



Automated
Logic

**THE SPECIFIER'S GUIDE TO
INTEGRATED BUILDING
SYSTEMS**

INTRODUCTION

In today's construction landscape, building specifiers face the challenge of meeting stringent demands for energy efficiency, sustainability, and occupant comfort. Integrated building systems offer a powerful solution, optimizing building performance by connecting core functions like HVAC, lighting, security, and more. In fact, integrated building systems can reduce energy consumption by up to 30% and increase overall building efficiency.

This guide explores the fundamentals of integrated building systems, providing valuable insights for specifiers and highlighting the capabilities of advanced building automation solutions.



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Integrated Building Systems- A Specifier's Perspective



Integrated building systems are transforming how we design and construct buildings. By connecting essential functions like HVAC, lighting, and security, these systems optimize building performance, creating spaces that are more efficient, sustainable, and comfortable for occupants. As a specifier, you play a crucial role in guiding your clients towards these solutions. This chapter provides a foundation for understanding integrated building systems and how they can benefit your projects.

What are Integrated Building Systems?

Imagine a building where systems seamlessly communicate, exchange information, and act without human intervention. The HVAC system adjusts based on real-time occupancy data, lighting dynamically responds to daylight, and security systems integrate with access control for enhanced safety. This is the power of integrated building systems.

Instead of operating in isolation, these systems form an interconnected network. This synergy is achieved through a central control platform and often utilizes an IP (Internet Protocol) network, allowing devices and systems to communicate using standard open network protocols, such as BACnet. This ensures interoperability and facilitates the flow of information essential for optimization.





Why Should Specifiers Care?

Integrated building systems offer significant advantages for your clients (building owners) and your own practice:

Benefits for Specifiers:



Streamlined Design Process: Simplify design and coordination by viewing building systems holistically and reducing potential conflicts.



Reduced Complexity: Make system management and troubleshooting easier with a centralized platform.



Smoother Construction: Minimize on-site conflicts and delays through clear communication protocols and coordinated design.



Increased Client Satisfaction: Deliver high-performing, sustainable, and comfortable buildings that exceed your clients' expectations.



Competitive Advantage: Position yourself as a forward-thinking specifier with expertise in integrated building systems.



Simplified Integration: Streamline the integration of different building systems by leveraging the standardized infrastructure of IP networks.

Benefits for Specifier's Clients:



Reduced Operating Costs: Help your clients save money through optimized energy consumption, reduced maintenance needs, and improved operational efficiency.



Enhanced Sustainability: Meet your clients' sustainability goals by specifying systems that minimize environmental impact and contribute to green building certifications as well as reporting of metrics to document sustainability goals.



Improved Occupant Comfort and Productivity: Create healthier, more comfortable spaces for occupants, leading to increased satisfaction and productivity.



Increased Building Value: Position your clients' buildings as premium assets with integrated systems that attract tenants and command higher rental rates.



Future-Ready Infrastructure: Ensure your clients' buildings are equipped to adapt to future technologies and changing needs with a scalable and adaptable IP network foundation.

By understanding the value of integrated building systems, you can guide your clients towards smart building solutions that meet their needs and enhance your reputation as a trusted advisor.

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Key Considerations for Specifiers

Open Protocols and Interoperability

Open communication protocols are essential for seamless integration and futureproofing. They ensure that different systems can "talk" to each other, regardless of the manufacturer. BACnet and Modbus are some of the widely adopted open protocols.

Actionable Insight

- Prioritize systems that support open protocols to avoid vendor lock-in and ensure long-term flexibility.
- Specify BACnet/IP as the primary communication protocol whenever possible due to its wide industry adoption and support for a broad range of building systems over IP networks.
- Consider emerging IP-based protocols like MQTT, especially for IoT devices and cloud-based applications.
- Consult with system integrators and manufacturers to determine the most suitable protocols for your project's specific requirements.
- Develop a detailed communication matrix that outlines the protocols used for each system and their interdependencies.

Scalability and Flexibility

Buildings evolve over time, and their systems need to adapt. Specify systems that can scale up or down to accommodate changing needs, such as tenant renovations or technology upgrades.

Actionable Insight

- Consider a modular system design that allows for easy expansion or reconfiguration.
- Utilize a structured cabling system that adheres to industry standards (e.g., TIA/EIA-568) to ensure a robust and scalable network infrastructure.
- Design the network with sufficient bandwidth capacity to manage current and future data traffic. For example, specify a building automation system with a flexible architecture that can accommodate additional sensors, controllers, and equipment as needed.
- Design the system with spare capacity to accommodate future expansion and avoid costly upgrades.



