25 00 00 INTEGRATED AUTOMATION

Revision February 2026

1. **General Requirements**
    a. All buildings and major remodels shall be engineered as standalone for Building Management Systems (BMS) utilizing Tridium JACE 9000 or later.
2. **Systems**
    a. Approved system manufacturers
        i. Tridium Vykon Niagara N4 JACE 8000 with Workplace N4 Version 4.15.0.0 or newer Software.
        ii. Solidyne BACnet DEC-UC-2 Series Universal Digital Controllers.
        iii. Solidyne BACnet DEC-VAV-2 VAV Controllers
    b. Only Tridium systems using BACnet Protocol (ASHRAE 135 Standard) are permitted. All systems and devices shall have the ability to be integrated into the Tridium Web Supervisor front-end platform.
    c. Each panel shall be fully licensed using non “proprietary” license files, listing SUIT as the owner and shall include BACnet Client/Server options.
    d. All I/P networking shall be on SUIT’s IT network. No ethernet driven sub-networks, only building level BACnet MSTP local networks are approved. Coordinate I/P requirements with the SUIT C&PM Project Manager prior to start of Construction Documents.
    e. I/P Addresses will be assigned by the Southern Ute Indian Tribe (SUSS) IT Department. To gain assignment, MAC address(s) shall be provided for each device to be connected, included with device name, function and physical location.
    f. The contractor/vendor shall be fully trained, certified and authorized by the manufacturer as a local dealer or branch office. The successful contractor/vendor to maintain an ample parts inventory to supply SUIT Property & Facilities’ (P&F) Building Maintenance with parts on an as needed basis. All “regularly used” components (i.e. JACE’s & DDC components) shall be available within 24 hours of ordering.
    g. All panels shall have 1 open and useable 120 VAC convenience outlet located within the panel.
    h. Individual power supplies to panel devices shall be provided through a “single switched” circuit to allow easy de-energization during service.

i. BMS system shall be fully integrated with other systems using BACnet protocols (Air Handler Unit controllers, Variable Speed Drives, Occupancy Sensing, Chillers, Boilers, Water Pumping Packages, etc.) The points to be integrated shall include all points offered by the system manufacturer and will be subject to review and approval by the SUIT Property and Facilities (P&F) Building Maintenance HVAC Dept. At P&F's discretion, points may be omitted if deemed not needed.

j. System HVAC zones not controlled by occupancy sensing shall each be configured with a local seven (7) day time of day (with holidays) schedule (separate schedule per zone or equipment) which can be easily managed via the front-end graphics. Each zone shall provide four temperature set points, each separately adjustable depending on occupancy status.
    i. Un-occupied Cooling
    ii. Occupied Cooling
    iii. Occupied Heating
    iv. Un-Occupied Heating

k. The system architecture shall be fully modular permitting expansion of application software, system peripherals, and field hardware.

l. The system, upon completion of the installation and prior to acceptance of the project or inspection by the commissioning agent and P&F, shall perform all operating functions, display all integrated points (including sub systems) and accept all operator commands via the front-end graphical system as detailed in this specification.

m. The system will, using the SUIT's Ethernet, be capable of alarming a critical alarm condition within ten (10) seconds of field occurrence for all vendor-supplied points. Non-critical alarms, alert conditions, and return-to-normal transitions will be logged and displayed at any operator workstation within twenty (20) seconds of their occurrence in the field. All graphic displays must display the graphic and display all values within ten (10) seconds of initiation, and data can be no older than twenty (20) seconds from a true field value.

n. The system shall be designed so all individual alarm points for each piece of equipment triggers one "General Alarm" per equipment is visible on the frontend graphics. This alarm will be selectable and generate a pop-up menu providing more detailed information on the exact alarm(s).

o. All controllable points (i.e.: Valve positions, start/stops and set points shall be provided with a "Timed Override" feature so that commanded points shall return to Automatic Control upon the expiration of the override timer. This "Timed

Override" feature shall be a form of a pop-up menu that is operator selectable from the graphic which the equipment is located.

