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BUILDING AUTOMATION – SHAPING THE FUTURE OF INTELLIGENT INFRASTRUCTURE

As we stand at the intersection of innovation and sustainability, building automation is no longer a peripheral concept — it is the heartbeat of modern infrastructure. The convergence of intelligent systems, IoT, data analytics, and user-centric design is transforming how buildings are conceived, operated, and experienced. From seamless HVAC controls and dynamic lighting to real-time energy optimization and occupant-driven analytics, automation is redefining both performance and purpose.

In this issue of INBAC Magazine, we explore the emerging horizons of building automation — not just as a technological upgrade, but as a strategic necessity for resilient, adaptive, and efficient built environments. We delve into real-world applications, future-ready systems, and the evolving role of integrators, all through the lenses of those leading this transformation.

We extend our heartfelt thanks to the contributors and authors who have enriched this edition with their knowledge, case studies, and thought leadership. Your voices continue to elevate INBAC Magazine as a platform of substance and foresight.

Let this issue inspire us to keep pushing boundaries and reimagining what our buildings can truly become.

SINCERELY,
DR. AMIT CHAUDHARI (CFPS, LEED AP, PMP, WELL AP)
EDITOR-IN-CHIEF
BUILDING TECHNOLOGY BIZBITS MAGAZINE

INFRASTRUCTURE TECHNOLOGY: BUILDING SUSTAINABLE SMART SPACES

In the present India – Where we see a humongous infrastructure development in Road networks, Metro Rails, Services along with Real Estate development in major Metros and Tier II and III cities are impacting in rapid urbanization and climate change also impacting in polluting air, water, Noise and light to some extent.

The integration of infrastructure technology plays a pivotal role in creating sustainable smart spaces. These spaces leverage advanced technologies to enhance energy efficiency, reduce environmental impact, and improve the quality of life for residents.

This essay delves on key components such as IoT, renewable energy integration, smart mobility, and data-driven urban planning.

IoT and Smart Management

The Internet of Things (IoT) serves as the backbone of smart infrastructure.

These services are very well adopted and implemented in building and vehicles giving a vast expanse and possibilities of energy efficiencies, ease and comfort of utilities by embedding sensors and actuators like smart lighting systems, adjust brightness based on occupancy and ambient light levels, etc. that too with the ease of monitoring and operating those efficiently to the most optimum level.

Renewable Energy Integration

Integrating renewable energy sources into infrastructure is crucial for achieving sustainability goals. Solar panels, wind turbines, and geothermal systems are increasingly being incorporated into building designs, rooftop solar panels to reduce electricity consumption and employs 100% wastewater recycling for landscape irrigation.

Similarly if these sources are aligned with Infrastructure – to cater to street and road lighting along with sensors mapping to optimise it further can have big impact on energy consumption.

Along with implementation of these sources, if they form a network all across cities, infra interconnecting state can be a boon to the nation's environment.

Beyond the foundational implementation of IoT and automation in infrastructure, the strategic use of sensors and smart intervals can significantly enhance the efficiency of sustainable smart spaces. These adaptive technologies enable dynamic control over infrastructure operations, resulting in optimized energy use across various systems.

Sensors placed in strategic locations — such as building entryways, public lighting and water distribution systems — can collect real-time environmental and occupancy data. When paired with smart intervals, which allow systems to operate only when needed and at optimal performance levels, infrastructure can become far more energy-efficient.

For example:

