Automatic Temperature Control 25.10.00

Description:

The University of Maryland has a campus-wide Central Control and Monitoring System (CCMS) to manage energy systems and monitor fire alarm systems and energy usage. The purpose of the section is to describe the University of Maryland's Central Control and Monitoring System (CCMS) and Building Automation Systems (BAS). This section is to apply to all new construction and renovation projects that involve automated control of building systems.

These guidelines are intended to assist in-house construction project management teams, outside design professionals, automation vendors, construction management firms, etc. involved in the design, procurement and/or installation of control, monitoring or building automation systems at the University of Maryland, College Park.

Related Sections:

- TBD

Effective Date:

January 1, 2020

Applicable Standards:

- TBD

Design Guidelines

- **Products**
  - The University of Maryland, College Park has three (3) acceptable manufactures for use; Distech, Staefa Talon and Automated Logic.
- **Control Systems**
  - Generally, the University prefers simple control systems and concepts. Control systems shall be DDC. The DDC control system shall be used along with electric/electronic actuators. Pneumatic actuators are required on larger valves in "cooling plant" applications where the speed of operation is important. DDC systems in renovation projects shall be an extension of the existing building DDC if one exists.
  - Provide entry of all software and database additions required to interface with the existing CCMS. The University will provide the communication media between buildings via the campus Ethernet. Coordinate with the University for the connection.
- **Equipment Nomenclature and Numbering**
  - To avoid duplication with existing mechanical equipment ID numbers, for all renovation or addition designs to existing buildings, the designation numbers assigned to mechanical equipment such as AHUs, Pumps, Chillers, Exhaust Fans, etc., shall be coordinated with the campus building automation group which is part of the HVAC Department. The numbers assigned to new equipment shall be consistent throughout all drawings and documentation.
    Major equipment (Chillers, Cooling Towers, Pumps, Air Handling Units, Air Compressors, etc. shall be abbreviated with a 2 to 4 letter identifier, followed by building number, followed by the floor it is located on, followed by an I.D. number. Examples include:
    AHU-077-02-03 – Air Handling Unit - Building 077 – Second Floor – Unit ID Number 03
    CT-415-0R-04 – Cooling Tower – Building 415 – Roof – Unit ID Number 04
    CHWP-003-0B-01 – Chilled Water Pump – Building 003 – Basement – Unit ID 01

Equipment	Abbreviation
Air Handling Unit	AHU
Water Cooled Chiller	CH
Air Cooled Chiller	ACC

Cooling Tower	CT
Chilled Water Pump	CHWP
Condenser Water Pump	CDWP
Packaged Rooftop Unit	RTU

Floor	**Floor ID**
Sub-Basement	SB
Basement	0B
Ground Floor	00
First Floor	01
Second Floor	02
Third Floor	03
Roof	0R

15 Day Test

- The Central Control and Monitoring System (CCMS) contractor shall formally notify the CCMS and HVAC group that the systems are ready for the 15 consecutive day test period once all of the project automation system controller and integrated input/output point data, control sequence, alarms and graphical programming have been downloaded, validated and tested.
- During the test period the CCMS contractor shall be responsible for maintain communications at all tiers as well as maintaining proper operation of the input sensors and controlled devices. Additionally, the CCMS contractor shall assure that all control logic and outputs remain in an automatic state.
- It shall be the responsibility of all contractors that the HVAC equipment within the building remains in an operational and automatic mode of operation (Chillers, Variable Frequency Drives, terminal units, and motorized valve and damper actuators, etc.).
- Prior to the test period, the contractor shall be responsible for defining historical trend point information of all primary equipment status, temperature, volume, pressure, humidity, set points, controlled discrete and modulated variables points. During the test period the contractor shall be responsible for assuring trend data integrity. By default, Analog trend data points shall be defined using 15 minute interval and Binary trend data shall be defined as Change of State.
- During the test, if communication or sensory failure is detected (with the exception of the campus Ethernet system going off line) or the HVAC equipment fails to operate properly, the contractors shall be responsible for corrective action within 24 hours.
- If the operation of the building HVAC systems or CCMS communication is interrupted for a period of greater than 24 consecutive hours, the 15 day test will stop and will be started again from day one after corrective actions have been performed.
- At the conclusion of the 15 day period, the trend data, sequencing, alarming and graphical user interface shall be used to determine if the HVAC systems maintained building space conditions, functioned in accordance with the specified sequence and controlled the primary control variables in a stable and predictable manner.
- If this information shows numerous significant periods of time when HVAC was not operating properly or fails to maintain correct building conditions, the test will be declared a failure and must be repeated as required until the systems are demonstrated to operate properly for 15 consecutive days.

