Section 230900

Instrumentation and Controls for HVAC

Building Automation System Design and Construction Standards

University of Rochester

Utilities and Energy Management

Energy Operations Group

Note: Please send any issues or proposed deviations in email to Levi Olsen at lolsen@facilities.rochester.edu or the Manager of the Energy Operations Group.

Final Version

Updated: February 21, 2014
# University of Rochester Building Automation Systems Design and Construction Standards

## Table of Contents

### Sections:

1. General
2. Required Documentation For Projects
2a. Required Trending
3. Building Automation Communication
3a. Alarms
4. Laboratories and Critical Spaces
5. Specified Products
6. Standard Details and Sequences
7. Controller Naming Standard
7a. Room level controller device naming
8. Point Naming Standard
9. BACnet Instance ID and Network Number Standard
10. Graphics Standards
11. Commissioning Requirements
12. Training Requirements
13. Energy Sequences
14. User Interface Requirements/ System Architecture/Integration
Section 1

General Requirements

**Statement of Intentions:** It is the intention of the University of Rochester to create a DDC system that is reliable, easy to navigate and maintain, and is cost effective in order to best support the mission of University as a whole. The criticality of the medicine, research, and learning that occurs at this institution deserves a system that takes full advantage of the technology available to create a safe and operational environment for each member of the University of Rochester Team.

This document is intended to cover standards and instructions for design and installation on all construction projects and installations of BAS controls at the University of Rochester. This includes both in house installations and contracted installations.

These standards that are laid heretofore are intended to create the Building Automation System of University of Rochester to maintain the best environment for all groups and users of the system and its information. The Energy Operations Group is the creator and maintainer of this standard. Deviations from this standard must be approved in writing by the Energy Operations Group at the University of Rochester. All installation under this standard and application of this standard shall be subject to all applicable local, state, and federal codes and requirements.
Acceptable Vendors

Currently, the University of Rochester utilizes three separate vendors for Building Automation Systems. They are Andover Controls supplied through Day Automation, Automated Logic Controls supplied through Logical Control Solutions, and Siemens Controls supplied through the Rochester branch of Siemens Technologies. Note: The only exception to this standard for acceptable vendors shall be the Eastman Dental Center, CVRI, and Strong West, which shall remain Johnson Controls. Any one of these acceptable vendors must comply with all standards that are applicable here in. Some of these standards are specifically laid out on a per vendor basis in order to maintain a consistent product for all Building Automation Systems at the University. The contact information of the three acceptable vendors are listed below.

Day Automation
7931 Rae Blvd.
Victor, NY 14564
Telephone: (585)924-4630

Logical Control Solutions
829 Phillips Road
Victor, NY 14564
Telephone: (585)424-5340

Siemens Industry, Inc.
Building Technologies Division
422 East Henrietta Road
Rochester, NY 14620
Telephone:(585)797-2300


**Critical Expectations**

Alarm delivery is one of the most critical functions of the BAS system at the University of Rochester. Alarm installations shall be in such a manner to avoid all possible lost alarms. System architecture in hardware and software must be designed in such a way to make alarms a priority.

All new installations shall be de-scoped and pre-approved by the Energy Operations Group. The impact on the system must be evaluated by the Energy Operations Group before any new equipment is merged with the existing system. All controllers and hardware shall be a part of the larger University Building Automation System and shall be able to be accessed from anywhere in the University Facilities Private Network.

Protecting the stability and integrity of the University’s Building Automation System is critical and a primary function of the Energy Operations Group. Therefore, all demolition of existing controllers shall be overseen by the University Energy Operations Group, and may in some cases be performed by the contracting vendor with approval from the Energy Operations Group.

**General Installation Requirements**

**Energy Metering Installations**

All metering installations shall report through the existing building automation system. Installations shall occur per the Utilities and Energy Management Standards for Energy Metering.

**Electrical Installation**

1. All references to Arc Flash shall be clarified and followed as is required by University of Rochester Arc Flash Policy. ([http://www.safety.rochester.edu/ih/electrical/electricalsafety1.html](http://www.safety.rochester.edu/ih/electrical/electricalsafety1.html))
2. All work is to be run in ¾ inch or larger conduit in all mechanical spaces or spaces where there is an inherent danger of exposed wires being cut. Cable trays are acceptable in ceilings and hallways provided blue conduit exits the cable tray in order to penetrate at the room level.

3. All 3rd party equipment alarm wires shall be in conduit runs for as long as possible and shall exit the conduit as close to the termination of the alarm wire as can be accessed for service on the equipment. A short lead should be left on the alarm wire in order to move equipment if access is difficult. This type of equipment is usually, but is not limited to, laboratory equipment such as ultra low freezers, liquid nitrogen tanks, incubators, constant temperature boxes and chambers.

4. All communication, sensor wiring, and low voltage wires going for room level control shall be in conduit or cable tray until it at least penetrates the room that the terminal equipment controller and sensors are in. Wiring within the room shall be installed in such a manner as to minimize the risk of damage to the wire by keeping it well supported and out of the way with termination leads being kept as short as possible.

5. All higher level control (Building Level Controllers) should have communication lines in conduit for their entirety. Wire within the rooms run within acceptable applications not to be run in conduit shall be plenum rated.

6. All raceways and ring runs shall be dedicated to both low voltage applications and BAS applications only and shall be labeled at all terminations and junctions and every 10 feet.

7. All conduit associated with the BAS must be a medium blue color along with all of the junction box covers for the system. Conduit in finished spaces may be painted the color of the surroundings with junction boxes colored medium blue.

8. All low power (<50vac) must be separated from all higher voltages, or must be protected and guarded so as to avoid Arc Flash exposure. This is referred to as NFPA defined level 0 arc flash hazard.
9. All 120Vac power sources for controller panels shall be installed in a lower junction box to create a separation from the lower voltage controls section. All controllers requiring 120V must have the power guarded and protected in order to minimize the risk of arc flash. This portion will be NFPA arc flash hazard level 1 and shall be appropriately labeled with arc flash labeling.

10. All controllers that have an IP/Ethernet connection or run major equipment (i.e. air handlers, heating pumps, etc.) must be protected by an Uninterrupted Power Supply (UPS) with surge suppression and battery backup. The UPS must be a Minuteman brand UPS model EN600 (600VA) or ETR 1500 (1500VA) in the case of larger power load requirements. Other acceptable manufacturers are Eaton and Emerson, but the electrical sizing must be the same as the Minuteman, they must use identical batteries, they must have identical outer casing dimensions as well, and must be approved by EOG before they are used. If the controller is already on a building UPS system and is surge protected than a dedicated UPS will not be installed at the controller level, but each controller must be labeled with its UPS power source so that it can be identified. In all cases the incoming power to the controller must have a means of disconnect which must be clearly identified as the disconnect from the load side of the UPS.

11. All electrical circuits used for controllers must be dedicated to the building automation system and must be installed on standby power, where it is available. All circuits for the building automation system controllers must be coordinated on standby power systems and also coordinated with all associated systems and equipment that the BAS is controlling to enable full function of appropriate equipment during standby power mode.

12. Controllers and equipment power sources should be carefully coordinated to avoid field tracing difficulties. Labeling should include power and network/communication sources and destinations on all controllers for the best field tracing in the future. Power should come from a dedicated
BAS power panel when available. New building construction should include BAS dedicated power panels.

13. All power and communication/control wiring shall be run in separate raceway/conduit.

14. All control wiring shall be home runs to the main controller and shall contain no splices.

15. All wires are to be labeled clearly with wrap around tags on both terminations of the wire. All junction box covers shall be painted medium blue. Both box covers and termination cabinets are to be clearly labeled. Wires, both power and communication shall be labeled on both sides of visual obstructions and shall contain labels at regular 10 foot intervals.

16. All power wiring that is of an auxiliary nature, meaning that power is fed from a secondary source, must be run in yellow wire. This will indicate that there is a need to disconnect a secondary “power source” in order to safely secure the equipment that is being fed by yellow wire.

17. All abandoned control wiring, pneumatic tubing, control enclosures, conduit, sensing devices, abandoned controllers, and raceway shall be removed to its source when involved in a project.

18. All safety circuit devices such as low temperature detectors, high pressure cut outs, and fire safety devices shall be physically wired in series with the variable frequency drive safety circuit or motor starter in such a way that the equipment will shut down without intervention from the BAS. BAS is to monitor all of these points for purpose of alarming. Multiple safety devices of the same type must also be wired in series when applied within the same system.

19. All heating pumps, lighting, and critical exhaust fans, as deemed so by the University Facilities or Energy Operations Group shall be wired to fail in a system and environmentally safe position in case of loss of BAS signal. For example, exhaust fans may fail on due to a critical environment that they are serving.

20. The freeze protection circuit must shut the fan down, must shut the outside air dampers and exhaust air dampers fully and open the return air
dampers fully, and must control the air temperature inside the air handler to 90 degrees Fahrenheit with the heating valve. All safety operations, except modulation of the heating valve, must be done through the hardwired circuitry and not done through the BAS software. Software safety shutdowns are not acceptable. If there is no heating coil, the return air fans shall also turn on.

21. All safeties must operate whether in manual or automatic position, except preheating valves, which upon loss of power or controller signal will fail full open.

22. All smoke fire systems controlled by the BAS shall have notification to the central fire panel when called for by the Authority Having Jurisdiction (AHJ).

23. All electrical installation is to adhere to the latest version of the National Electrical Code that has been adopted by New York State. All installations shall comply with all local and state codes.

24. All Automation Level Network (ALN)/Building Level Network (BLN) controllers shall use an IP/Ethernet connection to the University Facilities Private Network for communication. The Floor Level Network (FLN), Infinet, Arcnet, room level controllers, single use, or specific use equipment controllers contained in the “sub architecture” are not required to be IP based, but may be IP based at any level.

25. Power supplies for controllers and end devices (such as valves, transducers, and actuators) shall be separate transformers and shall follow what is required in section 5 of this document.

26. All grounding for 120 volt circuits and above shall be accomplished appropriately with separate grounding wires and also proper bonding as is called out in the National Electrical Code at the revision which has been adopted by local and state authorities and shall also include all requirements above and beyond that code required by those authorities.

27. All conduit installed must have minimum of 20% spare area under maximum code conduit fill area in order to have room for future wire pulls.
28. All controller layouts shall be physically wired such that all critical inputs and outputs shall be wired to the same controller on the network. Points for PID type control loops shall not be passed from controller to controller across the network. All control loops in a controller shall act in a standalone manner, if the network communication to that controller were lost.

29. Each major piece of equipment that is called to be shut down by the fire system shall include an additional “Form C” (Normally Closed) relay to alert the building automation system when it is shut down. This will in turn initiate an appropriate fire alarm shutdown sequence which may be necessary for associated fans and equipment in the building automation system.

Accessibility

1. All electrical cabinets containing controllers must be lockable and must use the LL802 key to open the lock, except terminal unit boxes (such as those for VAV’s). Power enclosures located below the main controllers shall be lockable with LL802 key when they are not located within a secured mechanical space.

2. All major controller cabinet locations should be placed in easily accessible places in secured mechanical spaces. Room level controllers need not be placed in secured mechanical rooms, but still should be accessible for replacement and maintenance as needed.

3. Also all actuators and valves must be placed in spaces that are accessible for full testing without removal. Actuators and valves should be easily removable and should have hand valves in place in order to easily change out actuators and control valves without shutting a section of the larger system down than is already affected by the actuator and valve itself.

4. Ladders should not be required to reach controllers, except in the case of room level controllers above ceilings. Also, all devices, valves, and actuators
shall not require a ladder to access them, except in cases where it is required to be above ceiling for room level control.

5. All room level controllers shall have adequate access to remove covers, replace and service components. This includes valves, dampers, filters, etc.

6. Access panels for controllers, actuators, sensors, etc. above ceilings shall be a minimum of 24” x 24”.

7. All devices that are capable of physical reset (such as a low temp detector or high pressure cutout) shall be in an easily accessible place that can be reset. This must be able to be reset without the use of a ladder, in all cases that are reasonable.

Spare Capacity

1. All installations involving new upper level, main level, ALN, or BLN controllers should leave at least 10 percent spare point capacity of a distributed variety (BI, BO, AI, and AO), specifically for each type of point provided on the controller. These point types are defined below:

   a. Binary Input (BI): An on/off indication that has a maximum cycle rate of 1 Hz. This is typically sensing a contact closure.

   b. Binary Output (BO): A contact closure on the controller that will cause an action in the system.

   c. Analog Input (AI): A continuously varying voltage or amperage signal that is varied by a sensor in relation to a sensed variable. This signal is processed in the controller after an analog-to-digital converter on the controller that converts the analog signal to a digital value.

   d. Analog Output (AO): A continuously varying voltage or amperage signal that is generated from the controller after digital-to-analog conversion. The voltage or amperage signal will be used, for instance,
to drive a modulating actuator or reset a hardwired set point on a packaged device.

Thanks to Cornell University for the previous definitions: (Cornell BACS Guidelines-
http://cds.fs.cornell.edu/file/15955_BACS.pdf)

2. All controller cabinets or enclosures installed are required to be large enough to house spare expansion modules in anticipation of future growth.

Required Naming and Labeling

1. All installations shall include the updated graphics which should be referred to through the vendor specific graphic standard. This should include tables of contents, floor plans which include locations of important sensors, good labeling and notes, equipment specific graphics and all standard links as laid out in detail in the graphics standards section 10.

2. All installations shall include updated controller names (See section 6 for details) with specific descriptions for all controllers

3. All installations shall include updated point names (See section 7 for details). Any and all exceptions shall be approved by EOG.

4. All installations shall provide all labor, materials, equipment, and services necessary to be compatible with the existing University system.

5. All of the devices will be labeled on the system graphics for their normal failsafe position.

Future Planning

1. All installations near any existing controllers in the same vendor’s system shall be reviewed with the Energy Operations Group to ensure that the installation fits in with all future planning and upgrades.
Section 2.

Documentation required for projects

1. All bids given to the University for any projects, whether for Facilities, Campus Planning Design and Construction Management (CPDCM), Central Utilities, or directly to the Energy Operations Group (EOG) shall contain specified controllers to be used for each application.

2. All point names and controller name lists will be provided in a CSV type file that can be edited by EOG. They must be sent to EOG as early as possible. This process should take place after a vendor has been chosen to do the job and the job has been designed to the point that the database can be built. All names must be approved by EOG through email before they can be implemented.

3. Each controls installation shall include a set of as built documents that are sent electronically to EOG. As builts are to be surrendered to the EOG group and the appropriate Facilities group at the time of turnover, including digital media copies, one for each group. These documents must contain all applicable schematics, system architecture, valve schedules, product specification sheets, and sequences for how the controls are operating when the project has reached completion. The documents will be linked by EOG via a University shared drive for all University system users to utilize on a link in the graphics for the project. All appropriate graphics shall contain inactive specialty links created by the vendor before turnover for the previously explained purpose. The specialty links shall be included on the lowest graphics table of contents page that is applicable to the entire document to be linked.

4. As built documentation must be updated within the one year warranty period with any changes that were made to the project as completed at the time of turnover. A new electronic copy of this documentation is to be sent to the project manager, the architect of record, and the Energy Operations Group electronically in order to include them in the project documentation and link them up to the appropriate graphics.
5. As built documentation submitted to the Energy Operations Group shall be of a PDF form that will be tabbed and/or bookmarked and labeled in a manner which allows ease of documentation navigation.

