

# K-12 Industry Solutions to Help Facilities Managers Become Tech-savvy and Data-driven

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## KEY TAKEAWAYS

- Aging school facilities create challenges for students, municipalities, and school communities.
- Next-generation building management systems support environmental and sustainability goals.
- ABB has determined six strategies for creating healthy environments.

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## OVERVIEW

K-12 institutions in the United States make up approximately 7.5 million square feet of managed space. However, the challenges for facilities management presented by aging school buildings and systems, ineffective energy usage, and decreasing budgets require a smarter, more strategic approach. Facilities leaders are looking for solutions that meet the needs of today's constraints and establish a framework to support tomorrow's demands.

Using next-generation sensing technology and AI, industry leader ABB provides robust, scalable, autonomous or semi-autonomous building automation solutions to address K-12 institutions' challenges, focusing on creating optimal learning environments while reducing costs and driving efficiencies.

## CONTEXT

Saheel Chandrani explained challenges facing K-12 institutions due to outdated infrastructure. Mr. Chandrani discussed benefits of implementing building management systems, such as ABB's building automation solutions, to address those challenges.

## KEY TAKEAWAYS

### **Aging school facilities create challenges for students, municipalities, and school communities.**

Outside of infrastructure investment, schools represent one of the largest areas of public spending in the United States. Between 50 and 55 million people (about 50 million children and 6 million adults) are in 100,000 US school buildings daily. These buildings represent approximately 7.5 billion square feet. Unlike most other building stock, schools serve more needs than a typical single-use building, including educational

spaces for children, voting locations, emergency shelters, community gathering spaces, and more.

Despite this tremendous importance, the American Society of Civil Engineers' 2021 Report Card found that US schools earned only a D+ rating. Half of school districts were found to be struggling to upgrade and maintain key building systems, with 41% of districts in need of updating or completely replacing schools' HVAC systems—a technical and financial challenge.

Poor energy performance and energy cost concerns add to the challenge. Districts spend roughly \$8 billion per year in energy, the second largest expense category after teacher salaries. Despite the high cost, the investment for infrastructure repair and upgrade to meet even a minimal acceptable standard is exponentially higher, estimated at \$270 billion.

In addition, inadequate HVAC infrastructure negatively affects the learning experience. The impact of low- to poorly ventilated spaces on personal health can result in a 50% to 370% increase in respiratory illness. Poor indoor air quality is directly tied to lower daily attendance rates and slower learning.

Within schools, the facility departments are charged with addressing these challenges. However, most must do more than ever before.

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**Facility management and building operators within the K-12 spaces . . . are always expected to do more with less. They're often tasked with being innovative and effective in achieving their missions and outcomes of running efficient schools.**

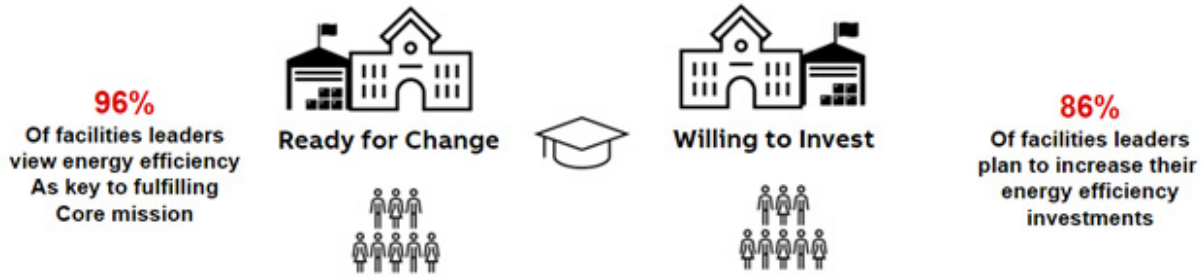
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*Saheel Chandrani, ABB*

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Figure 1: Facilities leaders are ready for change and willing to invest in energy improvements



## Next-generation building management systems support environmental and sustainability goals.

To address challenges of energy performance, poor indoor air quality, and the strain on facilities management resources, K-12 institutions can benefit from installing modern building management systems that leverage sophisticated data gathering, intelligent analysis, and collaborative technology solutions.

A building management system offers powerful insights to facilities managers to help proactively create cost efficiencies, build better futures for their institutions, reduce the demand on facilities resources, and provides a single management view for most building systems within a school facility. This simplified user interface offers quick and easy understanding of current building performance and status, reducing the demand on facilities department resources.

