Weill Cornell Medicine

Engineering & Maintenance

STANDARD

Building Management Systems

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E&M Standard: Building Management Systems

TABLE OF CONTENTS

1. PURPOSE AND INTENT

1.1 This document provides both general and specific requirements for the installation and modification of Building Management Systems at Weill Cornell Medicine. It should be used when building or renovating any WCM space.

2. APPROVED MANUFACTURERS

2.1 The following manufacturers are approved for providing BMS Systems within WCM space:

a. Automated Logic Controls
b. Schneider Controls (formerly Andover)
c. Siemens Building Technologies
Note: Siemens Desigo Platform only. Apogee Platform is no longer accepted.

2.2 Where specific manufacturers or products are specified herein, substitutions are not allowed unless specifically approved for a specific project by WCM's Department of Engineering and Maintenance.

3. GENERAL REQUIREMENTS

3.1 The system and components provided shall be the most current system the manufacturer has to offer at the time of installation.

3.2 The entire BMS System shall be interfaced with the existing BMS Systems. Where a laboratory flow tracking system is required (i.e. for pressure control applications), that system is to be fully controllable by the ALC, Schneider or Siemens BMS System provided without the use of software provided by any third party.

3.3 Field mounted sensors and transmitters for temperature, relative humidity and static pressure inputs to direct digital controllers shall be electronic with a 4-20 mA current output signal.

3.4 Actuation of automatic control valves and dampers shall be electric.

3.5 All point names, equipment ID's, BMS equipment labeling, etc. must comply with WCM's existing **Equipment Naming Convention for Preventive Maintenance Program and Building Management Systems** contained in **Appendix 1** of this document.

3.6 Network computer advisory messages, printouts, logging, alarm formats, trending, etc. must follow WCM's existing format.

3.7 Open System Architecture: The BMS System must ensure open architecture. The BMS shall have open BACnet communication protocol. It shall have the ability to communicate through KNX, LonWorks, Modbus, M-bus, DALI, etc.

4. EXISTING SYSTEMS

4.1 The design engineer and select BMS contractor shall survey the existing WCM BMS serving the WCM space and determine the upgrades required to interface the control work described herein (i.e., hardware, software, communication wiring, etc.). All new software, software upgrades, hardware, power, control and signal wiring, new direct digital control units and electronic components required to interface the control work described herein to the existing systems shall be provided.

5. DIRECT DIGITAL CONTROL SYSTEM

5.1 The direct digital control system shall consist of a network of ALC, Schneider, or Siemens software and microprocessor based direct digital control units (DDC). Each direct digital control unit shall perform all specified control and monitoring functions independently. Failure of one control unit shall have no effect upon any other unit in the network. The direct digital control units shall communicate with each other and an existing campus PC Based network computers.

5.2 The BMS System must ensure open architecture. The BMS shall have open BACnet communication protocol. It shall have the ability to communicate through KNX, LonWorks, Modbus, M-bus, DALI, etc.

5.3 The operator, through any WCM ITS tagged network device, shall have the ability to monitor DDC application and sensor data, override set points and schedules, set and reset control points and download programs to the local direct digital control units.

5.4 System input/output point capacity shall be expandable by the addition of DDC units or other controllers to the communications network. Installed cabinets shall have 10% spare of each type of input/output used in the cabinet (i.e. DI, DO, AI, AO, etc.), with a minimum of two (2) spares for each type used.

5.5 Provide 10% spare parts (minimum 1) of each type of sensor used (i.e. thermostats, pressure sensor, temperature sensor, airflow, water flow, differential pressure, etc.)

5.6 Equipment normally associated with a conventional analog control panel will be replaced by a local, stand-alone direct digital control unit. Pneumatic equipment other than E/P relays and I/P transducers shall not be used. Typically, use of any required pneumatic device should be avoided where possible.

5.7 There shall be a discrete analog and/or digital output signal for each field device. Split ranging of a single analog output to sequence valves and dampers is not acceptable.

6. SYSTEM ARCHITECTURE

6.1 Prior to concluding the project update all systems trees, profiles, BMS architecture, etc. to reflect panel or device ID, physical location and IP address.

6.2 The BMS System must ensure open architecture. The BMS shall have open BACnet communication protocol. It shall have the ability to communicate through KNX, LonWorks, Modbus, M-bus, DALI, etc. The system architecture shall consist of a network of independent, stand-alone direct digital control units. Each control unit shall perform all specified control functions independently. Failure of one control unit shall have no effect upon any other unit in the network. Each direct digital control unit shall communicate with each other and with network computers.

6.3 New work shall be connected to the existing BMS network via an ethernet system and interconnection through WCM's intranet. WCM's existing BMS system has been divided into nodes. Components within each node are connected via cable. The Nodes are interconnected via the intranet. The interconnection point and method of interconnection for all new work is to be coordinated with Engineering and Maintenance.

6.4 Each direct digital control unit shall be capable of sharing point information with other direct digital control units, such that control sequences or closed loop control executed at one control unit may receive input signals from sensors connected to other units on the network. If the network communications link fails or the originating control unit malfunctions, the control loop shall continue to function, using the last value received from the failed direct digital control unit.

7. OPERATING ENVIRONMENT

7.1 The entire control system installed within the building shall be capable of operating at ambient temperature between 40°F. and 110°F., except for the network computer where the operating temperature range shall be between 50°F. and 95°F. with relative humidity maintained between 20% and 85%, non-condensing. All equipment installed outside the building shall be rated for outdoor use and shall be capable of operating in a temperature range between -5°F. and 110°F.

7.2 The entire system shall operate normally within fluctuations of plus or minus 10 percent in the nominal voltage of primary power sources.

8. DIRECT DIGITAL CONTROL UNITS

8.1. The operating programs and database shall be protected against loss of normal power by 72-hour (minimum) volatile memory battery backup.

8.2 In the event of power failure or power interruption, and where Emergency or UPS power is not otherwise provided, all unit outputs shall go to a fail-safe condition, allowing all final control elements (i.e., valves, dampers, fans, pumps, etc.) to go to their respective fail-safe modes.

8.3 Upon recovery from a power failure (normal power restored), the control unit shall automatically resume full operation based upon a restart software program. In addition, all control loops shall be reset upon system restart to the condition they would have been in had a power failure not occurred. All equipment shall be commanded to the last known operating mode. The next subsequent scan of the system shall update all control points in the local controllers and network computer to current status.

8.4 Each module in the cabinet that controls a field device (i.e. pump, valve, damper, etc.) shall have a manual override switch on the front of the module that will enable a technician to manually operate the end device without the use of a computer in the event of a cabinet or communication failure.

8.5 System software shall return to the designed nominal set point when released from Operator (or equiv.) Priority or from Disabled.

8.6 Each cabinet shall have a readable drawing of the final cabinet configuration, showing all inputs, outputs, sensors, etc. The cabinet shall be provided with a pocket to hold the drawing.

9. COMPUTERS, HANDHELDS AND ACCESS DEVICES

9.1 When required, a master station (fat client) computer equipped with required software and licenses shall be provided. The number of master stations required is project specific and is to be determined by WCM's Department of Engineering and Maintenance.

9.2 All WCM BMS systems should be consist of web-based software and be accessible form any ITS tagged device with proper security access rights. As a result, laptops and other touchpad, handheld devices, etc. may also be required. The need for these devices as part of the project will be determined by WCM's Department of Engineering and Maintenance.

10. SYSTEM COMMUNICATIONS

10.1 Each master station shall alarm and notify the operator by screen display, audio tone and text message when a communications breakdown occurs between any direct digital control unit and the network computer or unitary controller and direct digital control unit.

11. NETWORK COMPUTER SOFTWARE

11.1 The existing network computer operating system and software graphics shall be reused. If a more current version of the software is available at the time of installation, the software shall be upgraded to this newest version.

12. GRAPHICS

12.1 The existing graphics shall be used as the basis for new graphics required for this project unless otherwise requested by Engineering & Maintenance. Sample graphics are provided in **Appendix 2**. Deviations from the standard graphics formats already in use will not be accepted without Engineering and Maintenance approval. Where necessary, existing graphics shall also be modified to incorporate this project.

12.2 Provide a separate graphic display for each controlled system. As a minimum, the following systems require graphic displays:

	System
1	Campus Menu
2	Building Menu
3	Air Handler
4	Air Handler with Face/Bypass Preheat Coils
5	General Exhaust Fans
6	Fume hood and Specialty Exhaust Fans
7	Fume hood
8	Supplemental A/C Units
9	Chilled Water System
10	Cooling Tower
11	Steam/Hot Water Heat Exchanger
12	Lab Air Compressors, Lab Vacuum Pumps
13	Misc. Alarms, Metering
14	Floor Control Menu
15	Floor Graphics
16	Lab Controller, VAV, CAV Schedules

12.3 Floor plans shall incorporate the actual architectural drawings for background use. Custom drawn backgrounds by the BMS vendor are not acceptable. Single line ductwork from the terminal device to the diffuser location(s) have to be shown to scale on the floor plans.

12.4 Equipment status shall be displayed using the color convention already in use on the specific BMS. Typically, that color convention is as follows:

Green – On
Blue – Off
Yellow – Alarm

NOTE: The above colors may vary by BMS vendor. It is important that the color scheme not change from project to project on the same manufacturer BMS system.

12.5 Points (status, analog quantities) that changed to an alarm condition shall be displayed as blinking yellow. When the alarm condition has cleared, the points shall revert to their normal color, which is typically steady blue.

12.6 Alarms shall not automatically generate a graphic display but shall send a message to the operator indicating on which graphic display the alarm condition may be viewed.

12.7 Space temperatures shall be alarmed. The alarm set points will be +/- 5 degrees of the current set point. The alarm set point will change accordingly if a room set point is manually changed at the computer.

12.8 Network computer advisory messages, logging and alarm formats shall follow WCM's existing format.

12.9 All BMS controlled fans shall be added to WCM's existing Emergency Fan Operation program and the associated graphics.

12.10 Graphics must have a link within the bottom bar (or equiv.) to access the approved submittals complete with Sequence of Operations and 'as-built' wiring diagrams.

13. LABORATORY FLOW CONTROL SYSTEM (WITH OR WITHOUT FUME HOODS)

13.1 When a laboratory flow control system is required, the system shall be fully integrated with the building management system to enable simultaneous two-way communications between the two systems. **The use of third party software to accomplish this control is not acceptable**. This functionality shall allow an operator to remotely monitor and adjust all variables and set points associated with the laboratory flow control system directly from any building management systems from any master station computer (new or existing) or ITS tagged laptop, handheld, etc.

13.2 A digital display indicating face velocity shall be provided on each fume hood.

13.3 Sash position sensors shall be provided for all fume hoods.

13.4 The exhaust through the fume hood should be calculated and incorporated as part of the room total exhaust. The fume hood exhaust should never be a plug number.

13.5 Minimum laboratory airflow settings for supply terminal boxes shall never be set higher than 4 ACH Unoccupied and 6 ACH Occupied. These minimum ACH rates will be lower for dry lab and administrative spaces.

14. INSTRUMENTATION

14.1 Temperature Transmitters (Electronic Type):

a. Duct mounted averaging type transmitters shall consist of a 1000-ohm platinum RTD averaging element with an accuracy of ±1°F. over entire operating span. Probe length shall be one (1) linear foot per four (4) square feet of duct area.

b. Duct mounted non-averaging type transmitters shall consist of a 1000-ohm platinum RTD element with an accuracy of ±0.5°F. over the entire operating span. Probe length shall be full length of duct.

c. Liquid insertion type transmitters shall consist of a spring loaded 1000-ohm platinum RTD with an accuracy of ± 1.0°F. over entire operating span.

d. Space transmitter shall consist of a 1000-ohm platinum RTD element with an accuracy of ±1°F. over entire operating span.

e. Space thermostats shall be provided with a user accessible override button so that users can manually override a night setback setting for a pre-determined time period. The default setting for such time period is one hour. Devices should not display temperatures locally.

f. All sensors shall be provided with a communications port access to operations information. An operator shall be capable of accessing the information via a hand-held terminal unit.

g. Combination temperature and humidity transmitters are not acceptable.

14.2 Occupancy/vacancy sensors shall be used in all spaces receiving the BMS controls. These sensors shall provide 100% coverage of the area(s) they are used to control. The same sensor(s) being used to communicate with a lighting control system will also be tied into the BMS to indicate occupied/unoccupied status.

14.3 Static Pressure Transmitters (Electronic Type): Transmitter will have an accuracy of ±0.05% of span.

14.4 Protective Thermostats and Detectors

a. Electric high temperature thermostats shall be bimetallic element type with snap-acting manual reset switch and with a sensing element with at least 10-inch insertion length. Thermostats shall be set for duct temperature of 125°F., unless otherwise noted.

b. Electric low temperature (freeze protection) thermostats shall have adjustable non-averaging capillary installed to protect the entire cross-sectional area of coil face. Switch actuation shall occur if any 12-inch length of capillary senses a temperature below set point.

14.5 Relative Humidity Transmitters:

a. Duct mounted relative humidity transmitter shall have an accuracy of ±5.0% R.H. over the range of set point and ±2.5% R.H. over the range of 0-95% R.H. at 25°C. Repeatability ±0.5% R.H.; linearity ±1% R.H.

b. Space relative humidity transmitter shall have an accuracy of ±5.0% R.H. over the range of set point and ±2.5% R.H. over the range of 0-95% R.H. at 25°C. Repeatability ±0.5% R.H.; linearity ±1% R.H.

c. Combination temperature and humidity transmitters are not acceptable.

14.6 Weather Station

a. The weather station shall initially be used to measure outside air dry bulb temperature and relative humidity.

b. Temperature sensor shall have an accuracy of ±1°F.over a range of -40°F. to 120°F.

c. Relative humidity sensor, shall have an accuracy of ±2% R.H. over the range of 20-90% R.H.

d. Surge arresters shall be provided at sensor inputs to prevent system damage from voltage spikes.

14.7 Thermowells

a. Provide a Thermowell for every temperature sensing element installed in piping and equipment, including transmitter sensing bulbs, RTD's and temperature switches.

b. Thermowells shall be Type 304 stainless steel, tapered pattern, 3/4 inch NPT external process connection, 1/2 inch NPT internal thread, with lagging extension, equal to insulation thickness, where installed in insulated piping.

c. Thermowells shall have an insertion length of at least 1/3 of pipe diameter but in no case shall wells be less than 4-1/2-inch insertion length. Maximum immersion length shall be 6 inches or 3/4 of pipe diameter, whichever is smaller.

d. Thermowells shall be rated for maximum system operating pressure, temperature and fluid velocity.

e. Internal bore of Thermowells shall be sized to exactly fit the diameter of the sensing element to be installed.