Cybersecurity

Building automation systems are increasingly connected to the internet, making cybersecurity a paramount concern. Specifiers must prioritize security measures to protect building systems, occupant data, and ensure compliance with relevant cybersecurity frameworks and standards.

Compliance: Adhere to recognized cybersecurity frameworks and standards such as:

NIST Cybersecurity Framework

A voluntary framework consisting of standards, guidelines, and best practices to manage cybersecurity risk. Specifically, consider NIST SP 800-82, "Guide to Industrial Control Systems (ICS) Security," which provides guidance on securing building automation systems.

Cybersecurity Maturity Model Certification

A U.S. Department of Defense program that requires contractors to meet cybersecurity standards to protect sensitive information. While not directly applicable to all buildings, the CMMC provides a valuable set of security controls for consideration.

Canadian Centre for Cyber Security Guidance

Refer to CCCS publications like "Baseline Cyber Security Controls for Small and Medium Organizations" and sector-specific guides for best practices relevant to building automation systems. Also, consider the "ITSG-33 Security Control Catalog" for a comprehensive set of security controls.

Actionable Insight

Network Segmentation: Isolate building automation networks from other IT networks to limit the impact of a cyberattack. Implement firewalls and intrusion detection systems to monitor network traffic and prevent unauthorized access. Use VLANs (Virtual LANs) to further segment the network and enhance security.

System Access Controls: Implement strong passwords, multi-factor authentication, and role-based access control to restrict system access to authorized personnel. Conduct regular security audits to identify vulnerabilities and ensure compliance with industry best practices and regulatory requirements.

Regular Updates: Ensure that systems are updated with the latest security patches and firmware. Establish a schedule for regular system updates and maintenance to address security vulnerabilities promptly. Subscribe to vendor security advisories and notifications to stay informed about emerging threats

Encryption: Encrypt sensitive data transmitted between devices and systems. Use secure communication protocols like BACnet Secure Connect (BACnet/SC) that use HTTPS and TLS to protect data in transit and at rest.

Consult with Cybersecurity Experts: Engage cybersecurity professionals experienced in building automation systems to conduct risk assessments, vulnerability analyses, and penetration testing. They can assist in developing and implementing a comprehensive cybersecurity strategy tailored to the specific needs of the building.

Manufacturer Best Practices: Follow guidelines or recommended best practices from the BAS Manufacturer as well as those from the manufacturers of the other building systems such as lighting control or access control.

By incorporating these cybersecurity measures and adhering to relevant frameworks, specifiers can help ensure the resilience and security of building automation systems against cyber threats.



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Advanced Building Automation Solutions

Comprehensive Building Management

Leading building automation systems provide a centralized platform for monitoring and controlling all building systems, including HVAC, lighting, security, and access control. These systems offer a range of features to optimize building performance, enhance occupant comfort, and reduce operating costs.

Actionable Insight

- Look for systems with advanced features such as real-time data visualization, alarm management, trend analysis, and fault detection and diagnostics.
- Specify systems with customizable dashboards capabilities to provide building operators with relevant information at a glance.
- Specify systems with reporting capabilities to provide management and building operators with reports capable of providing key sustainability/ESG metrics.
- Specify building automation systems that offer secure remote access capabilities via IP networks, allowing for convenient monitoring and control from any location.
- Consider systems with mobile access capabilities, allowing building operators to monitor and control systems remotely through mobile devices. Ensure that mobile access is secured with strong authentication and encryption measures.
- Specify building automation systems that offer advanced data analytics capabilities, enabling building operators to identify trends, predict equipment failures, and optimize building performance. Consider cloud-based platforms for data storage, analysis, and remote access.

Open Architecture and Integration

Open architecture is crucial for ensuring interoperability and futureproofing. Systems with open APIs allow for seamless integration with third-party systems and enable the incorporation of new technologies as they emerge.

Actionable Insight

- Specify systems that adhere to open standards and provide well-documented APIs.
- Ensure that the building automation system supports standard IP-based protocols and APIs for seamless integration with other building systems and third-party applications.
- Request documentation and test APIs before specifying a system to ensure compatibility and ease of integration.
- Consult with system integrators to ensure compatibility between different systems and avoid potential integration challenges.
- Conduct thorough integration testing to verify that all systems are communicating correctly and functioning as intended.

