# Taco Master Guide Specification – BACnet Intelligent Building Management System (IBMS) – Centrally Monitored

# [Specifier Note: Edit all highlighted sections as needed to meet the specific intent of the project.]

# General Conditions

* 1. GENERAL
		1. This section describes the Integrated Building Management System (IBMS) technical and/or products specification to be undertaken by the IBMS Contractor.
		2. Portions of work described in this section but which may not be further detailed in other sections of the IBMS specifications shall not relieve IBMS Contractor his obligation to carry out the mentioned works. Conversely, the description of work in other sections of the IBMS but which has not been described in this section is also deemed to be included in the scope of works.
	2. SCOPE OF WORK
		1. Furnish and install IBMS software and workstations compliant with the specifications herein consisting of:

***Specifier Note: Indicate the number and location of the Operator Workstations to be provided.***

* + - 1. An IBMS server computer with processor, memory and other requirements as specified.
			2. (xx) Operator workstations (OWS) consisting of a client computer workstation computer with processor, memory and other requirements as specified.
			3. BACnet BTL Listed Advanced Workstation Software complying with the B-AWS profile Engineering Toolkit software meeting the requirements as specified from an approved manufacturer.
			4. The work shall include the IBMS for the (Fill in Project Name)
			5. Any and all wiring changes necessary in accordance with Part 3 (Execution) and Part 4 (Sequences of Operation) of these Specifications.
		1. Furnish and install new BACnet Controls of the following equipment subject to the “Minimum controller requirements” of paragraph 1.4. ***Specifier Note: Delete each of the following sections as appropriate for the specific project if equipment type is not controlled or monitored by the scope of these specifications. Edit each quantity of systems for each remaining paragraph as appropriate to provide the total quantities of equipment/scope of work of items to be monitored and controlled by the IBMS system. See points list for each section indicated.***
			1. Central Chilled Water Plant
				1. Water-Cooled Chilled Water Plant (See Points list Section 4.1.A) consisting of:

(0) Water-Cooled Chillers

(0) Cooling Towers

(0) Condenser Water Pumps

(0) Isolation Valves for each condenser water loop of each chiller

(0) Tower Isolation Valves for each cooling tower

(0) Water cooled chiller plant water treatment panel

(0) Lot condenser water header sensors and control points as shown on the drawings or indicated on the points list

* + - * 1. Air-Cooled Chiller plant (See Points list Section 4.1.B) consisting of:

(0) Air Cooled Chillers

* + - * 1. Miscellaneous Common Central Chilled Water Plant equipment (See Points List Section 4.1.C) consisting of:

(0) Primary Chilled Water Pumps

(0) Secondary Chilled Water Pumps

(0) Chiller plant bypass valve

(0) Associated isolation valve for each chiller

Temperature sensors, control valves, and control points as shown on the drawings or indicated on the points list.

(0) Filtration Water Pump

* + - * 1. District Cooling Heat Exchangers (See Points List Section 4.1.D)
			1. Central Hot Water Plant (See Points List Section 4.2) consisting of:
				1. (0) Boilers
				2. (0) Primary Hot Water Pumps
				3. (0) Secondary Hot Water Loop Pumps
				4. (0) Hot water Secondary Loop Mixing Valve
			2. Air Handling Units (See Points List Section 4.3)
				1. (0) 100% Fresh Air Variable Air Volume AHU with Heat Recovery Units (HRUs)
				2. (0) VAV AHU with Outside Air
				3. (0) VAV AHU, 100% Re-circulation with Fixed OSA option
				4. (0) VAV AHU, with DX, OSA damper control
				5. (0) Packaged VAV RTU or split with DX cooling, with/without OEM Economiser
				6. (0) Water Cooled Packaged VAV AHU with DX cooling
				7. (0) Packaged or split VAV heat pump with DX cooling, with/without OEM Economiser
				8. (0) 100% Fresh Air Constant Air Volume AHU with Heat Recovery Systems
				9. (0) CAV AHU with Outside Air
				10. (0) CAV AHU, 100% Re-circulation with Fixed OSA option
				11. (0) CAV AHU, with DX, OSA damper control
				12. (0) Packaged CAV RTU or split with DX cooling, with/without OEM Economizer
				13. (0) Suntrac Hybrid Climate Systems, CAV, 2H2C, with/without OEM Economizer
				14. (0) Water Cooled Packaged CAV AHU with DX cooling
				15. (0) Packaged or split CAV heat pump with DX cooling, with/without OEM Economizer
				16. (0) Suntrac Hybrid Climate Systems, CAV, Heat Pump, 3H2C, with/without OEM Economizer
				17. (0) CAV Multizone with Outside Air
				18. (0) VRF/VRV Condensing Units
				19. (0) VRF/VRV Evaporators
			3. Terminal HVAC Equipment (See Points List, Section 4.4)
				1. Pressure Depending CAV/VAV