14.8 Differential Pressure Transmitters (Used in Water Service)

a. Differential pressure transmitters shall be variable capacitance type.

14.9 Differential Pressure Transmitter (Air Units Only)

a. Air flow sensing elements serving flow tracking systems supply and exhaust variable/constant volume terminal units and fume hood exhaust valves shall be furnished with electronic differential pressure transmitters.

b. Electronic differential pressure transmitters shall have an accuracy of ±1.0% of span, including linearity, hysteresis and repeatability. Repeatability ±0.5% of span.

14.10 Airflow Measuring Stations

a. Airflow measuring stations shall have an accuracy of ±2% of actual flow over their range, with a 6 to 1 capacity turndown. Repeatability ±0.5% of span.

14.11 Differential Pressure Switch – Water

a. Differential pressure switch shall contain brass bellows, which shall operate snap-acting SPDT contacts. High and low sensing ports shall be 1/4 inch NPT. Adjustable operating range shall be capable of sustaining 75 psig in either direction.

14.12 Differential Pressure Switch – Air

a. Differential pressure switch shall be diaphragm operated with SPDT contacts. Contact rating shall be 15A, 120VAC. High and low sensing ports shall be 1/8 inch NPT connected to angle type tips designed to sense pressure.

14.13 Electric Pneumatic Valve

a. Forged brass or bronze three-way valve operated by a continuous duty Class A or Class F coil, for interlock between electrical system and pneumatic control system. Provide pilot valve, as required for large air consumption devices. Valves shall be field cabinet mounted, unless otherwise directed by Engineer.

14.14 Current Sensing Relays

a. Relay shall be field adjustable for detecting a.c. current levels in equipment served. Relay shall be non-latching and shall have no time delay.

15. AUTOMATIC CONTROL VALVES

15.1 Preheat valves shall be normally open type. Chilled water and reheat valves shall be normally closed type.

15.2 Heat exchanger, reheat and chilled water valves shall be normally closed type.

15.3 Whenever the flow rate is such as to require a single valve larger than 2-1/2 inches, provide two valves in parallel, arranged to operate in sequence. Provide a separate control signal to each valve.

15.4 Control valves operating in sequence with other valves or dampers in modulating service shall be provided with pilot positioning relays. Provide a separate control signal to each valve.

16. AUTOMATIC CONTROL AND AUTOMATIC SMOKE DAMPERS

16.1 Dampers under modulating control such as outdoor air, return air and spill air dampers in air conditioning systems and air intake, recirculation air, and exhaust air dampers in ventilation systems will have opposed blade action.

16.2 The position of a damper shall be proofed and never assumed. The position of each damper including fire smoke dampers shall be communicated back to the BMS and identified on the graphic.

16.2 Dampers in two-position service such as outdoor air intake and exhaust air dampers in 100 percent outdoor air ventilation systems, fan discharge dampers and floor isolation dampers in supply and return air ducts will have parallel blade action.

16.3 A sufficient number of damper operators shall be installed to operate single and multiple damper sections smoothly and in unison at the maximum rated static pressure and air velocity, and to provide the close-off torque required to meet damper leakage criteria. Provide auxiliary drive shafts with pillow block bearings and bearing support brackets rigidly attached to the damper frame assembly on damper banks more than one damper section wide.

16.4 Pilot positioners having adjustable operating ranges and starting points shall be provided for modulating dampers and dampers that operate in sequence with other dampers or valve operators.

17. POWER REQUIREMENTS

17.1 Power for each direct digital control unit, field equipment panel, flow tracking system components, etc. shall be taken from a 120 volt a.c. dedicated circuit. Control system components that serve equipment/systems connected to the emergency power system shall themselves be powered from the emergency power system (i.e. if an air handler is on emergency power, all of it's related controls shall be connected to emergency power). Control system components fed from the emergency power system shall be fed through a UPS capable of sustaining the equipment for a minimum of 2 hours.

17.2 All control cabinets shall be provided with battery backup capable of supporting all random access memory (RAM), clock functions, and DDC database and operating programs within the control unit for 72 hours (minimum) in the event of power failure or power interruption.

17.3 When a central UPS is provided, provide a UPS power riser drawing, including UPS sizing calculations.

17.4. When instrument air is provided, the system must be connected to emergency power when available.

18. DESCRIPTION OF CONTROL OPERATION

18.1 **Appendix 3 – Standard Point Lists** identifies the minimum points that are to be included for various systems/equipment. Typically, these points are displayed on the system graphics in accordance with WCM's standard graphic schemes. These points are in addition to any other points required to successfully implement the required Sequence of Operation for any system. Alarming and Trending requirements are also identified within this Appendix.

18.2 Unless otherwise noted, air conditioning systems, heating and ventilating systems and exhaust fans may be started manually from the DDC system network computer, the smoke control panel, or from a time of day program within the local stand-alone direct digital control units and run subject to smoke detector and protection interlocks. In addition, the network computer can start and stop each system regardless of the time program.

18.3 All constant speed motors and variable frequency drives shall be provided with "Hand-Off-Auto" switches located at the starter or drive. Motors can be started locally by placing these switches in the "Hand" position.

18.4 Motor run status at DDC units shall be determined via adjustable current sensing relays.

18.5 Any time a motor is switched to the Hand or Off position via the HOA switch, an "off-normal" alarm shall be transmitted to the network computer.

18.6 Alarming devices (i.e., freezestats, pressure switches, dry alarm contacts) shall be wired so that alarm contacts "open" in the alarm condition.

18.7 All points needed for the operation of a program shall be physically located within that cabinet, with the exception of programs that are utilizing campus-wide or building-wide data. When points such as outside air temperature must be shared across many cabinets, the programs shall default to the last known good data upon loss of cabinet to cabinet communication.

18.8 Individual freezestats shall be provided for each cooling coil in air handler units. Each freezestat is to be separately alarmed. Freezestats shall be self-resetting, adjustable and shall operate a software lockout which will trip the unit. The software lockout, when activated, will require operator intervention at a network computer to reset. Reset shall be via operation of a software reset pushbutton.

18.9 When an air handler trips on freezestat, the preheat valve will be modulated to maintain a preheat temperature of 50 degrees. The preheat valves will not go fully open in response to a freezestat trip as this results in overheating the supply air upon restoration of the unit.

18.10 Individual temperature sensors shall be provided for each heating coil in air handler units. The sensors must be named for the coil they are monitoring (i.e. Top.East, Bottom.Center, etc.) per the standard nomenclature.

18.11 Pressure safeties for air handlers (i.e. high static, low suction static, etc.) shall provide hard lockouts which will require a physical reset at the equipment in addition to a reset of the software lockout point. Pressure safeties shall be individually alarmed.

18.12 All trended shall be offline type to reduce or eliminate network traffic. The trend data shall be saved to the appropriate server for a minimum of 90 days.

18.13 All graphics shall include a link to a .pdf document of the applicable approved controls submittal with sequence of operation.

19. INSTALLATION REQUIREMENTS

19.1 All floor mounted equipment and cabinets shall be installed on minimum 4” concrete pads.

19.2 All control components including automatic control valves, dampers, instruments, sensors, etc. shall be tagged for identification. Acceptable methods of tagging are: laminated plastic, stamped metal, engraved plastic.

19.3 All cabinets and panels shall be permanently labeled with a screw-fastened type engraved nameplate with 1/4-inch-high white lettering on black background.

19.4 Control air piping ¾” and larger shall be labeled with pipe identification labels.

19.5 All devices powered by 120V and above shall be clearly labeled with the panel and circuit number of the source. Brother “P-Touch” type labeling is acceptable.

19.6 BMS System signaling and control wiring in Mechanical Equipment Rooms, communications, electrical closets or other areas in which the potential for physical damage is high, shall be in conduit, EMT or cable tray.

19.7 BMS System signaling and control wiring above removable ceilings shall be bundled together and run in flexible innerduct. The innerduct shall be imprinted as a minimum every 10 feet with the name of the controls manufacturer (Siemens or Andover). Innerduct for Siemens work shall be blue. Innerduct for Andover work shall be orange.

19.8 Use of tie wraps for supporting conduit, wire, cable, etc., is not permitted.

19.9 All BMS equipment must be located in accessible locations. When equipment is installed above the ceiling or in an open ceiling configuration, the centerline of the equipment can be no higher than 11 feet above the finished floor. This is Based on the use of an 8 foot “A frame” ladder with a 6' person standing no higher than the second step from the top. Equipment needs to be installed in locations where the “A frame” ladder can be set up without standing on furniture, lab benches, etc. Access to equipment can not be obstructed by light fixtures, piping, supports, other equipment, etc.

19.10 When equipment is installed above hard or otherwise inaccessible ceilings, access doors with a minimum opening of 2’ x 2’ must be provided. Access doors must be installed in locations such that the above access requirements are met.

19.11 The DDC control units related to VAV’s, air valves, CVB’s, etc. can be located remotely from the devices they control, provided that the access requirements for both the controller and the controlled device are met.

19.12 Other than control units related to a specific device, all control panels must be mounted in accessible locations at floor level. Cabinets shall not be installed in locations where they will be blocked by furniture, user equipment or machinery. Cabinets shall be lockable if not installed in locked rooms. Cabinets are not required to be installed in locked rooms. All locked BMS cabinets across the campus (new and existing) shall be keyed to a single key specific to each approved BMS manufacturer

20. TESTING, CALIBRATION AND COMMISSIONING

20.1 Test and adjust all installed components including the operation of control loops, set points and interlocks. Every input/output point shall be tested for proper performance through the entire system. Maintain accurate test records for submittal to the owner.

20.2 As part of the point to point testing, and commissioning both the BMS vendor and the commissioning agent should verify that no points are kept in ‘OPER”, Operator, or otherwise locked mode at the point the system is being turned over to WCM Engineering & Maintenance.

21. INSTRUCTION OF OPERATING PERSONNEL

21.1 Provide a minimum of 12 hours of operating and maintenance instruction for one building operator, offsite by factory trained engineers representing the direct control system manufacturer.

21.2 Provide on-site technician training to the extent and duration necessary to familiarize the owner's technician's with the BMS System operation of all systems provided as part of the project. Typically, training sessions are 1-3 hours each in length and are spread over multiple days for operational reasons. The overall amount of training required will be dependent on the size of the project, systems involved and the number of staff that need to be trained. As-built drawings and, if applicable, commissioning documents should be shared in advance of the training session(s).

22. SERVICING AND MAINTENANCE REQUIREMENTS

22.1 Two (2) complete sets and (1) electronic set, each, of the following shall be provided to the owner (additional sets may be required by WCM's consultants):

a. Written operating and maintenance instructions
b. "As-built" wiring diagrams in PDF
c. Specification data sheets
d. Maintenance schedules
e. Approved design submittal complete with Sequence of Operations

Note: Items 'b' and 'e' above should also be available through a link on the Graphic as well.

22.2 Three (3) complete sets of any special tools, meters, etc. required to service the components provided.

APPENDIX 1
EQUIPMENT IDENTIFICATION AND BMS POINT NAMES

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The following system is to be utilized for identifying all equipment, meters, etc. on the design, construction and as-built drawings. This system is also used within the WCM computerized maintenance management system for service calls and the Preventive Maintenance Program.

EQUIPMENT DESIGNATION

The following format must be used for all equipment designation:

Equipment Designation: **EEEE-BB-FF-NNAA**

where:

EEEE is the Equipment Type Codes as identified under the EQUIPMENT TYPE CODES section below.

BB is the Building Code as determined by Capital Planning Space Management.

FF is the Floor that the equipment is physically located on.

Floor Examples:

SSB	Sub-Sub-Basement
SB	Sub-Basement
B	Basement
01-17	Floors 1 through 17
R06	Roof at 6th floor elevation (typical)

NN is the sequential number for each of that specific equipment type physically located on that floor in that building.

APPENDIX 1
EQUIPMENT IDENTIFICATION AND BMS POINT NAMES

AA (if needed) is an alphabetical code that is applied to separate two or more pieces of equipment that may be part of the same overall equipment type (i.e. Compressor A and Compressor B in a two-compressor set)

Examples:

ACCH-S-R12-1 is an **A**ir **C**ooled **Ch**iller located in the **S** building on the **12**th floor **r**oof (Floor **R12**) and it is the **1**st piece of this equipment type on the level in this building

HWCP-S-11-3A is a **H**ot **W**ater **C**irculating **P**ump in the **S** building **11**th floor and it is the **3**rd of that type of equipment type located on that floor, and it is pump **A** of a set of two or more (i.e. a skid mounted system or similar)

BMS POINT IDENTIFICATION

The following system is to be utilized for identifying items that are connected in some way to one of the WCM Building Management Systems.

Please note that the position of the 'BUILDING CODE' and the 'EQUIPMENT TYPE CODE' are intentionally reversed for the 'BMS POINT IDENTIFICATION' as compared to the 'EQUIPMENT DESIGNATION'.

Additionally, for 'BMS POINT IDENTIFICATION', "periods" are used as separators in place of "dashes".

BMS Point Name: **BB.EEEE.FF.NNAA.DDDD.DDDD**

where:

BB is the Building Code as determined by Capital Planning Space Management.

EEEE is the Equipment Type Codes as identified under the EQUIPMENT TYPE CODES section below.

FF is the Floor that the equipment is physically located on.

Floor Examples:

APPENDIX 1
EQUIPMENT IDENTIFICATION AND BMS POINT NAMES

SSB	Sub-Sub-Basement
SB	Sub-Basement
B	Basement
01-17	Floors 1 through 17
R06	Roof at 6th floor elevation (typical)

NN is the sequential number for each of that specific equipment type physically located on that floor in that building.

AA (if needed) is an alphabetical code that is applied to separate two or more pieces of equipment that may be part of the same overall equipment type (i.e. Compressor A and Compressor B in a two-compressor set)

DDDD is the further equipment/system/point descriptor from the Building Automation System Point Glossary (see the separate WCM BMS Standards). Multiple point descriptors may be required.