p. Building Systems Integration
   i. All indicated equipment shall be required to have the ability to interface with other automation systems on equipment located throughout SUIT or Tridium Web Supervisor are the two approved HMI's. This section establishes seamless interconnection with third party electrical and mechanical building systems. These subsystems shall be controlled and monitored through the same front-end system as deemed by P&F and are graphically programmed with the same user consoles as provided to each and every operator station.
   ii. All desired system information to or from the indicated equipment shall be available to the system. No limits shall be placed by the equipment manufacturer on the owner with regard to the access of or the transmission of or what may be done with the data provided from the equipment control system.
   iii. Full cooperation by the equipment manufacturer in this open protocol effort shall be a requirement for bidding. No exceptions shall be allowed to this requirement, and no bid shall be accepted which does not define clearly and exactly how the proposed equipment will comply with this section. This includes but is not limited to all Variable Frequency Drives (VFD), electric power equipment, emergency generators, lighting systems, and the Air Quality Monitoring System.

3. <u>Common Details for All Graphic Pages</u>

a. Graphics shall be simulated and submitted for approval prior to creation. All graphics shall allow for full operator interaction including PID loop tuning, schedule changes, zone temperature or other process variable current values and temporary over riding ability. Provide backgrounds showing walls, room numbers and such as provided by the project ACAD drawing layers. Graphics shall include setpoint vs. actual values for all analog points. Highly integrated sub systems may use textual pages to display large amounts of integrated data (i.e. reports).

b. Standard Colors and Dimensions all Graphic Pages:

   i. The dimensions of the graphic page shall be 1600 pixels wide and 900 pixels high.

ii. The background color of graphic pages shall be Gradient “Black” (hex-#ff000000 to #ff164668).
iii. All images to represent mechanical systems shall come from “ControlPix 3D Graphics and Niagara “KitPxGraphics” module(s). Additional graphic images may be required for a specific project and must be approved by P&F Building Maintenance HVAC Dept.

c. Banner/Header for all Graphic Pages:

i. The dimensions of the Banner/Header shall be 1200 pixels wide and 100 pixels high.
ii. The background color of the Banner/Header shall be “Black” (hex-#ff000000 to #ff1644668) to match and blend into the Graphics Page.
iii. The Border frame shall be Style “Solid”, Width “1.00”, Brush “#404040”
iv. The Building Name and Equipment Description Bound Label font shall be “White” “20.0pt Georgia”. And Centered in the Border Frame.
v. The Border shall have Link Buttons listing a “Home”, “HW System”, “CHW System”, “Floor Plan(s)”, “VAV Report “, “Chart Builder”, “OSA Temp” etc. depending on the Project.
vi. The Link Button dimensions shall be 120 pixels wide and 20 pixels high.
vii. The Link Button Bound Label font shall be “White” “Bold 11.0pt Tahoma”.
viii. The Link Button Border frame shall be “Solid”, Width “1.00”, Silver “#ffc0c0c0”.

d. Hydronic Piping Sizes:

i. All piping and fitting images shall be aligned.

e. Hydronic Piping Colors:

i. Heating water supply: Dark Red in appearance.
ii. Heating water return: Light Red in appearance
iii. Steam supply: Dark Orange in appearance.
iv. Steam return: Light Orange in appearance.
v. Chilled water supply: Dark Blue in appearance.
vi. Chilled water return: Light Blue in appearance.
vii. Condenser/Cooling Tower water supply: Dark Green in appearance.
viii. Condenser/Cooling Tower water return: Light Green in appearance.

f. Overlapping Piping:

i. When two pipes of the same color intersect, one of the pipes shall separate in length to prevent false indication of a “4-way cross”.
ii. When two pipes of different colors intersect, they may overlap without modification.

g. Graphic Font:
i. The Font used for point Bound Labels text shall be “Black” “14.0pt Georgia”.
ii. The Font used for graphic page title Bound Labels text shall be “White” “18.0pt Georgia”.
iii. Background colors shall also be utilized to indicate point status (Alarm, Down, Overridden, Fault, etc.) using the Niagara 4 default colors.

h. Room Temperature Spectrum Bindings Animation on Floor Plan Graphics and Graphics is as follows:

i. The background color shall increase brightness with greater deviation below effective heating/cooling setpoint.

