SECTION 25 00 00 – building automation systems (BAS) general

GENERAL

[Note: This document describes how to employ this and other controls-related Specifications. The Engineer is instructed to consult the document for guidance on the nature of these Specifications, methods for deleting non-applicable text, and use and deletion of Editor’s Notes before proceeding with modification of this Specification to suit the Project.

Engineer shall consult the BJC BAS Configuration Guide for information about other controls related design responsibilities not indicated in Division 25 specifications.]

* + - 1. RELATED DOCUMENTS
         1. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
         2. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section and this Section is directly applicable to them.
      2. SUMMARY
         1. Section Includes:

Description of Work.

General Information

Quality Assurance.

System Architecture.

Distributed Processing Units/Quantity and Location.

Demolition and Reuse of Existing Materials and Equipment.

Sequence of Work.

* + - * 1. The HVAC systems being controlled are ***[describe the type of mechanical systems included in the Project]***. This Section defines the manner and method by which these controls function.
        2. Johnson Controls, Inc. (JCI) is the Building Automation System (BAS) Controls Provider for BJC Healthcare**.**

**[For Design- -Build projects, include the following paragraphs D andE. Select paragraph E as indicated.]**

* + - * 1. Owner shall hire BAS Provider for controls related scope as outlined in Division 25.
        2. **[Select for new BAS system]** BAS Provider shall be hired by the owner to furnish and install a direct digital control and building automation system (BAS). The new BAS shall utilize electronic sensing, microprocessor-based digital control, and electronic actuation of dampers and valves (except where noted otherwise) to perform control sequences and functions specified. The BAS for this Project will generally consist of monitoring and control of systems described herein. Reference shall also be made to control Drawings, Sequence of Operation, and points lists. **Contractor/Engineer** shall coordinate with JCI any work necessary to complete controls scope of work.
        3. **[Select for modifications to existing BAS System]** BAS Provider shall be hired by the owner to furnish and install direct digital controls that will be part of an existing building automation system. The existing BAS utilizes electronic sensing, microprocessor-based digital control, and electronic actuation of dampers and valves (except where noted otherwise) to perform control sequences and functions specified. The BAS for this Project generally consists of monitoring and control of systems described herein. Reference shall also be made to control Drawings, Sequence of Operation, and points lists.

[For Design-Bid-Build projects, include the following paragraphs D and E, Select paragraph E as indicated.]

* + - * 1. General Contractor shall hire BAS Provider for controls related scope as outlined in Division 25.
        2. **[Select for modifications to existing Johnson Metasys© BAS System]** BAS Provider shall furnish and install direct digital controls that will be part of an existing building automation system. The existing BAS utilizes electronic sensing, microprocessor-based digital control, and electronic actuation of dampers and valves (except where noted otherwise) to perform control sequences and functions specified. The BAS for this Project generally consists of monitoring and control of systems described herein. Reference shall also be made to control Drawings, Sequence of Operation and points lists.
        3. **[Select for new Johnson Metasys© BAS System:]** BAS Provider shall furnish and install a direct digital control and building automation system (BAS). The new BAS shall utilize electronic sensing, microprocessor-based digital control, and electronic actuation of dampers and valves (except where noted otherwise) to perform control sequences and functions specified. The BAS for this Project will generally consist of monitoring and control of systems described herein. Reference shall also be made to control Drawings, Sequence of Operations and points lists. BAS Provider will provide Johnson Controls system components and any necessary field mounted devices (sensors, switches, control valves, actuators, etc) unless otherwise stated in the documents.
        4. **Contractor/Engineer** shall coordinate with BAS Provider any work necessary to complete the controls scope of work. Any such work shall be included in engineer’s fee and contractor’s bid.
        5. It shall be the Contractor's responsibility to assure that all project equipment is compatible with Johnson Metasys controller hardware and software and that ***control interface of all equipment has been coordinated with the BAS Provider and equipment manufacturers prior to equipment submittal submission.***
      1. REFERENCE STANDARDS
         1. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
         2. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
         3. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).

ASHRAE 135: BACnet - A Data Communication Protocol for Building Automation and Control Networks, latest edition. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. and all current addenda and annexes.

NEMA Compliance:

NEMA 250: Enclosure for Electrical Equipment.