Example:

S.AHU.11.5.SF.LTD is in **S** building, **A**ir **H**andler **U**nit, **11**th Floor, Unit #**5** on that floor, the **S**upply **F**an section, **L**ow **T**emperature **D**etector

EQUIPMENT TYPE CODES

The following is a current list of Equipment Type Codes currently used by Engineering & Maintenance. These codes are consistent with the WCM computerized maintenance management system. These codes should be used as specified in sections 'EQUIPMENT DEISGNATION' and 'BMS POINT IDENTIFICATION' above.

Equip. Type Code	Equipment
ABS	ABSORBER
ACCH	AIR COOLED CHILLER
ACU	PACKAGED A/C UNIT
AHU	AIR HANDLER UNIT

APPENDIX 1
EQUIPMENT IDENTIFICATION AND BMS POINT NAMES

AP	AIR PURIFIER
APRS	AIR PRESSURE REDUCING STATION
ATS	AUTOMATIC TRANSFER SWITCH
AWT	ACID WASTE TANK
B	BOILER
BAT	BATTERIES/CHARGERS
CAC	CONTROL AIR COMPRESSOR
CAD	CONTROL AIR DRYER
CDM	CLOTHES DRYER MACHINE
CHWP	CHILLED WATER PUMP
CP	CONDENSATE PUMP
CR	COLD ROOM
CT	COOLING TOWER
CURT	CURTAINS
CWM	CLOTHES WASHER MACHINE
CWP	CONDENSER WATER PUMP
D	DOOR
DC	DRY COOLER
DH	DEHUMIDIFIER
DHWH	DOMESTIC HW HEATER
DHWP	DOMESTIC HW CIRC PUMP
DHWT	DOMESTIC HW STOR TANK
DPE	DIST. PANEL EMERGENCY
DPN	DIST. PANEL NORMAL
DR	DRAIN
DS	DISCONNECT SWITCH
DWP	DOMESTIC WATER PUMP
DWT	DOMESTIC WATER TANK
E	ELEVATOR
EF	EXHAUST FAN
EMP	EMPLOYEE
ERU	ENERGY RECOVERY UNIT
ESC	ESCALATOR
ET	EXPANSION TANK

APPENDIX 1
EQUIPMENT IDENTIFICATION AND BMS POINT NAMES

FBRC	FILTER BANK. RAD. CARB.
FCU	FAN COIL UNIT
FDR	FIRE DOOR
FK	FLOOD KIT
FL	FREEZER LABORATORY
FOP	FUEL OIL PUMP
FOT	FUEL OIL TANK
FP	FIRE PUMP
FPB	FAN POWERED BOX
GEN	GENERATOR
GP	GLYCOL PUMP
GT	GREASE TRAP
H	HUMIDIFIER
HAF	HOT AIR FURNACE
HWCP	HW CIRCULATING PUMP
HX	HEAT EXCHANGER
IM	ICE MACHINE
IR	INCUBATOR ROOM
IS	IRRIGATION SYSTEM
JP	JOCKEY PUMP
K	KITCHEN
LAC	LAB AIR COMPRESSOR
LAD	LAB AIR DRYER
LGS	LAB GAS/AIR SHUTOFFS
LPE	LIGHTING PANEL EMERGENCY
LPN	LIGHTING PANEL NORMAL
LVP	LAB VACUUM PUMP
MCCE	MCC EMERG.
MCCN	MCC NORMAL
MDCW	METER DOMESTIC WATER
MEE	MISC.ELECTRICAL EQUIP
MELE	METER ELECTRIC
MSTM	METER STEAM
MWP	MAKEUP WATER PUMP

APPENDIX 1
EQUIPMENT IDENTIFICATION AND BMS POINT NAMES

PC	POWER CONDITIONER
PPE	POWER PANEL EMERG.
PPN	POWER PANEL NORMAL
RF	RETURN FAN
RHCW	REHEAT COIL-WATER
RL	REFRIGERATOR-LABORATOR
ROOM	ROOM
RRS	REFRIGERANT RECOVERY
SAFE	SAFE
SEC	SECURITY SYSTEM
SEP	SEWAGE EJECTOR PUMP
SP	SUMP PUMP
SPR	FIRE SPRINKLER SYSTEM
SPRV	STEAM PRV STATION
SSF	SIDE STREAM FILTER
SWG	SWITCHGEAR
TXE	TRANSFORMER EMERGENCY
TXN	TRANSFORMER NORMAL
UHE	UNIT HEATER-ELECTRIC
UHG	UNIT HEATER-GAS
UHHW	UNIT HEATER-HOT WATR
UHS	UNIT HEATER-STEAM
VAV	VARIABLE AIR VOL BOX
VFD	VARIABLE FREQ. DRIVE
WAC	WINDOW AIR CONDITIONE
WCCH	WATER COOLED CHILLER
WS	WATER SOFTENER
WT	WATER TANK
WTS	WATER TREATMENT SYSTEM

SAMPLE EQUIPMENT LIST

Tag #	**Equipment Description**

APPENDIX 1
EQUIPMENT IDENTIFICATION AND BMS POINT NAMES

ABS-S-11-1	ABSORBER S-11-1
ABS-SI-5-1	ABSORBER SI-5-1
ACCH-S-R12-1	AIR COOLED CHILLER S-R12-1
ACCH-S-R14-1	AIR COOLED CHILLER S-R14-1
ACU-S-10-1	A/C UNIT S-10-1 (ACCR2)
ACU-S-3-1	A/C UNIT S-3-1 (SERVES ANIMAL HOLDING ROOM S318)
ACU-S-3-2	A/C UNIT S-3-2 (SERVES ANIMAL HOLDING ROOM S303)
ACU-S-3-3	A/C UNIT S-3-3 (SERVES ANIMAL HOLDING ROOM S302)
ACU-S-3-4	A/C UNIT S-3-4 (SERVES ANIMAL HOLDING ROOM S301)
AHU-S-11-1	AIR HANDLER UNIT S-11-1 (AC 11-1)
AHU-S-11-1A	AIR HANDLER UNIT S-11-1A (AC 11-1A)
AHU-S-11-2	AIR HANDLER UNIT S-11-2 (A/C 11-2)
AHU-S-11-3	AIR HANDLER UNIT S-11-3
AHU-S-11-5	AIR HANDLER UNIT S-11-5 (AC-5)
AHU-S-B-1	AIR HANDLER UNIT S-B-1 (AC-1)
AHU-S-B-2	AIR HANDLER UNIT S-B-2 (AC-2)
AHU-SI-1-1	AIR HANDLER UNIT SI-1-1 (ACU-4)
AHU-SI-1-2	AIR HANDLER UNIT SI-1-2 (ACU-5)
AHU-SI-2-1	AIR HANDLER UNIT SI-2-1 (ACU-6)
AHU-SI-3-1	AIR HANDLER UNIT SI-3-1
AHU-SI-B-1	AIR HANDLER UNIT SI-B-1 (ACU-1)
AHU-SI-B-2	AIR HANDLER UNIT SI-B-2 (ACU-2)
ATS-S-B-1	AUTO TRANSFER SW. S-B-1 (ATS-18)
ATS-S-B-2	AUTO TRANSFER SW. S-B-2 (ATS-19)
AWT-S-B-1	ACID WASTE TANK S-B-1
CAC-S-B-1A	CONTROL AIR COMPRESSOR S-B-1A
CAC-S-B-1B	CONTROL AIR COMPRESSOR S-B-1B

APPENDIX 1
EQUIPMENT IDENTIFICATION AND BMS POINT NAMES

CAC-S-B-2	CONTROL AIR COMPRESSOR S-B-2
CAC-S-B-3	CONTROL AIR COMP. S-B-3
CAD-SI-3-1A	CONTROL AIR DRYER SI-3-1A
CAD-SI-3-1B	CONTROL AIR DRYER SI-3-1B
CHWP-S-11-1	CHILLED WATER PUMP S-11-1
CHWP-S-11-2	CHILLED WATER PUMP S-11-2
CHWP-SI-3-1	CHILLED WATER PUMP SI-3-1
CHWP-SI-3-2	CHILLED WATER PUMP SI-3-2
CP-S-11-1A	CONDENSATE PUMP S-11-1A
CP-S-11-1B	CONDENSATE PUMP S-11-1B
CP-S-B-1A	CONDENSATE PUMP S-B-1A
CP-S-B-1B	CONDENSATE PUMP S-B-1B
CR-S-2-1	COLD ROOM S-2-1
CR-S-4-1	COLD ROOM S-4-1
CT-S-R12-1	COOLING TOWER S-R12-1
CT-S-R14-1	COOLING TOWER S-R14-1 (SERVES ABS-SI-5-1)
CWP-S-11-1	CONDENSER WATER PUMP S-11-1 (CW-1)
CWP-S-11-2	CONDENSER WATER PUMP S-11-2 (CW-2)
CWP-SI-5-1	CONDENSER WATER PUMP SI-5-1 (SERVES ABS-SI-5-1)
DHWH-S-B-1A	DOMESTIC HOT WATER HEATER S-B-1A
DHWH-S-B-1B	DOMESTIC HOT WATER HEATER S-B-1B
DWP-S-11-1	DOMESTIC WATER PUMP S-11-1
DWP-S-11-2	DOMESTIC WATER PUMP S-11-2
DWP-S-B-1	DOMESTIC WATER PUMP 1 S-B-1
DWP-S-B-2	DOMESTIC WATER PUMP 1 S-B-2
DWT-S-12-1	DOMESTIC WATER TANK S-12-1

APPENDIX 1
EQUIPMENT IDENTIFICATION AND BMS POINT NAMES

E-S-1	ELEVATOR S-1 (PASSENGER)
E-S-2	ELEVATOR S-2 (PASSENGER)
EF-S-11-10	EXHAUST FAN S-11-10 (SERVES ROOM S1108)
EF-S-11-3	EXHAUST FAN S-11-3 (EX-3)
EF-S-11-5	EXHAUST FAN S-11-5 (EX-5)
EF-S-R12-1	EXHAUST FAN S-R12-1 (EX-R-1)
EF-S-R12-10	EXHAUST FAN S-R12-10 (FXS8-3)
EF-S-R12-17	EXHAUST FAN S-R12-17 (EFR 7-1)
EF-S-R12-18	EXHAUST FAN S-R12-18 (EFR 2-1)
EF-S-R12-19	EXHAUST FAN S-R12-19 (EFR 2-2)
EF-S-R12-2	EXHAUST FAN S-R12-2 (EX-R-2)
EFR-S-R14-1	EXHAUST FAN RADIOACTIVE SI-R14-1 (EF-13)
EFR-S-R14-2	EXHAUST FAN RADIOACTIVE SI-R14-2 (EF-14)
EFRC-SI-3-2	EXHAUST FAN RADIOACTIVE CARBON SI-3-2 (EF-2)
EFRC-SI-3-3	EXHAUST FAN RADIOACTIVE CARBON SI-3-3 (EF-3)
EFRC-SI-4-1	EXHAUST FAN RADIOACTIVE CARBON SI-4-1 (EF-5)
EFRC-SI-4-2	EXHAUST FAN RADIOACTIVE CARBON SI-4-2 (EF-6)
FBRC-SI-B-1	FILTER BANK RADIOACTIVE CARBON SI-B-1
FBRC-SI-B-2	FILTER BANK RADIOACTIVE CARBON SI-B-2
FBRC-SI-B-3	FILTER BANK RADIOACTIVE CARBON SI-B-3
HX-S-11-1	HEAT EXCHANGER S-11-1
HX-S-11-2	HEAT EXCHANGER S-11-2
HX-S-11-3	HEAT EXCHANGER S-11-3
LAC-S-11-1	LAB AIR COMPRESSOR S-11-1
LAC-S-11-2	LAB AIR COMPRESSOR S-11-2

APPENDIX 1
EQUIPMENT IDENTIFICATION AND BMS POINT NAMES

TXE-S-B-1	TRANSFORMER EMERG. S-B-1
TXE-S-B-2	TRANSFORMER EMERG. S-B-2
UHHW-SI-2-1	UNIT HEATER HOT WATER SI-2-1
UHHW-SI-2-2	UNIT HEATER HOT WATER SI-2-2
VFD-S-11-1	VARIABLE FREQ. DRIVE S-11-1
VFD-S-11-10	VARIABLE FREQ. DRIVE S-11-10
WTS-S-11-1	WATER TREATMENT SYSTEM S-11-1
WTS-S-11-2	WATER TREATMENT SYSTEM S-11-2
WTS-S-11-3	WATER TREATMENT SYSTEM S-11-3

SAMPLE BMS POINT NAMES

ABBREVIATION	MEANING
.ABS	ABSORBER
.ACCH	AIR COOLED CHILLER
.ACU	PACKAGED A/C UNIT
.AHU	AIR HANDLER UNIT
.ALM	ALARM POINT
.APRS	AIR PRESSURE REDUCING STATION
.ATS	AUTOMATIC TRANSFER SWITCH
.AWT	ACID WASTE TANK
.B	BOILER
.BAT	BATTERY
.BOT	BOTTOM
.BYP	BYPASS
.CAC	CONTROL AIR COMPRESSOR
.CAD	CONTROL AIR DRYER

APPENDIX 1
EQUIPMENT IDENTIFICATION AND BMS POINT NAMES

ABBREVIATION	MEANING
.CFM	AIR FLOW CFM
.CHWP	CHILLED WATER PUMP
.CHWR	CHILLED WATER RETURN TEMP
.CHWS	CHILLED WATER SUPPLY TEMP
.CLS	CLOSED
.COWP	CONDENSER WATER PUMP
.COWR	CONDENSER WATER RETURN
.COWS	CONDENSER WATER SUPPLY
.CP	CONDENSATE PUMP
.CR	COLD ROOM
.CT	COOLING TOWER
.CTF	COOLING TOWER FAN
.CTRL	CONTROL
.CV	CONSTANT VOLUME BOX
.CV	COOLING VALVE
.DAY	DAY
.DCW	DOMESTIC COLD WATER
.DHW	DOMESTIC HOT WATER
.DHWH	DOMESTIC HW HEATER
.DHWT	DOMESTIC HW STORAGE TANK
.DMPR	DAMPER
.DP	DIFFERENTIAL PRESSURE
.DT	DISCHARGE TEMPERATURE
.DWN	DOWN
.EF	EXHAUST FAN
.EFR	EXHAUST FAN RADIOACTIVE
.EMER	EMERGENCY
.EST	EAST
.ET	EXPANSION TANK