(0) Without reheat

(0) With reheat

* + - * 1. Pressure Independent CAV/VAV

(0) Without Reheat

(0) With Reheat

(0) Fan Powered

(0) Dual Duct Variable Air Volume Terminal Units with and without reheat

(0) Room Pressurization Zones with Tracking

* + - * 1. Fan Coil Units

(0) 2-pipe, 3-spd Fan, On/Off Valves

(0) 2-pipe, 3-spd Fan, Modulating Valves

(0) 2-pipe, Modulating Fan, Modulating Valves

(0) 4-pipe, 3-spd Fan, On/Off Valves

(0) 4-pipe, 3-spd Fan, Modulating Valves

(0) 4-pipe, Modulating Fan, Modulating Valves

* + - * 1. Water Source Heat Pump

(0) Single Stage

(0) 2-stage

* + - * 1. Unit heaters

(0) Electric

(0) Hot Water

* + - * 1. Unit Ventilators

(0) ASHRAE Cycle 2

* + - * 1. Baseboard heaters/radiant floors

(0) Perimeter hot water radiators zones

(0) HW radiant floors zones

(0) HW radiant floor manifolds & circulating pumps

* + - * 1. Chilled Beams/ceilings

(0) Zone control

(0) Loop water temperature control

* + - 1. Ventilation Fans
				1. (0) Elevator Exhaust Fans
				2. (0) Toilet Exhaust Fans
				3. (0) General Exhaust Fans
				4. (0) Fresh Air Fans
				5. (0) Stairwell and Firemen’s Lift Pressurization Fans
				6. (0) Smoke Exhaust Fans
				7. (0) Carpark 2-spd Supply Fans
				8. (0) Carpark 2-spd Exhaust Fans
				9. (0) Carpark Jet Fans
			2. Fire Protection System
				1. (0) Fire Water Tank
				2. (0) Diesel Fire Pump Set
				3. (0) Electric Fire Pump Set
				4. (0) Jockey Pump Set
				5. (0) Fire Suppression System Zones
			3. Sanitary Systems
				1. (0) Water Tanks (Raw, Filtrated, Soft, RO, Roof, Hot)
				2. (0) Water Transfer Pump Sets
				3. (0) Booster Pump Sets
				4. (0) Water Treatment system
				5. (0) Sanitary, Sump, Sewer or Grey Water Pump Sets
				6. (0) Domestic Hot Water Return/circulating pumps
				7. (0) Irrigation Control Pump Sets
				8. (0) Diesel Fuel Tank Pumps
			4. (0) Irrigation Systems
			5. (0) Swimming Pool Systems
			6. BTU/KWH Sub-metering systems
				1. (0) Common Building Areas
				2. (0) Tenant Spaces
			7. Escalator & Elevator Systems
				1. (0) Escalators
				2. (0) Elevators
			8. Electrical Systems, Switchgear, Distribution panels, Generators, & UPS Equipment
				1. (0) Ring Main Unit & HV Switchgear
				2. (0) HV Switchgear
				3. (0) Transformers
				4. (0) Main Distribution Board with Automatic Transfer Switch (ATS)
				5. (0) Generator Control Panel
				6. (0) Generators
				7. (0) Sub-Main Distribution Boards
				8. (0) UPS Systems
			9. Lighting System Control
				1. (0) External Lighting Circuits
				2. (0) Interior Common Area Lighting Zones
				3. (0) Conference Rooms, Classrooms
				4. (0) Toilets, Storage, and other Miscellaneous areas
			10. (0) Security/Access control Systems
			11. (0) CCTV panels
			12. (0) AV/Sound System
			13. Medical Gas Systems
				1. (0) Master Medical Gases Alarm Panel
				2. (0) Oxygen Gas
				3. (0) Medical Air Gas
				4. (0) Instrument Air Gas
				5. (0) Vacuum System
				6. (0) Nitrous Gas
				7. (0) AGS
				8. (0) Medical/Instrument Air Compressors
				9. (0) Medical/Instrument Air Dryers
				10. (0) Vacuum System Pumps
				11. (0) AGS System
			14. LP Gas System
			15. Electric Demand Limiting Program
				1. First Priority Shed
				2. Rotate Priority Shed
				3. Last Priority Shed
		1. INTEGRATION OF BACNET PRODUCTS PROVIDED BY OTHERS

