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Total Building Solutions for Hospitals

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Answers for infrastructure and cities.

Executive Summary

Hospital facility managers need to be able to leverage information to make their buildings work better and to help meet their hospital's mission. A system that integrates information from all hospital sub-systems—HVAC, energy management, fire safety, air quality, and security — into a common, centrally-monitored total building solution can help reduce energy usage; streamline maintenance; improve occupant comfort, safety, and security; comply with hospital building codes; and enhance sustainability. An integrated building system drives efficiencies and helps to reduce overhead costs.

An integrated building system provides flexibility and the ability to interface with other sub-systems and information, such as weather data, energy procurement information, maintenance management software, and equipment optimization software. It can help bridge the communication gap between facility managers, medical staff, and patients, resulting in improved productivity and comfort through participation, a reduction in utility expenses, and a commitment to a "green" workplace.

Hospital facility directors can learn more about integrated building systems by participating in related organizations, becoming familiar with research and trends in the industry, and understanding the codes and standards related to their facility. They can partner with a consultant or solutions provider who is aware of the issues of risk versus ease of accessibility and who has a breadth of solutions, proven experience, and a vision for the future.

Background

Today, technology is rapidly evolving; and, along with industry trends, hospital facility managers have more to manage than ever before. Faced with increasingly complex systems, large amounts of available data, and limited human and capital resources, they need tools to organize and leverage all of this information to make their hospitals work better and smarter.

At the same time, building management systems are becoming more complex with multiple systems converging, from HVAC and air quality systems, energy management systems, and fire safety and security systems, to any or all of the following demands.

Goals might include:

- Pressure to reduce carbon emissions
- Increase demand for distributed power
- Heightened demand for indoor patient and critical environment air quality metrics
- Demand for patient to staff user interfaces
- Growing need for echarging stations
- Water management to conserve and improve energy use
- Demand for real-time software capabilities to improve hospital safety and security performance
- Patient ease and comfort
- Faster and safer hospital procedures
- Joint Commission and other regulatory compliance

Systems and technologies to meet these goals might include:

- Demand Response and smart grid
- Mobile devices and demand for mobile applications
- Smart lighting control
- Power over Ethernet capabilities
- Energy harvesting technologies making smart devices a reality
- Building Information Modeling
- Alternative energy demands or demand for green technology, such as solar power
- The emergence of cloud computer moving data points to analytics
- Convergence of IP, bringing integration of data systems together more rapidly

These systems and demands, together with rapid change and convergence, are driving new solutions in hospital management systems.

Challenges

- Convergence of patient outcomes and hospital reimbursement
- Consolidation and standardization of hospital IT systems
- Big data analytics/Next Gen healthcare IT
- Rapidly-evolving technology
- Increasingly complex systems
- Large amounts of data
- Limited human and capital resources
- Multiple converging systems
- Risk management

Building on Today's Capabilities

The common denominator is that the tools for managing these different sources of information are remarkably similar. For example, it is possible to pull information from all independent building systems—automation, fire safety, and security— into a Command and Control center. From there, hospital facility managers have the ability to centrally monitor the entire facility through an integrated system.

Building system capabilities often include:

- Third-party application integration (i.e., Patient Infotainment Control, Admission Discharge Transfer (ADT), Nurse Call, Operation Room Scheduling, Computerized Maintenance Management Systems)
- Event management
- Graphics
- Scheduling
- Reporting
- History and trends
- Data integration
- Client access and user management
- Time and attendance
- Logic engines
- Integration with LED signage and other mass notification modalities
- Future possible integration, such as nurse call functionality
- Preventative Maintenance scheduling
- Lab controls/room pressurization control
- Third-party equipment integration: boilers/chillers/AHUs

How can you optimize these capabilities into an intelligent, manageable system? The common denominator is that the tools for managing these different sources of information are remarkably similar. For example, it is possible to pull information from all independent hospital systems—building automation, fire safety, and security systems—into a Command and Control center. From there, hospital facility managers have the ability to centrally monitor the entire facility through an integrated system. The benefits of an integrated hospital system - or total building solution - are realized in four main areas: system consolidation, personnel management, patient care and comfort, and preventive maintenance.

System consolidation

- Eliminates cost of duplicate front-end equipment
- Simplifies operator access to multiple systems
- Consolidates facility information using a single user interface for monitoring, commanding, and management

For example, in a VA Medical Center, integrated building automation, security, and fire alarm systems reduced the cost of multiple front ends, maintenance, and training. Operators could have visibility into all systems and common reporting through a single user interface.

Personnel management

- Improves patient throughput
- Reduces training requirements
- Reduces after-hours night shift requirements
- More efficiently directs personnel
- More efficiently handles and escalates alarms

For example, an integrated time and attendance system seamlessly tracks staff in a hospital. The system knows who is onsite and available to respond to issues to provide a faster, more effective response. Using a common platform reduces the training requirements for staff.