Focus on Sustainability

Advanced building automation solutions are designed to support sustainable building practices and help achieve green building certifications, such as LEED (Leadership in Energy and Environmental Design) and BREEAM (Building Research Establishment Environmental Assessment Method) or WELL Building Standard developed by the International Well Building Institute (IWBI). These systems optimize energy consumption, reduce water usage, and improve indoor environmental quality, while also tracking and reporting key performance indicators (KPIs) related to carbon reduction. This data-driven approach allows building owners and operators to measure the effectiveness of their sustainability initiatives and identify areas for further improvement.

Actionable Insight

- Look for systems with features that support energy efficiency, such as load shedding/demand limiting, demand-controlled ventilation, optimized start/stop schedules, and energy metering and analysis.
- Utilize AI-powered algorithms for predictive energy optimization, which anticipate occupancy patterns and adjust building systems accordingly.
- Specify systems that can track and report on energy consumption data to identify areas for improvement and measure the effectiveness of energy-saving strategies.
- Integrate building automation systems with smart grids to leverage time-of-use energy pricing and demand response programs.

• Reduce Water Consumption:

- Specify systems that can monitor and control water usage, detect leaks, and optimize irrigation schedules.
- Implement smart irrigation systems that utilize weather data and soil moisture sensors to adjust watering schedules, minimizing water waste.
- Consider greywater recycling systems for non-potable water use, such as irrigation and toilet flushing, further reducing water consumption.

• Enhance Indoor Environmental Quality (IEQ):

- Utilize advanced sensors to monitor indoor air quality parameters, including CO2 levels, VOCs (volatile organic compounds), and particulate matter.
- Implement demand-controlled ventilation systems that adjust airflow based on occupancy and real-time air quality data, ensuring optimal ventilation while minimizing energy waste.

• Integrate with Renewables:

- Consider systems that integrate with renewable energy sources, such as solar photovoltaic (PV) systems and wind turbines, to maximize the use of clean energy.
- Implement energy storage systems to store excess renewable energy generated on-site for later use, increasing self-consumption, and reducing reliance on the grid.

• Specify Building Systems to Achieve Interoperability:

- Select building automation systems that are certified by recognized organizations, such as the BACnet Testing Laboratories (BTL), to ensure interoperability and adherence to industry standards.

• Promote Sustainable Building Certifications:

- Utilize building automation systems to track and document building performance data required for green building certifications, streamlining the certification process.

By implementing these strategies and leveraging the capabilities of advanced building automation systems, specifiers can significantly contribute to creating sustainable, high-performance buildings that minimize environmental impact and enhance occupant well-being.

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Designing for the Future

The Role of the Specifier

Building specifiers play a vital role in driving the adoption of integrated building systems. By understanding the benefits, considering key factors, and specifying the right solutions, specifiers can create high-performing, sustainable, and future-ready buildings.

Actionable Insight

- **Develop a comprehensive specification:** Clearly outline the requirements for integrated building systems, including communication protocols, cybersecurity measures, and integration testing procedures. Specify open-source protocols and APIs to ensure interoperability and future-proof the system.
- **Define performance criteria:** Include specific performance metrics for each integrated system, such as energy efficiency targets, response times, and data reporting requirements. Specify requirements for data ownership and access to ensure building owners retain control of their data.
- **Stay informed:** Keep abreast of the latest industry standards and best practices for integrated building systems design. Participate in industry events, webinars, and training programs to maintain up-to-date knowledge. Engage with industry organizations and standard bodies, such as ASHRAE and BACnet International, to contribute to the development of future standards.
- **Collaborate effectively:** Work closely with the building owner, architects, engineers, and contractors throughout the design and construction process to ensure seamless integration of all building systems. Facilitate early collaboration between stakeholders through workshops and design charrettes to foster a shared understanding of project goals.
- **Design a robust network infrastructure:** Collaborate with building owner IT team, IT specialists and network engineers to design a secure and scalable IP network infrastructure that meets the specific needs of the building automation system. Consider emerging network technologies, such as 5G and Wi-Fi 6, to support future bandwidth demands and IoT connectivity.

By embracing these actionable insights, specifiers can help shape the future of buildings, creating intelligent, efficient, and sustainable environments that meet the evolving needs of occupants and owners.



CONCLUSION



Integrated building systems are revolutionizing the way we design, build, and operate buildings. By embracing these technologies, specifiers can create spaces that are more efficient, sustainable, and comfortable. Advanced building automation solutions empower specifiers to deliver exceptional buildings that meet the evolving needs of their clients.

By considering the key factors outlined in this guide and specifying solutions with robust capabilities, specifiers can unlock the full potential of integrated building systems. This will lead to buildings that not only meet the demands of today but are also prepared for the challenges and opportunities of tomorrow.

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