***Specifier Note: Delete or modify the following sections as appropriate for the specific project.***

* + - 1. Furnish and install BACnet IP or BACnet MS/TP wiring trunk to the following BACnet gateways/interfaces provided by other contractors:
				1. Fire Alarm System Gateway (provided by Fire Alarm Contractor). The gateway shall be provided and installed by the Fire Alarm Contractor. He shall further provide to the IBMS contractor all necessary setup, programming, and configuration software to allow the IBMS contractor to access necessary Fire Alarm BACnet objects that are in accordance with the BACnet standard.
				2. Security Access System Gateway (provided by Security System Contractor). The gateway shall be provided and installed by the Security System Contractor. He shall further provide to the IBMS contractor all necessary setup, programming, and configuration software to allow the IBMS contractor to access necessary Security/Access system BACnet objects that are in accordance with the BACnet standard.
				3. Generator System Gateway (provided by Generator System Contractor). The gateway shall be provided and installed by the Generator System Contractor. He shall further provide to the IBMS contractor all necessary setup, programming, and configuration software to allow the IBMS contractor to access necessary Generator system BACnet objects that are in accordance with the BACnet standard.
				4. Lighting System Gateway (provided by the Electrical or Lighting System Contractor). The gateway shall be provided and installed by the Electrical or Lighting System Contractor. He shall further provide to the IBMS contractor all necessary setup, programming, and configuration software to allow the IBMS contractor to access necessary Lighting System BACnet objects that are in accordance with the BACnet standard.
				5. Elevator/Lift System Gateway (provided by the Elevator/Lift Systems Contractor). The gateway shall be provided and installed by the Elevator/Lift systems Contractor. He shall further provide to the IBMS contractor all necessary setup, programming, and configuration software to allow the IBMS contractor to access necessary Elevator/Lift System BACnet objects that are in accordance with the BACnet standard.
				6. Chiller System Gateway (Provided by the Chiller Manufacturer). The gateway shall be provided and installed by the Chiller Manufacturer and/or Mechanical Contractor. He shall further provide to the IBMS contractor all necessary setup, programming, and configuration software to allow the IBMS contractor to access necessary Chiller system BACnet objects that are in accordance with the BACnet standard.
				7. Variable Refrigerant Volume Systems Gateway (Provided by the VRV Supplier and/or Mechanical Contractor.) The gateway shall be provided and installed by the VRV or Mechanical System Contractor. He shall further provide to the IBMS contractor all necessary setup, programming, and configuration software to allow the IBMS contractor to access necessary VRF system BACnet objects that are in accordance with the BACnet standard.
				8. Car Park Systems Gateway (Provided by the Car Park Systems supplier and/or contractor). The gateway shall be provided and installed by the Security System Contractor. He shall further provide to the BMS contractor all necessary setup, programming, and configuration software to allow the BMS contractor to access necessary Car Park system BACnet objects that are in accordance with the BACnet standard.
				9. Variable Frequency Drives with BACnet interface (Provided by AHU, Pump, or Mechanical Contractor). The gateway shall be provided and installed by the VFD supplier. He shall further provide to the BMS contractor all necessary setup, programming, and configuration software to allow the IBMS contractor to access necessary VFD BACnet objects that are in accordance with the BACnet standard.
				10. Power Meters & Sub-Meters with BACnet interface (Provided by Electrical Contractor or IBMS Contractor as required.) The gateway shall be provided and installed by the power meter supplier. He shall further provide to the IBMS contractor all necessary setup, programming, and configuration software to allow the IBMS contractor to access necessary meter BACnet objects that are in accordance with the BACnet standard.
				11. BTU Meters & Sub-Meters with BACnet interface (Provided by Mechanical Contractor or IBMS Contractor as required.) The gateway shall be provided and installed by the BTU meter supplier. He shall further provide to the IBMS contractor all necessary setup, programming, and configuration software to allow the IBMS contractor to access necessary meter BACnet objects that are in accordance with the BACnet standard.