NEMA ICS 1: General Standards for Industrial Controls.

NFPA Compliance:

NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" where applicable to controls and control sequences.

NFPA 70 National Electrical Code (NEC).

Institute of Electrical and Electronics Engineers (IEEE)

IEEE 142: Recommended Practice for Grounding of Industrial and Commercial Power Systems.

IEEE 802.3: CSMA/CD (Ethernet – Based) LAN.

IEEE 802.4: Token Bus Working Group (ARCNET – Based) LAN.

IEEE 519: Recommended Practices and Requirements for Harmonic Control in Electric Power Systems.

* + - 1. QUALITY ASSURANCE
         1. Product Line Demonstrated History: The product line being proposed for the Project must have an installed history of demonstrated satisfactory operation for a length of one (1) year since date of final completion in at least ten (10) installations of comparative size and complexity. Submittals shall document this requirement with references.
         2. Installer's Qualifications: Firms specializing and experienced in control system installations for not less than 5 years. Firms with experience in DDC installation projects with point counts equal to this Project and systems of the same character as this Project. If installer is a Value Added Reseller (VAR) of a manufacturer’s product, installer must demonstrate at least three years prior experience with that manufacturer’s products. Experience starts with awarded Final Completion of previous projects. Submittals must document this experience with references.
         3. Installer's Experience with Proposed Product Line: Firms shall have specialized in and be experienced with the installation of the proposed product line for not less than one year from date of final completion on at least three (3) projects of similar size and complexity. Submittals shall document this experience with references.
         4. Installer’s Field Coordinator and Sequence Programmer Qualifications:Individual(s) shall specialize in and be experienced with control system installation for not less than five (5) years. Proposed field coordinator shall have experience with the installation of the proposed product line for not less than two (2) projects of similar size and complexity. Installer shall submit the names of the proposed individual and at least one alternate for each duty. Submittals shall document this experience with references. Proposed individuals must show proof of the following training:

Product Line Training: Individuals overseeing the installation and configuration of the proposed product line must provide evidence of the most advanced training offered by the manufacturer on that product line for installation and configuration.

Programming Training: Individuals involved with programming the Site-specific sequences shall provide evidence of the most advanced programming training offered by the vendor of the programming application offered by the manufacturer.

* + - * 1. Installer’s Service Qualifications: The installer must be experienced in control system operation, maintenance and service. Installer must document a minimum five (5) year history of servicing installations of similar size and complexity. Installer must also document at least a one year history of servicing the proposed product line.
      1. SUBMITTALS
         1. General: Submit under provisions of Division 01 and per this section. Refer to Section 25 08 00 for additional Commissioning submittal requirements.
         2. Functional Intent: Throughout the Contract Documents, detailed requirements are specified, some of which indicate a means, method or configuration acceptable to meet that requirement. Contractor may submit products that utilize alternate means, methods, and configurations that meet the functional intent. However these will only be allowed with prior approval.
         3. Electronic Submittals: While all requirements for hard copy submittal apply, control submittals and operation and maintenance (O&M) information shall also be provided in electronic format as follows:

Drawings and Diagrams: Shop Drawings shall be provided on electronic media as an AutoCAD drawing. All ‘x reference’ and font files must be bound to the AutoCAD files.

Other Submittals: All other submittals shall be provided as a searchable pdf.

* + - * 1. Qualifications: Manufacturer, Installer, and Key personnel qualifications as indicated for the appropriate items.
        2. Product Data: Submit manufacturer's technical product data for each control device, panel, and accessory furnished, indicating dimensions, capacities, performance and electrical characteristics, and material finishes. Also include installation and start-up instructions.

Shop Drawings: Submit Shop Drawings electronically on AutoCAD software for each control system, including a complete drawing for each air handling unit, system, pump, device, etc. with all point descriptors, addresses and point names indicated. Shop Drawings shall contain the following information:

System Architecture and System Layout:

One-line diagram indicating schematic locations of all control units, workstations, LAN interface devices, gateways, etc. Indicate network number, device ID, address, device instance, MAC address, drawing reference number, and controller type for each control unit. Indicate media, protocol, baud rate, and type of each LAN. All optical isolators, repeaters, end-of-line resistors, junctions, ground locations etc. shall be located on the diagram.