i. Decimal precision. Unless indicated otherwise, point values shall use following decimal precision:

i. Temperatures (°F) and temperature setpoints: 1 decimal place.
ii. Flow Air (CFM) and Water (gal/min) and airflow setpoints: no decimal places.
iii. Percent (%): 1 decimal place.
iv. Pressure (in/wc) and duct static pressure setpoints: 1 decimal place.
v. Pressure (in/wc) and building static pressure setpoints: 2 decimal places.
vi. Air and Water pressure (psi) and setpoints: 1 decimal place.
vii. Humidity (%RH) and humidity setpoints: 1 decimal place.
viii. Enthalpy (btu/lb): 1 decimal place.
ix. Concentration (ppm): no decimal places.
x. Frequency (Hz): 1 decimal place.
xi. Time: Hours (hr), Minutes (min), Seconds (s), Days (day), Weeks (wk), Months (mo), Years (yr): no decimal places.

j. Historical Data View:
i. The Chart Builder Header Button will navigate to the AX History Chart Builder Page.

ii. Expand the Navigation tree and navigate to the “Histories” database to drag-and-drop histories onto the History Viewer.

k. Wire Sheet View:

i. Wire sheets shall be neat and orderly with text blocks to describe the contents of the folder like point types and programming sequences. All objects shall be given a descriptive name.
ii. Unit Schedule- are in all units that require a schedule and are linked to Vykon optimized start stop (OSS) and the building schedule.

4. <u>Field Devices</u>

i. Temperature Sensors:
1. Provide temperature sensors for duct, immersion, remote probe, and outside air applications.
2. DDC temperature sensors shall be of the-10K or 10,000-ohm Type 3 thermistor type.
3. All sensors of a particular category shall be of the same type manufacturer and shall have an interchangeability of +/- 0.1% at thee reference temperature.
4. Sensor time constant response to temperature change time shall be less than three (3) seconds per degree change.
5. Sensors requiring field-calibration shall not be acceptable.
6. All sensors shall be precise and accurate so that they do not require adjustments or calibrations.
7. Minimum sensor operating ranges shall be as follows:
a. Chilled Water – 30°F to 100°F
b. Condenser water – 30°F to 150°F
c. Air Systems – 0°F to 150°F
d. Outside Air – 0°F to 120°F
e. Hot Water – 40°F to 240°F

ii. Duct Sensors:
1. Provide probe type sensors designed for duct type mounting.
2. Sensor shall be encapsulated in an aluminum probe 8” to 12” in length depending on location. Provide stainless steel probes in high humidity areas.

3. Averaging Sensors shall be 10K or 10,000-ohm, Type 3, Copper jacket (flexible) or 24" 10K Type 3, Stainless Probe depending on location.
4. Sensors shall include a suitable junction box for terminating sensor wiring and shall include a lagging protrusion where installed in externally insulated ducts.
5. Adjacent to each sensor provide a test hole plugged with a removable cap or plug to be used for test and calibration purposes.
6. All sensors shall be located in the most easily accessible location while providing accurate temperature sampling.

iii. Immersion Sensors:

1. Provide Immersion type sensors with a ½"OD threaded fitting for direct installation in a thermo-well.
2. The probe shall be encapsulated in an aluminum, brass, or stainless-steel jacket as deemed appropriate by the project engineer and shall be installed in a stainless steel thermo-well suitable for installation in a ¾"NPT threaded fitting.
3. Sensors shall include a suitable junction box for terminating sensor wiring.
4. Thermo-wells shall have pressure and temperature ratings suitable for their application.
5. Thermo-wells for insulated piping shall have a 2-1/2"lagging protrusion.
6. Locate thermo-wells so the sensing probe will give a true and correct temperature reading.
7. Install thermo-wells on the side of pipes and so as to not cause undue restriction in small piping.
8. Where thermo-wells are located in pipe lines 1-1/2" and smaller, provide a section of pipe of such diameter that the net area of the pipe line will not be reduced by the thermometer well.
9. All thermo-wells shall be filled with thermal grease or conductive compound and complete with caps and chains.
10. Thermo-wells installed on 2-1/2" piping and larger shall be installed at 45-degree angle in the direction of water flow in the monitored piping.

iv. Remote Probe Sensors:

1. Provide remote probe sensors with sensing elements encapsulated in a nominal 2" stainless steel sheath suitable for return air, or strap-on mounting.
2. Sensors shall include a nominal 3' lead section and a suitable junction box for terminating sensor wiring.