- **Lighting systems** equipped with motion and ambient light sensors can adjust brightness or switch off when areas are unoccupied.
- **Smart irrigation** systems use soil moisture sensors and weather forecasts to avoid overwatering landscapes.
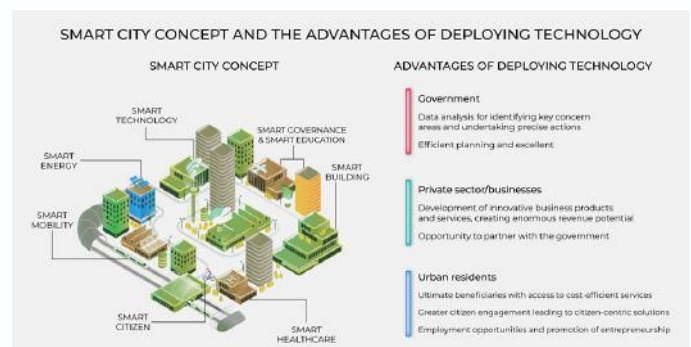
These adaptive operations are particularly valuable in large-scale developments or retrofitted spaces, where manual energy management would be inefficient or infeasible. By leveraging data-driven automation, energy usage becomes predictive and responsive, further reducing operational costs and environmental impact.

Incorporating predictive maintenance, powered by these same sensor networks, also ensures that systems are running at peak efficiency. Malfunctions or inefficiencies can be identified and resolved before they lead to energy waste

Smart Mobility and Transportation

Transportation is a significant contributor to urban carbon emissions. Smart mobility solutions aim to reduce this impact by optimizing traffic flow and promoting sustainable modes of transport. Intelligent transportation systems (ITS) use real-time data to manage traffic lights, reduce congestion, and improve public transit efficiency.

Electric vehicles (EVs) and autonomous shuttles are becoming integral components of smart cities. Infrastructure such as EV charging stations and dedicated lanes for autonomous vehicles are being developed to support these technologies.

Data-Driven Urban Planning

Data analytics plays a vital role in the planning and management of sustainable smart spaces. Digital twins, which are virtual replicas of physical assets, allow urban planners to simulate and analyze the performance of infrastructure before implementation. This approach helps in identifying potential issues, optimizing designs, and ensuring that developments meet sustainability criteria.

Challenges and Future Directions

Despite the advancements in infrastructure technology, several challenges remain. High initial costs, technological integration complexities, and data privacy concerns can impede the widespread adoption of smart infrastructure solutions. Additionally, there is a need for standardized protocols and interoperability among different systems to ensure seamless integration.

Looking ahead, the future of sustainable smart spaces lies in the continued evolution of technology and collaborative efforts among governments, industries, and communities. Emphasizing research and development, policy support, and public awareness will be crucial in overcoming existing barriers and achieving the vision of sustainable urban livin**g.**

Take away

Infrastructure technology plays a pivotal role in the creation of sustainable smart spaces. By integrating IoT, renewable energy sources, smart mobility solutions, and data-driven planning, cities can reduce their environmental footprint and enhance the quality of life for their residents. As technology continues to advance, the potential for creating more efficient, resilient, and sustainable urban environments expands, paving the way for a greener and cleaner future for the next generation.

Sustainable Smart City

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INFRASTRUCTURE TECHNOLOGY AND ITS ROLE IN CREATING SUSTAINABLE SMART SPACES

There was a time when the world was literally slower, major part of the world lived in rural areas. People respected the pace of patience and were very much close to nature. Growing up as a millennial, I have witnessed both the worlds - a pre-digital era and now the fast-evolving digital age. Honestly the world is moving with a lightning speed, earlier the world breathed a little easier with less traffic, cleaner air and a slower pace of life. But as the digital technology exploded, so did the urban density, consumerism and mobility and these urban challenges have made the engineers to find solution that could resolve the challenges caused due to increased pollution, high energy use, noise, housing shortages and mental fatigue from constant connectivity. It's very ironic that these very technologies that promised freedom, have also brought many complexities. We need smart cities because our traditional urban systems are no longer equipped to handle the complex challenges of rapid urbanization, climate change, and digital lifestyles.

Across the globe the cities are getting smarter. Technology is transforming urban spaces which are resolving the urban challenges. India, too, is embracing this global trend. As per current stats, with over 100 cities are selected under the smart cities mission. The focus of this mission is on using technology to improve the quality of life, reduce environmental impact and promote sustainable development. The below image shows the visual comparison of smart cities between global averages and India.