6. All BACnet Instance ID’s and Network ID’s shall be maintained within the number range of each vendor and shall be reported in a vendor specific master spreadsheet form to EOG for each project.

7. All IP addresses used in projects should be from the UF&S private network and should be submitted to EOG via email during the project.

8. A copy of all as built documentation shall be left in all main panel controller locations in a plastic sleeve located on the inside of the door.

9. All specific documentation that shall be required for any structured pricing process, as applicable.

10. Provide riser diagrams for all controller and BAS major equipment designating locations.

11. All building automation system submittals and as built documentation should include a quality sequence of operations section for each piece of equipment to be controlled.

12. All graphics associated AutoCad type files used to create graphics or floor plans on the BAS graphics package shall be surrendered in electronic format to the Energy Operations Group in order to update graphics in the future.

13. All submittals and as built packages shall include full riser diagrams for power and communication with locations labeled for all controllers, transformers, and other relevant control components.
Section 2a.

Required Trending

1. All projects must contain trended points that include but are not limited to the following:
   a. All associated temperatures and their set point
   b. All associated humidity and their set point
   c. All associated valve and damper positions/signals
   d. All CFM and flow values and set points
   e. All digital proofs for pumps and fans
   f. All vfd signals
   g. All pressurization values and set points

2. The specific trending requirements of each point are dependent upon the level of criticality determined for that space. All spaces shall be categorized into 3 categories. Each category determines the level of trending required in the frequency that samples are taken, the range of values that are to be captured, and in the length of time that the data will be stored. A space may be determined during the project as requiring a specific level of trending, in order to be categorized in level 1, 2, or 3. See table below for trending level specific requirements.

3. All points must be minimally trended as specified in the table below but may have additional trended points or resolution as is appropriate for the project application and is decided upon by the owner, the appropriate Facilities group, and the Energy Operations Group.

4. One week of trend data is to be kept locally at controller level at all times for each level of space. Historical logging is to be stored on the system server for different lengths of time specified for each category in the chart below.

5. All specialty systems such as Medical Gas, vacuum, compressed air, etc. shall be trended on an as needed basis as is decided by the Facilities group for the designated project area.

6. Minimal trending requirements shall be at a level 3 unless otherwise specified by the Facilities group responsible for the area being trended.
# Trending Specifics for Categories of Criticality

<table>
<thead>
<tr>
<th>Building Level Trending</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Points to be trended</strong></td>
<td><strong>Type of Trending</strong></td>
<td><strong>Time/ Variation</strong></td>
<td><strong>Time/ Variation</strong></td>
</tr>
<tr>
<td>Valves/Damper Signals</td>
<td>Instantaneous values at specified time interval</td>
<td>5 min</td>
<td>10 min</td>
</tr>
<tr>
<td>VFD signals</td>
<td>Instantaneous values at specified time interval</td>
<td>5 min</td>
<td>10 min</td>
</tr>
<tr>
<td>AHU/Heat Exchanger temps</td>
<td>Instantaneous values at specified time interval</td>
<td>5 min</td>
<td>10 min</td>
</tr>
<tr>
<td>AHU temp set points</td>
<td>Change of Value variation</td>
<td>0.5 degrees</td>
<td>1 degree</td>
</tr>
<tr>
<td>AHU relative humidity set point</td>
<td>Instantaneous values at specified time interval</td>
<td>5 min</td>
<td>10 min</td>
</tr>
<tr>
<td>AHU relative humidity set point</td>
<td>Change of Value variation</td>
<td>3%</td>
<td>5%</td>
</tr>
<tr>
<td>Pressures air and waterside</td>
<td>Instantaneous values at specified time interval</td>
<td>1 min</td>
<td>5 min</td>
</tr>
<tr>
<td>Air pressure set points</td>
<td>Change of Value variation</td>
<td>0.1 inches WC</td>
<td>0.2 inches WC</td>
</tr>
<tr>
<td>Water pressure set points</td>
<td>Change of value variation</td>
<td>1 PSI</td>
<td>2 PSI</td>
</tr>
<tr>
<td>All binary /digital points and equipment proofs and specialty alarms</td>
<td>Change of Value variation</td>
<td>Change of State/ ON/OFF</td>
<td>Change of State/ ON/OFF</td>
</tr>
<tr>
<td>CFM</td>
<td>Instantaneous values at specified time interval</td>
<td>5 min</td>
<td>10 min</td>
</tr>
<tr>
<td>CFM set point</td>
<td>Change of Value variation</td>
<td>10 cfm</td>
<td>10 cfm</td>
</tr>
<tr>
<td>Return Air CO2</td>
<td>Instantaneous values at specified time interval</td>
<td>5 min</td>
<td>10 min</td>
</tr>
</tbody>
</table>
### Room Level Trending

<table>
<thead>
<tr>
<th>Points to be trended</th>
<th>Type of Trending</th>
<th>Interval Variation</th>
<th>Interval Variation</th>
<th>Interval Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Room Temperature (RMT)</strong></td>
<td>Instantaneous values at specified time interval</td>
<td>5 min</td>
<td>10 min</td>
<td>15 min</td>
</tr>
<tr>
<td><strong>Room Temperature Set point</strong></td>
<td>Change of value variation</td>
<td>0.5 degrees</td>
<td>1 degree</td>
<td>1 degree</td>
</tr>
<tr>
<td><strong>Room Humidity (RMH)</strong></td>
<td>Instantaneous values at specified time interval</td>
<td>5 min</td>
<td>10 min</td>
<td>15 min</td>
</tr>
<tr>
<td><strong>Room Humidity set point</strong></td>
<td>Change of value variation</td>
<td>3%</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td><strong>CFM at room level</strong></td>
<td>Instantaneous values at specified time intervals</td>
<td>5 min</td>
<td>10 min</td>
<td>15 min</td>
</tr>
<tr>
<td><strong>CFM set point at room level</strong></td>
<td>Change of Value variation</td>
<td>5 cfm</td>
<td>10 cfm</td>
<td>10 cfm</td>
</tr>
<tr>
<td><strong>Space CO2 levels</strong></td>
<td>Instantaneous values at specified time interval</td>
<td>5 min</td>
<td>10 min</td>
<td>15 min</td>
</tr>
<tr>
<td><strong>Occupancy Sensor Status</strong></td>
<td>Change of value variation</td>
<td>Change of State Occupied/Unoccupied</td>
<td>Change of State Occupied/Unoccupied</td>
<td>Change of State Occupied/Unoccupied</td>
</tr>
<tr>
<td><strong>Fume Hood FPM</strong></td>
<td>Instantaneous value at specified time interval</td>
<td>5 min</td>
<td>10 min</td>
<td>15 min</td>
</tr>
</tbody>
</table>
## Energy Meter Trending

<table>
<thead>
<tr>
<th>Points to be trended</th>
<th>Type of trending</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Metering Data for Electrical, Steam, Gas, Chilled Water, District Hot Water, etc. kiloWatts, kiloWatt hours, GPM, Totalized Gallons, Btu, Btu/h, Lbs. per hour and Lbs. shall be trended in the BAS at a minimum.</td>
<td>Instantaneous values at specified time interval</td>
<td>15 min</td>
</tr>
</tbody>
</table>

**Total Length of time trend data is to be stored per category**: Forever
Section 3.

Building Automation Communication

BACnet

1. All installations shall be BACnet for each level of new controller that is installed. Each controller shall be “native” BACnet in that there should be no converters from proprietary to BACnet language outside of the controller.
2. All installations shall follow the BACnet Standard numbering scheme for the University of Rochester. See the Instance ID and BACnet Network Numbers Standard for the University of Rochester in Section 5 of this document.
3. All BACnet installations shall use the required BBMD for their area subnet applications. This BBMD shall come from the existing BBMD (Provided by the Energy Operations Group) in the subnet, or from a newly supplied BBMD controller specifically included in the new installation for that newly created subnet. The BBMD shall be a controller which is a zero node controller (containing no physical I/O points) solely installed and maintained in the subnet for routing all BACnet traffic for the entire subnet.
4. All BACnet installations including 3rd party equipment shall be managed by one of the three BAS contractors or directly by EOG in special exceptions. It is the requirement of the BAS contractor to provide BACnet Instance ID numbers and Network numbers that are appropriate within their assigned range and report them back to EOG. See Section 2, number 4.
5. All third party equipment shall be integrated with BACnet, preferably. This may be done MS/TP or TCP/IP where it makes sense to implement either. In the event that BACnet is not available with the third party equipment then it may be implemented in Modbus RTU (RS485) or TCP/IP as appropriate.
6. All floor level or room level controllers shall be BACnet MS/TP. They shall not operate on proprietary languages.
7. MS/TP controllers from the 3 primary BAS vendors may not be intermixed on MS/TP networks. All controllers installed must be accessible from the front
end software for controller level changes, such as programming, schedules, point database management, etc.

8. “Enhanced” BACnet MS/TP schemes may be used as long as the information leaving the “proprietary system” on the IP level may be accessed as BACnet compliant traffic that may be received and used by other University systems.
Section 3a.

Alarms

1. All third party alarms shall be wired back to the main level panel not on the FLN or MS/TP level, but must go back to the ALN (BLN) level controller. Bus Interface Modules (BIM) may not be used for 3rd party or any critical alarms on the FLN.

2. During Construction... All controllers, points, and alarms shall be inaccessible to the Customer Service Center on their alarm screen until the project is complete, all appropriate personnel are trained, and the project is turned over to the University. This may be accomplished through “out of service” functions, access groups, or whatever is most appropriate for each vendor.

3. During Construction... All controllers, alarms, and points shall not be left in a failed or off line mode to be seen by users while under construction. These panels must be labeled with “OUTOFSERVICE” if they cannot be made invisible, or are not in a state of proper operation.

4. During Construction... Points to be alarmed, messages, alarm colors, remote alternate notifications, and alarm parameters must be approved by EOG and the appropriate group of Facilities personnel that will be caretakers of the project upon turnover before turnover occurs and alarms are implemented.

5. All alarm priority colors associated with smoke evacuation panels intended for the use of the local fire department shall be determined and approved by the University of Rochester Fire Marshall’s office.

6. All patient care spaces and medicine dispensing sights must have temperature and humidity sensors with associated alarms and trends installed per Medical Center Facilities and Operations requirements due to requirements from NYS Department of Health, JCAHO, and other applicable governing organizations.

7. All system controller failures or losses of communication must be sent to the alarm screen in the Customer Service Center.
8. All alarms with messages must be named with “_MSG” contained at the end of the point name that is laid out in the point naming standard. See section 8.

9. For all new installed controllers that are connected directly to the University Facilities and Services Private network, there shall be a test alarm created and added to the test alarms graphic for EOG. This test alarm shall be able to be triggered by an EOG operator to manually verify communication and system alarm functionality.

10. No filter monitoring points shall be made alarm-able except in cases of Hepa filters and clean room applications where Facilities requires alarms. In these instances, binary points that alarm the filter are not acceptable. The filter must be monitored by an analog value that indicates filter loading and can be displayed on a graphic.

11. All equipment alarms that shall be wired in as normally closed with the point set up as such in the respective BAS. This means that the alarm will come in due to any failure such as a cut or loose wire in the field.

12. Alarm parameters will be set up in accordance with the Facilities representative appropriate for that area and in accordance with the customer’s requirements. Delays shall be implemented on alarms where appropriate to reduce false alarm scenarios.

13. All alarms activated during a project shall include a sign off by the commissioning authority, if the project has one.
Section 4.

Laboratories and Critical Spaces

1. All installations in critical lab spaces cannot be operationally dependent upon sharing control information across the network in order to operate the critical lab. All information required to operate the critical lab spaces must be within a vendor specific hard wired network of controllers in order to minimize communication delays or loss of control with loss of UF&S network connection.

2. All air handlers that have humidity added to the air stream by whatever means must have a physically wired humidity high limit that shuts off humidifying source. In addition an airflow switch shall be hard wired in series to cut out the humidifying source. Upon startup of the air handling unit the air switch must be made and after that air flow switch is showing airflow, then the humidity source shall be incrementally modulated to the full required signal for control. Humidifiers that are not protected in this manner are not allowed.

3. Phoenix installations will not be Celeris with a macro server or BACnet gateway that is not distributed in the nature of its architecture, but will be either direct BACnet integration from a valve level, or will be wired in an analog manner as shown in the wiring diagrams at the end of this section.

4. Fume hoods shall have air flow sensors and monitors that indicate air (specific) face velocity at hood and report the values back to the BAS in feet per minute, minimally. All fume hood associated exhaust fans shall be alarmed by the BAS. Specific hood alarms shall be local for best safety of the occupants. Exceptions will be considered on a case by case basis.

5. Room pressurization monitoring devices shall display information in inches of water column, minimally.

6. All VAV or two position fume hood applications shall consist of an air flow sensor, a hood occupancy sensor and a sash position sensor that reports back to the back to the BAS for global level room occupancy control.
7. Room occupancy for a lab with a fume hood will be determined by both the occupancy of general room sensor(s) and the occupancy of the zone presence sensor.

8. All fume hoods will be controlled in one of the following manners (as is allowed by local codes):
   a. If room air changes at unoccupied level are driven by the total fume hood required maximum air flow, the fume hood and room as a whole shall act in a VAV configuration.
   b. If room air changes at unoccupied level are not driven by the total fume hood required maximum air flow, then the fume hood and room as a whole shall act in a two position manner with an occupied and unoccupied air flow rate, determined by University of Rochester Environmental Health and Safety (EH&S).
   c. If the room air changes at unoccupied air change rates require at least the total fume hood air flow for a constant volume to maintain that minimum air flow, then the fume hood shall remain a single speed constant volume fume hood and shall control the air changes and room pressurization by variable or staged general laboratory exhaust.
   d. If the application of the space is such that the criticality of the room requires a constant air change rate for safety or process application, then the room air change rates and pressurization should be kept by constant volume control, with no energy savings schemes employed. This may only be done with permission from EH&S and Utilities and Energy Management.

9. Fume hoods shall be made alarm-able with specific alarm messages and priorities only as is deemed appropriate by the appropriate area Facilities representative for the specific project.

10. If Phoenix Venturi valves are used in any manner they shall be wired into the BAS as shown in schematic diagrams below. Other air valves may be used for these applications, but all valve performances must be proven to the owner. Both operation and energy consumption must be considered
and the performance of the valves must meet manufacturer’s recommendations for the hood and for all ASHRAE testing requirements.

11. Each project design with critical spaces and laboratories must contain minimally 2 air valve options that meet specifications and both must have preliminary performance criteria, energy modeling, and cost presented to Facilities, Central Utilities, and the project manager.

12. All room pressurization schemes and air change rates must be operated minimally by a two position occupancy controlled scheme this scheme must be self-contained within the programming of the BAS. The only case that air flows and pressurization in Laboratories and critical spaces may be maintained by VAV boxes in applications deemed appropriate by the specific project design engineer.

13. Design engineers may choose to use Venturi type valves for supply air, general, and lab exhaust air and fume hood exhaust, controlling the entire air scheme with Venturi valves as is appropriate for the specific laboratory application. In this case, the BAS must control the room pressurization and air change rates completely. If the installation is Phoenix valves they must act as analog valves.