Air Flow Monitoring (AFM)

- All AFMS' shall be thermal dispersion type by Ebtron.
- AFMS based on Pitot tube sensing are not acceptable.
- Variable Air Volume (VAV) Air Handling Units (AHU) with supply and return fan shall monitor both the supply and return air flow using AFMS'.

- Variable Air Volume (VAV) Air Handling Units (AHU) with only a supply fan shall, at minimum, monitor the outside air volume.
- AFMS are not required for Constant Air Volume (CAV) Air Handling Units.

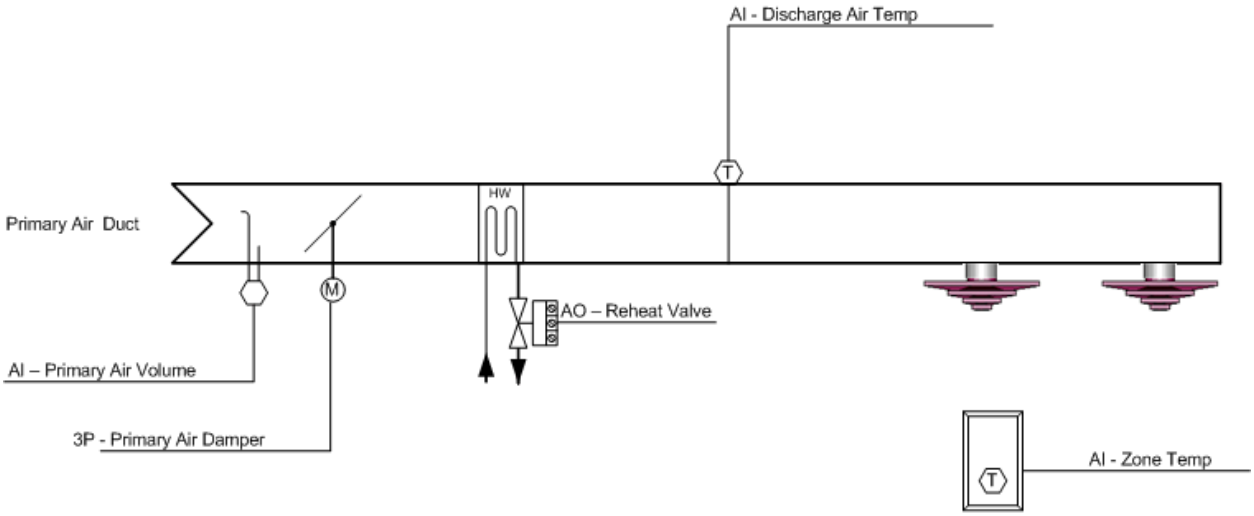
Safeties

- All AHU safeties and associated controls shall be hard wired with manual reset whether the system is locally or remotely controlled and/or manually overridden for constant or variable speed fans.
  Redundant automation controls applications shall emulate all hardwired safeties sequences.
- The unit smoke detector, when tripped, will stop the supply and return fans. The minimum outside air dampers, economizer dampers, and relief dampers will close and return air dampers shall open.
- The unit freezestat, when tripped, will stop the supply and return fans. The minimum outside air dampers, economizer dampers, and relief dampers will close. The return air dampers shall open and the hot water coil pump motor shall be energized.
- The preheat water valve shall modulate as required to maintain the preheat coil leaving air temperature low limit set point (45F) and the chilled water valve shall fully open.
- The freeze alarm condition shall override all other automation system valve commands.
- Freezestat length shall, at minimum, be 1 linear foot per square foot of coil cross sectional area.