Figure 2: Consolidating facility management systems into a single view



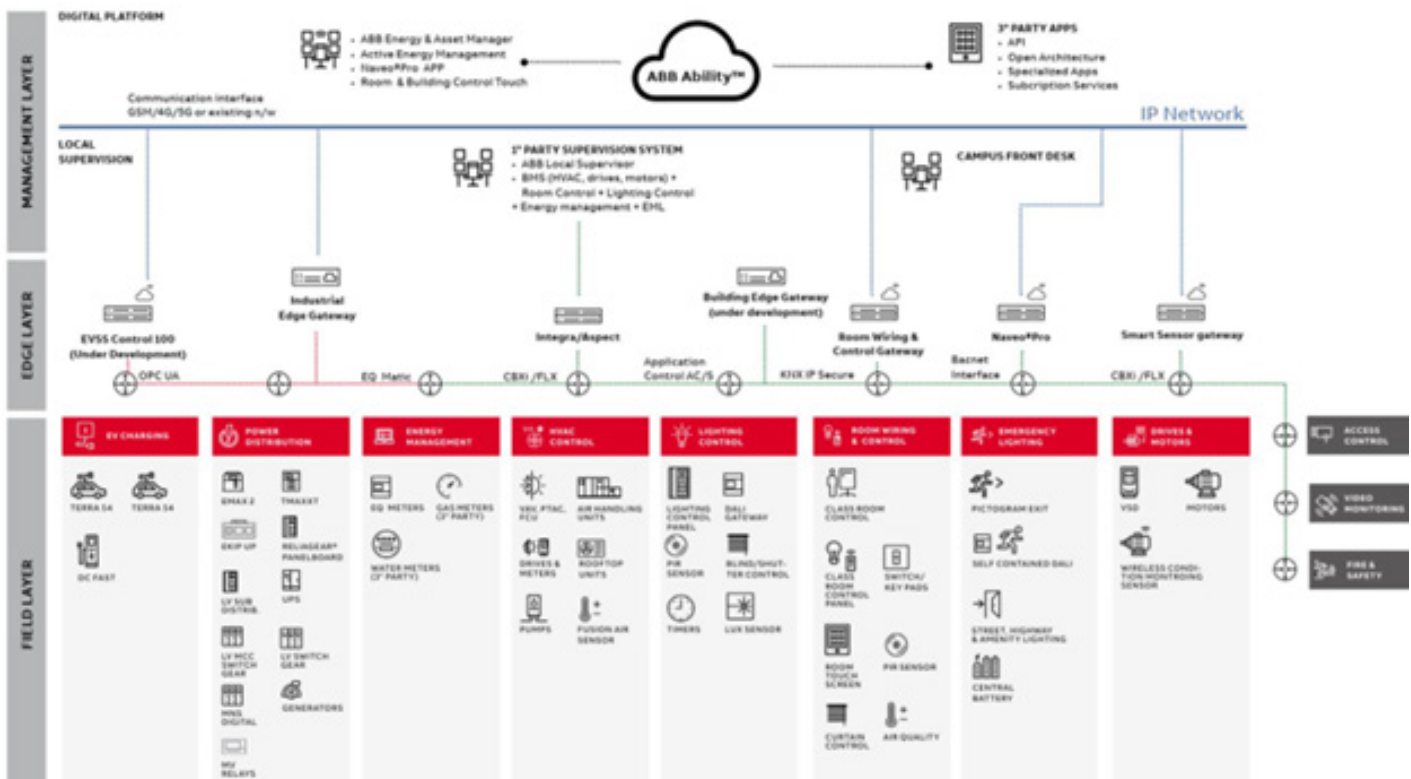
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These connected, intelligent systems are supported by a robust IT infrastructure. Integrating all dimensions of building technology that supports K-12 facility managers and their objectives is best achieved using open networking and communication standards that allow for a fully free flow of information or data between a variety of systems and subsystems. Dedicated IP networks across the supervisory level create a strong, resilient backbone for today's and tomorrow's technologies.

ABB recommends implementing dedicated IP networks and employing a converged information technology (IT) and operational technology (OT) approach to architecture.

This IT/OT convergence optimizes the functionality of next-generation sensors. Sensing technology is critical for measuring indoor air quality. Significant advances in sensing technology support a distributed architecture of sensing in every controlled space. Modern room or space sensors measure temperature and humidity, and also easily and cost-effectively measure and report out CO<sub>2</sub>, volatile organic compounds (VOCs), occupancy data, and more. Sensor devices can simultaneously provide visual feedback directly to occupants, whether an indication of indoor air quality, fire drills, code blues, or other status. This sensing technology, in addition to providing detailed, real-time data, allows facility managers to directly interact with the students in their spaces.

Figure 3: Building management system architecture



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Bringing AI into building management systems can bring school facilities to autonomous or semi-autonomous function. AI's powerful new analytical technologies enhance the ability to design and manage the built environment in ways that meet human and environmental needs, allowing for prompt decision making or changes in operational characteristics of systems. Through self-learning, school buildings or systems can achieve peak efficiency and support zero-emissions goals.

With innovative sensing technology and building intelligence, facilities managers can make informed decisions that save money as they lessen their school's impact on the environment and improve the education delivery of their campuses—all while maintaining data and system security. Industry leaders such as ABB employ strong cybersecurity practices across all systems, down to the edge level.