14. Venturi type valves designed for complete shut off should be only used where appropriate for specific application.

15. All air change rates should be designed with safety as primary function, but should eliminate as much energy waste as possible. University of Rochester Environmental Health and Safety should be consulted for appropriate occupied and unoccupied air change rates for each specific application.

16. All Laboratories or critical spaces required to have desiccant dehumidification units shall operate units in an analog manner in order to control the airflow added to the room air through means of an analog solution. The desiccant dehumidifier shall not be cycled as a means of controlling set point of humidity.

17. Laboratory or critical spaces shall have all set points for design called out on design documents. This shall include but is not limited to temperature and humidity. The specifics shall be labeled so as to clearly understand
what units each set point will be measured in and the range of acceptable temperature that the controls contractor will be required to maintain. The temperature and humidity range shall be called out in a form of total range that is expected. Examples that must be called out specifically on the documentation are 71.5 °F to 72.5 °F or 30% RH to 40% RH. The following examples may not be solely used in the documentation, 72°F ±0.5 or 35% RH ±5.

18. At no point shall the extreme temperature/humidity set points be designed as the standard conditions in the room. Capacity must be designed in each project to reach reasonable room conditions below or above the maximum allowable extremes for equipment, process, and occupancy in that space.

19. All spaces with specific pressure and/or air change rate control shall have a room graphic that is representative of the space. That graphic shall have a value displayed on it that will enable an operator to adjust air change rates and pressure set points in a universal manner. Changes in air changes rates from this graphic will result in maintained differential pressure and changes in differential pressure from this graphic will result in maintained air change rates.

20. All application specific controller sequences must exactly match the required sequence of operations for the project and must be approved as such by the Energy Operations Group. If the controller sequence does not precisely match the sequence of operations, then the following clause will apply:

Application specific controllers shall not be used on any critical spaces such as rooms with pressure control, or critical air flow rooms. Operating rooms, isolation rooms, vivarium spaces, laboratories, etc. shall all have physical sensor points with controllers that use specific programming (approved by EOG and Facilities) to ensure ability to adapt to varying situations and conditions. Controllers for all spaces must still be standalone and must be physically located near the critical spaces, where possible.
Note: Application specific controllers may be used on non-critical spaces with applications such as air terminal units and fan coils, as long as there is appropriate I/O on the controller to adequately cover the sequence of operations specified and the application standard programming matches the sequence of operations.
Figure 1. Analog Phoenix Valve wiring details
Figure 2. Analog Phoenix Valve with shut off
Section 5.

Specified Products

Temperature Sensors for Room Temp and Air Flow Applications

Temperature room sensors shall be 1000Ω platinum RTD, if possible Greystone TE200AD, Siemens QAA2212.FWSN, or Automated Logic ZS/RS sensor.

All sensors that control individual rooms shall have enable/disable set point adjustment, a temperature display and an occupancy override button.

Humidity Sensors

Room level humidity sensors shall always be a combination temperature/humidity sensor. Sensors shall be a minimum of plus or minus 2% accuracy for applications used to control space conditions and plus or minus 5% accuracy for applications only used as monitoring points.

Air Differential Pressure Sensor Specification

Air pressure differential sensors shall be Setra Model 264 or equivalent.

Air Flow Sensors/Stations

Air flow stations shall be Ebtron, Paragon, or Air Monitor.

Current Sensors

All pumps and fans shall use current switches/sensors for proofing the fan. All devices shall be split core and shall have an adjustable range. Acceptable manufacturers are Veris or Senva.

CO2 Sensors

All CO2 sensors shall be Veris industries CDE/CWE series.
Duct Humidity Sensors

All duct humidity sensors shall be Greystone, BAPI, or Vaisala HMD60U (4-20mA)

Air Flow Switches

All airflow switches shall be Cleveland Controls AFS-460 or AFS-222 or Siemens SW141 Differential Static Airflow switches.

Duct Temperature Sensors

All duct temperature sensors shall be Siemens, Greystone, or BAPI. Discharge, exhaust, and return air shall be a single point probe, 1000Ω platinum RTD. All mixed air shall use an averaging type element that covers the duct area completely.

Low Temperature detectors

Standard application low temperature detectors (freeze stats) shall be Penn line voltage 2 pole with manual reset. It will be model A70 or equivalent.

Wet Differential Pressure Sensors

Sensor shall be a Setra Model 230 with 3 valve manifold assembly or equivalent and shall be installed with gauges.

Control Valves

1. All valves shall be electronically actuated with a voltage signal, which also may include floating point type actuators for some applications.
2. No valves shall be pneumatically actuated, except in the case where explosion hazard, etc. makes pneumatics imperative.
3. Acceptable control valve actuators manufacturers are Belimo and Siemens.
4. All control valves shall be globe style valves or characterized ball valves.
5. All control valves shall be installed not more than 60 degrees down from the upright position.
6. Control valves below 2 ½ inches shall be female NPT connections and 2 ½ inches and above shall be flanged type valves. The connections shall
include unions directly on both sides of the control valve. COGEN Control valves on the primary district side shall have of 200 psid close off pressure and shall be rated to handle 250 psig and 250 degrees Fahrenheit minimally.

7. Control valves for all water applications shall be equal percentage type.
8. Steam control valves shall be linear type with high temperature packing and stainless steel trim.
9. Reheat valves shall be a normally open valve body and the actuator shall fail in place of last known signal.
10. Hot water radiation valves shall be a normally open valve body and the actuator shall fail open.
11. Chilled water valves shall be normally closed and the actuator shall fail closed.
12. Preheat valves shall be normally open and the actuator shall fail open.
13. Steam valves feeding heat exchangers be normally closed and the actuator shall fail closed.
14. Hot water valves feeding heat exchangers shall be normally open and the actuator shall fail open.

**Damper Actuators**

1. All damper actuators shall be electronically actuated with a low voltage.
2. No damper actuators shall be pneumatically actuated, except in the case where explosion hazard, etc. makes pneumatics imperative.
3. Acceptable damper actuator manufacturers are Belimo and Siemens.
4. If end switch is required, then the actuator shall have an internal end switch integrated into the device.
5. All actuators shall be spring return, except for air terminal units (ATU, VAV, CAV, etc.)

**Control transformers**

1. Control transformers shall have integrated breakers or fuses that can be reset.
2. Control transformers shall not be loaded more than 80% of rated load.
3. Control transformers shall be RIB, Lectro, or equivalent.
4. Transformers shall be placed in a central location when used to power room level controllers, etc. This location will be preferably next to the main IP level panel in a separate cabinet.
5. Transformers shall be powered from surge protection side of UPS, and shall not be on the battery backup side of the UPS.

**External Control/Status Relays**

1. Relay control voltage shall be 24 volts.
2. Equipment control such as fan or pump start/stop relays shall be fully enclosed and be able to mount externally to a control cabinet or disconnect box through a ½ knock out hole. These cabinets shall be lockable with the appropriate arc flash labeling on them as is required by University of Rochester Arc Flash Policy referenced in section 1.
3. Equipment control relays shall contain an LED status light that is installed so as to be easily visible and labeled.
4. Equipment control relays shall have integrated Hand/Off/Auto switch if equipment disconnect does not already have Hand/Off/Auto capability.
5. Equipment control relays shall be RIB type or equivalent.
6. Relays for safety devices and fan status shall be general purpose compact power relays with status indicator lights. Make shall be IDEC or equivalent.
Section 6.

Standard Details and Sequences

1. A forthcoming addendum for this section will include standard sequences for systems that will include energy savings and demand control strategies.
2. Standard sections will be required in programming for global programs such as building/global outside air and relative humidity sensor schemes, peak demand limiting, load shedding by medium, and building occupancy zoning.
3. This issue of standards contains the requirements for a chilled water bridge in the section below.

McMaster Bridge Detail and Sequence
The McMaster Bridge shall be built as is pictured in the schematic above. The intention of the McMaster Bridge is to provide the proper amount of flow to the building that is required to meet the needs of the cooling load while minimizing the central chilled water plant pressure differential. The thus maximizing efficiencies of the central cooling plant while meeting the load. All temperature sensors noted as T/S are DDC temperatures sensors. The temperature wells shall have local gauges or thermometers. The pressure differential sensors shall be separate sensors and shall also contain local pressure gauges.

The pump on the bridge shall be dual lead/lag type pumps for redundancy. All pumps shall have variable frequency drives controlling their speed.

All chilled water coils shall be sized for a 16 degree Fahrenheit delta from supply to return. All control valves for chilled water loads shall be two way modulating valves.

In order to accommodate the two way valves on load side of the bridge, there shall be an end of the line bypass on the main supply and return lines with a balancing valve to control bypass flow.

Additional circulation pumps may be required where a building bridge solution is applied in order to minimize liability of freezing at coils.

**Option 1.**

All new buildings using chilled water shall have a building level bridge for system chilled water provided by the central chiller plant(s). The bridge shall be configured and operated as laid out in the section below.

**Sequence of Operations**

**Chilled Water Bridge Pump Run Conditions:**

The chilled water pump(s) shall be enabled whenever:
The bridge control valve bypass is unable to maintain set point.
AND the outside air temperature is greater than 55°F (adj.).

Chilled Water Pump Differential Pressure Control Mode:

When the outside air temperature is greater than 55 degrees, the cooling will be enabled to operate in all units with cooling enable/disable or economizer mode that are contained within the bridge load. When cooling is enabled the building bridge pump will be enabled and will operate to control the pressure differential set point of 11 psi (adj.). During this mode of operation the bridge control valve shall modulate to maintain a return water set point of 60 degrees (adj.).

Bridge Control Valve Mode:

When the chilled water bridge pump is enabled the bridge control valve shall modulate to maintain a chilled water return water set point of 60 degrees (adj.).

When the chilled water pump is disabled the bridge control valve shall modulate to maintain a chilled water differential pressure. The chilled water differential pressure shall be reset from 5 to 20 psi based upon load needed indicated by the valve positions of the loads that are understood by the design engineer to require the most cooling or be worst case. Cooling loads that exist during the heating season may be a good worst case cooling load. Representative loads may be chosen as is appropriate to operate bridge successfully during all seasons of the year.

Option 2. If a building bridge is not desirable, or a renovation is to be done in a smaller area than would affect the entire building, then individual McMaster Bridges may be installed with the same sequence and configuration at each air handling unit or chilled water loop. In the case of a chilled water loop such as a fan coil loop, space temperatures and set points may be substituted as indicators of cooling load conditions being met in order to operate the bridge.

Requirement for all bridges:

All chilled water bridges must contain a software mode point that will disable the bridge from using chilled water during a load shedding event. When in this mode,
no alarms are to be triggered for any of the equipment contained in the bridge. Also while in this mode, alarms for temperatures not meeting set points shall not be initiated, until the mode point is taken out of chilled water shed.

**Note:** Units that require process cooling for critical research needs may be operated without a McMaster bridge configuration with prior approval from Central Utilities Director. All process equipment and loops must have a separation heat exchanger prior to the building chilled water bridge.
Section 7.

Standard Controller Naming for University of Rochester BAS

Standard Controller Naming Template is as follows:

- MC/RC Trunk#. building acronym. panel# _ room Location of panel or controller

- Example: RC.HH.01.01_P603

- This example addressing scheme will be a part of all controller names for all systems.
  - RC = River Campus Designation
  - HH= Hutch Hall – Building Acronym
  - 01 = Trunk Number / Network Level Controller Number
  - 01 = Controller number (infinet, BLN, Arcnet)
  - P603 = (i.e. Penthouse 603) Panel / Controller physical location

- Complete Controller Name will be as follows:
  - Use ALC prefix for Automated Logic ALC.RC.HH.01.01_P603
  - Use AND prefix for Andover AND.RC.HH.01.01_P603
  - Use SIE prefix for Siemens SIE.RC.HH.01.01_P603

- Alias / System name → RCHH0101P603 (16 Character Restriction)

- All description fields will contain a description of major equipment served by the controller.

- A controller number of 00 will designate a network level controller or controller with AEM.

- All future panel changes which take place and require panel deletion and re-add will adhere to the standard in both Name and System Name or Alias.

- For all building abbreviations, see attached sheet.

- The description field of the controller name must contain a short description of the equipment that is controlled by the controller.

  Example of Description: AHU1, AHU2, Reheat pumps, Chilled water bridge, VAV w/ Reheat Room 413, etc.
Room level controller

With application specific or single equipment use controllers at the room or terminal level an additional underscore will be added to the end of the name which will be followed by a three character acronym of the specific equipment that it is controlling. This will be applied to the name as it can be, but will be left off in cases where a character limitation is exceeded. An example of room level controller names is as follows:
SIE.MC.HWH.02.16.1W151_FCU

A complete list of acceptable acronyms that will be appended to controller names at the room or single equipment level is contained in the table below.

<table>
<thead>
<tr>
<th>Single Use/ Application Specific/Dedicated Room Level Controllers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Terminal Units (VAV, CAV, dual duct box, etc.)</td>
<td>ATU</td>
</tr>
<tr>
<td>Fume Hood Controller</td>
<td>FHC</td>
</tr>
<tr>
<td>Fume Hood Monitor</td>
<td>FHM</td>
</tr>
<tr>
<td>Room Pressure Controller</td>
<td>RPC</td>
</tr>
<tr>
<td>Room Pressure Monitor</td>
<td>RPM</td>
</tr>
<tr>
<td>Variable Frequency Drive</td>
<td>VFD</td>
</tr>
<tr>
<td>Reheat Controller</td>
<td>RHC</td>
</tr>
<tr>
<td>Terminal Humidity Controller</td>
<td>THC</td>
</tr>
<tr>
<td>Laboratory Room Controller</td>
<td>LRC</td>
</tr>
</tbody>
</table>
Figure 1. Model of “trunk” layout with numbering scheme.