APPENDIX 1
EQUIPMENT IDENTIFICATION AND BMS POINT NAMES

ABBREVIATION	MEANING
.FA	FIRE ALARM
.FCU	FAN COIL UNIT
.FD	FIRE DAMPER
.FH	FUME HOOD
.FHR	FUME HOOD RADIOACTIVE
.FIRE	FIRE
.FL	FREEZER - LABORATORY
.FLOW	FLOW
.FLR	FLOOR
.FP	FIRE PUMP
.GPM	WATER FLOW GPM
.H	HUMIDIFIER
.HI	HIGH
.HIL	HIGH LIMIT
.HIS	HIGH STATIC
.HPS	HIGH PRESSURE STEAM
.HWCP	HW CIRCULATING PUMP
.HX	HEAT EXCHANGER
.INT	INTAKE
.LAC	LAB AIR COMPRESSOR
.LAD	LAB AIR DRYER
.LAG	LAG
.LEAD	LEAD EQUIPMENT STATUS
.LO	LOW
.LOCK	LOCKOUT
.LOL	LOW LIMIT
.LOS	LOW STATIC
.LPS	LOW PRESSURE STEAM
.LRC	LAB CONTROLLER

APPENDIX 1
EQUIPMENT IDENTIFICATION AND BMS POINT NAMES

ABBREVIATION	MEANING
.LTD	LOW TEMPERATURE DETECTOR
.LVP	LAB VACUUM PUMP
.MAX	MAXIMUM
.MBC	MBC CABINET
.MIN	MINIMUM
.MOIST	MOISTURE
.MPS	MEDIUM PRESSURE STEAM
.MWP	MAKEUP WATER PUMP
.NGT	NIGHT
.NORM	NORMAL
.NTH	NORTH
.NYPH	NEW YORK PRESBYTERIAN HOSPITAL
.OA	OUTSIDE AIR
.OAH	OUTSIDE AIR RELATIVE HUMIDITY
.OAT	OUTSIDE AIR TEMPERATURE
.OCC	OCCUPIED
.OPN	OPEN
.P	PUMP
.PHRT	PREHEAT RETURN TEMPERATURE
.PHST	PREHEAT SUPPLY TEMPERATURE
.PHV	PREHEAT VALVE
.PRF	PROOF
.PRI	PRIMARY
.PRS	PRESSURE
.PRV	PRESSURE REDUCING VALVE
.R	RETURN
.RESET	RESET
.RF	RETURN FAN
.RHR	REHEAT RETURN TEMPERATURE

APPENDIX 1
EQUIPMENT IDENTIFICATION AND BMS POINT NAMES

ABBREVIATION	MEANING
.RHS	REHEAT SUPPLY TEMPERATURE
.RMT	ROOM TEMPERATURE
.RT	RETURN TEMPERATURE
.S	SUPPLY
.SD	SMOKE DETECTOR
.SDMPR	SMOKE DAMPER
.SEC	SECONDARY
.SEP	SEWAGE JECTOR PUMP
.SF	SUPPLY FAN
.SHUT	SHUTDOWN
.SMP	SUMP PUMP
.SP	SET POINT
.SPD	SPEED
.SS	START/STOP
.ST	SUPPLY TEMPERATURE
.START	START
.STAT	STATIC
.STDBY	STANDBY
.STH	SOUTH
.STM	STEAM
.STPT	SETPOINT
.SUM	SUMMER
.SV	STEAM VALVE
.SWOV	SWITCHOVER
.TMR	TIMER
.TOP	TOP
.TRIG	TRIGGER
.UNOCC	UNOCCUPIED
.UP	UP

APPENDIX 1
EQUIPMENT IDENTIFICATION AND BMS POINT NAMES

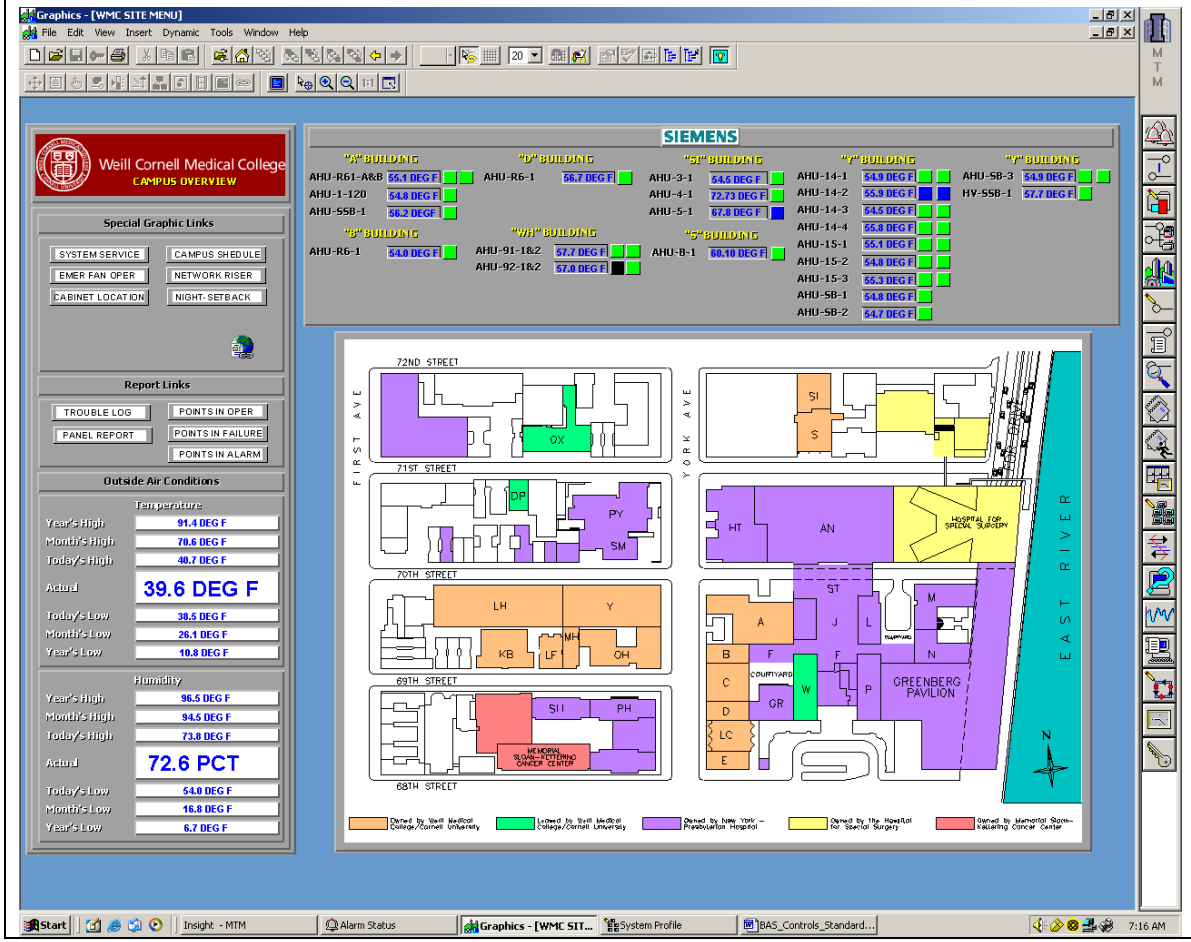
ABBREVIATION	MEANING
.UV	ULTRAVIOLET
.VAV	VAV BOX
.VFD	VARIABLE FREQUENCY DRIVE
.W	WEST
.WCCH	WATER COOLED CHILLER
.WINT	WINTER
.WMC	WEILL MEDICAL COLLEGE
.WTS	WATER TREATMENT SYSTEM