Patient care and comfort

Intelligent networking of information and communication technology, as well as medical and building technology, meets hospital requirements for patient comfort and supports the staff in providing care by providing:

- Fully-integrated patient terminals that give medical staff access to patients' digital medical history
- OR rooms with integrated control units for all tasks
- Integrated bedside environmental controls that empower patients to control temperature, lighting, and shades

Preventive maintenance

- Faster maintenance response to system troubles
- Monitor system status and performance from workstation
- Reduce system downtime
- Determine when service is required

In another scenario, any integrated system functionality will be logged in the automation system.

For example, the cycle of electronic locking hardware is logged within a building automation system (BAS) and is based on the manufacturer's specifications. On Mean Time to Failure (MTTF), a work order is initiated through a Computerized Maintenance Management System (CMMS) to inspect or replace the unit. The manufacturer has the appropriate systems in place and works closely with the hospital facility manager to meet their specifications.

What does a total building solution provide? A total building solution integrates all building sub-systems and can include some or all of the following:

- Building Automation
- Air Quality
- Security
- Fire and Life Safety
- Power Monitoring (EPMS)
- Lighting
- Metering
- Mass Notification
- IT Infrastructure-Connectivity to all Systems
- Open Protocols/BACnet, etc.

Not only does this approach help to drastically reduce costs—from initial construction or retrofit, energy usage, operations, and maintenance—but it also helps to improve occupant comfort, provide a safer environment, and enhance sustainability based on actionable information and intelligent control. (See Figure 1.)

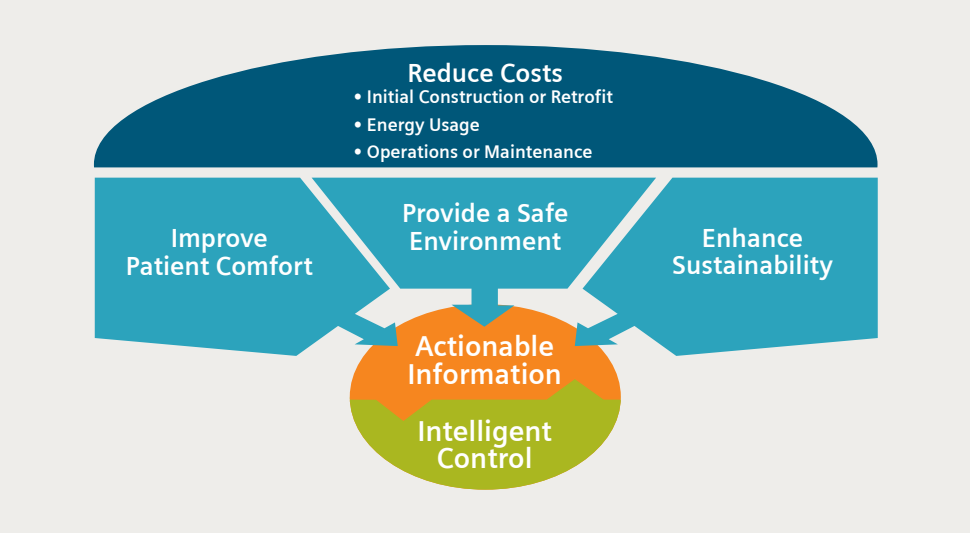

Figure 1. Total Building Solution

Highlights

The benefits of an integrated building system, or total building solution, are realized in four main areas: systems consolidation, personnel management, patient care and comfort, and preventive maintenance.

Overall, integration drives efficiencies and reduces overhead to help meet federal energy mandates and goals.

Benefits of an Integrated Building System

With a common head-end/user interface and intelligent interaction between automation and the fire and security systems, an integrated system can better service the needs of the hospital. Hospital security must allow for complex access patterns. For example, a technician requires access to different rooms than a cleaning person does, and access for both can also be dependent on the time of day. Further, in exceptional cases, such as a fire, it must be possible to change complex access patterns within seconds to allow for safe evacuation.

A common interface also serves to streamline management of the systems by providing a single point of contact for hospital subsystems. Overall, integration drives efficiencies and reduces the overhead to help meet federal energy mandates and goals and helps to reduce labor and maintenance costs for operating the building. There is also an automatic interaction between systems. For example, if there is a fire alarm, the system can bring the elevators to the first floor, turn on all of the emergency lights, close the smoke dampers, unlock the doors, and notify first responders of the alarm condition. In addition, the system can automatically make an announcement to occupants to start the evacuation. The common interface of fire, security, and other systems also assists hospitals in meeting compliance requirements.

Approach to Integration: What is the best path?