Building name acronyms to be used in controller names:

**River Campus:**

Anderson Tower- ANDE
Hoyt – Hoyt
Meliora – Mel
Harkness – Hark
Hutch – HH
Interfaith Chapel – IFC
Todd Union – Todd
Delta Kappa Epsilon – DKE
Alpha Delta Phi – ADP
Theta Chi – TCHI
Psi Upsilon – PSIU
Quad Annex – QANX
Sigma Alpha Mu – SAM
Sigma Chi – SCHI
Medieval House (Delta Upsilon) – MEDH
Drama House – DRAM
Burton – BURT
Crosby Hall – CROS
Danforth Dining – DANF
University Health Service – UHS
Wilder Tower – WILD
University Security Center – 612
Fairchild House – FAIR
Gale House – GALE
Slater House – SLAT
Munro House – MUNR
Kendrick House – KEND
Chambers – CHAM
Morey Hall-MOR
Wilson Commons- WC
Rush Rhees Library- RRL
Bausch and Lomb Hall- B&L
Dewey Hall - DEW
Schlegel Hall - SCH
Gleason Hall - GLE
Strong Auditorium - STR
Gilbert Hall - GILB
Tiernan Hall - TIER
Lovejoy Hall - LOVE
Hoeing Hall - HOE
Lattimore Hall - LAT
Hutchison Hall - HH
Goergen Hall - BMEO
Hylan Hall - HYL
New York State Optics/Optics Annex/Wilmot Annex - NYSO
Wilmot Hall - WILM
Sage Arts Center - SAGE
Spurrier Gym - SPUR
Wilder Tower - WILD
Goergen Sports Complex/Zornow Athletic Center/Palestra/Fieldhouse - GAC
Goergen Hall - BMEO
Fauver Stadium - FAUV
Susan B. Anthony Building - SBA
Frederick Douglass Building - FDB
Taylor Hall- TAYL
Gavett Hall- GAV
Hopeman Hall- HOPE
Wallis Hall- WALL
Raymond F. LeChase Hall (Warner School) – WARN
O’Brien Hall (Dormitory Building) (2012) – OBRI
Rettner Hall (Media Arts Innovation Center)- RETT

**Off Site Properties:**

Eastman School of Music- ESM
Eastman Student Living Center – ESLC
Eastman Annex – ESMA
Eastman Kilbourn Hall – ESMK
Miller Center, Sibley Music Library – SIBL
Eastman Theatre -ETHR
Memorial Art Gallery- MAG
University Facilities Building- UFC
Mid-Campus Chiller Plant- MCCP
Alumni Advancement Center- AAC
River View Apartments – RVA
575 MT Hope – 575
590 MT Hope – 590
630 MT Hope – 630
668 MT Hope – 668
685 MT Hope – 685
692 MT Hope – 692
Data Center Services – DCS
Goler House - GOLR
Southside Living Center – SLC
De Kiewiet Tower – DKWT
Valentine Tower – VLNT
Laboratory for Laser Energetics – LLE
Robert L Sproull Center for Ultra High Intensity Laser Research – COI
Whipple Park Apartments – WHIP

University Medical Center -
Strong Memorial Hospital- SMH
Parking Garage - PARK
School of Medicine and Dentistry- SMD
Emergency Department (Frank & Caroline Gannet Emergency Center) - ED
Kornberg Medical Research Building- KMRB
Medical Research Building Extension- MRBX
Wilmot Cancer Center- WCC
Ambulatory Care Facility- ACF
Helenwood Hall- HWH

Saunders Research Building-CTSB

Annex – ANEX

Central Utilities Plant – CUP

Kinder Care Learning Center – KCLC
Section 8.

University of Rochester Building Automation System

Point Naming Standard

Goals of Point Naming Standard

It is the intention of the University of Rochester to create a point naming standard that is functional in all of our Building Management Systems while accomplishing the three following goals:

1. Consistency of point naming for familiarity amongst users
2. Alarm screens on each system that produce the same information in an easy to extract form that can be paged to a Facilities mechanic who has enough information to respond to the alarm.
3. Consistency of the pieces of each name amongst systems in order to be able to predict point names easily in all systems.

In order to accomplish these goals, we are standardizing on each section of the name as is laid out below.

All portions of this name must show up on the alarm screen of the appropriate BAS in order for clarity. The sections below describe what portions must be shown on the alarm screen.

The University Point Naming standard is divided into two categories which include the Medical Center (MC) and River Campus (RC). Each point will have 3 sections each separated by underscores. The first section will be named according to the location in MC and RC. The second section will be named according to equipment type and number. The third section will be named by the appropriate point identifying tag. See each section below for a more thorough description of specifics for point naming.
Point structure is laid out below:

**LocationOfPoint_EquipmentTypeAndNumber_PointIdentifyingTag**

Details for each portion of the above point structure are laid out in the following sections.

1. **Location of point**
   The MC point naming will begin with the building abbreviation and grid room number applicable to the point. This number will contain an underscore between the building and MC grid room number.

   Ex: ANEX_1C172 or SMH_B1250 or SMD_76800

   The RC point naming will begin with the Building Acronym (See Building Acronym Standard). The building acronym will be followed by an underscore, which will in turn be followed by the room number of the location of the point being described.

   Ex: GAC_121 or HH_237 or OBRI_324

   Note: See Section 4 for listing of Building Abbreviations

2. **Equipment type and number**
   Both of the MC and RC point names will include the second section which will include the Famis (University of Rochester maintenance management software) acronym. A list of MC and RC Famis acronyms is included later in this document. The Famis acronym will be followed by an equipment number, if appropriate. This equipment number will be the same as is indicated in the construction drawings at the time of construction. If an existing point is being renamed, then the existing equipment number will be kept following the Famis equipment acronym.

   New Point Ex: AHU1 or DHX2 or FCU3
Existing point: For an air handler the previous equipment tag is AHS23, it will become AHU23. Another example would be for a chilled water pump, CHP7. This will become CWP7.

Note: See Section 5 for listing of Equipment Acronyms and Abbreviations

3. **Point identifying tag**

The final section of the point name will be identified with the standard published point identifying tag. The list of these tags is also included at the end of this document. They are typically 3 characters and describe the function of the point. There are exceptions as noted.

**Exceptions:** Any exceptions to this standard would need to be approved by the Energy Operations Group management team. Also, please contact the same for any clarifications on standard.

Note: See Section 6 for listing of Point Description Abbreviations

**Examples of complete point names:**

MC: SMH_B1250_AHU14_DAT or SMD_76801_HX1_RWT or ANEX_1C172_CWP3_PRF

RC: HH_500_AHU14_DAS or RRL_234_FCU13_SWT or GAC_121_POOL_RMT

**Messaged Alarms**

All messaged alarm points must have the suffix of _MSG that appears on the alarm screen.
New Descriptions Not Contained in the Standard

Any new descriptions, acronyms, or abbreviations not contained in this document that are needed for point naming are to be confirmed with the Energy Operations Group, so that they can be added to the standard. Any clarifications on which names or portions of names are be used will be clarified with the Energy Operations Group.

Point Naming Project Procedure

All BAS contractors naming points shall submit a list of point names for all projects via email to the Energy Operations Group for approval of meeting the standard name contained in this procedure/standard.

Exceptions to Point Naming Standard

1. Application Specific controllers that have pre-programmed names used within the controller itself are not required to conform to this standard, unless the point names are to be used outside the controller itself. For example, anytime a point is to be “unbundled” and used for a graphic, it should have a name adhering to the point naming standard in order to achieve the goals.

2. When there are character limitations, each name may be truncated in a consistent form that complies best with the point naming standard and is approved by the Energy Operations Group. In this case, each alarm point must have the ability to display the full standard name on the alarm screen to achieve the goals.

3. Point names may be duplicated in a controller for the sake of system efficiency, but must have the ability to easily connect all pieces of the name together and must display only the pieces of the required information stated in sections 1, 2, and 3 of this standard on the alarm screen.
Standard Abbreviations for Point naming

4. Location of Point

Building Abbreviation list for River Campus

Anderson Tower - ANDE
Hoyt – Hoyt
Meliora – Mel
Harkness – Hark
Hutch – HH
Interfaith Chapel – IFC
Todd Union – Todd
Delta Kappa Epsilon – DKE
Alpha Delta Phi – ADP
Theta Chi – TCHI
Psi Upsilon – PSIU
Quad Annex – QANX
Sigma Alpha Mu – SAM
Sigma Chi – SCHI
Medieval House (Delta Upsilon) – MEDH
Drama House – DRAM
Burton – BURT
Crosby Hall – CROS
Danforth Dining – DANF
University Health Service – UHS
Wilder Tower – WILD
University Security Center – 612
Fairchild House – FAIR
Gale House – GALE
Slater House – SLAT
Munro House – MUNR
Kendrick House – KEND
Chambers – CHAM
Morey Hall-MOR
Wilson Commons- WC
Rush Rhees Library- RRL
Bausch and Lomb Hall- B&L
Dewey Hall- DEW
Schlegel Hall- SCH
Gleason Hall- GLE
Strong Auditorium- STR
Gilbert Hall- GILB
Tiernan Hall- TIER
Lovejoy Hall- LOVE
Hoeing Hall- HOE
Lattimore Hall- LAT
Hutchison Hall- HH
Goergen Hall- BMEO
Hylan Hall- HYL
New York State Optics/Optics Annex/Wilmot Annex- NYSO
Wilmot Hall- WILM
Sage Arts Center- SAGE
Spurrier Gym- SPUR
Wilder Tower- WILD
Goergen Sports Complex/ Zornow Athletic Center/Palestra/Fieldhouse- GAC
Goergen Hall- BMEO
Fauver Stadium- FAUV
Susan B. Anthony Building- SBA
Frederick Douglass Building- FDB
Taylor Hall- TAYL
Gavett Hall- GAV
Hopeman Hall- HOPE
Wallis Hall- WALL
Raymond F. LeChase Hall (Warner School) – WARN
O’Brien Hall (Dormitory Building) (2012) – OBRI
Rettner Hall (Media Arts and Innovation Center)- RETT
Off Site Properties:

Eastman School of Music- ESM
Eastman Student Living Center – ESLC
Eastman Annex – ESMA
Eastman Kilbourn Hall – ESMK
Miller Center, Sibley Music Library – SIBL
Eastman Theatre - ETHR
Memorial Art Gallery- MAG
University Facilities Building- UFC
Mid-Campus Chiller Plant- MCCP
Alumni Advancement Center- AAC
River View Apartments – RVA
575 MT Hope – 575
590 MT Hope – 590
630 MT Hope – 630
668 MT Hope – 668
685 MT Hope – 685
692 MT Hope – 692
Data Center Services – DCS
Goler House - GOLR
Southside Living Center – SLC
De Kiewiet Tower – DKWT
Valentine Tower – VLNT
Laboratory for Laser Energetics – LLE
Robert L Sproull Center for Ultra High Intensity Laser Research – COI
Whipple Park Apartments – WHIP

University Medical Center -
Strong Memorial Hospital- SMH
Parking Garage - PARK
School of Medicine and Dentistry- SMD
Emergency Department (Frank & Caroline Gannet Emergency Center) - ED
Kornberg Medical Research Building- KMRB
Medical Research Building Extension- MRBX
Wilmot Cancer Center- WCC
Ambulatory Care Facility- ACF
Helenwood Hall- HWH
Saunders Research Building-CTSB
Annex – ANEX
Central Utilities Plant – CUP
Kinder Care Learning Center – KCLC
## 5. Standardized Acronyms and Abbreviations

### Equipment Acronyms River Campus

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADO</td>
<td>AUTOMATIC DOOR OPENER</td>
</tr>
<tr>
<td>AWO</td>
<td>AUTOMATIC WINDOW OPENER</td>
</tr>
<tr>
<td>AHU</td>
<td>AIR HANDLING SYSTEM</td>
</tr>
<tr>
<td>AWP</td>
<td>ACID WASTE PUMP</td>
</tr>
<tr>
<td>BFP</td>
<td>BACK FLOW PREVENTER</td>
</tr>
<tr>
<td>BLR</td>
<td>BOILER</td>
</tr>
<tr>
<td>CAS</td>
<td>COMPRESSED AIR SYSTEM</td>
</tr>
<tr>
<td>CHLR</td>
<td>CHILLER</td>
</tr>
<tr>
<td>CPS</td>
<td>CHILLED WATER PUMP SYSTEM</td>
</tr>
<tr>
<td>CS</td>
<td>CARD SWIPE</td>
</tr>
<tr>
<td>CT</td>
<td>COOLING TOWER</td>
</tr>
<tr>
<td>CTD</td>
<td>COOLING TOWER DAMPER</td>
</tr>
<tr>
<td>CTB</td>
<td>CONSTANT TEMPERATURE BOX</td>
</tr>
<tr>
<td>DH</td>
<td>DEHUMIDIFIER</td>
</tr>
<tr>
<td>DHP</td>
<td>DEHUMIDIFIER PUMP</td>
</tr>
<tr>
<td>DHX</td>
<td>DOMESTIC HOT WATER HEAT EXCHANGER.</td>
</tr>
<tr>
<td>DOOR</td>
<td>DOOR</td>
</tr>
<tr>
<td>DPS</td>
<td>DOMESTIC WATER PUMP SYSTEM</td>
</tr>
<tr>
<td>DWS</td>
<td>DISSTILLED WATER STILL</td>
</tr>
<tr>
<td>EDR</td>
<td>EXIT DOOR</td>
</tr>
<tr>
<td>EFS</td>
<td>EXHAUST SYSTEM</td>
</tr>
<tr>
<td>EGEN</td>
<td>EMERGENCY GENERATOR</td>
</tr>
<tr>
<td>ERU</td>
<td>ENERGY RECOVERY UNIT- AHU W/ ENTHALPY WHEEL</td>
</tr>
<tr>
<td>ET</td>
<td>EXPANSION TANKS</td>
</tr>
<tr>
<td>EXLT</td>
<td>EXIT LIGHTS/EMERGENCY LIGHTS</td>
</tr>
<tr>
<td>FAP</td>
<td>FIRE ALARM PANEL</td>
</tr>
<tr>
<td>FCU</td>
<td>FAN COIL UNIT</td>
</tr>
<tr>
<td>FHS</td>
<td>FUME HOOD SYSTEM</td>
</tr>
<tr>
<td>FP</td>
<td>FIRE PUMP</td>
</tr>
<tr>
<td>HX</td>
<td>HEAT EXCHANGER</td>
</tr>
<tr>
<td>HP</td>
<td>HEAT PUMP(DX UNIT)</td>
</tr>
<tr>
<td>HPS</td>
<td>HEATING PUMP SYSTEM</td>
</tr>
<tr>
<td>HRU</td>
<td>HEAT RECOVERY UNIT/ENERGY HEAT WHEEL</td>
</tr>
<tr>
<td>HWH</td>
<td>STEAM GENERATOR</td>
</tr>
<tr>
<td>HWT</td>
<td>HOT WATER TANK</td>
</tr>
<tr>
<td>ICS</td>
<td>INSTRUMENT COOLING SYSTEM</td>
</tr>
</tbody>
</table>
### Equipment Acronyms Medical Center