Provide floor plans locating all control units, workstations, servers, LAN interface devices, gateways, etc. Include all WAN and LAN communication wiring routing, power wiring, power originating sources, and low voltage power wiring. Indicate network number, device ID, address, device instance, MAC address, drawing reference number, and controller type for each control unit. Indicate media, protocol, baud rate, and type of each LAN. All optical isolators, repeaters, end-of-line resistors, junctions, ground locations etc. shall be located on the floor plans. Wiring routing conditions shall be maintained accurately throughout the construction period and the Record Drawings shall be updated to accurately reflect accurate, actual installed conditions.

Schematic flow diagram of each air and water system showing fans, coils, dampers, valves, pumps, heat exchange equipment and control devices. Include written description of sequence of operation.

All physical points on the schematic flow diagram shall be indicated with names, descriptors, and point addresses identified as listed in the point summary table.

With each schematic, provide a point summary table listing building number and abbreviation, system type, equipment type, full point name, point description, Ethernet backbone network number, network number, device ID, object ID (object type, instance number). If this information is not available at the time of Shop Drawings submittals, furnish with O&M manual documentation for Owner review and approval.

Label each control device with setting or adjustable range of control.

Label each input and output with the appropriate range.

Provide a Bill of Materials with each schematic. Indicate device identification to match schematic and actual field labeling, quantity, actual product ordering number, manufacturer, description, size, voltage range, pressure range, temperature range, etc. as applicable.

With each schematic, provide valve and actuator information including size, Cv, design flow, design pressure drop, manufacturer, model number, close off rating, etc. Indicate normal positions of spring return valves and dampers. Engineer of Record shall provide design information on mechanical schedules.

Indicate all required electrical wiring. Electrical wiring diagrams shall include both ladder logic type diagram for motor starter, control, and safety circuits and detailed digital interface panel point termination diagrams with all wire numbers and terminal block numbers identified. Provide panel termination Drawings on separate Drawings. Ladder diagrams shall appear on system schematic. Clearly differentiate between portions of wiring that is existing, factory-installed and portions to be field-installed.

Details of control panels, including controls, instruments, and labeling shown in plan or elevation indicating the installed locations.

Sheets shall be consecutively numbered.

Each sheet shall have a title indicating the type of information included and the HVAC system controlled.

Table of Contents listing sheet titles and sheet numbers.

User Interface Graphic Screens.

Trends.

Alarms.

Legend and list of abbreviations.

Memory allocation projections.

Submit along with Shop Drawings but under separate cover calculated and guaranteed system response times of the most heavily loaded LAN in the system.

BACnet Protocol Information:

Submit the following:

BACnet object description, object ID, and device ID, for each I/O point.

Documentation for any non-standard BACnet objects, properties, or enumerations used detailing their structure, data types, and any associated lists of enumerated values.

Submit PICS indicating the BACnet functionality and configuration of each controller.

Control Logic Documentation:

Submit control logic program listings (for graphical programming) and logic flow charts illustrating (for line type programs) to document the control software of all control units.

Control logic shall be annotated to describe how it accomplishes the sequence of operation. Annotations shall be sufficient to allow an operator to relate each program component (block or line) to corresponding portions of the specified Sequence of Operation.

Include written description of each control sequence.

Include the equipment baseline for control PID Loop response, settings, setpoints, throttling ranges, gains, reset schedules, adjustable parameters and limits. Initial equipment setpoints shall be adjusted as needed for optimum equipment performance.

Sheets shall be consecutively numbered.

Each sheet shall have a title indicating the controller designations and the HVAC system controlled.

Include Table of Contents listing sheet titles and sheet numbers.

Submit one complete set of programming and operating manuals for all digital controllers concurrently with control logic documentation. This set will count toward the required number of Operation and Maintenance materials specified below and in Division 01.

Maintain Project record documents throughout the Warranty Period and submit final documents at the end of the Warranty Period.

* + - * 1. Record Documents:

BAS Provider shall submit separately and directly to BJC Healthcare Corporate Engineer and ROC Manager a pricing breakdown of all cost associated to Project for review. This is to include but not be limited to material quantity, description, unit list price, multiplier, cost, extended cost, material costs adjustment less Owner’s discount price, outside material price totaled and itemized, itemized subcontract price associated to Project, and total Project support price.

