

BACnet® Meets Hospital Needs

By Jon Williamson, P.E.

The Massachusetts Eye and Ear Infirmary (MEEI) in Boston operates continuously, which places stringent demands on building control and mechanical systems. MEEI is a specialty hospital providing patient care for disorders of the eye, ear, nose, throat, head, and neck. The hospital is an international leader in ophthalmology and otolaryngology research and a teaching partner of Harvard Medical School.

MEEI requires a building automation system (BAS) that will deliver uninterrupted performance 24 hours a day and needs responsive, immediate service when there is a problem with the HVAC system. Its 20-year-old proprietary control system provided neither. With facility expansion

on the horizon, MEEI decided to replace the BAS with an open protocol system.

Why BACnet?

"I wanted a facility management system that was open-ended to 'talk' to multiple vendors," says Bob Biggio,

MEEI's vice president of facilities planning. "We chose BACnet because an open protocol system allows us to integrate our existing equipment and whatever we add in the future. Plus, now we get monitoring, alarming, and trending capabilities through one unified control system, using a single, graphical user interface."

Comprehensive Facility Management

The BACnet system was installed in all three buildings of the MEEI main campus. These include the main tower, a 17-story building that houses the operating, inpatient, and outpatient examination rooms, medical staff offices, and cafeteria; an eight-story connector building that includes research areas and labs; and an eight-story data center/administration building. Combined, the buildings encompass 460,000 ft² (42 730 m²) of climate-controlled space.



Massachusetts Eye and Ear Infirmary replaced a proprietary system with BACnet.

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The BACnet system controls and monitors the hospital’s main chiller plant, hot water system, air-handling units, and VAV terminal boxes, plus specialized health-care applications such as operating rooms and isolation rooms. In addition, the system monitors the hospital’s medical gases, steam pressure, and building pressure. Because the hospital’s labs must abide by Massachusetts Water Resource Authority (MWRA) regulations concerning water discharge limits, MEEI also uses the BAS to monitor the alkalinity of the water being discharged from its waste treatment plant.

In MEEI’s data center, the BACnet system monitors critical alarms, including emergency generator oil tank levels, water pumps, air-conditioning unit failures, fire alarms, and the emergency power generator status. Integration with

existing equipment and non-HVAC systems is accomplished through hard-wired inputs and outputs.

Entire System is Native BACnet

The BAS at MEEI uses native BACnet controllers designed in strict accordance with ANSI/ASHRAE Standard 135-2004, *BACnet®—A Data Communication Protocol for Building Automation and Control Networks*. The controllers do not need special protocol converters, or gateways to interoperate with either BACnet or non-BACnet devices on the network because the system is bilingual. Not only does it speak native BACnet, but it also speaks to proprietary controllers, such as access controllers not currently addressed in the BACnet standard.

Included in the BAS at MEEI are powerful BACnet/IP-to-BACnet MS/TP

routers that send messages from the Ethernet network to the field controllers. These controllers also feature built-in I/O with expandability if additional points are required. The MEEI BACnet system includes several MS/TP field controllers and operates on an MS/TP field bus network. In addition, centrally located wired network drops, located on every floor in the main tower, allow MEEI’s facilities technicians to plug in a laptop computer and troubleshoot the HVAC equipment, as necessary.

BACnet Operator Workstation

MEEI’s entire facility management system, including all third-party equipment, is controlled by a native BACnet operator workstation (B-OWS).

“The B-OWS makes my job a lot easier now,” says Michael Canning, MEEI’s



Mounted on the wall in each OR is an intuitive, six-button sensor with LCD display. The sensor allows the medical staff to adjust the room's temperature and can override the hospital's night setback mode in preparation for an emergency after-hours surgery.

Advertisement formerly in this space.

director of facilities. "It consolidates all of our systems under one graphical front-end—providing us full alarming and control of all BACnet-compatible devices on our network."

Canning's technicians also use the BACnet system's Web-based front-end software to view alarms remotely over the Internet, even from their homes.

Smart Sensors

More than 21,000 surgeries are performed every year at MEEI. Proper environmental control in their operating rooms is critical for physicians and patients alike. Operating room (OR) temperatures are usually set cooler for adult patients and warmer for children. Mounted on the wall in each OR is an intuitive, six-button sensor with LCD display. The sensor allows the medical staff to adjust the room's temperature and can override the hospital's night setback mode in preparation for an emergency after-hours surgery.

Emergency Shutdown

The BACnet system plays a key role in MEEI's emergency shutdown procedure. In the event of a bioterrorist incident, the B-OWS operator can press

the emergency shutdown graphic toggle on the screen, and the system will signal a critical alarm immediately, page all maintenance personnel, and shut down the hospital's air-handling systems, close outside air dampers and open hot water valves (for freeze protection) to avoid spreading a virus or germs.

In addition to controlling the HVAC, the versatile BACnet system has recently been expanded to handle security, including access control and closed circuit television (CCTV), at the hospital. Since the BACnet standard currently does not address access control, proprietary controllers are used for the security system. The bilingual nature of the system allows the proprietary access controllers to directly communicate to the BACnet controllers without a gateway.

According to Biggio, the hospital's plans include more than \$40 million in new construction in the next five to six years. No doubt, the BACnet system at MEEI will continue to grow with the facility.

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