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>NOMENCLATURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACUR</td>
<td>AIR CURTAIN</td>
</tr>
<tr>
<td>ADO</td>
<td>AUTOMATIC DOOR OPENER</td>
</tr>
<tr>
<td>AFMS</td>
<td>SUPPLY AFMS</td>
</tr>
<tr>
<td>AHU</td>
<td>AIR HANDLING UNIT</td>
</tr>
<tr>
<td>AIRSC</td>
<td>AIR SCRUBBER</td>
</tr>
<tr>
<td>AST</td>
<td>DIESEL ABOVE GROUND STORAGE TANK</td>
</tr>
<tr>
<td>ATS</td>
<td>AUTOMATIC TRANSFER SWITCH</td>
</tr>
<tr>
<td>AWS</td>
<td>ANIMAL WATERING SYSTEM</td>
</tr>
<tr>
<td>AWO</td>
<td>AUTOMATIC WINDOW OPENER</td>
</tr>
<tr>
<td>AWT</td>
<td>ACID WASTE NEUTRALIZING TANK</td>
</tr>
<tr>
<td>BLR</td>
<td>BOILER</td>
</tr>
<tr>
<td>BSC</td>
<td>BIOSAFETY CABINET</td>
</tr>
<tr>
<td>BSL</td>
<td>BSL3</td>
</tr>
<tr>
<td>CAS</td>
<td>COMPRESSED AIR SYSTEM</td>
</tr>
<tr>
<td>CAV</td>
<td>CONSTANT AIR VOLUME BOX</td>
</tr>
<tr>
<td>CGTWR</td>
<td>COOLING TOWER</td>
</tr>
<tr>
<td>CLR</td>
<td>PLATE COOLER (HEAT PUMP LOOP)</td>
</tr>
<tr>
<td>CNTFG</td>
<td>CENTRIFUGE</td>
</tr>
<tr>
<td>CRYO</td>
<td>CRYOGENICS FREEZER</td>
</tr>
<tr>
<td>CS</td>
<td>CARD SWIPE</td>
</tr>
<tr>
<td>CSG</td>
<td>CLEAN STEAM GENERATOR</td>
</tr>
<tr>
<td>CTWD</td>
<td>COUNTER TOP WATER DISPENSER</td>
</tr>
<tr>
<td>CWP</td>
<td>CHILLED WATER PUMP</td>
</tr>
<tr>
<td>CWV</td>
<td>CHILLED WATER VALVE</td>
</tr>
<tr>
<td>DCTDT</td>
<td>DUCT DETECTOR</td>
</tr>
<tr>
<td>DHP</td>
<td>DEHUMIDIFIER PUMP</td>
</tr>
<tr>
<td>DHUM</td>
<td>DEHUMIDIFIER</td>
</tr>
<tr>
<td>DHWH</td>
<td>DOMESTIC HOT WATER HEATER (STEAM)</td>
</tr>
<tr>
<td>DHWP</td>
<td>DOMESTIC HOT WATER PUMP</td>
</tr>
<tr>
<td>DHX</td>
<td>COGEN HEAT EXCHANGER (DOMESTIC)</td>
</tr>
<tr>
<td>DMPR</td>
<td>DAMPER</td>
</tr>
<tr>
<td>DOOR</td>
<td>DOOR</td>
</tr>
<tr>
<td>DPM</td>
<td>DIFFERENTIAL PRESSURE MONITOR FOR ISOLATION</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>DWP</td>
<td>Domestic Water Pump</td>
</tr>
<tr>
<td>DXU</td>
<td>DX Unit</td>
</tr>
<tr>
<td>DYTK</td>
<td>Diesel Oil Day Tank</td>
</tr>
<tr>
<td>EAD</td>
<td>Exhaust Air Damper</td>
</tr>
<tr>
<td>EGEN</td>
<td>Emergency Generator</td>
</tr>
<tr>
<td>EHD</td>
<td>Exhaust Hood</td>
</tr>
<tr>
<td>ENVCH</td>
<td>Environmental Chamber</td>
</tr>
<tr>
<td>EAD</td>
<td>Energy Recovery Unit / AHU with Enthalpy Wheel</td>
</tr>
<tr>
<td>ES</td>
<td>End Switch</td>
</tr>
<tr>
<td>EXF</td>
<td>Exhaust Fan</td>
</tr>
<tr>
<td>EYE</td>
<td>Eye Wash</td>
</tr>
<tr>
<td>FAP</td>
<td>Fire Alarm Panel</td>
</tr>
<tr>
<td>FCU</td>
<td>Fan Coil Unit</td>
</tr>
<tr>
<td>FDMP</td>
<td>Fire Damper</td>
</tr>
<tr>
<td>FLTR</td>
<td>Air Filter</td>
</tr>
<tr>
<td>FMHD</td>
<td>Fume Hood</td>
</tr>
<tr>
<td>FRZ</td>
<td>Freezer</td>
</tr>
<tr>
<td>FTS</td>
<td>Emergency Generator</td>
</tr>
<tr>
<td>FURN</td>
<td>Furnace</td>
</tr>
<tr>
<td>FZR</td>
<td>Freezer (-20C)</td>
</tr>
<tr>
<td>HAD</td>
<td>House Air Dryer</td>
</tr>
<tr>
<td>HEPA</td>
<td>HEPA Filter</td>
</tr>
<tr>
<td>HP</td>
<td>Heat Pump</td>
</tr>
<tr>
<td>HRU</td>
<td>Heat Recovery Unit/ Energy Heat Wheel</td>
</tr>
<tr>
<td>HUM</td>
<td>Humidifier</td>
</tr>
<tr>
<td>HWP</td>
<td>Hot Water Pump</td>
</tr>
<tr>
<td>HX</td>
<td>COGEN Heat Exchanger</td>
</tr>
<tr>
<td>ICE</td>
<td>Ice Machine</td>
</tr>
<tr>
<td>INCB</td>
<td>Incubator</td>
</tr>
<tr>
<td>INTK</td>
<td>Intake Air Plenum</td>
</tr>
<tr>
<td>ISO</td>
<td>Patient Isolation Room</td>
</tr>
<tr>
<td>IUCB</td>
<td>Induction Unit Chilled Beam</td>
</tr>
<tr>
<td>LITE</td>
<td>Lighting Fixture</td>
</tr>
<tr>
<td>LNCHT</td>
<td>Linen Chute</td>
</tr>
<tr>
<td>LNT</td>
<td>Liquid Nitrogen Storage Tank (Alarmed) (Third Party)</td>
</tr>
<tr>
<td>LTD</td>
<td>Freeze Stat/ Low Temperature Detector</td>
</tr>
<tr>
<td>LVP</td>
<td>Lab Vacuum Pump</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>MAS</td>
<td>MIXED AIR SENSOR</td>
</tr>
<tr>
<td>METC</td>
<td>CHILLED WATER ENERGY METER</td>
</tr>
<tr>
<td>METH</td>
<td>DISTRICT HEATING WATER ENERGY METER</td>
</tr>
<tr>
<td>METD</td>
<td>DOMESTIC HOT WATER ENERGY METER</td>
</tr>
<tr>
<td>METE</td>
<td>ELECTICAL ENERGY METER</td>
</tr>
<tr>
<td>METS</td>
<td>STEAM ENERGY METER</td>
</tr>
<tr>
<td>MGAS</td>
<td>MEDICAL GAS</td>
</tr>
<tr>
<td>OAD</td>
<td>OUTSIDE AIR DAMPER</td>
</tr>
<tr>
<td>PAC</td>
<td>PACKAGED AIR CONDITIONER</td>
</tr>
<tr>
<td>PHX</td>
<td>PHOENIX/VENTURI VALVE</td>
</tr>
<tr>
<td>REF</td>
<td>MEDICAL/SCIENTIFIC REFRIGERATOR</td>
</tr>
<tr>
<td>RAH</td>
<td>RETURN AIR HUMIDITY</td>
</tr>
<tr>
<td>RIC</td>
<td>REACH IN COOLER</td>
</tr>
<tr>
<td>RIUL</td>
<td>REACH IN ULTRA LOW FREEZER (-80C)</td>
</tr>
<tr>
<td>RMT</td>
<td>VAV BOX ROOM</td>
</tr>
<tr>
<td>RTN</td>
<td>RETURN FAN</td>
</tr>
<tr>
<td>SDMP</td>
<td>SMOKE DAMPER</td>
</tr>
<tr>
<td>SMKPUR</td>
<td>SMOKE PURGE EQUIPMENT</td>
</tr>
<tr>
<td>SSHWR</td>
<td>SAFETY SHOWER</td>
</tr>
<tr>
<td>UPS</td>
<td>UNINTERRUPTIBLE POWER SUPPLY</td>
</tr>
<tr>
<td>UST</td>
<td>DIESEL FUEL UNDERGROUND STORAGE TANK</td>
</tr>
<tr>
<td>UVLT</td>
<td>ULTRAVIOLET LIGHT</td>
</tr>
<tr>
<td>VAV</td>
<td>VARIABLE AIR VOLUME BOX</td>
</tr>
<tr>
<td>VIV</td>
<td>VIVARIUM</td>
</tr>
<tr>
<td>VSD</td>
<td>VARIABLE SPEED DRIVE</td>
</tr>
<tr>
<td>WIC</td>
<td>WALK IN COOLER</td>
</tr>
<tr>
<td>WIN</td>
<td>WINDOW</td>
</tr>
<tr>
<td>WSHR</td>
<td>STERILIZER (WASHER)</td>
</tr>
</tbody>
</table>
# Point Description Abbreviations

Device or point name (Typically Two to Three Characters -- can be expanded with non-typical systems)

<table>
<thead>
<tr>
<th>Analog Inputs</th>
<th>Analog Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMP</td>
<td>BPV</td>
</tr>
<tr>
<td>BSP</td>
<td>CAD</td>
</tr>
<tr>
<td>BTU</td>
<td>CCV</td>
</tr>
<tr>
<td>CDT</td>
<td>CDD</td>
</tr>
<tr>
<td>DEW</td>
<td>EAD</td>
</tr>
<tr>
<td>DPT</td>
<td>DPB</td>
</tr>
<tr>
<td>EVP</td>
<td>FBD</td>
</tr>
<tr>
<td>GLS</td>
<td>FCV</td>
</tr>
<tr>
<td>GLR</td>
<td>HDD</td>
</tr>
<tr>
<td>HCT</td>
<td>HCV</td>
</tr>
<tr>
<td>HDT</td>
<td>ILV</td>
</tr>
<tr>
<td>LVL</td>
<td>ISV</td>
</tr>
<tr>
<td>MAT</td>
<td>MAD</td>
</tr>
<tr>
<td>OAT</td>
<td>OAD</td>
</tr>
<tr>
<td>RAE</td>
<td>RVD</td>
</tr>
<tr>
<td>RAH</td>
<td>SAD</td>
</tr>
<tr>
<td>RAT</td>
<td>SVD</td>
</tr>
<tr>
<td>RMH</td>
<td>EVD</td>
</tr>
<tr>
<td>RMT</td>
<td>SWF</td>
</tr>
<tr>
<td>RSP</td>
<td>SAH</td>
</tr>
<tr>
<td>RVP</td>
<td>SAT</td>
</tr>
<tr>
<td>RWT</td>
<td>SSP</td>
</tr>
<tr>
<td>SWT</td>
<td>SVP</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>---</td>
</tr>
<tr>
<td>ESP</td>
<td>Exhaust Static Pressure</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital Inputs</th>
<th>Digital Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALM</td>
<td>Alarm</td>
</tr>
<tr>
<td>DLK</td>
<td>Magnetic Door Lock</td>
</tr>
<tr>
<td>DXS</td>
<td>DX Cooling Stage</td>
</tr>
<tr>
<td>EMS</td>
<td>Emergency Stop Switch</td>
</tr>
<tr>
<td>ENB</td>
<td>Enable Command</td>
</tr>
<tr>
<td>EPO</td>
<td>Emergency Power Off Button</td>
</tr>
<tr>
<td>FC</td>
<td>Free Cooling Status</td>
</tr>
<tr>
<td>FF</td>
<td>Flame Failure</td>
</tr>
<tr>
<td>FIRE</td>
<td>Fire Alarm</td>
</tr>
<tr>
<td>HSP</td>
<td>High Static Pressure</td>
</tr>
<tr>
<td>HTD</td>
<td>High Temp Detector</td>
</tr>
<tr>
<td>LSP</td>
<td>Low Suction/static Pressure</td>
</tr>
<tr>
<td>LTD</td>
<td>Low Temp Detector</td>
</tr>
<tr>
<td>MOT</td>
<td>Motion Sensor</td>
</tr>
<tr>
<td>PHO</td>
<td>Photocell</td>
</tr>
<tr>
<td>PRF</td>
<td>Proof</td>
</tr>
<tr>
<td>RSD</td>
<td>Return Smoke Detector</td>
</tr>
<tr>
<td>RSP</td>
<td>Return Fan High Static</td>
</tr>
<tr>
<td>SSD</td>
<td>Supply Smoke Detector</td>
</tr>
<tr>
<td>JAM</td>
<td>Phoenix/Venturi Jam alarm</td>
</tr>
<tr>
<td>SFD</td>
<td>Smoke/Fire Damper</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Virtual/Numeric Points</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AST</td>
<td>SSTO Auto Start Accum Value</td>
</tr>
<tr>
<td>CCO</td>
<td>Cooling Coil Valve Output</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Night Heating Mode</th>
<th>Night Heating Set point</th>
<th>Night Setback</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHM</td>
<td>NHS</td>
<td>NSB</td>
</tr>
<tr>
<td>CDM</td>
<td>Cool-Down Mode</td>
<td>OAE</td>
</tr>
<tr>
<td>-----------</td>
<td>------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>CDS</td>
<td>Cool-Down Set point</td>
<td>OCC</td>
</tr>
<tr>
<td>DBS</td>
<td>Dead Band Switch</td>
<td>RAS</td>
</tr>
<tr>
<td>DCS</td>
<td>Differential CFM Set point</td>
<td>RCF</td>
</tr>
<tr>
<td>DSS</td>
<td>Flow Differential %</td>
<td>RVO</td>
</tr>
<tr>
<td>DST</td>
<td>Day Save Time</td>
<td>SAS</td>
</tr>
<tr>
<td>DYM</td>
<td>Day Mode</td>
<td>SCF</td>
</tr>
<tr>
<td>ECM</td>
<td>Economizer Mode</td>
<td>SCS</td>
</tr>
<tr>
<td>FBO</td>
<td>Face and Bypass Damper Output</td>
<td>SCT</td>
</tr>
<tr>
<td>HCO</td>
<td>Heating Coil Valve Output</td>
<td>SEA</td>
</tr>
<tr>
<td>HOS</td>
<td>Humidity Override Set point</td>
<td>SES</td>
</tr>
<tr>
<td>HUO</td>
<td>Humidifier Value Output</td>
<td>SHS</td>
</tr>
<tr>
<td>HUS</td>
<td>Humidity Set point</td>
<td>SPS</td>
</tr>
<tr>
<td>MAM</td>
<td>Mixed Air Minimum Position</td>
<td>SSS</td>
</tr>
<tr>
<td>MAO</td>
<td>Mixed Air Damper Output</td>
<td>SVO</td>
</tr>
<tr>
<td>MAS</td>
<td>Mixed Air Set point</td>
<td>WUM</td>
</tr>
<tr>
<td>MOD</td>
<td>Mode</td>
<td>WUS</td>
</tr>
<tr>
<td>NCM</td>
<td>Night Cooling Mode</td>
<td></td>
</tr>
<tr>
<td>NCS</td>
<td>Night Cooling Set point</td>
<td></td>
</tr>
<tr>
<td>NHM</td>
<td>Night Heating Mode</td>
<td></td>
</tr>
</tbody>
</table>

**ENERGY METER POINTS**

<table>
<thead>
<tr>
<th>SUPT</th>
<th>Supply Temperature</th>
<th>AMP</th>
<th>Amperes</th>
</tr>
</thead>
<tbody>
<tr>
<td>RETT</td>
<td>Return Temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUPP</td>
<td>Supply Pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RETP</td>
<td>Return Pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIFP</td>
<td>System Differential Pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIFT</td>
<td>System Differential Temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FLOW</strong></td>
<td>System Flow</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOT</strong></td>
<td>Totalized points</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gallons, lbs, etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>KWH</strong></td>
<td>Kilowatt Hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>KW</strong></td>
<td>Kilowatts</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Phoenix BACnet Integration Points Names** - Must also contain building and room number and be pre-approved by EOG