APPENDIX 2
SAMPLE GRAPHICS

APPENDIX 2: SAMPLE GRAPHICS

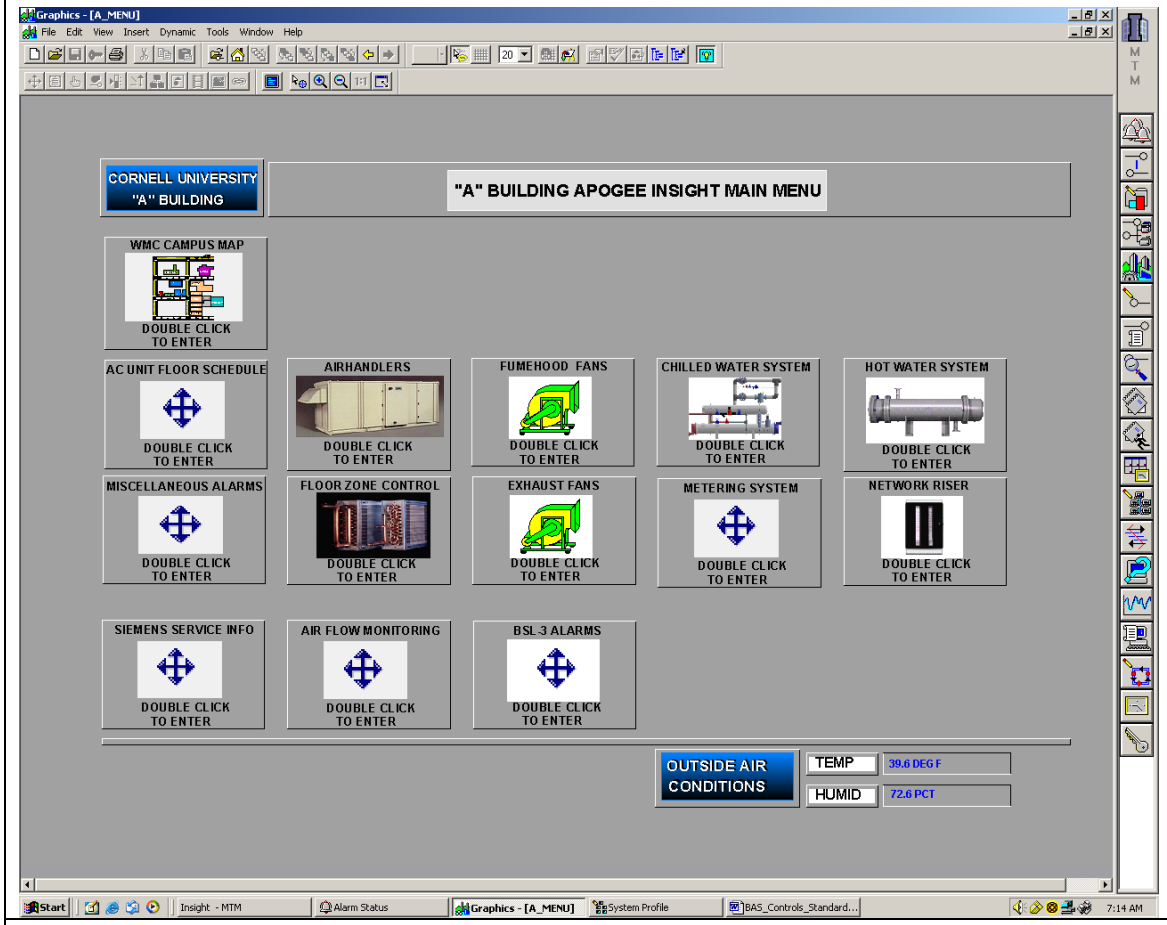
APPENDIX 2
SAMPLE GRAPHICS

Campus Menu



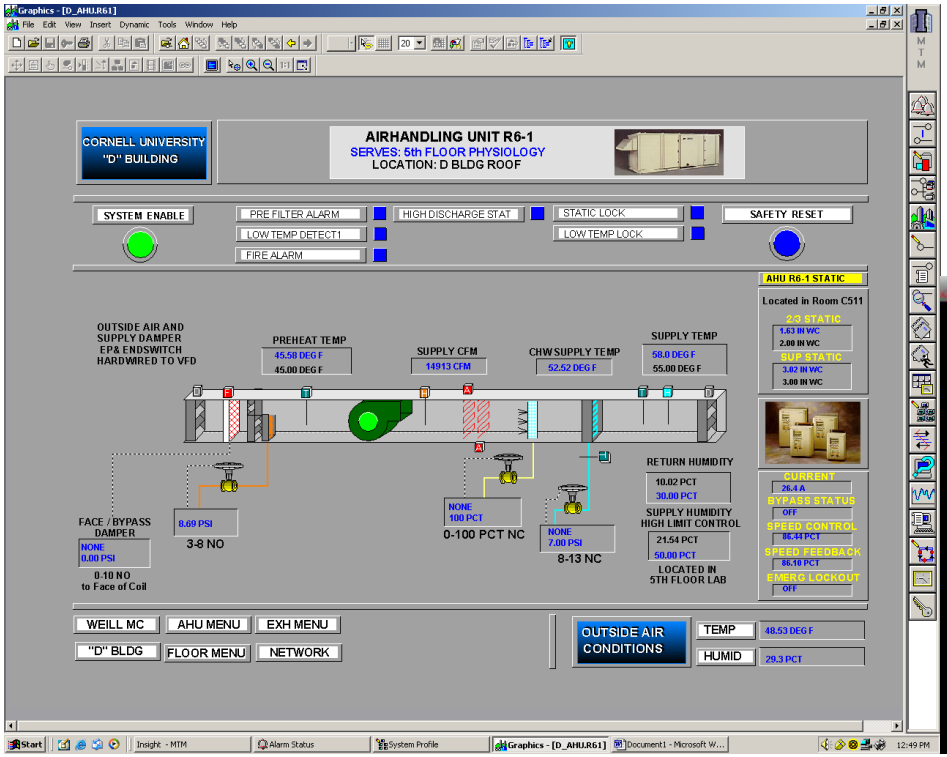
APPENDIX 2
SAMPLE GRAPHICS

Building Menu



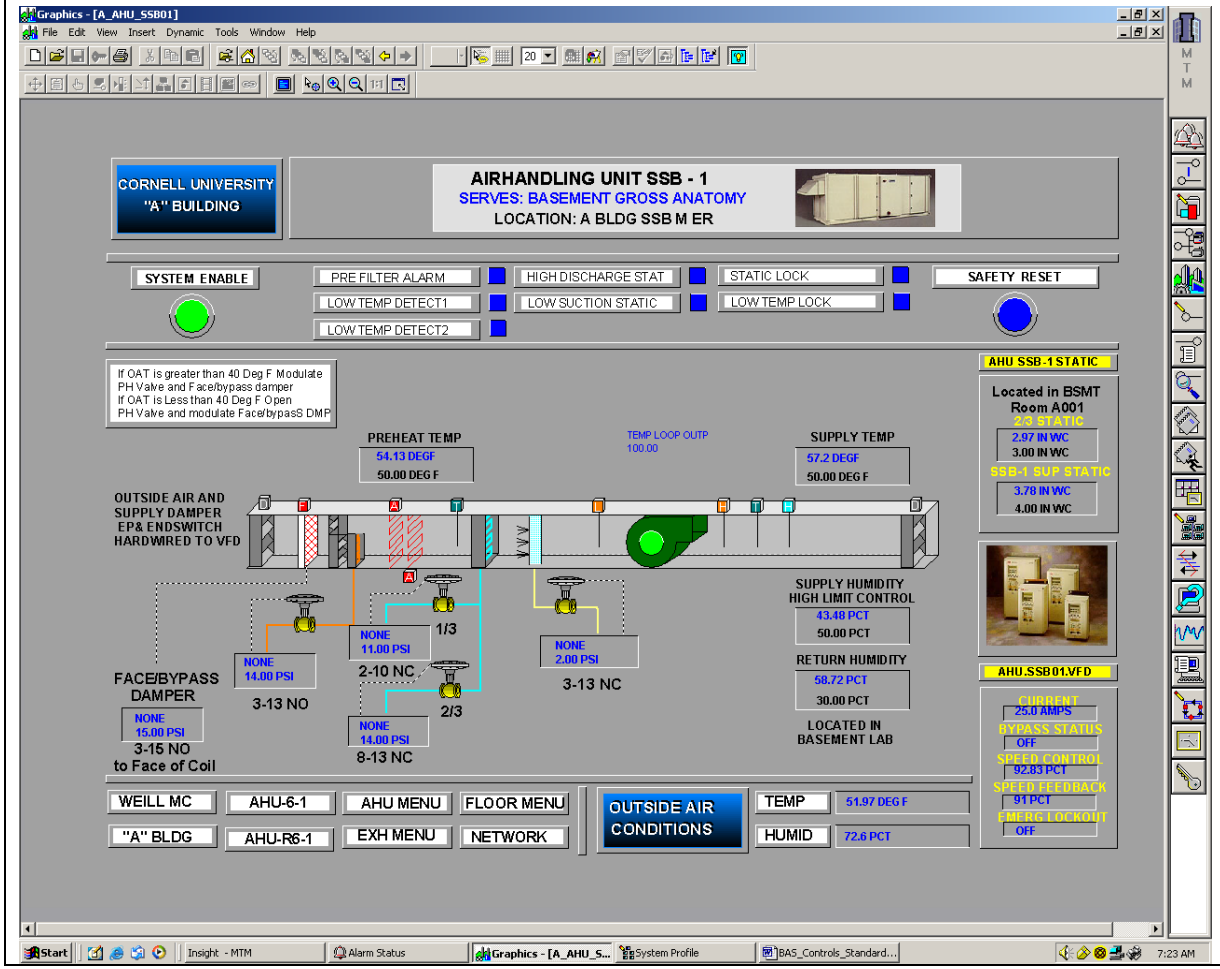
APPENDIX 2
SAMPLE GRAPHICS

Air Handler



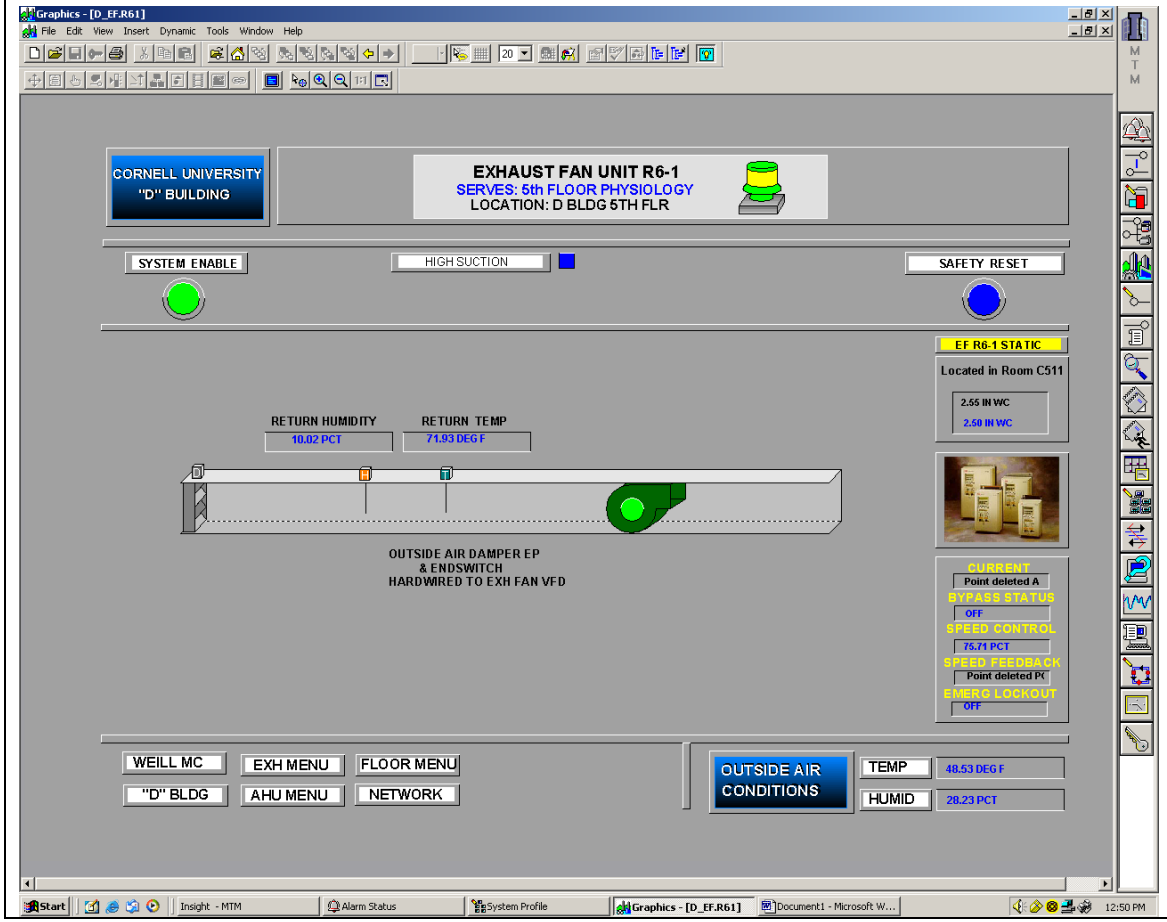
APPENDIX 2
SAMPLE GRAPHICS

Air Handler – Face/Bypass Preheat Coils



