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An Open and Shut Case

From standardised versions that bedeck high-rises draped in showy façades to customised offerings crafted to gratify individual tastes, doors and windows come in a host of materials and have become agents of wellness, energy-efficiency and sustainability.

QUICK BYTES

- Advancement of HVAC technology also caused the evolution of window design.
- Doors and windows have become critical components to aid buildings in achieving net-zero status.
- Materials like uPVC, WPC (Wood Plastic Composite) and aluminium are in vogue.

Windows and doors are important components of any building and have a significant influence on both the interiors and exteriors. They not only affect the overall look and feel but also play an important purpose in ensuring the security and utility of the space. The material, colour and pattern of the doors and windows have a massive impact on how the space appears and feels. The ongoing evolution of trends and styles has led to many appealing, affordable and energy-efficient fenestration solutions. uPVC has taken the lead in this evolutionary process and the Indian uPVC doors and windows market will reach US$ 1810 million by the end of 2025.

Erstwhile solutions

In the pre-high-rise era too, there was a demand for beautiful doors and windows. Heritage and traditional Indian structures serve as testament to this. We must also take note of the colonial structures and buildings modelled on the lines of 19th century architecture that continue to grace our cities. In such properties, solutions need to sync with the original design.

"Casement windows and doors made of repurposed wood or responsibly grown wood are still a good option for such homes and buildings," says **Niraj Doshi, Principal Architect, Niraj Doshi Design Consultancy**. "With good

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- Ahana Miller,
Principal Architect, ABM

rubber and silicon seals, they can be weatherproofed. You can also include double glazing in the windows."

Wood continues to remain a favourite in such properties but uPVC has made inroads too. "The traditional aesthetic is as popular as ever, in a modern or traditional home," says **Khozema Chitalwala , Principal Architect, Designers Group**. "These days, heritage windows made of uPVC look indistinguishable and are available in flush sash and storm-proof variants. The flush version has a smooth and sleek frame that mimics the design of 19th century windows. The storm-proof glass offers extensive protection from the elements. Traditional joinery techniques are applied and each joint is handcrafted for a one-of-a-kind look. Unlike timber, uPVC does not need regular repainting, the colour does not fade, and it is a cost-effective solution."

The evolution

By the time our buildings grew in height, the methods of building and constructing them also changed and factors like energy-efficiency and HVAC came into play.

"Windows and doors evolved with innovations in building and construction," says **Azril Aamir Jaffar, Group Principal and Director, VERITAS Design Group**. "For example, the transition from load-bearing walls to the post and beam has freed up the perimeter of buildings for more innovative facade designs. At the same time, the advancement of HVAC technology also caused the evolution of window design. These factors have affected evolution in terms of window segments and forms as well as the material used. From cast iron, mild steel and timber, a lighter material like aluminium has come into play. Besides this, glass for windows has also evolved from stained glass to tinted glass and single glass to double glazing, float, laminated, and tempered glass."

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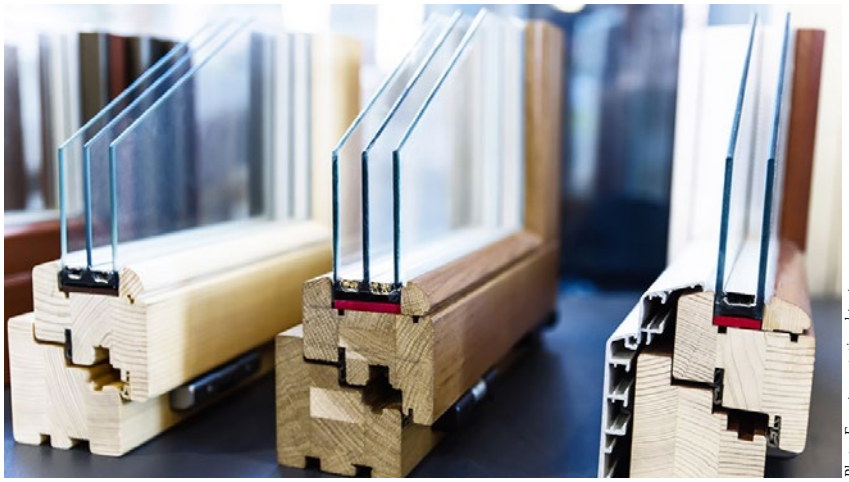
Adding to the conversation on material evolution, **Manju Yagnik, Vice-Chairperson, Nahar Group,** says, "Wooden windows have a rustic aesthetic and charming traditional quality. Natural weather resistance makes wood a strong substance. However, they are expensive and difficult to maintain. uPVC is all-weather, environment-friendly and heat and noise-resistant. Another metal that has a wide range of applications and is lightweight is aluminium. Aluminium windows and doors provide larger glass areas with a thinner frame that also provides structural strength. Nearly all high-quality uPVC products only require wiping down and never require painting. Steel windows and doors, on the other hand, are used in gothic, traditional and contemporary themes. They fulfil the needs of both the interior and exterior of the building. Having said that, the segment buying into bungalows and premium high-rises would probably still prefer aesthetics over functionality and wood will continue to remain a favourite with them."