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Jam Alarm</td>
<td>PHNX_JAM</td>
</tr>
<tr>
<td>Flow Alarm</td>
<td>PHNX_FLOW</td>
</tr>
<tr>
<td>Emergency Mode</td>
<td>PHNX_EMOD</td>
</tr>
<tr>
<td>Effective Flow Command</td>
<td>PHNX_FLOW_SIG</td>
</tr>
<tr>
<td>Valve Flow Feedback</td>
<td>PHNX_FLOW_FDBK</td>
</tr>
<tr>
<td>Offset Set Point</td>
<td>PHNX_OFST_SPT</td>
</tr>
<tr>
<td>Occupied Minimum Ventilation</td>
<td>PHNX_FLOW_MIN_UNOC</td>
</tr>
<tr>
<td>Unoccupied Minimum Ventilation</td>
<td>PHNX_FLOW_MIN_OCC</td>
</tr>
<tr>
<td>Standby Minimum Ventilation</td>
<td>PHNX_FLOW_MIN_STBY</td>
</tr>
<tr>
<td>Effective Offset Set Point</td>
<td>PHNX_OFST_SPT_EFF</td>
</tr>
<tr>
<td>Offset</td>
<td>PHNX_OFST</td>
</tr>
<tr>
<td>Total Zone Exhaust</td>
<td>PHNX_EX_ZTOT</td>
</tr>
<tr>
<td>Total Zone Supply</td>
<td>PHNX_SUP_ZTOT</td>
</tr>
<tr>
<td>Effective Emergency Mode</td>
<td>PHNX_EMOD_EFF</td>
</tr>
<tr>
<td>Effective Occupancy Mode</td>
<td>PHNX_OCC_EFF</td>
</tr>
<tr>
<td>Occupied Room Temperature Set Point</td>
<td>PHNX_OCC_RMT_STPT</td>
</tr>
<tr>
<td>Unoccupied Cooling Set Point</td>
<td>PHNX_UNOC_CLG_STPT</td>
</tr>
<tr>
<td>Unoccupied Heating Set Point</td>
<td>PHNX_UNOC_HTG_STPT</td>
</tr>
<tr>
<td>T Offset Lever Enabled</td>
<td>PHNX_OFST_LVR_ENAB</td>
</tr>
<tr>
<td>Average Room Temperature</td>
<td>PHNX_AVG_RMT</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Effective Temperature Set Point</td>
<td>PHNX_RMT_STPT_EFF</td>
</tr>
<tr>
<td>Cooling Demand</td>
<td>PHNX_CLG_DMND</td>
</tr>
<tr>
<td>Heating Demand</td>
<td>PHNX_HTG_DMND</td>
</tr>
<tr>
<td>Occupied Command</td>
<td>PHNX_OCC_CMD</td>
</tr>
<tr>
<td>PCC Emergency Command</td>
<td>PHNX_PCC_EMOD_CMD</td>
</tr>
<tr>
<td>HVAC Emergency Command</td>
<td>PHNX_HVAC_EMOD_CMD</td>
</tr>
</tbody>
</table>
Section 9.

University of Rochester BACnet Instance ID and Network Number Standard

The University of Rochester is requiring all BAS vendors to install all BACnet compliant products with the overall scheme of required Instance ID’s and Network Numbers as laid out below. The Instance ID number is laid out in 3 sections as follows:

The seven digit number that indicates an Instance ID shall be less than 4194303 in order to comply with BACnet standards.

1. The first 3 digits shall be the University of Rochester 3 digit building number. For instance, if the building is the Medical Center Annex, it shall be building number 102, making your Instance ID number: 102_ _ _ _. If your building is Hutchison Hall, building number 001, then your Instance ID shall be: 1_ _ _ _.

2. The 4th and 5th digits, the network number, shall be a vendor associated code number for the 3 major BAS vendors as follows:

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day Automation (Andover Controls)</td>
<td>00-30</td>
</tr>
<tr>
<td>Logical Controls Solutions (Automated Logic Controls)</td>
<td>31-60</td>
</tr>
<tr>
<td>Siemens Industries(Siemens Building Controls)</td>
<td>61-90</td>
</tr>
<tr>
<td>The Energy Operations Group reserved portion of addresses</td>
<td>91-99</td>
</tr>
</tbody>
</table>

Your BACnet Instance ID number is now as follows for the Medical Center Annex an acceptable number would be the following:
3. The 6th and 7th digits are the controller numbers. These are to be installed from 00-99 for each vendor on each network, which will limit all BACnet networks to 100 controllers per network, per building. Exceptions to this rule will not be allowed unless prior approval by the Energy Operations Group has been obtained. Therefore, complete Instance ID numbers that are acceptable must follow these rules whenever installed at the University of Rochester. Examples are listed in the chart below.

4.

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Instance ID Example for MC Annex (building 102)</th>
<th>Instance ID Example for Hutchison Hall (building 001)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andover</td>
<td>10215 _ _</td>
<td>127 _ _</td>
</tr>
<tr>
<td>Automated Logic</td>
<td>10242 _ _</td>
<td>154 _ _</td>
</tr>
<tr>
<td>Siemens</td>
<td>10287 _ _</td>
<td>163 _ _</td>
</tr>
</tbody>
</table>

**Network ID’s**

Network ID’s will be called out by simply following the Instance ID’s but removing the controller number (last two digits from the Instance ID).
The network numbers and Instance ID’s are to be managed by the three primary BAS vendor and an updated vendor specific spreadsheet must be submitted to EOG with all of that vendor’s Instance ID numbers whenever an addition or change is made to our BACnet system. All BACnet devices considered 3rd party will be given Instance ID’s and network numbers to whoever’s system they were installed with. If the BAS vendor installs alongside a piece of equipment and is expected to connect to that product via BACnet (MSTP or IP), then the BAS vendor will issue the third party equipment vendor Instance ID’s from their managed pool of ID numbers. Third party equipment includes, but is not limited to, variable frequency drives, lighting systems, pool equipment, boilers, chillers, meters, etc.

**Building Numbers Above 419**

There are multiple building numbers that are above the number 419. Due to BACnet Instance ID numbering limitations those buildings with actual building numbers above 419 will be assigned new building numbers by EOG in order to keep them within this standard. The buildings will be assigned a new number within the range of 230 to 299. The complete building list is attached below along with the new assignments of the buildings that are above the number 419.
Building Number Reference Chart

<table>
<thead>
<tr>
<th>Site Number</th>
<th>Building Number</th>
<th>Building Name</th>
<th>Assigned Numbers above 419</th>
</tr>
</thead>
<tbody>
<tr>
<td>RC</td>
<td>001</td>
<td>HUTCHISON</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>002</td>
<td>COMPUTER STUDIES</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>005</td>
<td>WILMOT</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>006</td>
<td>N Y S OPTICS</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>007</td>
<td>HYLAN</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>008</td>
<td>GOERGEN HALL</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>010</td>
<td>INTERFAITH CHAPEL</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>011</td>
<td>WALLIS HALL</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>012</td>
<td>DEWEY</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>013</td>
<td>HOPEMAN</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>014</td>
<td>HOYT HALL</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>015</td>
<td>GAVETT</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>016</td>
<td>TAYLOR HALL</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>017</td>
<td>BAUSCH &amp; LOMB</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>018</td>
<td>MELIORA</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>019</td>
<td>HARKNESS</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>020</td>
<td>SCHLESEL HALL</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>021</td>
<td>TODD UNION</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>022</td>
<td>STRONG AUDITORIUM</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>023</td>
<td>LATTIMORE HALL</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>024</td>
<td>LECHASE HALL</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>025</td>
<td>MOREY HALL</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>026</td>
<td>FREDERICK DOUGLASS</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>027</td>
<td>RUSH RHEES LIBRARY</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>028</td>
<td>WILSON COMMONS</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>029</td>
<td>RONALD RITTNER MEDIA ARTS</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>031</td>
<td>TIERNAN HALL</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>032</td>
<td>LOVEJOY HALL</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>033</td>
<td>BURTON HALL</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>034</td>
<td>GILBERT HALL</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>035</td>
<td>HOEING HALL</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>036</td>
<td>CROSBY HALL</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>037</td>
<td>GOERGEN ATHLETIC CENTER</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>038</td>
<td>FAUVER STADIUM</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>039</td>
<td>UHS</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>040</td>
<td>DANFORTH DINING HALL</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>041</td>
<td>SPURRIER GYMNASIUM</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>042</td>
<td>SUSAN B ANTHONY</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>043</td>
<td>WILDER TOWER</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>044</td>
<td>SAGE ARTS CENTER</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>045</td>
<td>ANDERSON TOWER</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>046</td>
<td>O'BRIEN HALL</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>048</td>
<td>612 WILSON BLVD</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>051</td>
<td>SLATER HALL</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>052</td>
<td>MUNRO</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>053</td>
<td>KENDRICK</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>054</td>
<td>GALE</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>055</td>
<td>FAIRCHILD</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>056</td>
<td>CHAMBERS</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>091</td>
<td>DRAMA HOUSE</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>092</td>
<td>ALPHA DELTA PHI</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>093</td>
<td>INTERCAMPUS MUSIC CENTER</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>094</td>
<td>DELTA UPSILON (OLD MEDIEVAL HOUSE)</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>095</td>
<td>SIGMA CHI</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>096</td>
<td>THETA CHI</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>097</td>
<td>PSI UPSILON</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>098</td>
<td>SIGMA ALPHA MU</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>099</td>
<td>COMMUNITY LEARNING CENTER</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>126</td>
<td>CENTRAL UTILITIES</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>141</td>
<td>MUNN GLC</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>142</td>
<td>KELLY GLC</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>143</td>
<td>TREVOR GLC</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>144</td>
<td>VALENTINE GLC</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>145</td>
<td>BRIGHT GLC</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>146</td>
<td>MOORE GLC</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>Number</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>--------</td>
<td>----------------------</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>147</td>
<td>DE KIEWIET GLC</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>148</td>
<td>SIBLEY GLC</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>149</td>
<td>ROSS GLC</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>151</td>
<td>UNIV. PARK UNT 1</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>152</td>
<td>UNIV. PARK UNT 2</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>153</td>
<td>UNIV. PARK UNT 3</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>154</td>
<td>UNIV. PARK UNT 4</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>155</td>
<td>UNIV. PARK UNT 5</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>156</td>
<td>UNIV. PARK UNT 6</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>157</td>
<td>UNIV. PARK UNT 7</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>158</td>
<td>UNIV. PARK UNT 8</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>159</td>
<td>UNIV. PARK UNT 9</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>512</td>
<td>512 INTERCAMPUS DR</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>514</td>
<td>514 INTERCAMPUS DR</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>516</td>
<td>516 INTERCAMPUS DR</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>520</td>
<td>520 INTERCAMPUS DR</td>
<td></td>
</tr>
<tr>
<td>MTHOP</td>
<td>061</td>
<td>575 MT HOPE AVENUE</td>
<td></td>
</tr>
<tr>
<td>MTHOP</td>
<td>062</td>
<td>590 MT HOPE AVENUE</td>
<td></td>
</tr>
<tr>
<td>MTHOP</td>
<td>063</td>
<td>668 MT HOPE AVENUE</td>
<td></td>
</tr>
<tr>
<td>MTHOP</td>
<td>064</td>
<td>685 MT HOPE (FAIRBANK)</td>
<td></td>
</tr>
<tr>
<td>MTHOP</td>
<td>065</td>
<td>692 MT HOPE AVENUE</td>
<td></td>
</tr>
<tr>
<td>MTHOP</td>
<td>066</td>
<td>630 MT HOPE AVENUE</td>
<td></td>
</tr>
<tr>
<td>MTHOP</td>
<td>125</td>
<td>GOLER HOUSE</td>
<td></td>
</tr>
<tr>
<td>MTHOP</td>
<td>502</td>
<td>1510 MT HOPE AVE</td>
<td></td>
</tr>
<tr>
<td>MTHOP</td>
<td>508</td>
<td>1351 MOUNT HOPE</td>
<td></td>
</tr>
<tr>
<td>MTHOP</td>
<td>510</td>
<td>MT HOPE FAMILY CENTER</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>102</td>
<td>MEDICAL CENTER ANNEX</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>103</td>
<td>HELEN WOOD HALL</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>104</td>
<td>SCHOOL OF MEDICINE AND DENTISTRY</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>105</td>
<td>STRONG MEMORIAL HOSPITAL</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>106</td>
<td>R WING PSYCHIATRY</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>107</td>
<td>S &amp; GG WING/SMD</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>108</td>
<td>ACCESS CENTER</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>109</td>
<td>AMBULATORY CARE FACILITY</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>110</td>
<td>PARKING GARAGE</td>
<td></td>
</tr>
<tr>
<td>Code</td>
<td>Number</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
<td>-------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>111</td>
<td>KORNBERG MEDICAL RESEARCH BUILDING</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>112</td>
<td>EASTMAN DENTAL CENTER</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>113</td>
<td>LEVINE PAVILION</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>114</td>
<td>AUTOCLAVE BUILDING</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>115</td>
<td>MRB-X</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>116</td>
<td>EMERGENCY DEPARTMENT</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>118</td>
<td>UR CHILDREN'S SCHOOL</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>119</td>
<td>CANCER CENTER</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>120</td>
<td>CLINICAL &amp; TRANSLATIONAL SCI. BLDG</td>
<td></td>
</tr>
<tr>
<td>CU</td>
<td>126</td>
<td>CENTRAL UTILITIES</td>
<td></td>
</tr>
<tr>
<td>CU</td>
<td>127</td>
<td>MC CHILLER PLANT</td>
<td></td>
</tr>
<tr>
<td>CU</td>
<td>128</td>
<td>RIVER PUMP HOUSE</td>
<td></td>
</tr>
<tr>
<td>CU</td>
<td>129</td>
<td>ELECTRICAL SUBSTATION</td>
<td></td>
</tr>
<tr>
<td>RCOFF</td>
<td>160</td>
<td>301 CASTLEMAN RD</td>
<td></td>
</tr>
<tr>
<td>RCOFF</td>
<td>505</td>
<td>GANNETT HOUSE</td>
<td></td>
</tr>
<tr>
<td>RCOFF</td>
<td>506</td>
<td>MEES OBSERVATORY</td>
<td></td>
</tr>
<tr>
<td>RCOFF</td>
<td>507</td>
<td>110 TOBEY VILLAGE</td>
<td></td>
</tr>
<tr>
<td>RURMCOFF</td>
<td>201</td>
<td>CVRI</td>
<td></td>
</tr>
<tr>
<td>RURMCOFF</td>
<td>521</td>
<td>300 SCIENCE PARKWAY DATA CENTER (PDC)</td>
<td></td>
</tr>
<tr>
<td>RURMCOFF</td>
<td>522</td>
<td>315 SCIENCE PARKWAY</td>
<td></td>
</tr>
<tr>
<td>RURMCOFF</td>
<td>523</td>
<td>FARMINGTON DATA CENTER (SDC)</td>
<td></td>
</tr>
<tr>
<td>RURMCOFF</td>
<td>530</td>
<td>905 CULVER ROAD</td>
<td></td>
</tr>
<tr>
<td>RURMCOFF</td>
<td>531</td>
<td>AMBULATORY SURGERY CENTER (ASC)</td>
<td></td>
</tr>
<tr>
<td>RURMCOFF</td>
<td>532</td>
<td>909 CULVER RD</td>
<td></td>
</tr>
<tr>
<td>RURMCOFF</td>
<td>534</td>
<td>913 CULVER RD</td>
<td></td>
</tr>
<tr>
<td>RURMCOFF</td>
<td>540</td>
<td>125 LATTIMORE</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>300</td>
<td>UNIVERSITY FACILITIES CENTER</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>301</td>
<td>WHIPPLE BLD 01</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>302</td>
<td>WHIPPLE BLD 02</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>303</td>
<td>WHIPPLE BLD 03</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>304</td>
<td>WHIPPLE BLD 04</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>305</td>
<td>WHIPPLE BLD 05</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>306</td>
<td>WHIPPLE BLD 06</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>307</td>
<td>WHIPPLE BLD 07</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>308</td>
<td>WHIPPLE BLD 08</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>309</td>
<td>WHIPPLE BLD 09</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>310</td>
<td>WHIPPLE BLD 10</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>311</td>
<td>WHIPPLE BLD 11</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>312</td>
<td>WHIPPLE BLD 12</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>313</td>
<td>WHIPPLE BLD 13</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>314</td>
<td>WHIPPLE BLD 14</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>315</td>
<td>WHIPPLE BLD 15</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>316</td>
<td>WHIPPLE BLD 16</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>317</td>
<td>WHIPPLE BLD 17</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>318</td>
<td>WHIPPLE BLD 18</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>319</td>
<td>WHIPPLE BLD 19</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>320</td>
<td>WHIPPLE BLD 20</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>321</td>
<td>WHIPPLE BLD 21</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>322</td>
<td>WHIPPLE BLD 22</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>323</td>
<td>WHIPPLE BLD 23</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>324</td>
<td>WHIPPLE BLD 24</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>325</td>
<td>WHIPPLE BLD 25</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>326</td>
<td>WHIPPLE BLD 26</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>327</td>
<td>WHIPPLE BLD 27</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>328</td>
<td>WHIPPLE BLD 28</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>329</td>
<td>WHIPPLE BLD 29</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>330</td>
<td>WHIPPLE BLD 30</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>331</td>
<td>WHIPPLE BLD 31</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>332</td>
<td>WHIPPLE BLD 32</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>333</td>
<td>CTR OPTOELECTRONICS</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>334</td>
<td>LAB FOR LASER ENERGETICS</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>335</td>
<td>ALUMNI AND ADVANCEMENT CENTER 335</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>336</td>
<td>ADVANCEMENT ALUMNI CENTER 336</td>
<td></td>
</tr>
<tr>
<td>ESM</td>
<td>400</td>
<td>EASTMAN SCHOOL - 26 GIBBS</td>
<td></td>
</tr>
<tr>
<td>ESM</td>
<td>401</td>
<td>EASTMAN THEATER - 26 GIBBS STREET</td>
<td></td>
</tr>
<tr>
<td>ESM</td>
<td>402</td>
<td>EASTMAN COMMONS STUDENT LIVING CTR</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
<td>-----------------------------------</td>
<td></td>
</tr>
<tr>
<td>ESM</td>
<td>403</td>
<td>EASTMAN ANNEX 1 - 30 SWAN STREET</td>
<td></td>
</tr>
<tr>
<td>ESM</td>
<td>404</td>
<td>EASTMAN OLD SIBLEY - 34 SWAN STREET</td>
<td></td>
</tr>
<tr>
<td>ESM</td>
<td>405</td>
<td>MILLER CENTER - 27 GIBBS STREET</td>
<td></td>
</tr>
<tr>
<td>ESM</td>
<td>406</td>
<td>MESSINGER HALL - 10 GIBBS ST</td>
<td></td>
</tr>
<tr>
<td>ESM</td>
<td>407</td>
<td>EASTMAN EAST WING (EEW)</td>
<td></td>
</tr>
<tr>
<td>MAG</td>
<td>413</td>
<td>CUTLER UNION</td>
<td></td>
</tr>
<tr>
<td>MAG</td>
<td>414</td>
<td>MEMORIAL ART GALLERY</td>
<td></td>
</tr>
<tr>
<td>MAG</td>
<td>415</td>
<td>MAG - 1967 ADDITION</td>
<td></td>
</tr>
<tr>
<td>MAG</td>
<td>416</td>
<td>VANDEN BRUL PAVILION</td>
<td></td>
</tr>
</tbody>
</table>
Section 10.