BAS Provider labor hours quantities shall be itemized by mechanical labor, electrical labor, and design and management labor. Hour quantities shall be itemized by journeyman rate, technician rate and design/management rate with quantity of hours listed separately.

Provide an accurate spreadsheet breakdown of physical point counts of all analog inputs, analog outputs, digital inputs, digital outputs, building controllers and application specific controllers. The total point count for the project shall be itemized in a logical manner to allow the owner to confirm point count accuracy. Below is an example.

Shop Drawings: Submit Shop Drawings electronically on AutoCAD software for each control system, including a complete drawing for each air handling unit, system, pump, device, etc. with all point descriptors, addresses and point names indicated. Shop Drawings shall contain the following information:

System Architecture and System Layout:

One-line diagram indicating schematic locations of all control units, workstations, LAN interface devices, gateways, etc. Indicate network number, device ID, address, device instance, MAC address, drawing reference number, and controller type for each control unit. Indicate media, protocol, baud rate, and type of each LAN. All optical isolators, repeaters, end-of-line resistors, junctions, ground locations etc. shall be located on the diagram.

Provide floor plans locating all control units, workstations, servers, LAN interface devices, gateways, etc. Include all WAN and LAN communication wiring routing, power wiring, power originating sources, and low voltage power wiring. Indicate network number, device ID, address, device instance, MAC address, drawing reference number, and controller type for each control unit. Indicate media, protocol, baud rate, and type of each LAN. All optical isolators, repeaters, end-of-line resistors, junctions, ground locations etc. shall be located on the floor plans. Wiring routing conditions shall be maintained accurately throughout the construction period and the Record Drawings shall be updated to accurately reflect actual installed conditions.

Schematic flow diagram of each air and water system showing fans, coils, dampers, valves, pumps, heat exchange equipment and control devices. Include written description of sequence of operation.

All physical points on the schematic flow diagram shall be indicated with names, descriptors, and point addresses identified as listed in the point summary table.

With each schematic, provide a point summary table listing building number and abbreviation, system type, equipment type, full point name, point description, Ethernet backbone network number, network number, device ID, object ID (object type, instance number). If this information is not available at the time of Shop Drawings submittals, furnish with O&M manual documentation for Owner review and approval. See Section 25 15 10 for additional requirements.

Label each control device with setting or adjustable range of control.

Label each input and output with the appropriate range.

Provide a Bill of Materials with each schematic. Indicate device identification to match schematic and actual field labeling, quantity, actual product ordering number, manufacturer, description, size, voltage range, pressure range, temperature range, etc. as applicable.

With each schematic, provide valve and actuator information including size, Cv, design flow, design pressure drop, manufacturer, model number, close off rating, etc. Indicate normal positions of spring return valves and dampers.

Indicate all required electrical wiring. Electrical wiring diagrams shall include both ladder logic type diagram for motor starter, control, and safety circuits and detailed digital interface panel point termination diagrams with all wire numbers and terminal block numbers identified. Provide panel termination Drawings on separate Drawings. Ladder diagrams shall appear on system schematic. Clearly differentiate between portions of wiring that is existing, factory-installed and portions to be field-installed.

Details of control panels, including controls, instruments, and labeling shown in plan or elevation indicating the installed locations.

Sheets shall be consecutively numbered.

Each sheet shall have a title indicating the type of information included and the HVAC system controlled.

Table of Contents listing sheet titles and sheet numbers.

Legend and list of abbreviations.

Record copies of product data, as-built control Shop Drawings and final sequence of operation updated to reflect the final installed condition.

Provide network architecture Record Drawings showing all nodes including a description field with specific controller identification, description and location information.

Provide record riser diagram showing the location of all controllers. Indicate device instance, MAC address and drawing reference number.

Maintain Project record documents throughout the Warranty Period and submit final documents at the end of the Warranty Period.

* + - * 1. Operation and Maintenance Data:

Submit maintenance instructions and spare parts lists for each type of control device, control unit, and accessory.

Submit BAS User’s Guides (Operating Manuals) for each controller type and for all workstation hardware and software and workstation peripherals.

Submit BAS advanced Programming Manuals for each controller type and for all workstation software.