"Because of the emergence of modern lifestyles and architectural developments, traditional designs, manufacturing methodologies and finishing methods have become obsolete," says **Sanjeev Chandiramani, COO, Ruparel Realty**. "As a result of these



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Double and triple glazed windows.

challenges, architects are looking for alternatives such as WPC, aluminium and uPVC. These are popular choices for high-end residences seeking a luxurious expression and warmth. They are well-known for their versatility and flexibility in producing a variety of shapes, and each serves a unique function based on its properties. These materials have been found to be exceptional, with greater potential when it comes to sustainability than other materials."

Heralding standardisation

As building and construction evolved, techniques like modular construction and prefab that catalyse the process became popular. This, in turn, facilitated the idea of standardisation of doors and windows.

"The idea of standardisation is to achieve a level of consistency and uniformity with the most effective strategies," explains **Arushi Marwah, Associate, Morphogenesis**. "Depending on the stakeholders and their objectives, standardisation depends broadly on the following categories: authorities and bylaws, context and location, fire safety norms, means of ingress and egress, orientation and solar factors as well as innovations and optimisation. If the glass sizing can be optimised at the beginning where the manufacturer creates a set system of sizing aligned with fire safety norms and bylaws, the entire façade system can be optimised with zero wastage. Once the modularity and a system are set, there are numerous possibilities of reuse and it enables us to have any sort of finish as a design element as per the architect's needs."

"When we are talking of building mass consumption units using modular construction or prefab standardisation, it cannot be limited to doors and windows alone, a number of components will have to be standardised to achieve a perfect synergy," says **Raman Sapru, Director - Design & Engineering, K Raheja Corp**. "For a country like India where mass consumption units have to be built across different price points in a defined time period, standardisation a great idea. The size of such components also needs to be such that they are available off the shelf, unlike customised components which cannot be procured easily. Standardisation enables multiple vendors to manufacture the component, so the availability of such products be it doors, windows or any other ceases to be an issue."

Since doors and windows act as agents of ventilation, its impact on air quality has been a subject of constant debate.

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Combating heat and noise

Considering that many buildings are located in areas prone to sound pollution, not to mention heat ingress, developers and architects prefer to use doors and windows that can combat these challenges.

"In case of high-rises located in the heart of the city, noise pollution is a major challenge," says **Yogesh Lahori, Vice President - Projects, Gera Developments**. "Use of double-glaze aluminium or uPVC windows can reduce the problem to a large extent. Low-E glass can help in filtering lesser heat coming through the window; along with this, use of sun control film also enhances performance. In case of wooden doors, we can increase the thickness and use rubber dampeners for better sound insulation."

To this **Ahana Miller, Principal Architect, ABM,** adds, "For sound reduction, I would recommend triple glazing; three layers of glass with two layers of air works best. However, it is expensive. Using Low-E glass on the outermost face reduces a substantial amount of heat gain, even more than using a reflective film on the outermost face."

"Combining Low-E glass with a double-glazing method can act as a high impenetrable barrier against the cold winters too, and prevent heat from escaping outdoors," says **Ritu Gupta, Co-Founder, Pramod Group**. "Also, the same will help reduce noise pollution because sound travels via vibrations through air and solids and the key to stopping noise getting in is to stop the

Photo courtesy: Pramod Group

Double glazed Low-E glass can help reduce noise pollution.

vibrations in their tracks. That's where the mechanics of soundproofing come into play with this combination of glass."

Indoor air quality and high-impact windows

As doors and windows act as agents of ventilation, their impact on air quality has been a subject of constant debate. "The most effective way to improve indoor air quality is to eliminate or reduce individual sources of pollution," points out Yagnik. "Some sources, such as those containing asbestos, can be sealed or enclosed; others, like gas stoves, can be adjusted to reduce emissions. In many cases, source control is also a more cost-effective method of protecting indoor air quality than increasing ventilation, because increased ventilation can raise energy costs."

Certain geographies across India and the world are prone to natural disasters like earthquakes. In such areas, high-impact windows have emerged as the right choice. "High-impact windows are coming into play as skyrises go higher and higher," adds Yagnik. "Apart from the mental peace they provide to residents during times of storms and rain, they also protect against UV damage, lower noise pollution and even reduced energy bills and insurance premiums."

Standardisation will not be limited to doors and windows alone, a number of components will have to be standardised.

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"Due to the change in context and geographical locations, high-impact windows are necessary," opines Marwah. "Depending on the climatology, this entails usage of specific kinds of glass. The building envelope and indoor air quality are in conjunction with each other and it is important to keep this into account when HVAC strategies are devised. They have been conceived with multiple kinds of systems with filters that control pollution levels and provide enhanced air quality of air. Motorised filters that can monitor carbon dioxide levels have been used to good effect."

Indeed, with continual innovation, doors and windows have started playing a key role in aiding homes and buildings attain wellness, energy-efficiency, net-zero status and much more, apart from promoting sustainability. As their utility has become multifaceted, they have become key components in the contemporary architecture and design ecosystem in defining the overall experience a space can offer to the end-user. CW