Graphics Standards

10.1 General

1. All graphics shall include labeling of all normal positions and ranges of valves. These shall be placed as close to the actual device that it represents on the graphics as is possible.

2. All remote sensors and hard to locate sensor placements and transformers shall be denoted on the floor plans. The active value of all such devices shall be displayed for device representation. A written description of the physical location of the sensor or hard to find device shall be additionally located on the point configuration screen itself, in a text field such as informational text or description.

3. All exterior and interior lighting controlled by the BAS shall be denoted on the floor plans, along with its specific location and the control points.

4. All links in any graphic applications shall be editable and customizable, in size, color, text, and link options.

5. All links shall be in ascending order from the top of the page down, if possible.

6. All spaces with specific pressure and/or air change rate control shall have a room graphic that is representative of the space. That graphic shall have a value displayed on it that will enable an operator to adjust air change rates and pressure set points in a universal manner. Changes in air changes rates from this graphic will result in maintained differential pressure and changes in differential pressure from this graphic will result in maintained air change rates.

7. Generally all text shall be black, white, yellow, or gold. Consistency is important and also readability. If required text color does not show up well in a particular application, then use the text color that best shows up against the background. Always attempt to use the 4 main colors for most applications and keep colors consistent in their use.
8. All analog values represented on graphics shall be represented by range of real values such as 4-20mA, 0-60Hz, etc. These values shall accompany the 0% to 100% ranges when displayed on the graphics.

9. All “as built” documentation will be provided to the Energy Operations Group before turn over in order to link them to the appropriate graphics.

10.2 Standard Modules for all Graphics

The following links and points shall be included on all graphic pages:

1. Area graphic links: These links will be in the upper right hand corner on the active graphic. The purpose of these links is to navigate geographically throughout the building and also back to the previous table of contents graphics or other pages without using the back buttons. These links must be located on all graphics and must have a logical sequence of backward navigation back to the main system graphic.

2. The advanced link Font should be “Arial”, Style should be “Bold” and Size should be “12”, ALL CAPS. The rectangle size should be 142, 26. The size may be larger depending on the text being written in the box, however the text should be simply stated enough to fit in 142, 26, if possible. All link boxes should be the same size on the same graphic. Active Color will be Red, or shall have a mouse over feature to indicate activity. Red active text option is preferred. Background will be Blue and text shall be white or yellow.

3. Point Information Blocks for OAT and OAH: Outside air temperature and humidity point information blocks are located in upper left hand corner of all graphics.

4. All graphics representing points that can be associated with alarm status and operating status will display appropriate colors. Green will mean active or on, blue will mean inactive or off. Alarm statuses should flash color of alarm priority. The alarm priorities are as follows:
Red = Alarm with Message (Critical/ Life Safety)
Pink= Alarm with Message
Yellow= Alarm without message, to be dispatched directly to Facilities.

5. All BACnet point priorities shall be displayed with points that can be commanded, turned into hand, disabled/enabled, or otherwise manipulated.

6. For all graphics the font color shall stand out to be easily contrasted against the background color. Font should be “MS Sans Serif”, Style should be “Bold” and Size should be “8.25”. Some acceptable styles are shown below.

10.3 Table of Contents Pages
1. All graphics shall be navigable through a series of standard pages beginning with the main page which will take you to a series of table of contents pages. Each project shall add all appropriate links to existing table of contents pages or shall create all new appropriate table of contents pages.
2. Below are three examples of acceptable table of contents graphics. Each of these graphics is to be of the active type with live points and links navigating to other graphics. The menu bar links relative size, color, and position are important pieces of consistency that must be maintained in all systems.
3. The main position of the top left hand corner of the first table of contents link shall be located in the following position: 4, 4
4. The size of the graphic shall be 1000 x 640
5. The name of the active graphic file should be area or building with an underscore and “Table of Contents”. Ex.: MRBX_Table of Contents
6. For all graphics, the name of file of background graphic should be the area or building name with an underscore and “TOC” for Table of Contents. Ex.: MRBX_TOC
7. On the left hand side of the main Building Table of Contents Page for each building, the page shall include the University of Rochester banner and/or shield and an architectural rendering or photograph of the building on the main building page. This main building page shall also contain the building name along with any applicable building abbreviations. The building number shall be included below that in parentheses. Links to building trends and occupancy building schedules shall also be included in the bottom left hand corner of the main building table of contents page.

The name of building or area will be centered at the top of the page or centered in the banner, ALL CAPS. The font shall be Times New Roman and shall be bold. The size should be “35” if possible so it will be large enough to be read clearly. No box will be used.

There shall be three titles on the tables of contents pages which shall read, “AHU’s”, “Floor Plans” and “Accessory Links”. These titles will create 3 columns in which to place links appropriate for that table of contents page. If the category “SPECIALTY LINKS” is needed then that can be placed where room allows next to
or under AHU’s, Floor Plans, or Accessory Links. Font should be “Times New Roman”, Style should be “Regular” and Size should be “32”, ALL CAPS.

Place all navigation links directly under the titles “AHU’s”, “Floor Plans”, “Accessory Links” and “Specialty Links”. The links must all be lined up and must be the same size for each column for consistency. Examples of accessory links: RC CHW AVAILABLE, TEC graphic links, VAV graphic links and block group links. Examples of specialty links: PDFs, AutoCAD, Submittals and Description of Operation.

10.3a AHU and Floor Plan links
The AHU active links and floor plan active links Font should be “Arial”, Style should be “Bold” and the size should be “12”, ALL CAPS. The AHU link boxes will include the AHU name and a short note for what general area that AHU serves. AHU link boxes will be standardized throughout all graphic pages as size 142, 26. Floor plan link boxes will be standardized throughout all graphic pages as size 142, 26. The air handlers will be Orange for the background. The graphic name to be used will be as simply stated as possible. A small gap should be left between vertical boxes. The rows and columns should be justified vertically and horizontally as shown below. The Floor Plan Graphics shall be Cyan for the background. The graphic name to be used will be as simply stated as possible. A small gap should be left between vertical boxes. The rows and columns should be justified vertically and horizontally as shown below. The labeling on the AHU links shall be as physically labeled on the unit or shall default to the label of AHU with the appropriate unit number. The floor plan notation shall be used is as follows: “BASEMENT, GROUND, FIRST, SECOND, THIRD, PENTHOUSE, etc.

```
<table>
<thead>
<tr>
<th>AHU-1 (Basement West)</th>
<th>BASEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHU-2 (Floors 1.P NorthWest)</td>
<td>FIRST</td>
</tr>
<tr>
<td>AHU-3 (Floors B-4 SouthWest)</td>
<td>SECOND</td>
</tr>
<tr>
<td>AHU-4 (Floors 1.P East)</td>
<td>THIRD</td>
</tr>
<tr>
<td>AHU-5 (Floor 4 Server Room)</td>
<td>FOURTH</td>
</tr>
<tr>
<td></td>
<td>PENTHOUSE</td>
</tr>
</tbody>
</table>
```

10.3b Accessory Links
Accessory active links Font should be “Arial”, Style should be “Bold” and Size should be “12”, ALL CAPS if possible. The link will respond with a mouse over movement to show that it is an active link. The background color will be green, and the non-activated text will be black, the activated text color shall be red, or shall have a mouse over function to indicate link activity. Boxes should be 238, 36. If size needs to be bigger to accommodate name, make all boxes consistent or make font smaller on ones that need it as shown below.

10.3c Specialty Links
Specialty active link Font should be “Arial”, Style should be “Bold” and Size should be “12”. ALL CAPS if possible. Make font smaller on ones that need it. The link will respond with a mouse over movement to show that it is an active link. The background color will be yellow, and non-activated text color will be black, the activated text color shall be red, or shall have a mouse over function to indicate link activity. Boxes should be 142, 26. If size needs to be bigger to accommodate name, make all boxes consistent. All specialty links shall be linked to documents on a designated University shared drive whose pathway shall be delineated to the vendor by the Energy Operations Group. Examples of specialty links: PDFs, AutoCAD, Submittals and Description of Operation

UNIVERSITY OF ROCHESTER APPROVAL: U of R Energy Operations Group will be consulted for final approval of all Advanced Link Titles wording.

10.4 Air Handling Unit Graphics
All air handler units will follow a standard layout as illustrated below. The intention of the air handler graphics is to contain all pertinent information to each unique system and its set points, alarms, and any useful notes or information
pertaining to the unit, its operation, and any other data that will be useful for an HVAC technician to use as a critical troubleshooting tool.

The name of the dynamic graphic file should be area or building with an underscore unit number. Ex.: MRBX_AHU13

The graphic size shall be: 1000x 640
All Air Handler graphics must depict the unit in a 3 dimensional manner.

All Air Handler graphics (AHU) will have a black background or a medium gray background. No other colors will be acceptable without prior approval from the Energy Operations Group.

All text shall be white, yellow, or gold, except as otherwise specified on the background. This is intended to promote visibility.

The air handler name will be centered at the top of the page. The font will be “Times New Roman”, Style will be “Bold” and Size will be large enough to be read clearly approximately “35”, ALL CAPS. The area served should be noted beneath the name if there are no expanded graphic links in the upper right hand corner taking you to the areas served. The location of the air handler should be noted below the air handler name also. Size should be somewhat smaller, centered under air handler name, Font will be “Times New Roman”, and Style will be “Bold”, ALL CAPS.

All AHU graphics shall include unit design CFM, rated HP, rated static pressure, and rated Amperage denoted on the graphic near all major motors.

All points on the graphic that can be animated in a standard fashion, such as fans, dampers, etc., will be animated.

All graphics representing points that can be associated with alarm status and operating status will display appropriate colors. Green will mean active or on, blue will mean inactive or off. Alarm statuses should flash color of alarm priority. The alarm priorities are as follows:
Red = Alarm with Message (Critical/ Life Safety)
Pink= Alarm with Message
10.4a Navigation Links on AHU Graphics

All links will be active links on the AHU graphic pages. Each graphic page will contain active navigational links in the upper right hand corner that will navigate you back to the floor plan that the air handler serves and also shall have links which will take you back to the table of contents pages for the previous levels. These links must also navigate you to the main page for the system. The specifics of these links are laid out in the section below.

The graphic links should have the name of the graphic shown. “BACK” should not be used. The top link should be the most general area graphic link. Examples include River Campus, Medical Center, ESM, MAG, etc. The next link under the site graphic link should be an area graphic link. For example, a building link such as Dewey, MRBX, ACF, Bausch & Lomb, etc. The next set of links down separated by about five spaces should be the floor plan graphic links of the areas served by the air handler. The next set of links down will be accessory links and under those will be the specialty links grouped together. Any graphics that can be navigated to from the AHU graphic will have a link back to the AHU graphic.

10.4a.1 Navigation Links on AHU Graphic to Previous TOC Pages

The Advanced Link Control Properties Font should be “Arial”, Style should be “Bold” and Size should be “12”, ALL CAPS. The rectangle size should be 142, 26. The size may be larger depending on the text being written in the box. However the text should be simply stated enough to fit in 142, 26 if possible. All link boxes should be the same size. The active link must be indicated by the color red for the font or must have a mouse over feature to indicate that the link is active. The background color will be blue, and non-activated text color will be yellow.

10.4a.2 Navigation Links on the AHU Graphic to Floor Plans
The next set of links under the graphic will be any floor plan advanced links that the air handler serves.

The floor plan link boxes will be standardized throughout all graphic pages as size 142x 26. The background color will be cyan. The text color will be black and will indicate an active link with the color red or another mouse over feature. The same link box setup will be used for **AHU advanced links**, with the exception that the background will be orange.

