.
 - 4) For Subsystems that are not BTL-listed (and/or do not support BACnet Alarm & Event services, Schedule/Calendar objects, and/or Trend Log objects):

- a) Include an alarm list that defines the messages to be used for each class of alarms, and the routing (i.e., to what printers/terminal) of each class of alarms.
 - b) If applicable, include a start/stop schedule list that defines each unique schedule to be provided, the details of the schedule, and the equipment affected by the schedule.
 - c) Include a list of all points/data to be trended.
- 5) For each screen proposed include a list of all setpoints and other operating parameters to be available via the IBAS.
 - 6) The data to be trended.
 - 7) Coordinate the above effort with the Subsystems' contractors to ensure that it properly represents the designs.
- 2. System Test Plan – Submit the plan and forms to be used in the System Test procedures described in Part 3.
 - 3. Commissioning: Provide for approval all materials as required by the Commissioning Specification.
 - 4. Any product data sheets, if applicable.
- B. Upon acceptance of the system installation submit the following Record Drawing documentation:
 - 1. Completed test forms.

1.04 WARRANTY

- A. Manufacturer shall guarantee the work to be free from defects in workmanship under normal use for a period of 24 months from date of acceptance of system by Owner.
- B. Modify any defective workmanship within guarantee period, immediately, without cost to Owner.

1.05 COMMISSIONING

- A. Commissioning shall comply with Sections 23 08 00 Commissioning for HVAC.
- B. The Commissioning specifications shall include requirements to test all communications functions between the IBAS and the Subsystems.
- C. The IBAS Contractor shall participate in the Commissioning tasks as specified. These tasks shall not be a substitute for proper start-up and testing of the IBAS functions for this project.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. The existing IBAS hardware/software system shall be used for execution of the work required herein.
- B. Communications wiring, routers, gateways, switches, etc. specified/installed under other section. Unless otherwise determined no hardware or software products/installation, (e.g., routers, gateways, communications wiring/devices) are required in this section for IBAS operation.
- C. The IBAS is not capable of executing any control sequences. All building Subsystem sequences shall be executed by the Subsystems' controls.
- D. Failure of the IBAS shall not interrupt normal operation of any of the building Subsystems.

2.02 SYSTEM ARCHITECTURE

- A. System Level:
 - 1. Each of the following Subsystems, when IBAS integration is included in the project, shall be specified with a separate point of interface to the IBAS.
 - a. HVAC System:

- 1) Note – All HVAC equipment controls (including that provided with the equipment) shall be integrated to the DDC System. The DDC System in turn communicates all required IBAS points/data to the IBAS.
 - b. Plumbing System.
 - c. Fire Alarm and Notification.
 - d. Energy and Utility Management.
 - e. Lighting.
 - f. Electrical System.
- B. Building Level:
1. All Subsystems shall communicate to the IBAS via BACnet/IP.
 2. Exceptions/Clarifications:
 - a. Any Subsystem not available with BACnet/IP (or N1) communications shall be integrated to the DDC System using BACnet MS/TP, Modbus, etc. The Subsystem’s points/data shall in turn be routed to the IBAS via the DDC System.
 - b. HVAC equipment controls provided with the equipment (i.e., chiller controls) shall communicate directly with the IBAS if the equipment is provided with a BACnet/IP interface. However, the DDC System shall still be responsible for simultaneous communications with this equipment for use in meeting the 25 90 00 Integrated Auto Control Sequences for Facility
 - c. Plumbing system integration functions (typically alarm contact closures) are best accomplished via connection to the DDC System. This includes chilled/hot/steam flow/BTU metering which shall be specified under Section 25 00 00 Integrated Automation.
 - d. Certain energy metering functions are best accomplished via connection to the DDC System. This includes chilled/hot/steam flow/BTU metering which shall be specified under Section 25 00 00 Integrated Automation.
- C. IBAS Enterprise Level:
1. The Subsystems in each DPS building shall communicate with the IBAS via the DPS intranet.

2.03 NETWORK ROUTERS & GATEWAYS

- A. All communications hardware/software needed for communicating BACnet/IP data to the IBAS is provided under other sections.
- B. All communications hardware/software needed for other interfaces (e.g., BACnet MS/TP, Modbus, etc.) is provided under other sections.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. No work shall disturb the operation of the IBAS for use in operating other DPS school’s.
- B. Work on the IBAS shall be scheduled in advance with the DPS Controls Application Engineer.
- C. Time Synchronization – All 25 00 00 Integrated Automation with real-time clocks shall be synchronized from the real-time clock in the IBAS at least once every 24 hours.
- D. Develop IBAS graphic screens and other functions in accordance with manufacturer’s instructions.

3.02 POINT/DATA INTEGRATION

- A. General:
 1. Points/data to be mapped are listed in 15985, on the drawings and/or in the Subsystem specifications.