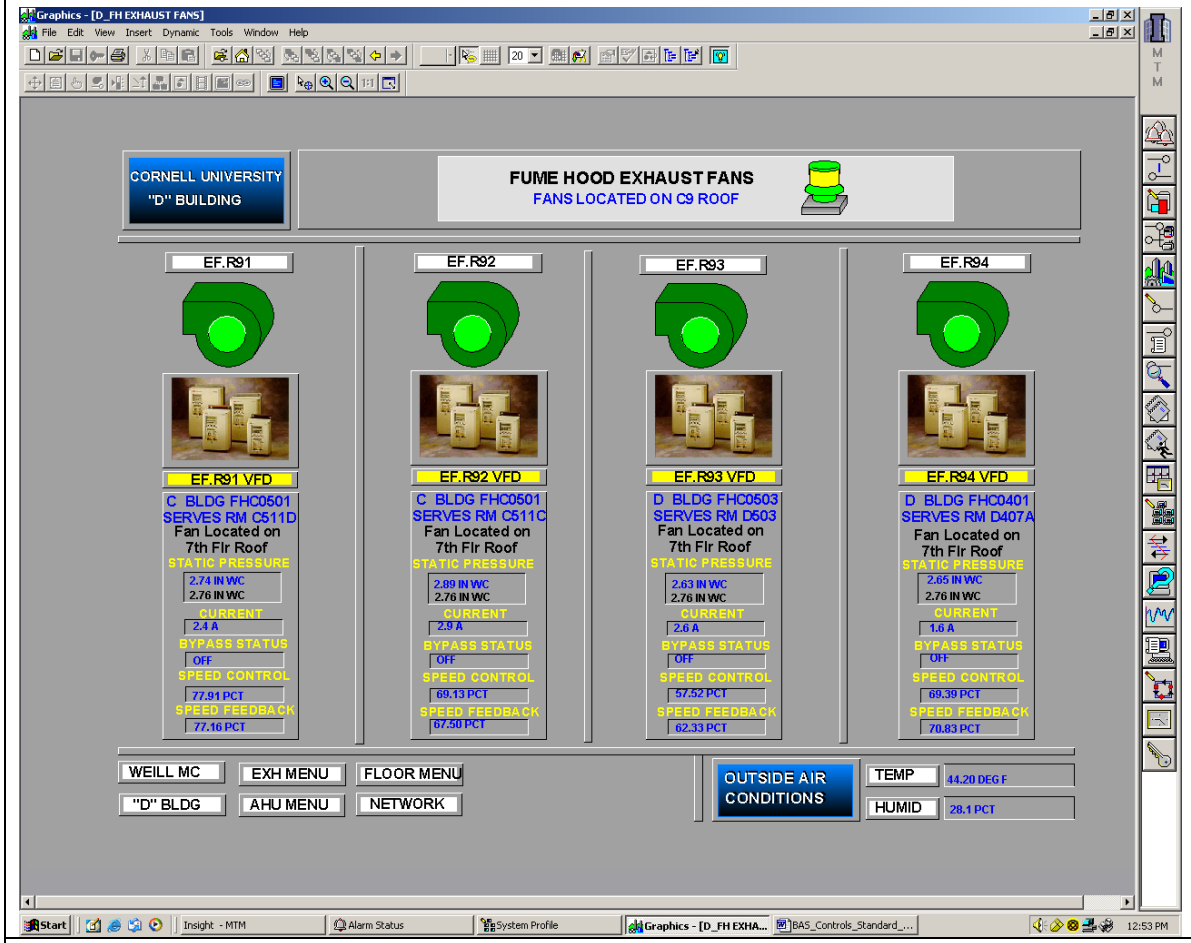
APPENDIX 2
SAMPLE GRAPHICS

General Exhaust Fan



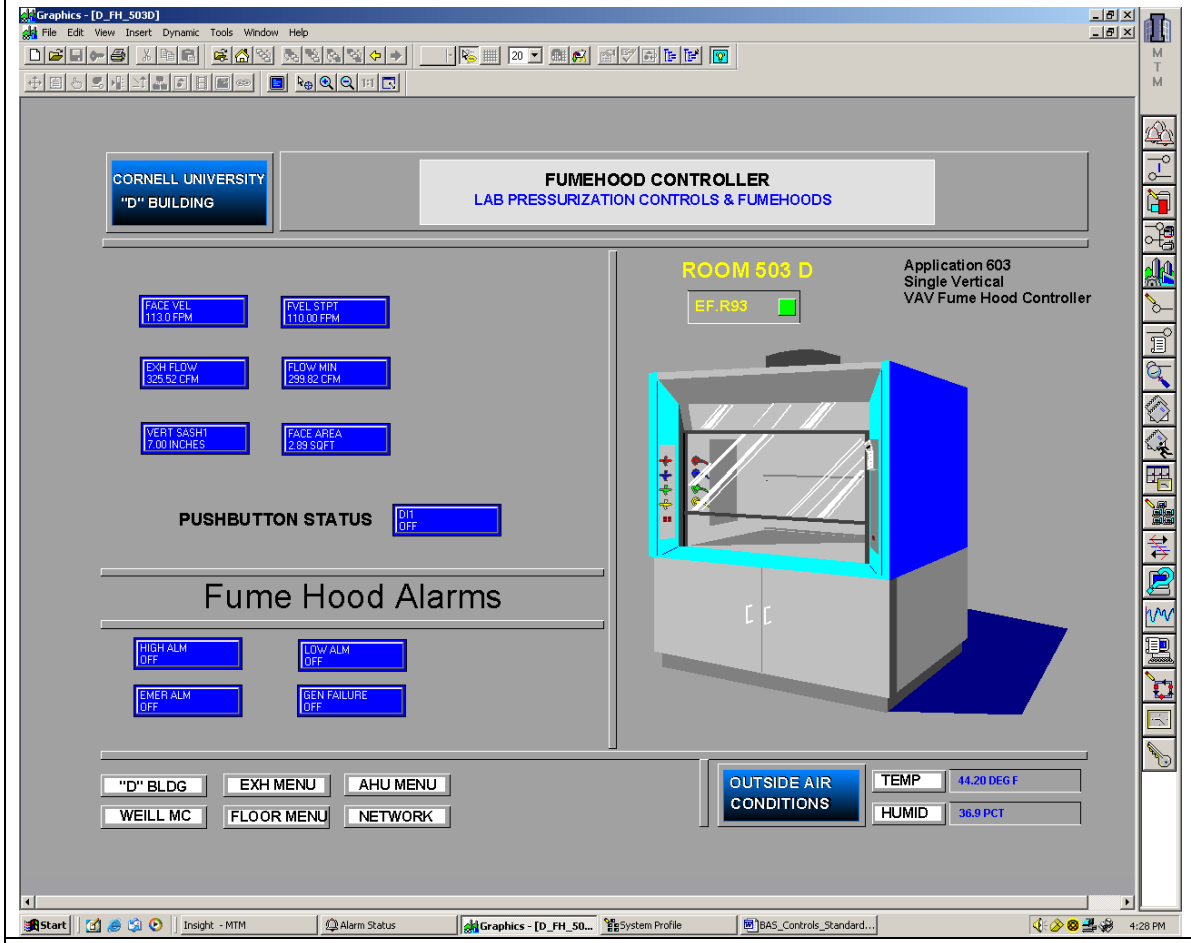
APPENDIX 2
SAMPLE GRAPHICS

Fume hood and Specialty Exhaust Fans



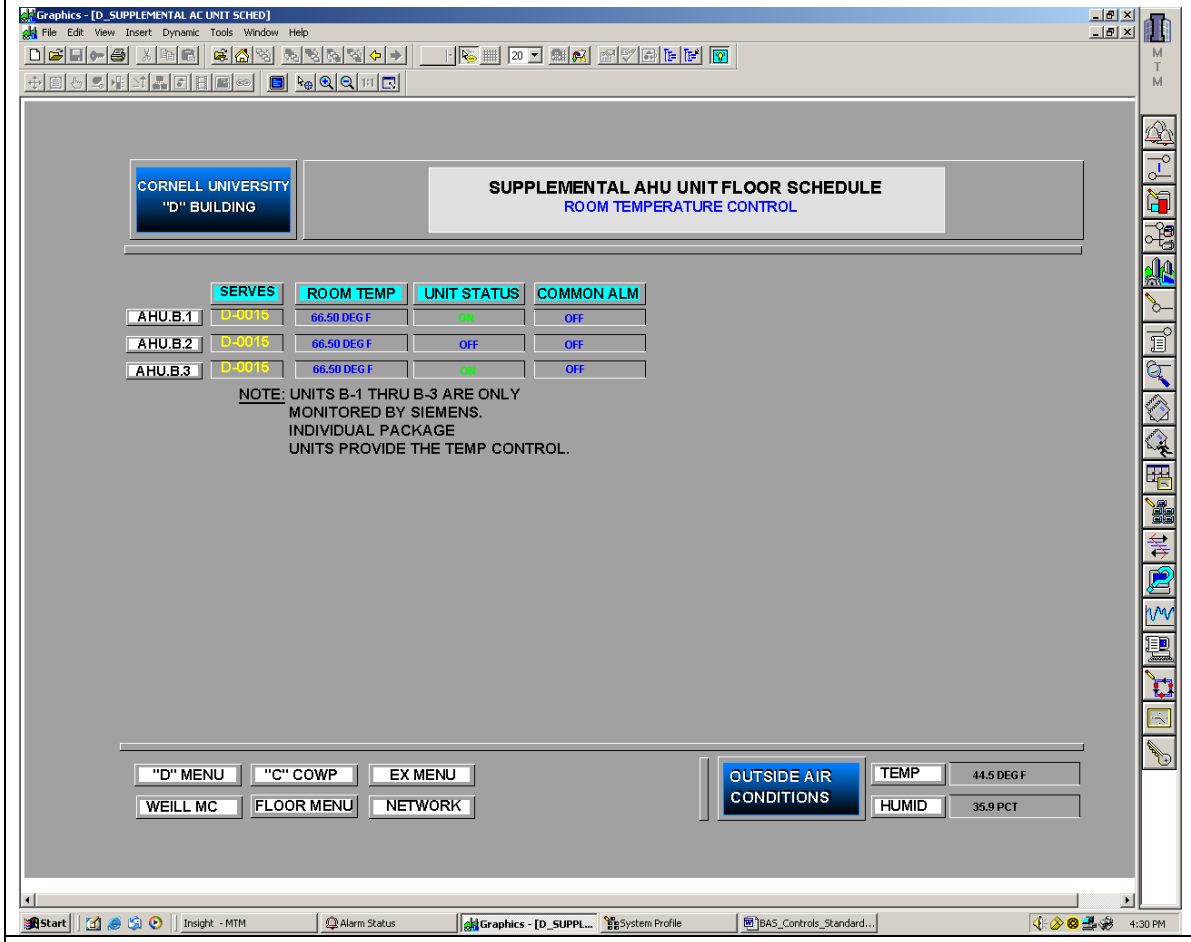
APPENDIX 2
SAMPLE GRAPHICS

Fume hood



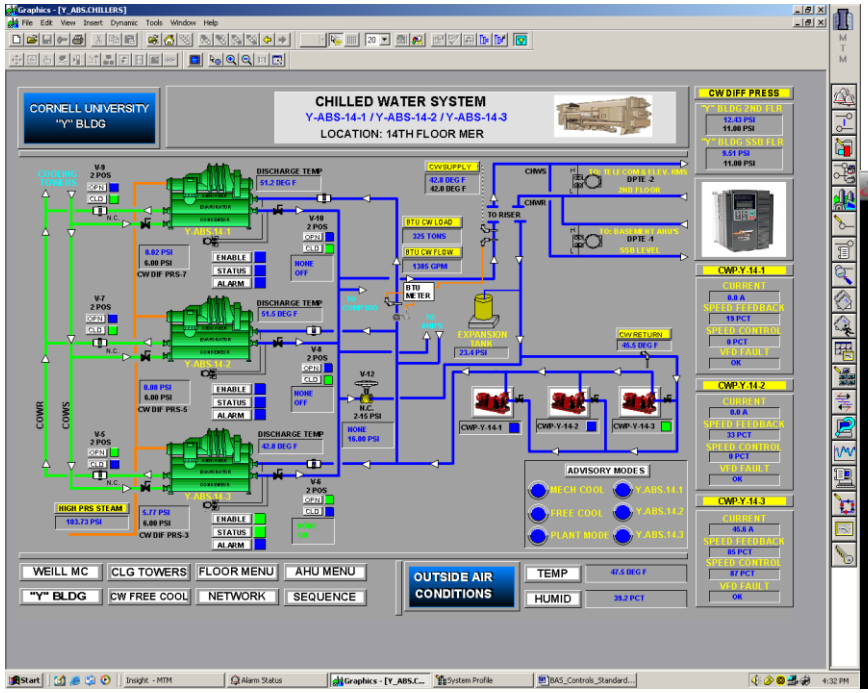
APPENDIX 2
SAMPLE GRAPHICS

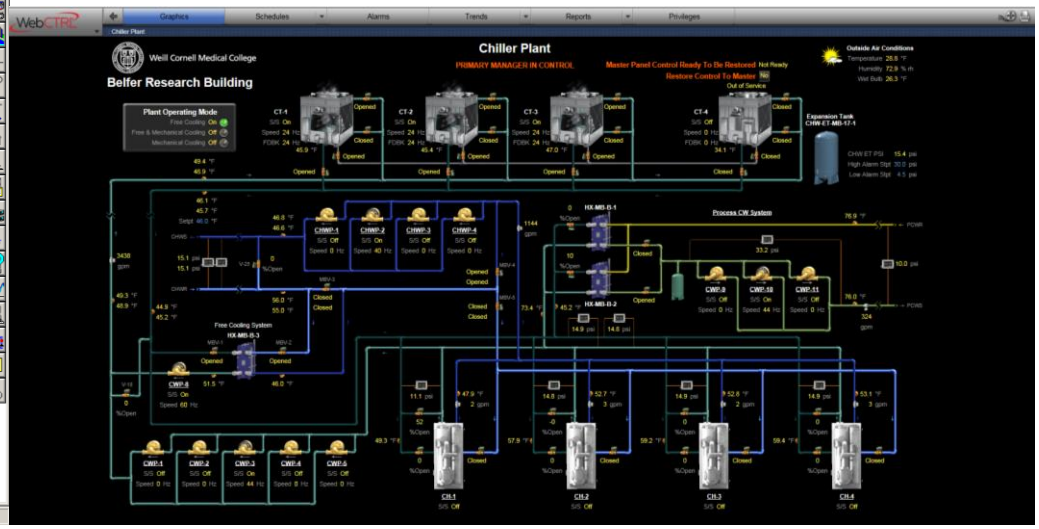
Supplemental A/C Units / FCUs / ACUs / Unit Heaters