## **ABB has determined six strategies for creating healthy environments.**

ABB has distilled the practical applications of next-generation sensing and AI solutions to six strategies.

Many of the activities identified by an audit and road-map development are facility improvement measures or projects, which require significant funding. Many state and local governments have funds set aside, whether through the Infrastructure Reduction Act (IRA) or other funding sources.

Through the IRA, for example, more than \$280 billion has been made available to support the updating of US K-12 schools. These funds can address a wide variety of needs, including achieving proper indoor air quality within schools while gaining dramatic improvements in energy performance.

### **Six strategies for creating healthy environments**

Strategy	Description
1. Visioning	To identify goals and how to achieve them, it is helpful to conduct independent audits of present conditions and establish baselines, then build a path forward based on real data. Audits can estimate a dollar amount of energy savings that can potentially be redirected as a funding mechanism for building reinvestment or other school-based projects to support and improve learning.
2. Operations	Given the resources and roadmap developed in Visioning, some meaningful outcomes might be achieved through small or limited investments in existing systems or subsystems. This includes implementing high-impact technologies to improve indoor air quality without compromising on energy efficiency.
3. Energy management	Installing high-efficiency motors and variable frequency drives can significantly improve the efficiency of existing mechanical equipment.
4. Asset monitoring	Apply AI to achieve self-learning and autonomous control of building systems to reach peak efficiency levels and reduce downtime while extending the useful life of mechanical equipment. AI can provide fault detection and diagnostic capability and automate the running of buildings or building systems, including the need for callout or maintenance.
5. Environment	Utilize the latest in self-testing emergency lighting technologies and door entry solutions to provide a safe and secure environment for students and teachers.
6. Training	Educate facility managers, operators, technicians, and engineers on the roles they can play in operating their buildings, or behaviors within the building, that could result in significant energy savings.

ABB has experience and expertise in funding approaches and opportunities available to schools and school districts, whether for infrastructure and renewal programs, or operational and equipment upgrade programs.



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## CASE STUDIES

### University of California Irvine

In the recent Anteater Pavilion project, UC Irvine wanted to achieve LEED® Silver certification and beat the California Energy Code Title 24 by 50%. UC Irvine engaged designers and contractors to put in place systems and solutions necessary to achieve their goals. ABB worked with the team to implement:

- Variable pumping/variable flow chilled water and hot water system.
- System dP control, dP setpoint optimization and reset.
- Variable air volume air terminals with hot water reheat. CO<sub>2</sub> and relative humidity control. Occupancy based temperature setpoint reset.
- BACnet® interface with lighting control system.

The finite control achieved through quality and distributed sensing enabled management of spaces with variable sizes, at the individual classroom level. With similar network architectures, and indoor air quality and energy efficiency challenges to those of K-12 facilities, UC Irvine is an example of how sensor and AI technology can impact school buildings. As a result of these improvements, UC Irvine achieved LEED® Platinum certification and is currently on track to show a 20% decrease in energy cost for the building and a 40% savings throughout the campus.

Figure 4: UC Irvine campus and Lake Orion Community Schools building



### Lake Orion Community Schools

Lake Orion Community Schools wanted to leverage state-of-the-art technology throughout their facilities. The designer and contractors on the project team designed a robust BACnet IP architecture from the ground up, allowing all the buildings and subsystems to be tied together. The enterprise-grade building management system and robust IP architecture enabled an easy user experience on a variety of mobile devices to accommodate staff traveling frequently across buildings throughout the spread-out campus.

Lake Orion Community Schools is now compliant with the latest cybersecurity and network security standards, while achieving comfort and convenience. Lake Orion Community Schools utilized all available state incentives to complete the project in support of their mission statement: *Educating our students for the challenges of tomorrow.*

**Good IAQ contributes to a favorable environment for students, performance of teachers and staff and a sense of comfort, health, and well-being. These elements combine to assist a school in its core mission, educating children.**

*US Environmental Protection Agency*



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## MORE INFORMATION

To learn more about ABB, visit <https://new.abb.com/low-voltage/products/building-automation>

## BIOGRAPHY

### Saheel Chandrani

Director of Engineering & Operations, ABB Building Solutions in the Americas

Saheel Chandrani is the director of engineering and operations for ABB Building Solutions in the Americas. Saheel oversees all elements of customer service, inside sales, technical support, multi-site engineering, and multi-site operations in North America. In this role, Saheel is responsible for defining and executing on a world-class customer experience while influencing future commercial, product, and digital transformation strategy and roadmap. Saheel brings 15+ years of experience from several building technology companies including Siemens, Johnson Controls, and Honeywell.

Saheel holds two bachelor's degrees in Mechanical Engineering and Management from New Jersey Institute of Technology as well as an MBA from Drexel University.