Include all submittals (product data, Shop Drawings, control logic documentation, hardware manuals, software manuals, installation guides or manuals, maintenance instructions and spare parts lists) in maintenance manual; in accordance with requirements of Division 01.

Contractor shall provide Owner with all product line technical manuals and technical bulletins, to include new and upgraded products, by the same distribution channel as to dealers or branches. This service will be provided for five (5) years as part of the Contract price, and will be offered to Owner thereafter for the same price as to a dealer or branch.

Manufacturer’s Certificates: For all listed and/or labeled products, provide certificate of conformance.

Product Warranty Certificates: Submit manufacturers product warranty certificates covering the hardware provided.

* + - 1. SYSTEM ARCHITECTURE
         1. The system provided shall incorporate hardware resources sufficient to meet the functional requirements of these Specifications. Contractor shall include all items not specifically itemized in these Specifications that are necessary to implement, maintain, and operate the system in compliance with the functional intent of these Specifications.
         2. The system shall be configured as a distributed processing network(s) capable of expansion as specified below.

Coordinate all requirements of the BAS WAN / Primary LAN with the BJC Healthcare IS Department and the BJC Remote Operations Center.

The BJC Healthcare IT department shall grant approval to utilize the owner’s IT network and provide Ethernet IP address after all their requirements are satisfied. After installing a network Ethernet drop, an IP address will be assigned to device.

* + - * 1. The system architecture shall consist of an Ethernet-based, wide area network (WAN), a single Local Area Network (LAN) or multi-leveled LANs that support BCs, AACs, ASCs, Operator Workstations (OWS), Smart Devices (SD), and Remote Communication Devices (RCDs) as applicable. The following indicates a functional description of the BAS structure.

BJC Healthcare WAN: Internet-based network connecting multiple facilities with a central data warehouse and server, accessible via standard web-browser. This is an existing infrastructure and the Division 25 Contractor shall not configure any components of this WAN. Division 25 may request reconfiguration of the BJC Healthcare WAN. Only BJC Healthcare IT approved reconfiguration requests shall be executed by BJC Healthcare IT. Refer to Section 25 30 00 for requirements.

* + - * 1. Remote Data Access: The system shall support the following methods of remote access to the building data. All remote access shall be approved by BJC Healthcare IS Security department prior to installation.
        2. The communication speed between the controllers, LAN interface devices, the Building Automation Server (BJCJNSCTDB01),, and operator interface devices shall be sufficient to ensure fast system response time under any loading condition. Contractor shall submit guaranteed response times with Shop Drawings including calculations to support the guarantee. In no case shall delay times between an event, request, or command initiation and its completion be greater than those listed herein. Contractor shall modify their BAS control design as necessary to accomplish these performance requirements. Generally requirements do not apply when a remote connection must be established:

10 seconds between a Level 1 (critical) alarm occurrence and enunciation at operator workstation.

30 seconds between a Level 2 alarm occurrence and enunciation at operator workstation.

60 seconds between a Level 3-5 alarm occurrence and enunciation at operator workstation.

10 seconds between an operator command via the operator interface to change a setpoint and the subsequent change in the controller.

5 seconds between an operator command via the operator interface to start/stop a device and the subsequent command to be received at the controller.

10 seconds between a change of value or state of an input and it being updated on the operator interface.

10 seconds between an operator selection of a graphic and it completely painting the screen and updating at least ten (10) points.

* + - * 1. The Operator Interface shall provide for overall system supervision, graphical user interface, management report generation, alarm annunciation, and remote monitoring.
        2. The BAS network devices shall monitor, control, and provide the field interface for all points specified. Each controller shall be capable of performing all specified energy management functions, and all DDC functions, independent of each other.
        3. Systems Configuration Database: The system architecture shall support maintaining the systems configuration database on a server or workstation on the Local Supervisory LAN. User tools provided to the Owner shall allow configuring, updating, maintaining, etc. current configurations and settings whether they are initiated at the server or the end device.
        4. Anytime any controller’s database or program is changed in the field, the controller shall be uploaded to the D drive of the BJCJNSCTDB01 Server.
      1. DELIVERY, STORAGE and HANDLING
         1. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons during shipping, storage and handling as required to prevent equipment damage, and to eliminate dirt and moisture from equipment. Store equipment and materials inside and protect from weather.
      2. WARRANTY
         1. Contractor shall warrant all products and labor for a period of **[Insert Warranty Period]** after Substantial Completion.
         2. The Owner reserves the right to make changes to the BAS during the Warranty Period. Such changes do not constitute a waiver of warranty. Contractor shall warrant parts and installation work regardless of any such changes made by Owner, unless the Contractor provides clear and convincing evidence that a specific problem is the result of such changes to the BAS. Any disagreement between Owner and **[insert “Contractor” if BAS contract is held by contractor. Select “BAS Provider” if BAS contract is held by Owner]** on such matters shall be subject to resolution through the Contract ‘Disputes’ clause.