APPENDIX 2
SAMPLE GRAPHICS

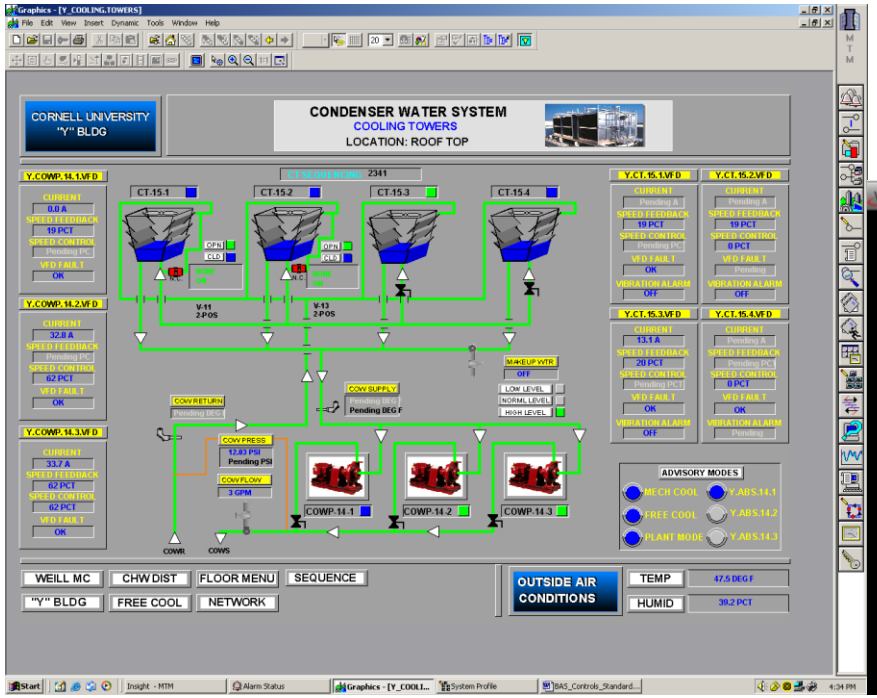
Chilled Water System

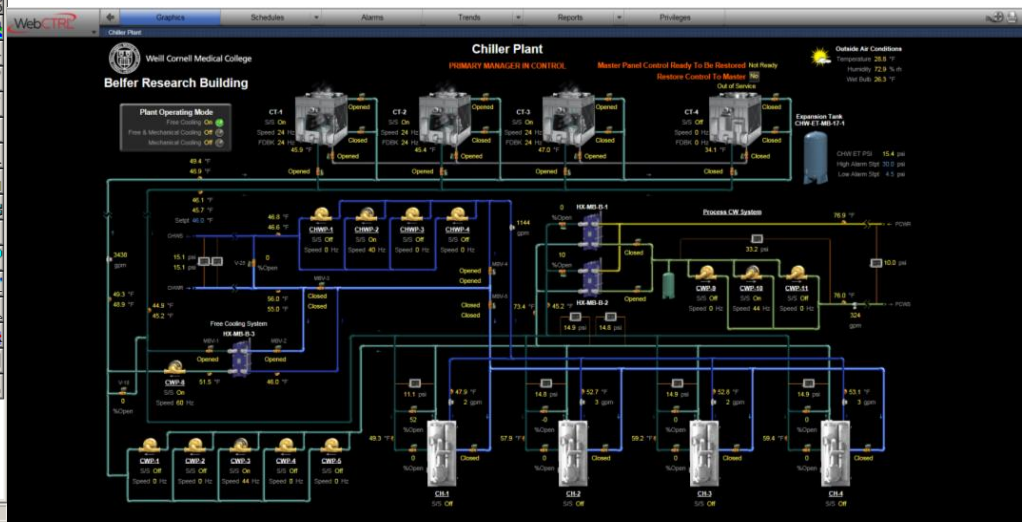




APPENDIX 2
SAMPLE GRAPHICS

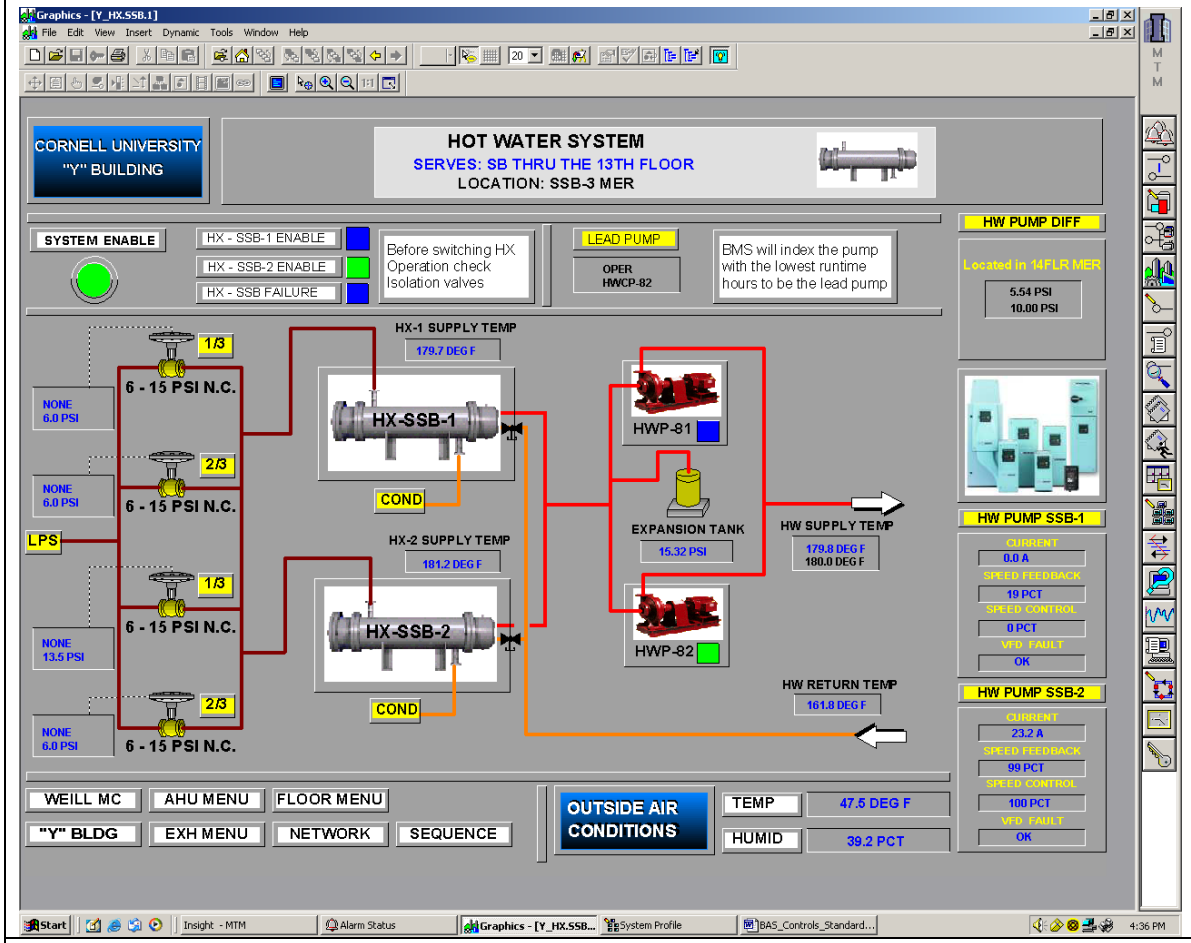
Cooling Tower System





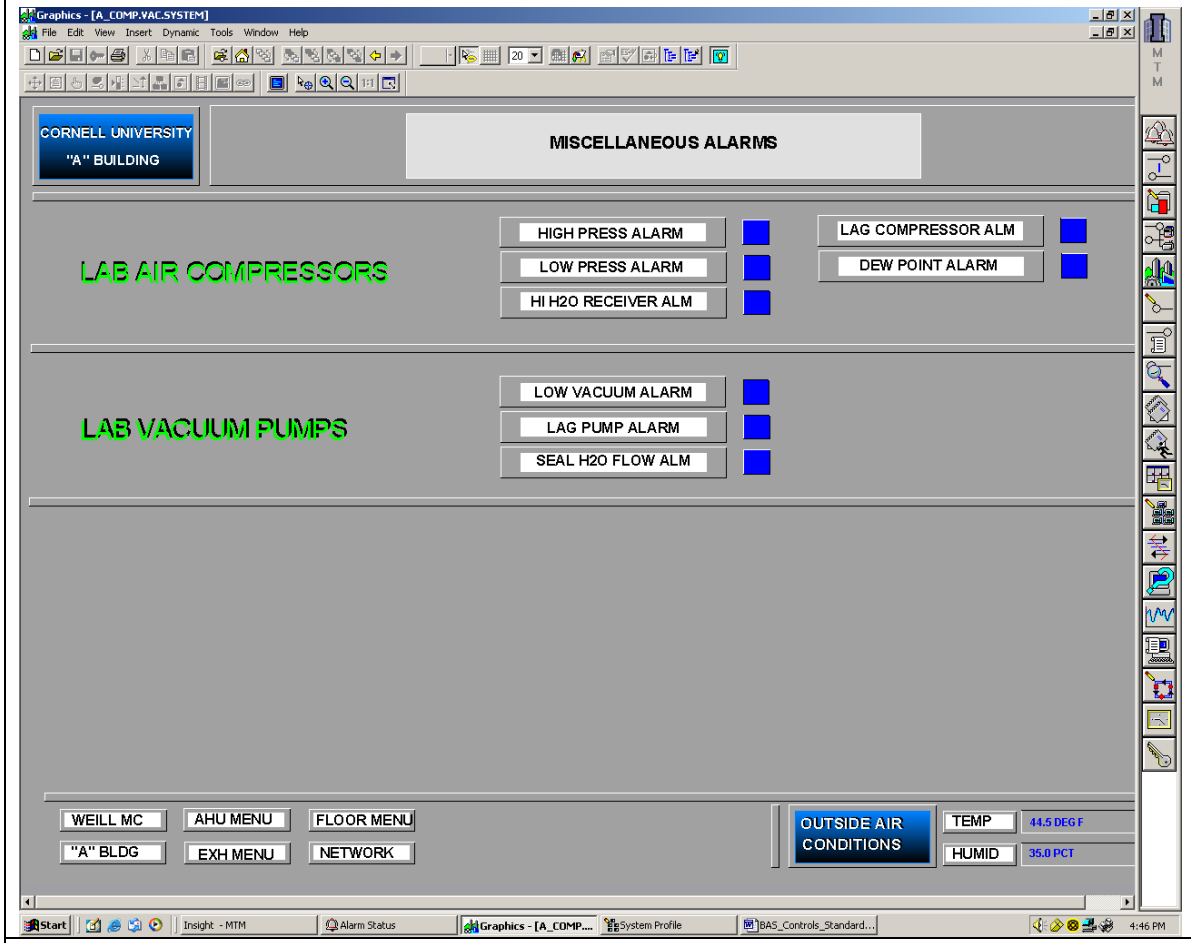
APPENDIX 2
SAMPLE GRAPHICS

Steam/Hot Water Heat Exchangers



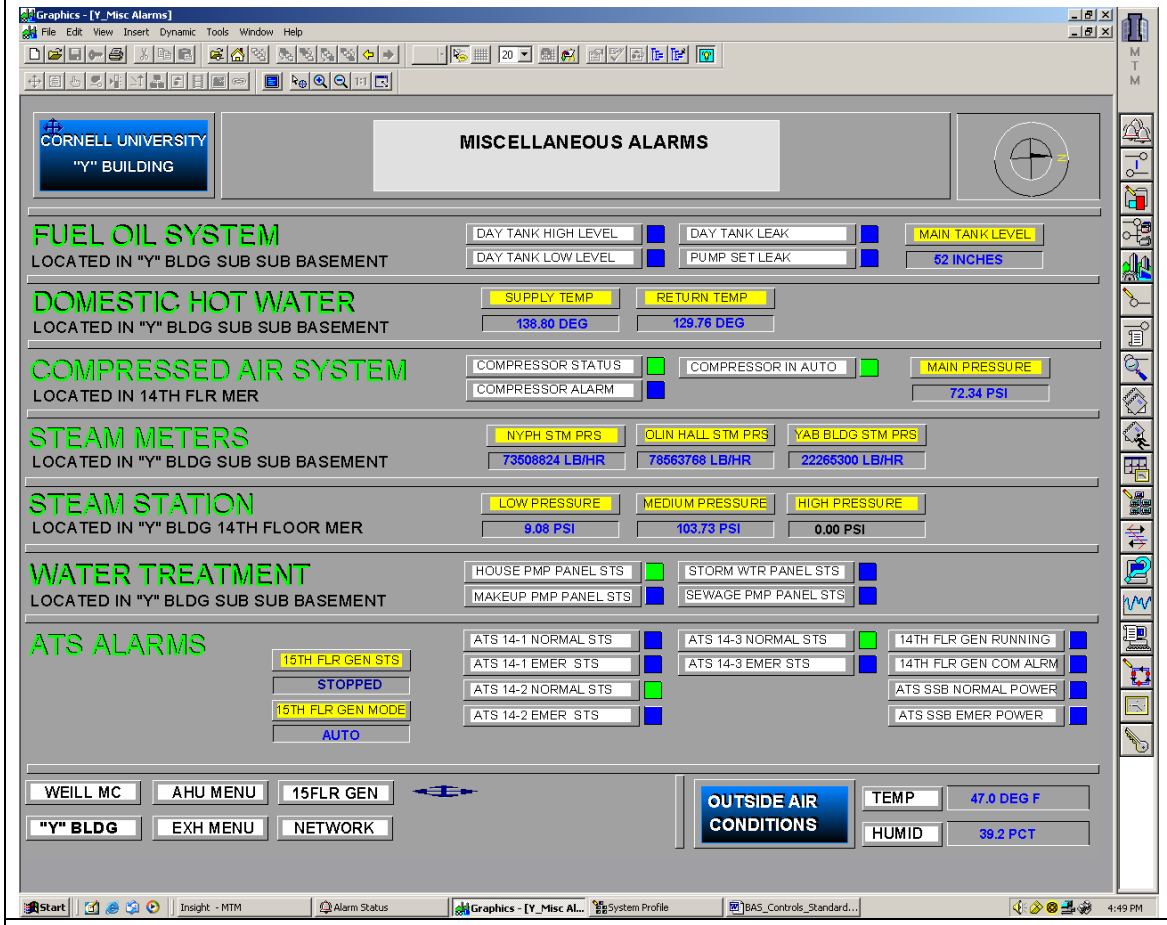
APPENDIX 2
SAMPLE GRAPHICS

Lab Air Compressors/ Lab Vacuum Pumps



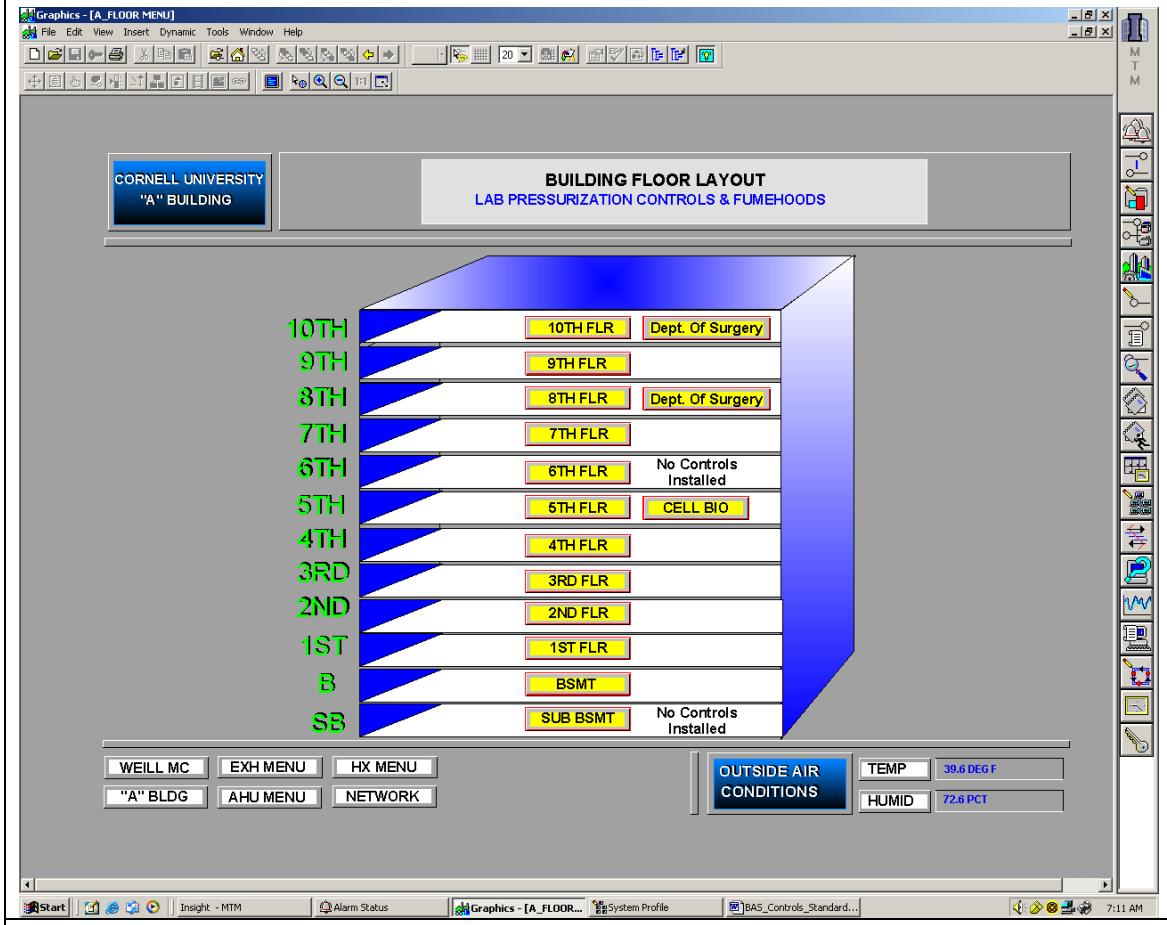
APPENDIX 2
SAMPLE GRAPHICS

Misc. Alarms, Metering



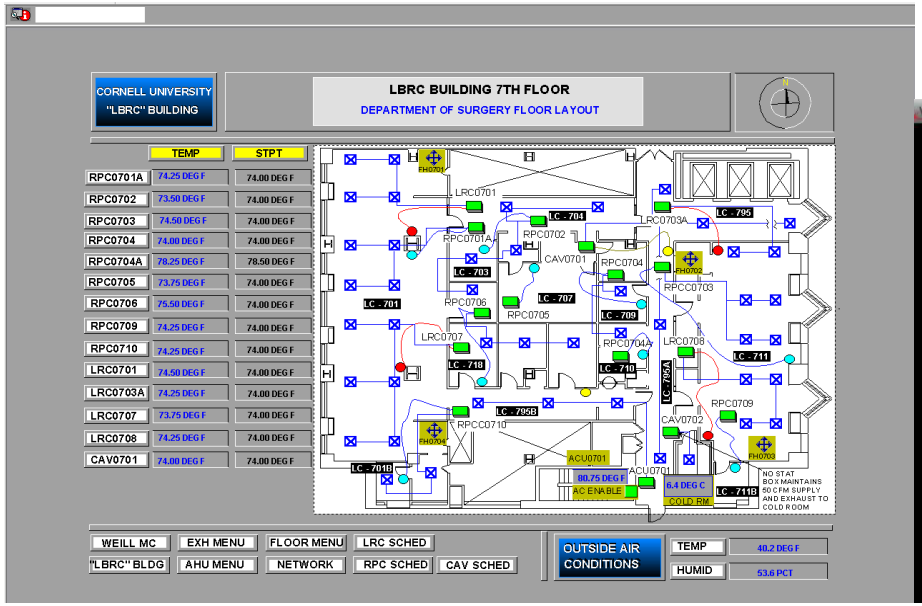
APPENDIX 2
SAMPLE GRAPHICS

Floor Menu



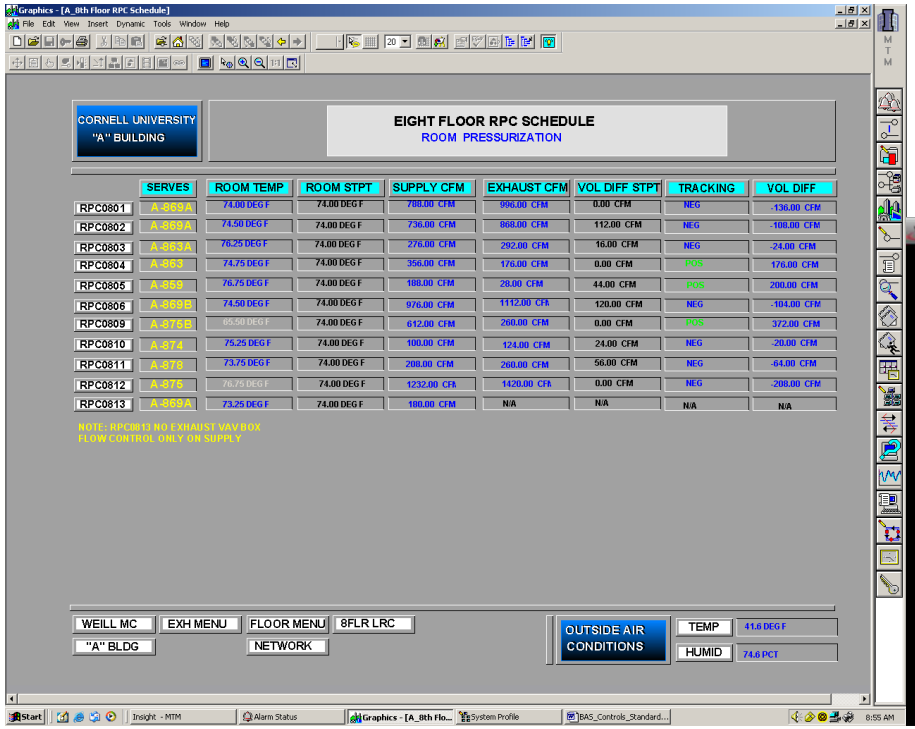
APPENDIX 2
SAMPLE GRAPHICS

Floor Graphic



APPENDIX 2
SAMPLE GRAPHICS

Lab Controllers, VAV Box Schedules, CAV Schedules



	SERVES	ROOM TEMP	ROOM STPT	SUPPLY CFM	EXHAUST CFM	VOL DIFF STPT	TRACKING	VOL DIFF
RPC0801	A-869A	74.00 DEG F	74.00 DEG F	788.00 CFM	996.00 CFM	0.00 CFM	NEG	-136.00 CFM
RPC0802	A-869A	74.50 DEG F	74.00 DEG F	736.00 CFM	868.00 CFM	112.00 CFM	NEG	-108.00 CFM
RPC0803	A-863A	76.25 DEG F	74.00 DEG F	276.00 CFM	292.00 CFM	16.00 CFM	NEG	-24.00 CFM
RPC0804	A-863	74.75 DEG F	74.00 DEG F	356.00 CFM	176.00 CFM	0.00 CFM	POS	176.00 CFM
RPC0805	A-859	76.75 DEG F	74.00 DEG F	188.00 CFM	28.00 CFM	44.00 CFM	POS	200.00 CFM
RPC0806	A-869B	74.50 DEG F	74.00 DEG F	976.00 CFM	1112.00 CFM	120.00 CFM	NEG	-104.00 CFM
RPC0809	A-875B	65.50 DEG F	74.00 DEG F	612.00 CFM	260.00 CFM	0.00 CFM	POS	372.00 CFM
RPC0810	A-874	75.25 DEG F	74.00 DEG F	100.00 CFM	124.00 CFM	24.00 CFM	NEG	-20.00 CFM
RPC0811	A-878	73.75 DEG F	74.00 DEG F	208.00 CFM	260.00 CFM	56.00 CFM	NEG	-64.00 CFM
RPC0812	A-875	76.75 DEG F	74.00 DEG F	1232.00 CFM	1420.00 CFM	0.00 CFM	NEG	-208.00 CFM
RPC0813	A-869A	73.25 DEG F	74.00 DEG F	180.00 CFM	N/A	N/A	N/A	N/A

OUTSIDE AIR CONDITIONS: TEMP 41.6 DEG F; HUMID 74.6 PCT

APPENDIX 3
STANDARD BMS POINT LISTS

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APPENDIX 3
STANDARD BMS POINT LISTS

The following point lists represent the minimum points that are to be included for various systems/equipment. Typically, these points are displayed on the system graphics in accordance with WCM's standard graphic schemes. These points are in addition to any other points required to successfully implement the required Sequence of Operation.

1.

Air Handler (100% Outside Air System, Standard Pre-Heat Configuration or Face/Bypass)				
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
System Enable		X		
Outside Air Temperature		X		Use existing weather station if located in the same building as the unit.
Outside Air Humidity		X		Use existing weather station if located in the same building as the unit.
Preheat Temperature & Setpoint	X	X		Per preheat coil
Discharge Temperature & Setpoint	X	X		
Discharge Humidity and Setpoint	X	X		
Exhaust Air Temperature	X	X		
Exhaust Air Humidity				
CFM		X		Per fan
Supply Static Pressure & Maximum	X	X		Per fan
Downstream Static Pressure and Setpoint	X	X	+/- 10% from setpoint	Variable volume systems, display each location used for control and monitoring
OA Damper Signal				In V or PSI, indicate signal range and units
Face/Bypass Damper Signal				Per valve, in V or PSI, indicate signal range and units
Preheat Valve Signal				Per valve, in V or PSI, indicate signal range and units
Chilled Water Valve Signal				Per valve, in V or PSI, indicate signal range and units
Humidifier Valve				Per valve, in V or PSI, indicate signal range and units
Chilled Water Supply Temperature				Can display data from another unit if it already exists in the same MER
Preheat Steam Pressure or Preheat Water Temperature				Can display data from another unit if it already exists in the same MER or display data from the steam station or heat exchanger
Fan Status	X	X		Per fan

APPENDIX 3
STANDARD BMS POINT LISTS

	Air Handler (100% Outside Air System, Standard Pre-Heat Configuration or Face/Bypass)			
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
Air/Air Heat Exchanger Enable				If applicable
Low Temperature Detector Status	X	X		Per detector
Low Temperature Detector Lockout	X	X		
High Suction	X	X		Per fan
High Static	X	X		Per fan
Fire Shutdown	X			
Filter Alarm	X			Per Bank
Heat Recovery Water Supply Temperature	X	X		If applicable
Heat Recovery Water Return Temperature		X		If applicable
Emergency Bypass Damper Status	X			If applicable

APPENDIX 3
STANDARD BMS POINT LISTS

2.

Air Handler (Return Air System, Standard Pre-Heat Configuration or Face/Bypass)				
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
System Enable				
Economizer Mode				
Outside Air Temperature				Use existing weather station if located in the same building as the unit.
Outside Air Humidity				Use existing weather station if located in the same building as the unit.
Preheat Temperature & Setpoint	X	X		Per preheat coil
Discharge Temperature & Setpoint	X	X		
Discharge Humidity and Setpoint	X	X		
Return Air Temperature	X	X		
Return Air Humidity				
Return CO2				
CFM		X		Per fan, (measured, not calculated)
Supply Static Pressure & Maximum	X	X		Per fan
Downstream Static Pressure and Setpoint				Variable volume systems, display each location used for control and monitoring
OA Damper Signal				In V or PSI, indicate signal range and units
Discharge/Spill Damper Signal				In V or PSI, indicate signal range and units
Mixed Air Damper Signal				In V or PSI, indicate signal range and units
Face/Bypass Damper Signal				Per valve, in V or PSI, indicate signal range and units
Preheat Valve Signal				Per valve, in V or PSI, indicate signal range and units
Chilled Water Valve Signal				Per valve, in V or PSI, indicate signal range and units
Humidifier Valve				Per valve, in V or PSI, indicate signal range and units
Chilled Water Supply Temperature		X		Can display signal from another unit in the same MER if it already exists
Preheat Steam Pressure or Preheat Water Temperature				Can display data from another unit if it already exists in the same MER or display data from the steam station or heat exchanger
Fan Status	X	X		Per fan
Air/Air Heat Exchanger Enable				If applicable

APPENDIX 3
STANDARD BMS POINT LISTS

	Air Handler (Return Air System, Standard Pre-Heat Configuration or Face/Bypass)			
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
Low Temperature Detector Status	X	X		Per detector
Low Temperature Detector Lockout	X	X		
High Suction	X	X		Per fan
High Static	X	X		Per fan
Fire Shutdown	X			
Filter Alarm	X			Per Bank
Heat Recovery Water Supply Temperature				If applicable
Heat Recovery Water Supply Temperature				If applicable
Emergency Bypass Damper Status	X			If applicable

APPENDIX 3
STANDARD BMS POINT LISTS

3.

General Exhaust Fans, Return Air Fans				
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
System Enable				
Outside Air Temperature				Use existing weather station if located in the same building as the unit.
Outside Air Humidity				Use existing weather station if located in the same building as the unit.