IBut for smart cities to truly succeed, the foundation lies in powerful yet often invisible component: infrastructure technology. One of the most visible aspects of infrastructure technology is Smart Building Automation. This includes systems like Building Management Systems (BMS) that control heating, ventilation, air conditioning (HVAC), lighting, security, and more. These systems talk to each other through a central platform, allowing buildings to operate efficiently. But if we take a deep dive into the history of BMS, it had started in 1960-1980s with a simple HVAC control system in commercial buildings, but from 2010s – till present it's extensively used due to rise in smart buildings IoT – enabled BMS system, real-time monitoring, AI based analytics, remote access via cloud. Also, due to integration with smart cities, to meet the sustainability goals and to achieve green building certifications. (LEED, IGBC, etc.).

- **Why Smart Building Systems Matter?**

By 2050, nearly 70% of the world's population will live in cities. Without smarter infrastructure, this will mean more congestion, pollution, and strain on resources. Smart buildings aren't just about technology—they're about using technology to make cities more liveable, inclusive, sustainable, and prepared for the future. They matter because:

- Everything in One Place: Facility managers can monitor and control all building systems from a single dashboard.

- Better Comfort: The system tweaks temperature, lighting, and airflow based on real-time needs and user preferences.

- Smart Metering: During high electricity demand, systems can reduce usage or tap into solar power, cutting both costs and emissions. Also, installation of smart water meters. IoT based smart electricity meters to monitor the energy consumptions.

What are the foundational technologies powering smart spaces?

Following are the foundational technologies powering smart spaces. In this article I have majorly focused on Digital Twin Technology, Building Management systems and Waste Management.

- IoT (Internet of Things): Sensors and devices collect real-time data on temperature, lighting, occupancy, air quality, etc., enabling responsive and adaptive building systems.

- Edge and Cloud Computing: Facilitate data processing and analytics, providing insights for optimization and predictive maintenance.

- 5G and High-Speed Connectivity: Enable seamless communication between devices, improving responsiveness and automation.

Major Focus

- **Digital Twin Technology:**

 The term "Digital Twin" comes from the idea that the digital model is "twin" of physical object or system. Today whenever there is client meeting, developers ask for a digital model of its structure with actual MEP services installed to visualise the structure beforehand. Virtual models of physical spaces used for simulation, monitoring, and scenario planning.

Professional experts of this industry will agree that earlier AutoCAD was the go-to tool for architects and engineers we used AutoCAD extensively for producing drawings, there was a high demand for draftsman who knew AutoCAD, but today, Revit and BIM (Building Information Modelling) have become the industry standard, offering intelligent 3D modelling, real-time collaboration, and lifecycle management of buildings

Those who haven't updated their skills or tools are now lagging. The industry has moved from just drawing to building virtually—where design, structure, services, cost, and timelines are all integrated into one smart model. With digital collaboration of different software's today all the electrical single line diagrams and schematics that I have been doing for middle east projects are produced in few minutes which earlier took days and weeks for submission, and all this is possible only because of computational design/script integration with other software's like excel, Amtech, etc.

INBAC Association provides an excellent opportunity to become a thought leader and an influencer. Our leadership team works together to expand our community and spread awareness around connected, sustainable spaces.

WHY INBAC?

- Lead smart infrastructure of Digital India
- Represent India on global platform
- Global collaborations and strong networks
- Drive the future of sustainable smart buildings

CONNECT
Public Private Partnerships

COLLABORATE
User & enterprise centric platform

CREATE
Value driven solutions

- **Building Management Systems:**

I started my career as a graduate electrical engineer in Bluestar in their EPC division in the year 2013 in building service sector, my first interaction with BMS system came when I had to review the technical datasheet submitted by BMS vendors, no body at that time knew whether this will be done by Electrical engineer or HVAC, and it was always a question it comes under who's scope and finally the person who leads the project decides who does the review, and that's how I first got introduced reviewing the TDS of sensors and various components of BMS. With years of experience in building service sector I have realised modern BMS are powerful however they fail to deliver because they are considered as last mile addition during construction. BMS generates a flood of data, but without analytics or visualization tools, it's just noise. To fix this problem we ned to start early during planning and not after construction. Link BMS with external data sources like weather APIs, municipal services, and smart grid systems for better urban resilience. Also, we need to know how to read the data, just installing the system for the sake of it without realising what the system is monitoring is complete waste of money and technology.