				12. Wireless Zigby Radio or EnOcean Gateways with BACnet Interface (Provided by this contractor as required.) The gateway shall enable bi-directional “wireless” communication between the gateway and downstream connected devices which may be “Zigby radio” or “EnOcean” technology wireless communication devices. The gateway shall include all power, antenna, communications, wireless devices, and other functions to seamless communicate the desired information in both directions as programmed. The wireless gateway will convert the downstream “points of interest” to applicable BACnet Analog Value (AV) or Binary Value (BV) objects and transmit them into the IBMS system using either BACnet I/P or BACnet MS/TP communications
			2. Integrate BACnet objects provided by the gateway(s) of Section 1.2.C.1 into B-AWS graphical user interface displays, alarm routing, and control sequences as required and specified in the sequences of operation.
		1. CONTROL WIRING
			1. The IBMS Contractor shall furnish all electrical control and interlock wiring connected to the controls and instrumentation systems.
			2. All conduits in connection with the controls and instrumentation system shall be furnished and installed by this Contractor. Such works shall conform to the applicable requirements of the Electrical Wiring standards for this project.
		2. The Control Contractor shall complete all sensing and control installations including electrical and electronic components, not the Mechanical Contractor, unless otherwise required.
		3. Provide a comprehensive operator and technician-training program as described herein.
		4. Provide as-built documentation, software, and all DDC control logic and all associated support documentation on approved media, which accurately represents the final installed system.
	1. COORDINATION WITH OTHER TRADES AND DIVISIONS
		1. 110 VAC or greater voltage power wiring to main control panels (i.e. AHU’s) as shown on the mechanical plans and/or specifications, shall be provided by the Electrical Contractor, and coordinated by this Contractor. Failure of the IBMS Contractor to coordinate requirements with other Divisions shall result in the IBMS Contractor to be responsible for any non-coordinated items.
		2. VAV terminal box manufacturer shall provide a line voltage to 24VAC transformer of minimum 40VA rating to supply control power to VAV terminal controls. The IBMS manufacturer shall be responsible for all low voltage control wiring of the VAV terminal unit controllers and coordinate such wiring with the terminal unit manufacturer as necessary. Contractor.
		3. Control Valves for cooling or heating coil shall be furnished by the IBMS contractor to the Mechanical Contractor for installation by the Mechanical Contractor.
		4. Thermowells for sensing of fluid temperatures by IBMS sensors shall be furnished by the IBMS contractor to the Mechanical Contractor for installation by the Mechanical Contractor.
		5. Motorized Smoke and Fire Control Dampers complete with damper operators shall be furnished and installed by the Mechanical Contractor as indicated on the drawings, conforming to the UL-555S Listing for such applications. Such damper operators shall be provided by the damper manufacturer complete with either a 0-10VDC analog or “end of travel” switch position indicator which shall be integrated by the IBMS contractor to the IBMS system in accordance with the Sequence of Operations and as indicated on the drawings.
	2. MINIMUM SYSTEM REQUIREMENTS
		1. Subject to the provisions of the applicable individual types of equipment contained herein, furnish and install BACnet BTL Listed equipment, software, and devices compliant with the BACnet standard profiles indicated in the following minimum quantities specified as follows:
			1. BACnet Advanced Operator Workstation (B-AWS profile) – consisting of (xx) Server(s) + (yy) Workstation(s) software and accessories at the location(s) shown on the drawings.
			2. BACnet Advanced Operator Workstation (B-AWS profile) Engineering Toolkit – Provide all Engineering Workstation software from the IBMS manufacturer necessary to allow the Owner complete access for the programming of additional points, sequences of operation, web graphical pages, and other tools needed to expand or modify the system as needed. Provide software copies or server workstation installation as needed to allow properly authorized users access to the software on designated “Engineering Workstations”.