Exhaust/Return Air Temperature				
Exhaust/Return Air Humidity				
Return CO2				
CFM				Per fan, (measured, not calculated)
Suction Static Pressure & Maximum	X	X		Per fan
Discharge/Spill Damper Signal				In V or PSI, indicate signal range and units
Fan Status	X	X		Per fan
Fire Shutdown	X			

4.

Fume hood Fans, Special Purpose Exhaust Fans Under 2000 CFM				
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
Suction Static Pressure & Maximum	X	X		
Fan Status	X	X		
Fire Shutdown	X			If applicable

APPENDIX 3
STANDARD BMS POINT LISTS

5.

	Steam Absorber			
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
System Enable				
Outside Air Temperature				Use existing weather station if located in the same building as the unit.
Outside Air Humidity				Use existing weather station if located in the same building as the unit.
Condenser Water Isolation Valve				
Chilled Water Isolation Valve				
Steam Control Valve Signal				
Steam Pressure before the control valve				Can display data from another unit if it already exists in the same MER or display data from the steam station
Status				
Common Alarm	X			
Chilled Water Discharge Temperature and Setpoint	X	X		
Chilled Water Return Temperature				
Chilled Water Flow				
Chilled Water BTU		X		

APPENDIX 3
STANDARD BMS POINT LISTS

6.

	Cooling Towers			
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
System Enable				
Outside Air Temperature				Use existing weather station if located in the same building as the unit.
Outside Air Humidity				Use existing weather station if located in the same building as the unit.
Condenser Water Bypass Valve				
Fan Status	X	X		Per fan
Fan Speed	X	X		Per Fan
Common Alarm	X	X		
Condenser Water Discharge Temperature and Setpoint	X	X		
Condenser Water Return Temperature		X		
Makeup Water Flow - Totalized				
Vibration Alarm	X			Per Fan
Basin Level High	X			
Basin Level Low	X			

APPENDIX 3
STANDARD BMS POINT LISTS

7.

	Steam/Hot Water Heat Exchanger			
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
System Enable				
Outside Air Temperature				Use existing weather station if located in the same building as the unit.
Outside Air Humidity				Use existing weather station if located in the same building as the unit.
Hot Water Supply Temperature	X	X		
Hot Water Return Temperature				
Steam Control Valve Signal				Per Valve
Steam Pressure before the control valve	X	X		Can display data from another unit if it already exists in the same MER or display data from the steam station
Differential Pressure and Setpoint	X	X		
Lead/Lag Heat Exchanger				

8.

	Lab Air Compressor/Lab Vacuum Pump System			
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
System Enable				
Discharge Pressure before regulator	X	X		
Discharge Pressure After Regulator (system pressure)	X	X		
Discharge Vacuum (system vacuum)	X	X		
Compressor/Pump status	X			Per compressor/pump
Lead/Lag				
Common Alarm	X			
Dryer Common Alarm	X			

9.

	Controlled Space

APPENDIX 3
STANDARD BMS POINT LISTS

Point Description	Alarm	Trend	Alarm Conditions	Notes
Outside Air Temperature				Use existing weather station if located in the same building as the unit.
Outside Air Humidity				Use existing weather station if located in the same building as the unit.
Space Temperature and Setpoint	X	X		+/-5% from setpoint and tracks with changes in setpoint
Space Humidity	X	X	+/- 20% of setpoint	Humidity controlled spaces only
Differential Pressure	X	X		Pressure controlled spaces only

10.

	Pumps (i.e. Chilled Water, Condenser Water, Reheat Hot Water, Heating Hot Water, Glycol, etc.)			
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
System Enable				
Outside Air Temperature				Use existing weather station if located in the same building as the unit.
Outside Air Humidity				Use existing weather station if located in the same building as the unit.
Pump Status	X	X		Per pump
Differential Pressure and Setpoint	X	X		
Lead/Lag Pump				

APPENDIX 3
STANDARD BMS POINT LISTS

11.

	Misc. Pumps (i.e. Domestic Water Booster, Sewage Ejector, Storm Water, etc.)			
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
System Enable				
Pump Status	X	X		Per pump
Differential Pressure and Setpoint	X	X		Pressure controlled systems
Sump High Level	X			Level controlled systems
Sump High High Level	X			Level controlled systems
Lead/Lag Pump				

12.

	Variable Frequency Drives			
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
System Enable				
Current		X		In Amps
Speed Control Signal		X		In percent
Speed Feedback		X		In percent
General Alarm	X			
Bypass Status	X			

Note: Drive information is typically shown on the system graphic for the equipment it is controlling

APPENDIX 3
STANDARD BMS POINT LISTS

13.

	Steam PRV			
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
Outside Air Temperature				Use existing weather station if located in the same building as the unit.
Outside Air Humidity				Use existing weather station if located in the same building as the unit.
Entering Steam Pressure	X	X		
Leaving Steam Pressure	X	X		
Steam Flow		X		Lbs/hour and totalized

14.

	Emergency Generator			
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
Status				
Mode (Off, Auto, Run)	X	X		Alarm when not in Auto
Common Alarm	X			

15.

	Automatic Transfer Switch			
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
Status				

APPENDIX 3
STANDARD BMS POINT LISTS

16.

	Fuel Oil System			
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
Main Tank Level	X	X		Analog value, usually in inches
Main Tank Level High	X			
Main Tank Level Low	X			
Day Tank Level High	X			
Day Tank Level Low	X			
Main Tank Room Leak	X			
Piping Leak	X			
Day Tank Leak	X			
Pump Set Leak	X			
Common Alarm	X			

17.

	Supplemental Chillers (Packaged Chillers)			
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
System Enable				
Outside Air Temperature				Use existing weather station if located in the same building as the unit.
Outside Air Humidity				Use existing weather station if located in the same building as the unit.
Status				
Chilled Water Discharge Temperature and Setpoint	X	X		
Chilled Water Return Temperature		X		
Common Alarm	X			

APPENDIX 3
STANDARD BMS POINT LISTS

18.

	Plate/Frame Heat Exchangers			
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
System Enable				
Outside Air Temperature				Use existing weather station if located in the same building as the unit.
Outside Air Humidity				Use existing weather station if located in the same building as the unit.
Primary Supply Temperature				
Primary Return Temperature				
Secondary Supply Temperature	X	X		
Secondary Return Temperature		X		
City Water Bypass Status	X	X		If bypass provided

19.

	Supplemental ACU Unit			
Point Description	**Alarm**	**Trend**	**Alarm Conditions**	**Notes**
Status				
Temperature Setpoint				
Space Temperature	X	X		
Common Alarm	X	X		
Fire Shutdown	X			If applicable