v. Outside Air Sensors:
   1. Provide shielded weatherproof outside air sensors with sensing elements encapsulated in a nominal 2" stainless steel sheath suitable for outdoor applications.
   2. Sensors shall include a waterproof junction box, or conduit body for terminating sensor wiring and a sun shield.
   3. Location shall be on exterior NORTH sidewall at a level requiring a six (6) foot stepladder for servicing. Do not install at ground accessible level.
   4. Accepted Manufacture: ACI Controls Model: A/AN-O-Sun or equivalent.

vi. Electronic Analog Sensors:
   1. Range: Sensors shall operate within the range indicated above for Heating, Ventilating, and Air Conditioning (HVAC) systems.
   2. Accuracy: Provide electronic analog sensors with an accuracy of +/- 0.5°F.
   3. Provide sensors with a time constant response to achieve 60% of a step temperature change in six (6) seconds in air or water flowing at three (3) feet per second.
   4. Sensors of the same type shall be interchangeable without calibration.

vii. Humidity Sensors:
   1. Duct Sensor with accuracy of +/- 2% RH at 77.0°F, range of 10% RH to 90% RH, including hysteresis, linearity, repeatability, and LED readout.
   2. Room Sensors with accuracy of +/- 3% RH @ 77.0°F, range of 0% RH to 100% RH and LED readout.
   3. Pressure Sensors
      a. Sized, as needed, for best accuracy.

b. Provide pressure sensors impervious to instantaneous pressure changes of 150% of working pressure.
c. Provide sensors with external adjustable span and adjustable zero (Averaging type).
d. Provide pressure sensors with the following characteristics:
    i. Ambient temperature: 40°F to 140°F depending on system.
    ii. Provide pressure sensors with stainless steel needle isolation valves between each sensor and sensor pressure source.
    iii. Provide differential pressure sensors with three (3) valve manifold for isolation and nulling.
    iv. Provide switching type sensors with platinum alloy, silver alloy, or gold-plated wiping contacts rated for the application, voltage and power levels.
    v. Provide valved calibration taps adjacent to each pressure sensor for calibration.

4. Differential Pressure Analog Sensors (Wet to Wet)
    a. Provide differential pressure analog sensors of the solid-state pre-amplifier types for electronic systems.
    b. Sized per system for best accuracy.
    c. Accepted Manufacture: Setra or Senva.

viii. Flow Sensors:
1. Provide sensors for measuring flow in piping and ductwork that are compatible with static pressure and differential pressure analog of the pneumatic and electronic controllers served.
2. Provide sensors with an output characteristic which gives a continuous mathematical function over the full range of flow from maximum to minimum required.
3. Mount flow sensor concealed in public spaces or exposed in mechanical equipment room.

ix. Temperature Indicators:
1. Provide a temperature indicator for each sensor, thermostat, and thermostat~~ic.~~

2. Sensing elements shall be compatible to, and similar to, those of sensors, thermostats, and thermostatic switches.
3. Sensing elements for pipes and taps shall have separable stainless steel or bronze screw wells with heat sensitive liquid in the well.
4. Select indicators with the midpoint range readings approximately equal to the normally expected temperature of the measure medium.
5. For local indication provide liquid-in-glass or remote bulb dial type indicators. For remote indication provide sensor-transmitter with remote indicator.
    a. Liquide-in-glass indicators shall be remote reading, seven (7) inches long, bronze or stainless-steel casings, rigid stem, adjustable, with stainless steel or bronze screw insertion wells for piping or bolted insertion for air.
6. Digital Temperature Indication
    a. Solar Thermometer shall be accurate within 1% of reading or 1 degree whichever is greater, Ambient operating -30F to 140F,
    Range: -50F to 300F, Lux: 10, Humidity: 100%, Sensor: NTC.
    b. Accepted Manufacture: Weiss

x. Damper Operators/Actuators:
1. Sized for specific application.
2. Control Voltage shall be 0-10 VDC Modulating unless specified as Open/Closed.
3. Accepted Manufacture: Belimo Actuators

xi. Automatic Control Valves:
1. Sized for specific application. (Provide separate Valve Schedule)
2. All valves shall be installed with plastic engraved name tags to match Valve Schedule. Attach with stainless steel chain.
3. Sequence staging shall be provided via the DDC system.
4. Control valves over ½”, shall be provided with a means to manually position the valve.
5. Accepted Manufacture: Belimo Actuators & Valves.