			3. BACnet Laptop Engineering Toolkit – Provide all Engineering Workstation software and network interface tools as needed from the IBMS manufacturer necessary to allow the Owner complete access via a laptop computer for the programming, configuration, and modification of field controllers. Generation of new web graphics for this level of tool are NOT needed. Provide (1) licensed copy of this toolkit for each required laptop service tool according to the specifications.
			4. BACnet Routers (B-RTR profile) – Install a minimum of (1) BACnet router per floor level and not more than 1 router per 62 MS/TP devices. If more than 31 MS/TP devices are connected to one router, than provide an MS/TP repeater device after every 31 MS/TP devices on the sub-network OR at every “T” in the MS/TP trunk wiring, whichever quantity is GREATER.
			5. BACnet Building Controllers (B-BC profile) – Furnish and install a minimum of (1) B-BC for control of
				1. Each central chilled water or hot water plant room exceeding 80 physical points of capacity. If co-located, one controller may be used for the entire plant room if capacity permits according to the points schedule.
				2. For each AHU exceeding a total quantity of (80) physical connected points
			6. BACnet Advanced Application Controllers (B-AAC profile) – Furnish and install a minimum of (1) BACnet Advanced Application Controllers (B-AAC) for the control of:
				1. Each central Chilled Water OR Hot Water plant < = 80 physical points of capacity.
				2. Central Station AHUs, > 68KW (20 Ton) Capacity - 1 controller per AHU
				3. VAV terminal units – 1 Controller per CAV/VAV terminal or fume hood system used in room pressurization applications along with associated independent or dependent control supply/exhaust terminal controller.
				4. FCU terminal units – 1 controller per FCU requiring customized sequence of operations as identified in Sequences of Operation
				5. General Ventilation, Smoke Pressurization, and other Exhaust Fans - 1 controller per 16 fans maximum
				6. Lighting Systems 1 controller per lighting distribution board
				7. Other Electrical Systems – 1 controller per Main, Sub-Main, ATS, or other Electrical distribution board as required to meet point requirements.
				8. Other controlled and monitored systems – 1 controller per each system interface location
			7. BACnet Application Specific (B-ASC profile) – Furnish and install a minimum of (1) BACnet Application Specific Controllers for the control of EACH:
				1. Central Station AHUs, < = 68KW (20 Ton) Capacity meeting the sequences of operation specified
				2. Packaged Unitary or Split system AHUs, typically < = 68KW (20 Ton) Capacity meeting the sequences of operation specified
				3. Single duct CAV/VAV terminal units with or without reheat
				4. Fan Coil Units (FCUs) meeting the sequences of operation specified
				5. Air and Water Source Heat Pump units meeting the sequences of operation specified.
			8. Digital Room Sensors (DRS) with display – Furnish and install Manufacturer’s compatible Digital Room Sensors with LCD display at each location shown on the drawings or as specified in the points list. At a minimum, provide 1 DRS sensor Per VAV terminal, FCU, or packaged unitary equipment unit (if controller does not have built in equivalent display).
	3. QUALIFICATION OF IBMS SUPPLIERS/BRAND NAME REFERENCES
		1. Any reference in this Specification to brand names or to a specific manufactured product without the use of “or approved equal” is to be interpreted to mean that the specific article or product is the only one to be supplied or used.
		2. All approved bidders must be Systems Integrators and specialty control contractors in the business of installing IBMS systems and direct digital temperature controls. Subject to the provisions of these specifications, provide an IBMS/DDC/control system from one of the following manufacturers:
			1. Taco Comfort Solutions
			2. KMC Controls
			3. Johnson Controls
			4. Honeywell, Inc.
			5. Siemens Building Technologies
			6. Schneider Electric
			7. Delta Controls
			8. Kieback & Peter
			9. Distech Controls
			10. Reliable Controls
		3. Components used for this project including control damper actuators, control valves (including PIC-V valves if used), sensors, switching devices, and other accessories shall be provided from one of the manufacturers named above or the following listed manufacturers:
			1. Control Actuators & Control Valves – Belimo
			2. Room, duct, pipe, outside ambient temperature, pressure, humidity, and other gas concentrations – Greystone Energy, Mamac, Carlo Gavazzi, Automation Components
			3. Power & Btu Meters – Veris, Dent, Kamstrup,
			4. PIC-V Control Valve body & assemblies – Griswold Controls, Flow Control Industries
		4. Only vendors named in this specification or pre-approved by addendum shall be acceptable.