Engineer shall consult with Owner prior to specifying the response times. Quicker response times may be dictated by the type of systems and facility. Edit to suit the Project. Recommended changes shall be approved in writing by BJC Remote Operations Center Manager.

* + - * 1. At no cost to the Owner, during the Warranty Period, BAS Provider shall provide maintenance services for software, firmware and hardware components as specified below:

Maintenance services shall be provided for all devices and hardware specified in the Contract Documents. Service all equipment per the manufacturer’s recommendations.

Emergency Service: Any malfunction, failure, or defect in any hardware component or failure of any control programming that would result in property damage or loss of comfort control shall be corrected and repaired following telephonic notification by the Owner to the Contractor. Emergency service shall be provided 24 hours per day, 7 days per week, and 365 days per year with no exceptions and at no cost to the Owner.

Response by telephone to any request for service shall be provided within two (2) hours of the Owner's initial telephone request for service.

In the event that the malfunction, failure, or defect is not corrected through the telephonic communication, at least one (1) hardware and software technician, trained in the system to be serviced, shall be dispatched to the Owner's Site within four (4) hours of the Owner's initial telephone request for such services, as specified.

Normal Service: Any malfunction, failure, or defect in any hardware component or failure of any control programming that would not result in property damage or loss of comfort control shall be corrected and repaired following telephonic notification by the Owner to the Contractor.

Response by telephone to any request for service shall be provided within eight (8) working hours of the Owner's initial telephone request for service.

In the event that the malfunction, failure, or defect is not corrected through the telephonic communication, at least one (1) hardware and software technician, trained in the system to be serviced, shall be dispatched to the Owner's Site within three (3) working days of the Owner's initial telephone request for such services, as specified.

At any time during the Warranty Period that BAS Provider is on Site for maintenance, emergency, or normal service, BAS PROVIDER shall notify Owner and the local building operating personnel. Contractor shall notify said personnel of all work anticipated being involved for the service work. In addition, no work affecting system operation shall commence until express permission is granted. After the work is completed a work order ticket describing in detail all work performed (i.e. hardware replaced or serviced, software or firmware modifications made, etc.), hours worked, follow-up work required, etc., must be signed by an authorized building operators or Monitoring Services personnel.

Owner’s Telephonic Request for Service: BAS Provider shall specify a maximum of three telephone numbers for Owner to call in the event of a need for service. At least one of the lines shall be attended at any given time at all times. Alternatively, pagers can be used for technicians trained in system to be serviced. One of the three paged technicians shall respond to every call within 15 minutes.

Technical Support: BAS Provider shall provide technical support by telephone throughout the Warranty Period.

Preventive maintenance shall be provided throughout the Warranty Period in accordance with the hardware component manufacturer's requirements.

PRODUCTS

* + - 1. GENERAL
         1. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
      2. manufacturers
         1. The BAS and digital control and communications components installed as work of this Contract shall be an integrated distributed processing system of the following manufacturer or communication protocol. No other products will be considered as substitutions.
         2. Johnson Controls Metasys Extended Architecture: Provide control products and systems that completely integrate and operate from the existing Metasys system currently in operation across the BJC organization. All access, programming, alarming, and system configuration shall be utilized from the existing system software and database without any third party programs or gateways.
      3. MATERIALS AND EQUIPMENT
         1. Materials shall be new, the best of their respective kinds without imperfections or blemishes, and shall not be damaged in any way. Used equipment shall not be used in any way for the permanent installation except where Drawings or Specifications specifically allow existing materials to remain in place.
      4. UNIFORMITY
         1. To the extent practical, all equipment of the same type serving the same function shall be identical and from the same manufacturer.