- **Static Pressure Transmitter**
  - Supply or exhaust duct mounted static pressure transmitters, with LCD display, shall be mounted in the associated AHU automation control panel.
  - The duct static pressure probe shall be installed approximately 2/3 of the way down the duct main trunk. Pressure probe sensing locations shall be indentified on automation control floor drawings and included in graphical user interface representation.

- **ATC Control Panels**
  - All controllers shall be mounted directly onto panel backplane. Stacking controllers is unacceptable.

- **VAV Terminal Units**
  - All VAV terminal units shall include discharge air temperature sensor downstream of the reheat coil.
  - If VAV terminal unit is “Cooling only” where no Re-Heat Coil exist then Discharge Air Temperature (AI) is not required.



VAV Terminal Unit with Reheat

Global Points

- Process variable inputs of Proportional Integral & Derivative Control loops shall be a hardwired input type wired directly into the associated controller. Process variable input values shall not be delivers across the controller network.

Graphic Equipment Representation

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BACnet over Campus IP Addressing Scheme

- System Addressing: Each BACnet Device Object Instance on an Intra-network has to be exclusive for each device.
- CCMS contractors shall conform to the following BACnet Network and Device Instance numbering format scheme, based on Cornell model as described in the Nov 2007 ASHRAE Journal, where after
- reviewing the controls submittal and validating the network architecture for a given project the
- university would then allocate a range of BACnet Network Numbers and Device Instance Numbers based on the following:
  - The format for the Network Number is SFFFN where:
    - S=Site (1=Main Campus, 2=Main Campus Extended Network, 3= Off Campus)
    - FFF=Facility (Building) Number (Always 3 digits – range 000-999)
    - N=Network Number (Always 1 digit - range 0-9)
  - The format for the Device Instance Number is SFFFNDD where:
    - DD=Device Number (Always 2 digits – range 00-99)
  - Whenever S=1 and either the N or DD range have been exceeded continue the numbering sequence with S=2.
  - The contractor's strict adherence to the format of both SFFFN and SFFNDD is required.

Documentation

- The CCMS contractor shall comply with the contract submittal requirements for content and quantity. Further, the CCMS contractor shall provide all associated documentation in editable digital format to the CCMA/HVAC group so documents can be revised to reflect future system enhancements by the university.

CCMS Point Description Approval

- Before final control submittal approval the building automation controls contractor shall submit a listing of all automated equipment (AHUs, Pumps, Chillers, Exhaust Fans, VAV's, FCU's) for review and approval by the CCMS group. The intent of the point description approval process is to avoid equipment tagging conflicts in existing building where renovation or addition work is performed.

Variable Speed Drives (VFD) Monitoring and Control

- All VFDs' shall be monitored by the building automation system by an industry standard integration
- protocols (BACnet or Modbus.
- All points necessary for the primary automated control functions of a VFD shall be hardwired to the building automation local controller.
- The VFD hard wired points shall include the following points:
  - Run Status - Digital Input
  - Run Command - Digital Output
  - Speed Control - Analog Output (As an alternative, Pulsed Digital Outputs using floating point control may be applied)
- All safeties shall be hardwired through the VFD safety circuit and shall stop the VFD controlled motor whenever drive is in the Bypass, Hand, or Auto state.

Chiller Monitoring and Control

- All associated primary pumps and isolation valves shall be hardwired interlocked to allow chiller operation by the unit's local control panel start switch
- All monitoring and control points shall mapped into the building automation system by an industry standard integration protocols (BACnet or Modbus).
- Engineer shall reference ASHRAE Guideline 22 for integration of chiller plant dash boarding.

Fume Hoods

Power for the fume hood face velocity monitor shall come from the fume hood, tapped in from the fume hood's electrical outlet.