

Case Study:

Boulder Community Foothills Hospital

Boulder, Colorado

Knowledge-Based Integration Delivers Savings, Control and LEED Certification



Boulder Community Hospital provides extensive healthcare services to the citizens of Boulder County, Colorado. Founded in 1922 as a non-profit, community-owned and governed hospital, its mission is to meet the evolving healthcare needs of Boulder County citizens while providing access to high-quality medical care.

As a result of burgeoning population growth and the aging of its citizens, Boulder Community Hospital faced major capacity challenges at its main campus. To address those challenges, the hospital's leadership chose to build a new satellite facility, called Boulder Community Foothills Hospital (BCFH). Johnson Controls was chosen to provide all of the facility technology systems for the new 60 bed, 220,000 square-foot facility.

Johnson Controls used an innovative knowledge-based integration approach in the design and construction of the facility's systems. This approach offers turnkey design assistance, integration and installation for all the low-voltage systems within a facility. The results include a smoother construction process and dramatically lower operating, energy and IT costs throughout the building lifecycle.

Soon after it opened, the hospital received LEED certification (Leadership in Energy and Environmental Design), becoming the first LEED-certified hospital in the nation.

Project Design Team	
Architect	Oz Architecture/Boulder Associates, Boulder, CO
General Contractor	Gerald H. Phipps, Denver, CO
Technology Contractor	Johnson Controls, Inc., Milwaukee, WI
Mechanical Engineer	Shaffer Boucom Engineering, Lakewood, CO
Electrical Engineer	BCER Consulting, Arvada, CO
Mechanical Contractor	Crabb Plumbing & Heating, Denver, CO
Electrical Contractor	Ludvik Electric, Lakewood, CO
Commissioning Authority	Farnsworth Group, Colorado Springs, CO
Program Manager	Farnsworth Group, Denver, CO
LEED Certification	Architectural Energy Corp., Boulder, CO

Single Point of Responsibility Allows Smooth Transition and Savings

Under the knowledge-based integration approach, Johnson Controls took responsibility for all the low-voltage systems, providing a single point of contact for the general contractor and BCFH. Johnson Controls oversaw the work of 15 sub-contractors and managed the selection, purchasing, installation and acceptance of all systems in a timely and efficient manner.

The Johnson Controls Metasys® building management system had already been installed on other Boulder Community Hospital campuses for monitoring and control of temperature and mechanical systems. Because the hospital desired to remotely monitor and control all of the systems at BCFH, installing an integrated Metasys system at the new campus allowed for a smooth transition. The Metasys system at BCFH monitors and controls systems for temperature, fire alarm, lighting, security, power, utilities, communications, computer networks, wireless and emergency systems.

With the single point of responsibility for all the systems, Johnson Controls was able to provide clear direction and specifications throughout the design and construction process. "Not only is this a terrific advantage during the design and construction period, it also adds 30 years of additional advantage by virtue of better installation, better oversight, control, budget and quality, which will dramatically reduce long-term lifecycle costs," says Michael Savone, project manager.

Integrated Systems Reduce Cost and Increase Performance

Johnson Controls recognized the opportunity to share pathways and eliminate redundancies due to the commonality of system technologies, along with the ability to share information with the other hospital campuses. "Because of our ability to combine services for all three facilities, we actually achieved monthly operating cost savings," reveals Savone.

By integrating Johnson Controls P2000 security system with video surveillance, alarm monitoring, intrusion detection and panic alarms, an employee can simply press a button when an event occurs and a message is sent to an on-site guard, as well as to an off-site dispatch service. Parking lots are secured with digital closed-circuit television (CCTV) and emergency communications.

When it came to network services, Johnson Controls used a local contractor to help manage information services, including telecom, LAN and WAN. "The team did an outstanding job. We saved more than \$300,000 on technology integration and about \$180,000 in upfront costs," states Savone. "Johnson Controls helped us upgrade systems from microwave to fiber optics. They developed a structured cable plan, acquired computers and managed phone switches, increasing the hospital's capacity and freeing up their staff's time."