EXECUTION

* + - 1. PREPARATION
         1. Examine areas and conditions under which control systems are to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
      2. INSTALLATION
         1. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
         2. All installation shall be in accordance with manufacturer’s published recommendations.
         3. Fasteners requiring explosive powder (shooting) or pneumatic-driven actuation will not be acceptable under any circumstances.
         4. Refer to additional requirements in other Sections of this Specification.
      3. SURGE PROTECTION
         1. Contractor shall furnish and install any power supply transient voltage surge suppression, filters, etc. as necessary for proper operation and protection of all control devices operator interfaces, printers, routers, gateways and other hardware and interface devices. All equipment shall be capable of handling voltage variations 10 percent above or below measured nominal value, with no effect on hardware, software, communications, and data storage.
      4. Control power source and supply

It is preferable to have the Division 26 Contractor supply power to DCS locations and provide the appropriate level of power for all control system components as located by the Engineer. For instance, it is good practice to supply emergency power (and sometimes uninterruptible power when available) at critical controllers, control system servers, routers, workstations etc. This Section, however, applies mainly to retrofits with no Division 26 Contractor.

* + - * 1. BAS Provider shall extend all power source wiring required for operation of all equipment and devices provided under Division 25 and the Drawings.

The following item will have to be customized for each system and Project. The consideration is where to provide power for controllers. For distributed controllers that are associated with one unit, it is convenient to power them along with the system so the controller can take action based on the presence of power. However on large centralized panels, it may be best to put these on the most reliable source of power that serves the equipment being controlled and then provide for individual monitoring of the various system power sources by the controller. The object is to make a robust system that does not interpret power failures as device failure and therefore in some instances have to take down the unit for manual acknowledged reset. This can compromise reliability. It is the responsibility of the Engineer to identify appropriate location for power and show on the drawings.

* + - * 1. General requirements for obtaining power include the following:

In the case where additional power is required, obtain power from a source that feeds the equipment being controlled such that both the control component and the equipment are powered from the same panel. Where equipment is powered from a 460V source, obtain power from the electrically most proximate 120v source fed from a common origin.

Where control equipment is located inside a new equipment enclosure, coordinate with the equipment manufacturer and feed the control with the same source as the equipment. If the equipment’s control transformer is large enough and is the correct voltage to supply the controls, it may be used. If the equipment’s control transformer is not large enough or of the correct voltage to supply the controls, provide separate transformer

Where a controller controls multiple systems on varying levels of power reliability (normal, emergency, and/or interruptible), the controller shall be powered by the highest level of reliability served. Furthermore, the controller in that condition shall monitor each power type served to determine so logic can assess whether a failure is due to a power loss and respond appropriately. A three-phase monitor into a digital input shall suffice as power monitoring.

The following item will have to be customized for each system and Project. The consideration is where to provide UPS’s for controllers. Engineer shall consult with Owner prior to specifying the UPS requirements. UPS requirements shall be dictated by the type of systems and facility. Edit to suit the Project.

Provide an uninterruptible power supply (UPS) system battery backup for each controller or DCS, as shown on the Drawings or specified except terminal equipment controllers. UPS shall protect against blackouts, brownouts, surges and noise.

UPS shall include LAN port and modem line surge protection.

UPS shall be sized for a 7-minute full load runtime, 23-minute 1/2 load runtime, with a typical runtime of up to 60 minutes. Transfer time shall be 2-4 milliseconds.

UPS shall provide a 480-joule suppression rating and current suppression protection for 36,000 amps and provide 90 percent recharge capability in 2-4 hours. Suppression response time shall be instantaneous. UPS low voltage switching shall occur when supply voltage is less than 94 volts.

Provide a Maintenance Bypass Switch that allows input voltage to bypass the UPS and directly power the connected equipment if an abnormal condition prevents the UPS from supporting the load, or if the UPS is required to be taken out of service. Provide all software, cables, peripherals etc. for a complete system.

Standalone Functionality: Refer to Section 25 14 00.

The Engineer shall include an appropriate amount of training requirements with the needs of Owner’s facilities staff.

* + - 1. BAS Start-Up, Commissioning and Training
         1. Refer to Section 25 08 00.

END OF SECTION 25 00 00