# Specifier Note: Delete Vendors not qualified in the project area from this section

* + 1. All manufacturers not named in paragraph 1.5.B above desiring to bid this project shall obtain the Engineer’s pre-approval not less than 1 week prior to bid day by a pre-submission of:
			1. The BACnet Testing Laboratory (BTL) certification listing (available at [www.bacnetinternational.org](http://www.bacnetinternational.org) website) of each model device that will be used to comply with the requirements of section 1.4.
			2. A copy of the testing submission letter for the product from the manufacturer to BTL for those products in testing at BTL and awaiting approval.
			3. The manufacturer shall submit a list of exact models and quantities to be provided to show compliance with the intent of section 1.4 for review and acceptance by the Consulting Engineer. Each of these models shall be listed on the BTL certification website or the manufacturer shall submit a copy of the BTL test submission letter as described in sub-paragraph 2 above.
			4. For components, submit manufacturer’s datasheet and written explanation from IBMS contractor of why suggested alternative is superior to the listed named vendors.

# Specifier Note: Delete paragraph E if other vendors not named WILL NOT be allowed to tender for the project.

* + 1. All HVAC equipment manufacturers desiring to provide a “package price” of HVAC equipment inclusive of the complete IBMS/DDC controls system are specifically required to provide separate prices for the equipment less controls. The equipment vendor shall provide a separate proposal for the IBMS inclusive of all HVAC equipment controllers, sensors, actuators, control valves, operator workstations and other devices necessary for a complete and functional IBMS system as stated by the requirements of this specification. Any equipment supplier that will NOT break out the controls portion of his “package” bid price will be excluded from providing BOTH controls AND equipment.

# Specifier Note: Delete sub-paragraph “F” from this section if HVAC equipment providers will not be allowed to provide the IBMS system