- **Waste management:**

Waste segregation was emphasized as the first and most crucial step during the Swachh Bharat Abhiyan (Clean India Mission). When I first visited my sister's place in Bangalore, I noticed this first-hand — every household and street corner had color-coded bins, making it easy and intuitive to dispose of waste the right way. However, the effectiveness of this initiative varies across city. That's frustrating but very common issue and it highlights a systemic gap between citizen responsibility and municipal execution We take the effort to segregate waste at home—dry, wet, and sometimes even hazardous or recyclable waste. But when the waste collector comes, they dump everything into a single bin. This defeats the whole purpose of segregation.

To address these issues, BMC has initiated pilot projects like the Green Tags initiative in Malabar Hill. This project employs smart tags on waste bins to monitor segregation practices, aiming to enhance efficiency and accountability in waste collection and recycling.

In a nutshell , today everyone needs a smart phone and every year there's an updated version of that phone, in similar way, the smart building technology that had begun years ago have now evolved so much and taken a paradigm shift in the way they operate that every year we see advancement in technology. Imagine a city as living body. Infrastructure technology is its nervous system.

It includes the sensors, networks, software, and systems that collect and analyse data to make real-time decisions. Whether it's adjusting traffic lights, optimizing energy usage in buildings, or detecting water leaks, these systems make our spaces smarter and more sustainable.

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SIPHONIC ROOF DRAINAGE FOR AIRPORTS – WHERE DESIGN MEETS DRAINAGE

With architects getting extremely creative with roof designs, airport roofs have started to look more like art installations than just structural covers. From sweeping curves to dramatic overhangs, the roof is no longer just a shelter; it's a statement. And because the airport is often the first impression of a city, designers are pulling out all the stops to showcase what the place stands for

Airport buildings are not just regular structures. They're meant to withstand pretty much everything, heavy rainfall, high wind speeds, and even potential manmade threats. In technical terms, they're classified as "important buildings," and rightly so. Which means every system in the building, especially something as crucial as rainwater drainage, needs to be planned with extra care. And let's not forget the changing climate. Abrupt showers, cloudbursts, and increasing rainfall intensity make roof drainage one of the most critical design components today. The bigger the roof, the tougher the challenge.

Now here's the issue: with such large and creatively shaped roofs, the old-school gravity drainage system just doesn't cut it anymore. Conventional systems require a lot of downpipes spread throughout the roof area. These pipes need to be placed at regular intervals, sloped carefully, and, frankly, they take up a lot of space. And space is something you don't really have the luxury of inside an airport terminal where every square inch is already carefully allocated. Also, traditional gravity systems don't really care about aesthetics. Imagine dozens of large pipes running vertically through lounges, shops, and passenger zones; it's just not practical.

This is exactly where Siphonic Roof Drainage steps in.

Siphonic drainage is not new, but its application in large infrastructure like airports is gaining serious momentum. The concept is simple: instead of using gravity and slopes, it uses water's own flow to create a vacuum-like effect that pulls water through the pipes; fast and efficiently.

Here's what makes it so exciting for airport roofs: one single siphonic downpipe can handle rainwater from up to 5,000 square meters of roof area. That's huge. You don't need dozens of vertical pipes anymore. Just a few smartly placed ones that are connected to specially designed roof outlets and routed through horizontal pipelines, no slope required.

What this means is:
- Less material.
- Fewer downpipes.
- More flexibility for architects and designers.
- And more usable space inside the building.

The cost savings are significant too; up to 70% compared to traditional systems. That's not a small number when you're dealing with buildings of this scale. Plus, fewer pipes mean fewer fittings, supports, and installation hassles.