For an existing hospital with disparate systems provided by multiple vendors, some type of higher-level system is needed that can interface with these building sub-systems from either a Command and Control platform or a system that can integrate these sub-systems through standard open protocols, such as BACnet, OPC, Ole for process control, SOAP (Simple Object Access Protocol) Server, SNMP (software network management protocol), and ONVIF video camera protocol. Also needed is systems support for building automation, lighting, fire safety, access control, video management, and power management (metering/ power quality). In addition, hospitals often require the integration of further systems – i.e., elevators that have to remain in a specific position in the case of fire, or medical technology systems, such as gas management or laboratory systems.

The advantage of new construction is that the overall system can be more tightly integrated from the beginning. By selecting the products and systems at the beginning of the project, the integrated hospital solution can be defined from the ground up, from the system design process with consistent naming conventions, to wiring on a common backbone and sharing infrastructure, such as an Ethernet network.

Future Possibilities

Enterprise integration is becoming more software-based and provides even greater flexibility with the ability to integrate other sub-systems and information, such as weather data, energy procurement information (energy pricing or demand requirements), maintenance management software, and equipment optimization software. In addition, interfaces with medical staff and patients will become more common. Often, hospital facility managers cannot actively support or optimize the performance of their building. The issue is there is limited communication between occupants, facility management, and the building automation system. This is in part because:

- Staff and patients have limited ways to affect energy consumption of buildings
- Facility managers don't have a systematic way to incorporate staff and patient feedback and preferences
- Patients and staff typically have little control over their comfort settings
- Facility management has no communication back to staff and patients about their behavior and how they should behave
- Staff and patients have no means to express their experience and needs
- The BAS system is unaware of actual occupancy

As outlined below, this lack of communication and interaction between hospital facility managers and staff and patients often leads to inefficiencies in energy waste, reduced productivity, and lower satisfaction of hospital occupants.

Energy waste

- Unreported hospital issues are not fixed
- Hospital cools or heats beyond staff and patient needs

Reduced productivity

- Experience poor comfort
- Staff spends more time responding to patient complaints

Employee satisfaction

- Employees might choose companies based on their commitment to "green"
- A "poor" BAS system can impact the perception of an employer

For example, if the goal is saving energy, automation allows hospitals to move shading to the appropriate position before switching on the cooling system. Alternatively, if there is enough daylight in a room, artificial lighting can be switched off entirely. These individual measures may seem small but add up quickly in reducing energy consumption and costs. However, the challenge is how to communicate effectively with staff and patients. Solutions inspired by social media trends to close the interaction gap and include run-time, two-way communications among occupants, facility management, and the BAS system provide integrated, optimal control without sacrificing the occupants' comfort. Communication tools are still evolving and can include web pages, mobile apps, mass notification systems, email, and more. The ultimate result is improved medical staff productivity due to improved comfort and increased satisfaction through participation; better communication between facility management, staff, and patients; reduction in utility expenses; and a commitment to a "Green" workplace.

Practical Advice on How to Get Started

To learn more about integrated hospital systems you can:

- Participate in related organizations.
- Become familiar with research that is being conducted within the industry.
- Watch trends in the industry, such as multi-faceted sensors.
- Know and understand the codes and standards related to your facility.

To learn more about integrating your hospital systems or a total hospital solution, select a consultant in the area of smart buildings and look for a partner or solutions provider who has a breadth of solutions, proven experience in the healthcare sector, and a vision for the future. It is also important to have a resource that understands the IT environment. You need someone who is aware of the issues of risk versus ease of accessibility.

About the Authors

Ronald Greaves is the Healthcare Vertical Marketing Manager and leads all Healthcare Business Initiatives for the Building Technologies Division of Siemens Industry, Inc. In his role, he partners with hospitals to pursue and implement innovative building technologies that improve their effectiveness to manage clinical, operational, and financial 'HURTS.' Ronald developed a roadmap that paves the way for Hospital IT integration with the Siemens Building Automation Control System to save energy, improve staff efficiency, and increase patient satisfaction.

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About Siemens Industry, Inc.

The Siemens Building Technologies Division is the world leader in the market for safe and secure, energy-efficient, and environment-friendly buildings and infrastructures. As a technology partner, service provider, system integrator, and product vendor, Building Technologies has offerings for safety and security, as well as building automation; heating, ventilation, and air conditioning (HVAC); and energy management. For more information, visit www.usa.siemens.com/buildingtechnologies.

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The information in this document contains general descriptions of technical options available, which do not always have to be present in individual cases. The required features should therefore be specified in each individual case at the time of closing the contract.

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Answers for infrastructure.
Our world is undergoing changes that force us to think in new ways: demographic change, urbanization, global warming, and resource shortages. Maximum efficiency has top priority – and not only where energy is concerned. In addition, we need to increase comfort for the well-being of users. Also, our need for safety and security is constantly growing. For our customers, success is defined by how well they manage these challenges. Siemens has the answers.

"We are the trusted technology partner for energy-efficient, safe, and secure buildings and infrastructure."