* + 1. All bidders shall be factory owned branch office or factory authorized and Certified Systems Integrator of the manufacturers specified.
		2. All bidders shall have a local engineering and service office within 150 miles of the job site and/or be able to remotely access a system via the internet within one working day to diagnose system problems or issues via the internet. **Specifier note: Change allowed radius to job site to meet local conditions of project.**
	1. UNACCEPTABLE PRODUCTS
		1. LONMARK Products - NO LON DEVICES OR GATEWAY DEVICES SHALL BE ACCEPTABLE.
		2. KNX products – NO KNX DEVICES SHALL BE ACCEPTABLE.
		3. GATEWAY Products – Other than those gateways specifically defined in Section 1.2.C.1, NO OTHER GATEWAY DEVICES SHALL BE ACCEPTABLE.
		4. PROPRIETARY Products – NO PROPRIETARY COMMUNICATION PRODUCTS SHALL BE ACCEPTABLE.
		5. HVAC EQUIPMENT MANUFACTURER FACTORY MOUNTED CONTROLS – HVAC Equipment manufacturers that desire to provide equipment with factory mounted controls shall only provide controls from one of the NAMED MANUFACTURERS OF SECTION 1.5.B.
	2. MANDATORY SYSTEM & QUALITY REQUIREMENTS
		1. All IBMS controllers installed under this contract shall strictly adhere to the following characteristics:
			1. The controller shall consist of native BACnet, direct digital control, microprocessor-based, real-time clock, peer-to-peer, networked, energy management, distributed devices utilizing the ASHRAE/ANSI standard 135 BACnet, communication protocol in an open, interoperable system. All controllers shall be BACnet Testing Laboratories (BTL) Listed at standard revision 2008 or later and PICs statements available on the BTL website.
			2. The BACnet operating stack must be embedded directly in every device at the board level and in all operator interface software packages.
			3. With the exception of those gateways identified in Section 1.2.C.1 no Gateways, Communication Bridges, Protocol Translator or any other device that translates any proprietary or other communication protocol to the BACnet communication protocol shall be permitted as a part of the installation pursuant with this specification section.
			4. Controllers and software used on this project shall be newly manufactured products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by Owner. Spare parts shall be available for at least five years after completion of this contract.
			5. Each of controller hardware shall be suitable for anticipated ambient conditions and rated for a minimum of 32 – 122F (0 – 50C).
			6. The IBMS contractor must provide a PICS document showing the proposed & installed systems compliance level to the ANSI/ASHRAE Standard 135-2008 or later revision for all BACnet devices.
		2. Control Components & Accessories – All control components and accessories used for this project shall be newly manufactured and supplied by the IBMS contractor from one of the named manufacturers of paragraph 1.5.C or as approved by Addendum in paragraph 1.5.E
		3. Quality Standards – As control devices and components shall meet the following quality and standards for use in commercial buildings as appropriate:
			1. Digital controllers and systems NOT used in “smoke control applications” - UL Standard 916, Category PAZX (Energy Management standard)
			2. Digital controllers and systems used in “smoke control applications” - UL Standard 864, Category UUKL (smoke control systems)
			3. Control components using voltages > 24VAC Nominal voltage – UL Standard 873 (Temperature Indicating and Regulating)
			4. Control components using voltages < = 24VAC Nominal voltage – UL 873 or UL Component recognized (ULR)
			5. FCC Part 15, Sub-Part A
			6. EMC Directive 89/336/EEC (European CE Mark)
			7. Uniform Building Code (UBC), including local amendments
			8. National Electrical Code (NEC)
	3. SUBMITTALS
		1. Submit under provisions of this Section
		2. Product Data: Manufacturer's data sheets on each product to be used, including:
			1. Preparation instructions and recommendations.
			2. Storage and handling requirements and recommendations.
			3. Installation methods.
		3. Drawings:
			1. The system supplier shall submit engineered drawings, control sequence, and bill of materials for approval.
			2. Drawings shall be submitted in the following standard sizes: 11 x 17 inch (ANSI B).
			3. XX complete sets (copies) of submittal drawings shall be provided.
			4. Drawings shall be available on CD-ROM or Flash Drive
		4. System Documentation: Include the following in submittal package:
			1. System configuration diagrams in simplified block format.
			2. All input/output object listings and an alarm point summary listing.
			3. Electrical drawings that show all system internal and external connection points, terminal block layouts, and terminal identification.
			4. Complete bill of materials, valve schedule and damper schedule.
			5. Manufacturer's instructions and drawings for installation, maintenance, and operation of all purchased items.
			6. Overall system operation and maintenance instructions-including preventive maintenance and troubleshooting instructions.
			7. For all system elements-operator's workstations, building controllers, application controllers, routers, and repeaters-provide BACnet Protocol Implementation Conformance Statements (PICS) as per ANSI/ASHRAE Standard 135.
			8. A list of all functions available and a sample of function block programming that shall be part of delivered system.
			9. Product Warranty – Submit Manufacturer’s standard product warranty statement. Products NOT meeting the requirements of Paragraph 1.9 below shall be rejected OR the IBMS contractor shall stipulate in his proposal that he fully complies with the cost provisions of paragraph 1.9 and he has included any additional replacement costs in his price.
		5. Project Management: The vendor shall provide a detailed project design and installation schedule with time markings and details for hardware items and software development phases.
	4. Project Warranty
		1. Material Warranty – The selected manufacturer of IBMS controllers and components shall be provided with a minimum 1 year manufacturer’s replacement warranty from the date of manufacture.
		2. Labor Warranty – The selected IBMS contractor shall provide a full project warranty in accordance with the Warranty provisions of the General Conditions and Defects Liability Period of the project.