And this isn't just theory; it's already being put to the test. Take a typical airport roof, which now averages 20,000 square meters or more. In a traditional gravity-based drainage setup, this would mean installing around 60 to 70 large downpipes, each needing specific slopes and routing that often clash with other services. It's bulky, rigid, and extremely difficult to coordinate in a space-constrained terminal. Compare that with a siphonic system, which can drain the same area with just 4 to 6 smaller downpipes, routed horizontally without any slope, straight into designated service ducts. This means a neater layout, minimal material usage, and far easier installation.

The following table provides a typical comparison between gravity and siphonic systems for a 20,000 sq.m roof.

Parameter	Gravity System	Siphonic System
Number of Downpipes	60–70	4–6
Pipe Size	200mm or more	Smaller (110–160mm)
Pipe Layout	Requires continuous slope	Zero slope; horizontal layout possible
Underground Connection	Every downpipe requires a chamber	No. of chambers substantially less
Groundwork	Lot of groundwork for many chambers	Less groundwork
Rainwater Harvesting Integration	Requires large network of underground pipes to converge	Less downpipes, easier to combine
Aesthetic Integration	Visually intrusive, hard to conceal	Easily concealed; minimal interference
Installation Complexity	High; coordination with MEP is difficult	Simplified layout; easier MEP coordination
Supporting Complexity	Large diameters, bracketing to wall difficult	Smaller diameters easier to bracket
Cost Efficiency	Higher overall cost	Up to 70% cost savings
Hydraulic Performance	Partial pipe flow with low velocity	Full-bore flow with higher velocity
Power Requirement	None	None
Environmental Impact	Higher CO_2 footprint	Significantly reduced CO_2 footprint
Suitability for Large Roofs	Not ideal; limited scalability	Highly suitable; scalable to large roof areas

Gravity Drainage   Siphonic Roof Drainage

Another beautiful part? The system doesn't need any power. No motors. No pumps. No electricity. It runs entirely on physics, just well-sized pipes, a good layout, and smart roof outlets. And because the system works under full-bore flow, the pipe diameters are smaller, and water moves at higher speeds. So not only is it more efficient, it also flushes itself better, meaning less maintenance and fewer blockages.

And here's something that's becoming increasingly important in our industry, sustainability. With fewer pipes and fittings, the overall material consumption drops drastically. In some cases, up to 90% material savings have been observed. That's a huge win when it comes to carbon footprint. It helps airport projects align with green building certifications like LEED or IGBC by contributing to points in water efficiency, innovation, and materials used.

The flexibility during the design phase is another big plus. Let's be honest, airport projects are dynamic. Things change. Spaces get resized, beams get added, duct paths shift. Siphonic drainage gives you that breathing space, you can adapt the pipe layout, tweak the lengths, or even shift the outlets without throwing the entire system off.

So, when you're dealing with a roof that's shaped like a bird, a wave, or a giant folded plate, to which the sky opens up, and rain comes pouring down, you need a Siphonic system that's quietly doing its job; efficiently, invisibly, and reliably. Because at the end of the day, no one notices the drainage system when it works well. And that's exactly how it should be.

About the Author

Ms. Aishwarya Krishnan is a Civil Engineer and the founder of Siphonic Innovations LLP, a niche consultancy specializing in sustainable roof drainage solutions for large-scale infrastructure. With projects spanning airports, commercial hubs, and urban developments across the globe, she brings deep expertise in hydraulics and construction management. Having transitioned from Professor to Entrepreneur, she continues to channel her passion for education through writing and sharing real-world industry insights.

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SHAPING INDIA'S FUTURE WORKSPACES: ORGATEC INDIA IN COLLABORATION WITH INBAC

At ORGATEC India, we believe the future of workspaces is not just about function—it's about intelligent design, connected infrastructure, and technology that enables people and businesses to thrive. That belief drives our vision as we prepare to bring the inaugural edition of ORGATEC India 2025 to Mumbai. In collaboration with INBAC (India's Building Automation Community) and other esteemed industry associations, we are proud to present a platform that will redefine organizational technology and workplace innovation in India.