Security, mechanical, technology and environment systems are monitored from one area.



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Project Manager
Boulder Community
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For emergency communications, the hospital uses a radio system for the security and facility departments. All departments and areas critical to operations have access to radio communications around the clock. In the event of phone loss, employees can communicate with each other to keep patient care going. Johnson Controls guaranteed that coverage by installing a new repeater to communicate with all three facilities on one frequency. This allowed the hospital to get rid of old repeaters and go to a single frequency for facility and security departments throughout the organization. BCFH also has the ability to connect back to the central office of the local phone provider in the event the communications link is lost.

"We are positioned well for future expansion," notes Savone. "The integration enables Johnson Controls to monitor all three campuses from a central command through fiber optic cable, and it allows us the flexibility to quickly, efficiently and cost-effectively add new systems as they are needed."

Because one full-time project management team is handling all systems at the BCFH site, savings were realized on the installation. "We eliminated the need for several part-time management teams representing several vendors. One project manager and 15 sub-contractors managed the entire installation," says Savone.

Guaranteed Price Reduces Risk

Johnson Controls developed a gross maximum price alternative to the fixed-fee pricing approach that most contractors submit. This approach guaranteed the cost of the technology systems integration to be five percent lower than the total technology budget. This reduced the risk for BCFH, since Johnson Controls agreed to absorb costs if expenses went over budget.

Technology and Environment Unite for First "Green" Hospital

Johnson Controls systems enabled BCFH to become the first Leadership in Energy and Environmental Design (LEED)-certified hospital in the United States. Locally harvested and manufactured materials, along with recycled materials, were used in construction. Seventy-five percent of construction waste was recycled, minimizing impact to the native site. Organic compounds high in recyclability were used in construction to minimize impact on landfills during future demolition.

Alternative transportation offerings were provided, including two bus stops, special parking for bikes and carpool vehicles, and electrical charging stations for electric cars. Improvements on community bike paths were made to promote biking.

Lighting does not affect adjacent neighborhoods. Up-lighting, bleeding and light pollution is non-existent. Day-lighting is maximized in occupied space. Sensors in rooms shut off lights when no one is present. Energy-efficient mechanical equipment was used in the central plant and water conservation measures were implemented throughout the facility, including waterless urinals in public restrooms.



Alternative transportation, including parking for bikes and carpool vehicles, bus stops and electrical charging stations for electric cars, was provided on the site.

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A reflective roof was installed and insulation in the roof and exterior walls was increased to minimize heat gain in the building, which also minimizes energy usage. Additional sound batting was installed between patient rooms to ensure privacy. Special window glazing was added to increase thermal value and, although not recommended, BCFH wanted operable windows. To avoid losing treated air when windows are opened, Johnson Controls installed window contacts. The contacts monitor windows so, when they are open, a signal is sent to the room's variable air volume box to shut down.

Getting It Done Right

"Customer service was done right. When you're used to working with a contractor or sub-contractor, there is usually a very structured change order process. When you're dealing with the owner, they often catch you in the hall, request that something be done, and once they've voiced it, expect you to follow through on it. Johnson Controls was flexible and adapted to this type of customer service without negative cost or schedule impacts," concludes Savone.



To avoid losing treated air, window contacts were installed, shutting down air to the room when windows are open.

BCFH Systems and Subcontractors	
Metasys Building Management System	Johnson Controls, Inc.
Integrated Security System	Johnson Controls, Inc.
Structured Cabling System	ACS Dataline, Inc.
Nurse Call System	Hill-Rom®, International Control Systems, Inc.
Time & Attendance System	Kronos®
WAN and Dial Tone	Qwest
Phone Switch and Handsets	MicroTechTel, Inc.
Network Hardware	International Electric, Inc.
Public Address System	International Electric, Inc.
Television System	Interface Communications
Radio System	Frontier Radio Systems, Inc.
Wireless Telephones	Spectralink Etc.
Program Management and Commissioning	Farnsworth Group
IS/Telecom Consultant	CyberLink

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A reflective roof and insulation minimize heat gain, and window overhangs allow sun in during winter and shade during summer.