- a. The final list of points/data to be integrated shall be defined by the submittal process as defined in Part 1.
 2. All DDC System input and output points shall be mapped into the IBAS. .
 3. Physical points shall be mapped into the appropriate BACnet I/O point objects. If possible.
 4. Equipment modes (e.g., economizer, warm-up, etc.) and setpoints shall be mapped into BACnet MD, BD or AD objects.
 5. Map any other data required for operation of the IBAS functions (i.e., start/stop schedule data).
 6. BACnet objects shall use the BACnet standard's object instance numbering scheme.
 7. Point/Data Operator Override - Any manual operator actions described by the DDC System or other Subsystem sequences shall be available from the IBAS.
- B. Alarms:
1. The following applies to Subsystems that are BTL-listed as B-BC or AAC devices and/or support BACnet Alarm & Event services.
 - a. Subsystems that are not BTL-listed or support the above services shall be polled by the IBAS for any alarms.
 - b. Alarms algorithms shall be set up in the IBAS for any Subsystems that do not perform alarm monitoring of its system points (i.e., the target object shall be polled by the IBAS and compared to high/low limits or normal/off-normal states by the IBAS).
 2. Alarms (i.e. limits, messages, priorities) shall be set up in each Subsystem by the Subsystem contractor.
 3. Alarms shall be automatically communicated from the Subsystem to the IBAS in real-time.
 4. When requested by the IBAS, the Subsystem shall provide an alarm summary.
 5. Alarm priority – Coordinate with the Subsystem contractor concerning the specific alarm priority values to be used.
- A. Historical Data Trending:
1. The following applies to Subsystems that are BTL-listed as a B-BC and/or supports the BACnet Trend Log object.
 - a. Subsystems that are not BTL-listed or support the Trend object shall be polled by the IBAS for trending requirements.
 2. Trends shall be set up in the Subsystem by the Subsystem contractor.
 3. The IBAS shall read trend data (i.e., via the BACnet Trend Log object) every 48 hours (or sooner if the trend log has reached capacity), or whenever needed to fulfill an operator display request (i.e., to display a trend report on the IBAS).

3.03 ALARM REPORTING AND MANAGEMENT

- A. Set up the IBAS so that the alarms for this project are properly received, processed and routed.
- B. Receipt of an alarm shall be indicated on any graphic that includes associated point data. This indication shall be both textual and graphical (i.e., the point name and/or associated device shall change color, flash, and/or etc.).
- C. The alarm shall be identified by the IBAS as being received from this building and routed to the alarm summary for this building.

3.04 GRAPHIC SCREENS

- A. The system shall be provided with color graphic screens that show all of the controlled systems with all associated points, setpoints and modes of operation. including:

1. Opening screen graphic showing the building, campus, facility, etc.
 2. Each HVAC air and water system monitored or controlled.
 3. Each floor and zone controlled (floor plan) - both HVAC and smoke detectors where applicable.
 4. Each VAV box with DDC controls.
 5. Each electrical subsystem monitored or controlled.
 6. Each prime mover equipment (boilers, chillers, heat exchangers, pumps, towers, and distribution system).
 7. Utility consumption and outdoor condition logs.
 8. Fuel oil and generator systems.
 9. Each miscellaneous monitored or controlled point.
 10. Screens for any Subsystems not listed above with all points/data represented.
 11. Menu penetrations: “buttons” shall be provided to allow the user to easily move among the various graphics and menus. At any time, the operator shall be able to return to the main menu with one mouse click and shall switch from graphic to other modes within two mouse clicks.
- B. The final selection and design of graphic screens shall be determined as part of the submittal process as defined in Part 1.

3.05 TESTING AND ACCEPTANCE

- A. The tests described herein are to be performed after Contractor has performed their own system start-up testing performed as a necessary part of the installation, startup, and debugging process.
- B. The testing required below shall be observed by the Owner, and coordinated with the Owner and Subsystem contractors. The Subsystem contractors shall participate in the tests associated with their system.
- C. Testing:
1. The IBAS work shall be tested for proper operation.
 2. The Contractor shall use a protocol packet analyzer (i.e., Wireshark or any other “sniffer” with a BACnet message decoding capabilities) to:
 - a. Verify that the IBAS communications is not generating excessive network traffic (i.e., high packet reject rates), excessive polling by the IBAS, excessive alarm/event messages sent by the Subsystems.
 - b. Verify that all messages between the IBAS and the Subsystems are properly formed.
 3. Testing shall demonstrate the end-to-end integrity of all data communications and user commands between the Subsystem(s) and the IBAS.
 4. Selected time schedules, set point and control mode modifications, and output overrides shall be verified by changing the schedule and observing the correct response of the controlled outputs.
 5. Communication with each Subsystem controller with a testing of the operation of sample of messages/services expected.
 6. Specified IBAS reports and trend logs shall be demonstrated.
 7. Alarms shall be demonstrated, along with the output to the alarm GUI.
 8. Workstation commands and operating screens shall be explained and demonstrated.
- D. Owner and Engineer shall review installation and operation of IBAS, and prepare a list describing any deficiencies (punch list).

- E. Upon receipt of list of deficiencies from Owner, Contractor shall prepare written report indicating by Subsystem each outstanding item on list. Contractor shall correct items appearing on installation-inspection report and present written request for re-inspection and approval to Owner.
- F. Upon satisfactory completion of punch list and successful demonstration of operation for all components, Owner shall provide acceptance of IBAS. The date of Owner acceptance shall constitute the start of the warranty period.
- G. On the date of acceptance, Contractor shall provide the project record documentation.

3.06 INSTRUCTION AND TRAINING

- A. Upon completion of work and acceptance by Owner, IBAS representatives shall provide 16 hours of instruction/training to 4 of Owner's operating personnel. This instruction/training shall, at a minimum, consist of a review of the GUI screens created for the project, operator capabilities, Record Drawing documentation, the specific IBAS Interface technology utilized plus a walk through of the Project to identify equipment locations and to answer site questions.

END OF SECTION 25 50 00