**10.4a.3 Navigation Links on the AHU Graphic for Accessories**

The next set of links under the **floor plan links** will be **accessory advanced links**. These include TEC graphic links, VAV graphic links, other systems graphic links with specialty equipment, and block group links. Accessory links will include any graphic that further explains the basic air handler control graphic.

The accessory advance link boxes will be standardized throughout all graphic pages as size 142, 26. The background color will be green. The text color will be black and will indicate an active link with the color red or another mouse over feature. See example below for all types of navigational links to be included in all graphics in section 10.3.

![Diagram of AHU graphic with links]

On all AHU graphics where space is unavailable to put all links on the page, accessory links will be used to navigate to another table of contents page containing more accessory links.
10.4a.4 Navigation Links on the AHU Graphic for Specialty Links

The next set of links under the accessory links will be specialty links. Examples of specialty links include Description of Operation, PDFs, AutoCAD, Submittals, As Built documentation and other important information for troubleshooting. These documents shall be located on a University shared drive by the vendor with a pathway that shall be delineated by the Energy Operations Group.

Specialty links will be sized 142 x 26 where possible. The background color will be yellow. The text color will be black and will indicate an active link with the color red or another mouse over feature. See examples of Specialty Links below.

10.4b Information Block and Point Block Requirements

All points that can be commanded or set from the graphic shall be contained in a box to indicate to the user that it can be set. All information block points should be located as near as possible to the device they represent on the AHU graphic or should be clearly indicative of what section of the AHU to which the points pertain. Information or point blocks shall be used for all binary (digital) points which include mode type points, fan and pump statuses, low temperature detectors, high static pressure points, and other safety type points. Each point or information block should indicate the point status or value clearly with the proper units. The actual point should be accessible from this block to be changed or view its properties.

10.4b.1 Occupied Point or Information Block

The occupied mode point or system start point should be on the left side of the graphic below the outside air temperature and humidity points if possible. An acceptable example is shown below and should be a switch type mechanism as shown in section 10.3b.2.
10.4b.2 Economizer Point or Information Block
The economizer point should be near the mixed air damper section in the center of the page. Some acceptable examples are shown below. An acceptable example is shown below and should be a switch type mechanism as shown in section 10.3b.2.

10.4b.3 Economizer Point or Information Block
The chilled water available point should be near the chilled water pump/system. An acceptable example is shown below.

10.4b.4 Analog Input and Set Points on AHU Graphics
For analog inputs that represent sensors that are shown, the point names or descriptors don’t have to be shown as long as they are next to the picture on the graphic that they represent and are clear as to what they are. The analog output set points that correspond to the inputs should have the last part of the name or an accurate descriptor shown so that it is obvious what set point it refers to. It should have the sensor name and the word “set point” or appropriate abbreviation shown. The value and units should also be shown. The set point shall be located above the temperature or point value, as a standard. The actual points should be accessible from the values on the graphics to be changed or view its properties through a double or single mouse click.

Notes for all of section 10.4b:
If any point (whether BI (DI), BO (DO), AI, AO) can be commanded or set, then the priority should be shown.

The font for all point information will be Arial, Regular, size 8. The block itself will be sized just large enough to display the name and fit on the graphic near the device.
If there are too many alarm-able points to fit on the graphic around the picture, for example, a fan wall, then the associated points linked to the picture will suffice and an expanded graphic will need to be created to accommodate all the point blocks with the appropriate information shown. See section 10.3c.

10.4c Imbedded Links for Graphics with too many Alarm-able Points

Graphic links may exist within the graphic other than in the upper right hand corner if they represent a part of the graphic that needs further detail. For example, the water side of the AHU coils or the expanded fan section of a fan wall system. In this case, the graphic link can be a “crosshair” picture link with the name of the graphic shown accurately conveying what the expanded graphic is.
10.4d Examples of Acceptable Forms of AHU Graphics
10.5 Floor Plan Graphics

All buildings and projects shall have complete floor plans. Any project that is completed shall add to the existing floor plan and update it for the scope of the work, or shall provide a complete new floor plan which shall be grayed out for all areas except those touching the scope of work for the project. All appropriate links and features will be included for anything that is involved in the scope of the controls project.

All projects shall include “Thermographic” set point variation indication by color (Color Mapping indicating adherence to set point) on their floor plans when available. See Section 10.4b.

The floor plan should fill as much of the page as possible. Page layout for portrait or landscape will be adjusted as necessary.
All floor plans shall indicate the direction of North despite the orientation that the floor plan graphic was laid out to best fit the page. This shall be indicated with a capital N and an arrow and shall be standard throughout the system in size, color and font, as Times New Roman font, size 12, and shall be black, gold, or white in color so as to stand out best against the background.

The background of the floor plan graphics shall be black or medium gray. The text shall be white, gold, or yellow so as to best stand out in each situation, unless otherwise noted in this section.

The graphic size shall be 1000 x 640.

The name of the active graphic file should be area or building with an underscore and “FirstFloor”. Ex.: MRBX_FirstFloor

The name of file of background graphic should be the area or building name with an underscore and “Floor1” for Table of Contents. Ex.: MRBX_Floor1

The floor plan will show all the room numbers where appropriate, large enough to see but not too large to take up the entire room box since dynamic point information blocks will be placed in the room also.

All special rooms such as CER’s, Mechanical Rooms, and electrical rooms shall be noted on the graphic in the room itself.

Information for all pumps shall include rated GPM, rated HP, and rated Amperage next to depiction of unit on the graphic.

Each room on the floor plan shall have a link to the room temperature point and an associated graphic with the equipment in the room, if applicable. All digital temperature point information blocks will be placed in the rooms where appropriate. Place temperature info block in room where digital stat is located. Do not cover the room number. The font should be “Arial”, Style should be “Bold” and Size should be “8”. See examples below.
If there is special equipment located in the room it shall be noted on the floor plan graphic. Equipment such as exterior and interior lighting controls and locations, BAS controller locations, duct static sensors, safeties and sensors not mounted on a piece of equipment shall be noted for their locations. Any control transformers that are not directly mounted in the controller panel location shall be called out for locations on floor plans with notes such as “located above ceiling”. Any special point information blocks will be placed in or near the rooms where appropriate. An example of a special point information block would be a TSI monitor value such as an FPM value. Mechanics need this information quickly available on the floor plan to monitor rooms. Place info block in or near room where TSI monitor is located. Do not cover room number. The font should be “Arial”, Style should be “Bold” and Size should be “8”. See below.

![Image]

If there is a room or rooms on the floor plan that require more information than a simple temperature block, a graphic link with crosshair picture placed on the room or rooms that takes you to an exploded view graphic of that room or rooms will be used.

Note: Any color coding that is used to represent statuses or equipment types shall have a legend on every page in which it is used. The legend that is used on the page shall be appropriate for that page only.

See examples of links for exploded areas, floor plan room temperatures, color legends, and an exploded view below.
10.5a Navigation Links on Floor Plans
All floor plan graphics will contain navigational links to table of contents pages and other floor plans associated with the building or area that the graphic is referring to. All links will be active navigational links. All area graphic links will be
active links in the upper right hand corner on the active graphic. The general area link is followed by the specific area links.

The advanced link Font should be “Arial”, Style will be “Bold” and Size should be “12”, ALL CAPS. The rectangle size should be 142, 26. The size may be larger depending on the text being written in the box. However the text should be simply stated enough to fit in 142, 26 if possible. All link boxes should be the same size. Active color of the text will be red, or shall have a mouse over feature to indicate activity, the background will be blue and text shall be white or yellow. These are listed from general to specific. Area page is first, followed by building or area next.

![River Campus](image)

The name of building or area will be centered at the top of the page.

The font should be “Times New Roman”, Style should be” Bold” and Size should be “35” if possible so it will be large enough to be read clearly, ALL CAPS. No box will be used.

**10.5b Air Handler links on the Floor Plans**

Located underneath the title of the floor plan will be colored boxes of all the same size with different color fill denoting specific air handlers which serve the associated outlined or shaded areas on the floor plan. Directly to the right of the boxes will be the air handler designation for that color. These boxes shall have “cross hair” type links in them and shall denote the current temperature for the discharge air of that unit directly underneath them. The crosshair will be sized to fill the box. Each of these links shall navigate you to the air handling unit. The designated color of each block shall correspond on each floor plan with the area that the unit serves being outlined with a thick border of that same color, when using “Thermographic” or “Color Mapping” set point variation indication. The entire area shall be shaded in the corresponding color when not using the “Thermographic” or “Color Mapping” representation. “Thermographic” or “Color Mapping” floor plans shall be used whenever possible. The colors used for air
handler designations will be consistent from one floor to the next if appropriate air handler serves rooms on more than one floor. The air handler designation Font should be “Times New Roman”, Style should be “Bold” and Size should be “16”, ALL CAPS. The crosshair will be sized to fill the box.

10.5c Links for AHU and Controller Locations
All air handlers should be located on the floor plan in their physical location. This should be represented by a colored, labeled box stating what air handler that it is and that box should be an active link which navigates the user to the AHU graphic. Locations of all main controllers shall be noted with a labeled box link on the floor plan for ease of location. The links will be approximately scaled to size in the room where they are located. This link will also have a text color change or a mouse over capability to indicate that it is an active link.
If the floor plan represents a mechanical room where digital control panels are present then there will be a green box showing the precise locations of the controller. A simple title consisting of the panel type and node number will be used. These boxes, shown as two examples below will be links to navigate the user to the panel in the system tree layout, if possible. If this link is not possible, it shall indicate all information to be able to find it manually in the system tree with ease.
10.5d Examples of Floor Plans
See below examples of acceptable floor plan layouts, navigation links, shading, expansion links, air handling links, gray shaded areas beyond the scope of work, air handler location representation links, “Thermographic” or “Color Mapping” floor plans, etc.
Section 11.

Commissioning Requirements/Warranty Requirements

1. The entire BAS installation shall be commissioned for operation and accuracy and testing of all sequence of operations. This includes all points in the system. The controls contractor shall be required to participate in all commissioning activities. At a minimum, the system should have a point to point check out and should prove all sequences for complete operation of all systems.

2. Each project will provide a checklist of all equipment with each I/O point that was functionally checked for communication with the larger system.

3. Each sensor is to be checked, calibrated, and recorded as to the accuracy of the actual installation and documentation is to be provided to the owner, both EOG and the appropriate Facilities group.

4. All aspects of all sequences are to be tested to ensure that they operate as per the design intent and as built documents are to note the testing. The Energy Operations Group and the appropriate Facilities Group will be invited to the testing process with a minimum 24 hour notice.

5. The low temperature detector shall be checked for operation to ensure that the preheat valves have failed to full heat, the mixed air dampers have modulated to full return air, and the fan has shut down. The unit shall also be tested on a day that is 20 degrees Fahrenheit or colder to ensure that the unit recovers from the shutdown upon hitting the reset button without any manipulation of valves, dampers, doors, etc.

6. All graphics are in place and operational as per the graphics standards provided in a previous section. This must be before the time of turnover for project completion.

7. A week long trend of all set points and control temperatures is to be provided to EOG and the appropriate Facilities group to ensure control has been achieved for all air handlers and major units. Trends of room temperatures and set points are also to be provided for all rooms that are trended in the categories of level 1 and level 2 trended points. See section
2a for trending specification requirements and definitions of level 1, level 2, and level 3 spaces. This week long trending must be completed for a week during heating season and a week during cooling season. The final report is to be sent to the Energy Operations Group and the appropriate Facilities group in an Excel file format or compatible.

8. The controls contractor shall have a final software system review with the Energy Operations Group in which the contractor shall navigate the system graphics, programming, system trees, etc. This will be finished with an email list of any deficiencies that must be followed up on by the contractor within 30 days of the review.

9. A schedule for all commissioning activities to be completed by the BAS vendor shall be submitted to the Energy Operations Group and the project manager.

10. As built documentation must be updated within the one year warranty period with any changes that were made to the project as completed at the time of turnover. A new electronic copy of this documentation is to be sent to the project manager, the architect of record, and the Energy Operations Group electronically in order to include them in the project documentation and link them up to the appropriate graphics.

11. As built documentation submitted to the Energy Operations Group shall be of a PDF form that will be tabbed and/or bookmarked and labeled in a manner which allows ease of documentation navigation. EOG and appropriate Facilities group will also be provided a copy on digital media.

12. All alarms activated during a project shall include a sign off by the commissioning authority, if the project has one.

13. Commissioning authority shall review all graphic screens for compliance to the standard.

14. Commissioning authority shall track all training requirements for each project.
Section 12.

Training Requirements

1. Specific training shall be provided for each project in proportion to the size of the project.
2. No less than 4 hours of training shall be provided to the appropriate Facilities group and the Energy Operations Group and must be written in the project contract as such. Training may include any topics chosen by the customer. Training for a very large project will be capped at a total of 40 hours for the Facilities Group and 40 hours for the Energy Operations Group (A total of 80 hours of training by the vendor.) This will also be specified in the contract.
3. The training will be assumed to be 8 hours per group unless otherwise specified at the beginning of the project in the contract documents. If nothing is specified, it will be 8 hours per group at a total of 16 hours of training provided by the vendor.
4. The training may require multiple sessions within the hour limit due to multiple shift coverage.
Section 13.

Energy Sequences

1. A forthcoming addendum for this section will include standard sequences such as load shedding for multiple mediums, peak demand limiting, optimal start programming, enthalpy/economization, sunrise/sunset outside lighting, zone scheduling, and other energy savings and demand control strategies.

2. All sequences and strategies currently used to save energy shall be called out in the project drawings and in the as built documentation. This includes scheduling, trim and respond, reset schedules for temperature, pressure, etc. and any other strategies that are to be used.
Section 14.

User Interface Requirements/System Architecture/Integration

1. All user interfaces for the Facilities crews are to be Web Based.
2. Work stations may be required for system tools access, but web based tools are preferred.
3. All controllers shall be capable of operating as standalone and shall not require a communication path, but shall be fully capable of communicating all points, alarms, program, graphics, schedules, and other information available within the controller itself to the University Building Automation System.
4. All global BACnet points shall be available to all controllers that are designated. These global points may include temperature and humidity or other similar values. Each controller shall fail at the last known value or shall be capable of failing at a set default value(adj.)
5. Controller or system failures or losses of communication must be sent to the alarm screen in the Customer Service Center and must be detected by the server for recording in the automated event history log. This includes losses of communication to workstations and ALN (BLN) machines.
6. Power loss for all panels shall not result in loss of permanent memory, but each controller shall be capable of downloading its stored memory into the volatile memory when power is lost and is recovered. In addition to the controller’s on board non-volatile memory, the central server must also store the controller database available for download in the event of a catastrophic failure of the controller.
7. Controllers shall automatically restart upon return from a power failure.
8. All controllers shall be able to buffer alarms upon communication loss with the university network and shall send the alarms with a time stamp to be distributed appropriately upon return of network communication.
9. All inputs and outputs shall be able to be overridden through software and physically at the controller level for purposes of testing, troubleshooting, and in case of equipment failure.
10. For all new installed controllers that are connected directly to the University Facilities and Services Private network, there shall be a test alarm created and added to the test alarms graphic for EOG. This test alarm shall be able to be triggered by an EOG operator to manually verify communication and system alarm functionality.