xii. Air Quality Monitoring System Sensors (CO_2):

1. Provide indoor air quality sensors to monitor Carbon Dioxide (CO2). Sensors shall be wall mounted and in the Sequence of Operation.
    a. Wall mounted sensors shall be provided with LED readout.
2. Sensor Voltage shall be 24 VAC Output Voltage 0-10 volts dc.
3. Sensing Range:
    a. CO2: 0-2000 ppm +/- 100 ppm
    b. Sample Rate: 1 second.
    c. Accuracy: 3% of reading at 400 to 2000 ppm.
    d. High level setpoint to be determined by SUIT.
4. CO2 sensor shall have no more than 1% drift during the first year and minimal drift thereafter so no calibration will be required.

    Accepted Manufacture: Senva

xiii. Airflow Stations (CFM):

1. Provide Fan Inlet and Temperature Measurement with Remote Transmitter.
2. Airflow Stations Provide throat, face, forward or flare mount adjustable brackets for each sensor node.
3. Each mounting bracket shall have integral 304 stainless steel mounting feet for mounting in or on the fan inlet.
4. The Air Measurement Device (AMD) shall not affect the airflow or sound performance of plenum fans.
5. Provide the following number of sensor nodes-based type. All sensors shall be connected to a single, remote transmitter. Fan array models shall calculate the airflow of each fan individually prior to outputting the total airflow rate and have a built-in alarm capable of removing a failed fan from the total airflow calculation.
    a. SWSI Fans: 2
    b. DWDI Fans: 2 per inlet
    c. Fan Arrays:
        i. Two to four fans: 2 per inlet
        ii. Five to eight fans: 1 per inlet

6. standards and have an accuracy of ±2% of reading over the entire operating range of 0 and 10,000 fpm [50.8 m/s] over a temperature range of -20 to 160 °F [-28.9 to 71.1 ^{o}C] and a humidity range between 0 and 100% RH (non-condensing).

7. Velocity-weighted temperature accuracy shall be better than ±0.15 °
8. Provide low and high airflow alarms with a user defined setpoint and tolerance.
9. Provide a fan fault alarm when installed on fan arrays.
10. Transmitters shall be provided with a 16-character by two-line, backlit, alpha-numeric LCD. Showing airflow rate, temperature, airflow alarm, fan fault alarm, and system status alarm shall be visible on the transmitters display.
11. Building Automation System Analog Signal Connections shall be 2 isolated, field selectable (0-5/0-10 VDC) analog output signals.
12. Analog output signals shall be configurable to provide, One output signal for airflow (linear).
    One output signal shall be field configurable for:
        (i) velocity-weighted temperature (linear), or
        (ii) airflow alarm (binary), or
        (iii) fan array alarm (multi-state), or
        (iv) system status alarm (binary)
13. Building Automation System Network Connection Provide One isolated Ethernet, field selectable (BACnet Ethernet, BACnet IP, TCP/IP) network connection.
14. Accepted Manufacture: Ebtron Gold Series.

xiv. Miscellaneous Field Devices:

1. <u>All field mounted valves, damper actuators, and sensors shall have engraved type nameplates attached by stainless steel chain. ID tag shall identify the device as shown on submittal drawings. “Dymo” type labels shall not be acceptable, except for room sensors.</u>
2. Field devices such as E/P’s, P/E’s, I/P’s and relays shall be located in their equipment’s respective control panel.
3. Wall mounted devices are not acceptable.
4. All field installed control devices, such as JACE’s, DDC Controllers, Relays, and such devices shall be installed inside a rated enclosure with wiring protected from external hazards.
5. All field control panels containing devices shall be equipped with a hinged lockable door.

6. Each panel and all devices inside each panel shall bear engraved nameplates which correspond to the ID as shown on submittal drawings. To be reviewed and approved by SUIT P&F Building Maintenance HVAC Department.
7. Do not attach nameplates to devices, rather attach to mounting back plane.
8. All devices shall be wired through a wiring terminal strip located within the panel.
9. Each terminal shall be identified to match submittal drawings.
10. Provide each panel with a 120 VAC switch, breaker and receptacle to accommodate test equipment.

END OF SECTION 25 00 00