Scheduled from November 4–6, 2025, at the iconic Jio World Convention Centre in BKC, Mumbai, ORGATEC India is not just an exhibition, it's a strategic convergence of solutions, ideas, and leadership across the spectrum of office design, building automation, facility management, workspace furniture, and digital infrastructure. This event is being organised by Koelnmesse India as the Indian edition of the globally acclaimed ORGATEC brand and is set to become the only trade fair in the country exclusively dedicated to the future of workplaces.

Our partnership with INBAC marks a pivotal step in bringing smart building technology to the forefront. INBAC has long been a torchbearer in advancing connected building systems and automation in India, and their support strengthens our shared commitment to build smarter, greener, and more efficient workspaces. One of the major highlights of our collaboration is the INBAC Pavilion at ORGATEC India a focused showcase of advanced automation technologies, real-time building intelligence, and next-gen IoT systems that are transforming the very foundations of commercial real estate and facility infrastructure.

To further drive industry dialogue, we have launched the 'ORGATEC India Workplace Dialogues' podcast series in association with INBAC. This content initiative is designed to give voice to changemakers in the workplace ecosystem featuring thought leaders from architecture, facility operations, building automation, and workspace innovation. These podcasts are being published across our social media platforms and will continue to build momentum as we approach the main event.

We're also proud to have onboard several key associations that represent the broader vision of workplace transformation in India. Alongside INBAC, ORGATEC India is supported by the Council for Realty Infrastructure and Services Promotion (CRISP), National Association of Software and Service Companies (NASSCOM), Manufacturers' Association for Information Technology (MAIT), Africa Facility Management Association (Africa FM), Architects Engineers & Surveyors Association (AESA) and Corporate Gifts Association of India (CGAI). Together, these organizations bring a diverse and authoritative voice across IT, smart facilities, digital ecosystems, and commercial interiors.

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If you're an innovator, manufacturer, service provider, or solutions leader in the fields of office automation, building systems, workspace furniture, connected lighting, IoT for commercial spaces, or smart AV integration, this is where your brand belongs. ORGATEC India offers a curated audience comprising CXOs, architects, real estate developers, procurement heads, interior consultants, and facilities professionals all seeking transformative ideas and scalable solutions.

For visitors, this event presents an unparalleled opportunity to experience the future of workspace environments under one roof. Through dynamic exhibits, interactive pavilions like the INBAC showcase, knowledge-led forums, and networking zones, professionals can engage with the ecosystem, explore new technologies, and find the right solutions for their evolving workplace needs. Whether you're designing campuses, managing buildings, rethinking interior layouts, or implementing ESG-driven facilities strategy, ORGATEC India is where you'll find the most relevant and future-proof answers. From July 2025, we will open registrations for visitors. With great brands expected to participate and thousands of visitors from across sectors, ORGATEC India 2025 promises to be a high-impact platform for showcasing innovation and connecting with decision-makers.

Above all, ORGATEC India 2025 is built on a belief that the workplace is no longer just a location, but a living system that must evolve with people, processes, and possibilities. We are committed to building a platform that doesn't just reflect change but inspires it. Our partnership with INBAC and other key associations is a testimony to this collective vision.

We invite you to be a part of this movement. Let's co-create the workspaces of tomorrow ones that are intelligent, sustainable, connected, and human centric.

📅 Dates: November 4–6, 2025
📍 Venue: Jio World Convention Centre, BKC, Mumbai
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INBAC's Founder & Director Mrs. Sakhee Chandrayan attended very prestigious AHR Expo at Orlando

The AHR Expo is one of the world's largest HVACR (Heating, Ventilation, Air Conditioning & Refrigeration) events, bringing together industry leaders, innovators, and professionals from across the globe. Mrs. Chandrayan's participation reflects INBAC's ongoing commitment to staying at the forefront of global trends in building automation and smart infrastructure.

BY MS. AKSHATA AYARE
KOELNMESSE INDIA

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- CONNECTIVITY TO SMART CITY INFRASTRUCTURE

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Statutory Note

Write to us: editor@inbac.org