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Passive Design Meets High-Rise: Challenges and Solutions in Southeast Asia

In this issue, *Southeast Asia Building* asked industry experts to tell us about passive design in architecture, specifically pertaining to high-rise developments in the Southeast Asia region. Read more to discover the challenges and benefits of passive design in high-rise architecture, and how architects can adapt using various technologies and innovations.

Interview with **Amit Singhal**, Director, GPM Architects & Planners



Amit Singhal has been associated with GPM Architects and Planners since 1999. His passion for architecture has resulted in the company's overall growth, especially in the commercial and retail design sectors. In addition to the daily responsibilities of the firm's operations, he plays an integral role in business development. As the Director of GPM Architects and Planners, he is the pioneering head of the commercial and recreational design teams. Besides being an enterprising

architect, Amit plays a pivotal role in project coordination between the site and the collaborators, which is a source of inspiration to the entire team.

Q: What is passive design in architecture?

A: Passive design is all about shaping a building to work in harmony with its environment, rather than against it. It focuses on deliberate yet straightforward decisions, such as orientation, shading, ventilation, and material choices, to manage light, heat, and airflow without relying heavily on mechanical systems. It's the effectiveness of passive design that stems from considering these aspects early in the design process: how the building is situated on the site, where openings are placed, and how materials perform over time. With proper execution, it enhances comfort, reduces energy use, and strengthens the long-term sustainability of a project.

Q: In Southeast Asia, what are the various factors to consider when implementing passive design in high-rise buildings?

A: Considering the climatic realities of Southeast Asia, characterised by high temperatures, persistent humidity, heavy rainfall, and intense solar exposure, passive design becomes an essential strategy for high-rise buildings. Beyond orientation and

shading, which directly impact solar heat gain, the design must strategically address natural ventilation to improve air movement in dense urban conditions where wind corridors are often obstructed.

Studies suggest that applying such passive measures in tropical climates can reduce cooling energy demand by more than 60%, making them both environmentally responsible and economically relevant in the long term. Material selection adds another layer of importance; choosing options that are durable, moisture-resistant, and locally suited ensures longevity and reduces maintenance challenges in humid environments. At the same time, integrating daylighting strategies and rainwater management into the building's form helps balance energy efficiency with resilience. Ultimately, passive design in this region is about tailoring every decision to both climate and context, ensuring that tall buildings remain comfortable, efficient, and sustainable over time.

Q: How is passive design incorporated into high-rise architecture? What technologies are used to optimise the process? Please give case studies from your firm that best showcase passive design.

A: In high-rise architecture, passive design begins at the earliest stage of planning. Orientation, massing, façade porosity, and shading strategies

determine how much a building can rely on natural forces, such as daylight, ventilation, and thermal mass, to reduce its dependence on mechanical systems. Technologies such as daylight and energy modelling, and thermal comfort simulations allow us to test and refine these strategies, ensuring that design decisions are measurable in their performance.

A project that reflects this approach is Mahagun Marina Wwalk in Greater Noida (West), a pre-certified IGBC green building. The design prioritises passive strategies that enhance both environmental performance and user experience. Vegetation and water bodies are integrated within the complex to improve the microclimate through passive cooling and natural air filtration. Wide, landscaped corridors and shaded public areas reduce heat gain while encouraging walkability, transforming shopping into an engaging, outdoor-like experience. Features such as mist-cooled piazzas, deep overhangs, and green rooftops balance comfort with reduced cooling loads.

Material and system choices also reinforce the passive-first approach. Building-Integrated Photovoltaic (BIPV) façades serve a dual purpose, acting as both shading devices and electricity generators. High-performance HVAC systems, supported by variant refrigerant technology and BEE-rated equipment, are employed only where mechanical intervention is unavoidable. Water-sensitive design complements this framework, featuring low-flow fixtures and a Moving Bed Biofilm Reactor (MBBR) wastewater treatment system, which enables recycling and reduces strain on local resources.

Marina Wwalk demonstrates how passive design in a commercial high-rise can extend beyond energy efficiency to create a resilient, enjoyable, and socially engaging environment. By allowing natural systems, such as light, wind, and greenery, to shape the design, the project redefines sustainability as the foundation of architecture itself.

Q: What are the current challenges in passive design? How can they be overcome?

A: Adopting passive design in high-rise buildings in India comes with its own set of challenges. One of the foremost is the pressure of urban density; tight sites often restrict optimal orientation, natural



Mahagun Marina Wwalk

ventilation, or daylight access. Climatic diversity across regions adds another layer of complexity; strategies effective in coastal cities may not be viable in arid or composite zones. Regulatory frameworks and development by-laws sometimes focus more on maximising built-up areas than environmental performance, limiting the scope for responsive design.

Although guidelines such as the Energy Conservation Building Code (ECBC) and rating systems like GRIHA and IGBC encourage climate-sensitive design, their implementation is still uneven. In many projects, developers often prioritise short-term cost efficiency over long-term sustainability benefits, making it difficult to invest in high-performance façades, shading systems, or integrated green infrastructure. Furthermore, passive strategies necessitate interdisciplinary collaboration among architects,

engineers, and planners, which is not always the norm in conventional project delivery models. Despite these challenges, the growing awareness of energy efficiency, occupant comfort, and resilience is prompting the industry to reassess its design approaches. With evolving policies and advances in digital simulation tools, the integration of passive design is becoming more achievable and more necessary for India's high-rise future.

Q: What are the long-term benefits of passive design? How can more people be encouraged to implement passive design in high-rise buildings?

A: The real strength of passive design lies in its long-term impact. By reducing dependency on mechanical cooling and artificial lighting, buildings achieve lower energy use, improved indoor comfort, and

healthier living conditions. Over the years, this translates into reduced operational costs, greater resilience against rising energy demands, and a longer building lifecycle with fewer maintenance challenges. On a larger scale, such approaches support sustainable urban growth by cutting carbon emissions and creating more liveable cities.

Encouraging wider adoption requires both policy support and a shift in mindset. More straightforward guidelines in building codes, fiscal incentives, and performance benchmarking can drive acceptance at an institutional level. Equally, communicating the human benefits, such as improved comfort, well-being, and long-term savings, helps end-users and developers view passive design as an investment rather than an add-on. When its advantages are understood across stakeholders, it naturally becomes embedded in the way we approach high-rise design.

Interview with Harsh Varshneya, Director and Head of Design, STHAPATI



Harsh Varshneya is the Director and Head of Design at STHAPATI, an award-winning multidisciplinary architectural practice headquartered in Lucknow and Delhi. Their globally recognised portfolio spans a spectrum of building typologies, from individual dwellings to large-scale urban developments.

Harsh Varshneya leads the firm's innovative ventures into urban mobility projects, both in India and internationally. Over the past decade, he has guided prestigious projects and various redevelopment initiatives within the aviation and railway sectors, shaping the nation's infrastructure landscape. His extensive portfolio includes the redevelopment of major academic institutions such as Delhi University and the transformation of key transport hubs in cities like Bangalore, Mumbai, Hyderabad, and beyond.

Q: What is passive design in architecture?

A: Passive design is about creating buildings that respond intelligently to their environment, optimising natural resources to maintain comfort and efficiency without relying heavily on mechanical systems. It involves harnessing elements like sunlight, wind, shading, and natural ventilation to reduce energy consumption while enhancing occupant comfort. In essence, it's architecture that works with nature rather than against it.