

THE ALLURE OF ALUMINIUM

OFTEN CALLED 'THE METAL OF THE FUTURE', ALUMINIUM HAS WIDESPREAD APPLICATIONS ACROSS VARIOUS SEGMENTS OF CONSTRUCTION

BY BINDU GOPAL RAO



As per industry estimates, the current market size of the façade industry in India is Rs 15,000 crore with an expected annual growth rate of 20% from 2019-2025. The major drivers of the industry have been growth in real estate in the country, increased commercial construction, urbanisation, key government projects like Smart Cities, urban housing projects and the like.

CONSTRUCTION CUES

Common uses of aluminium in the modern construction industry include long-span roof systems, taking advantage of the metal's high ductility to create consistent and durable forms over wide areas. Aluminium is an excellent component of exterior façades and cladding systems, and aluminium alloys have the strength to support heavy glass spans while facilitating new and exciting shapes, giving rise to many of the tallest and most innovative skyscrapers now populating the skylines of the world's premier cities.

Sagar Datta, an interior designer, says, "Aluminium was traditionally used in the framework of commercial buildings and offices, but is becoming an increasing popular choice for domestic use. The reason for its commercial success is the fact that, alongside exceptional aesthetics, aluminium door and window frames can be found at great value for money. The most eye-catching contemporary design involves innovation, and aluminium allows for this with ease."

Aluminium structures are low maintenance, energy-efficient and compatible with today's fast track construction techniques. They are lightweight, easy to transport, corrosion-resistant and have a higher strength-to-weight ratio, giving the alloys more strength than that of structural steel. "It has enabled countless conceptual structures to be realised, giving the architects more flexibility in design exploration and innovation. The possible applications for aluminium structures include windows, façades, roofing, cladding, curtain walling and structural glazing, prefabricat-

ed buildings, architectural hardware, H&V, shop fitting and partitions. Aluminium is also used extensively in industrial construction, ladders, scaffolding, thermal insulation, sound-proofing, air-conditioning and solar heating," says Dhruva Kalra, principal architect, I'm D'sign.

ADVANTAGE ALUMINIUM

Aluminium's ductility and softness allows it to be extruded and shaped into many shapes and contrasting elements, portraying a very modern and abstract design. It allows bold juxtaposition of planes, smooth curvilinear forms and fractal surfaces, creating iconic and impactful aesthetics. Aluminium structures are also compatible with computer-aided designs, and supplement parametric architecture with free geometries and futuristic design specific details.



1. Dhruva Kalra, principal architect, I'm D'sign.

2. Aluminium is an excellent component for exterior façades and cladding systems.

3. Virtual Reality, Augmented Reality and hologram technologies are being used in aluminium.





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4. Floor-to-ceiling aluminium windows used for a residential façade by Deco-Arte.

5. Amardeep Gulri, founder & principal designer, Deco-Arte.

6. Edwin R Saldanha, MD, Doors & Doors System.

7. Aluminium can withstand most climatic changes as seen in this Deco-Arte glass house.

New anti-corrosion finishes along with high-tech surface treatments are making aluminium structures more durable and versatile. Techniques like anodising and electrostatically sprayed coating have introduced a range of surface colours, like bronze, grey, red and blue, to match the desired design requirements, thus allowing for more imaginative designs. Aluminium being a 'forever material' is well adapted to the need for sustainability. It is a plentiful material and can be recycled repeatedly without loss of properties.

"Be it appealing aesthetics, high strength-to-weight ratio, functionality or sustainability, aluminium enables one to innovate, adapts itself to different kinds of buildings, and fits well with the need for environment-friendly construction even providing desired performance for ambience like sound insulation and greater thermal performance to keep the comfort level inside the building. An aluminium window in a building is not lost or consumed during the lifetime of a building, but only used, and can be recycled an indefinite number of times; there is no longer a 'grave' or land filling stage. Aluminium fulfils the idea of a 'cradle-to-cradle' approach," says Subhendu Ganguly, MD, AluK India.

METAL MATTERS

Today, aluminium occupies about 55% share of the total fenestration market in India, followed by 25-30% share of wood and steel, and the relatively new uPVC at 15-20%. Aluminium is widely preferred by the evolved customers (builders, in this case) as it is available in a broad range of customisations



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and price points, with a faster production cycle as compared to uPVC. Aluminium is the metal of choice for architects in evolved markets worldwide because of its superlative properties. Case in point, the 2019 world average for aluminium consumption in construction was 24%, compared to China where it is 31% and India where it is only 11%.

Aluminium can be formed into nearly any shape, which makes it extremely popular for structural applications and building components like doors, windows, sliding, roofing, curtain walls, sun shading, flashings, balustrades and decorations, to name a few. Aluminium is lightweight while offering similar, or better, strength and resilience. When used as a base metal in construction, aluminium structures weigh 35-65% less than steel, while providing equivalent strength. Fitting into the 21st century design trends, modern aluminium alloys are easily able to support the weight of heavy glass spans, for buildings designed around harnessing natural light for energy-efficiency. The extrusion process offers an almost infinite range of forms and sections, allowing designers to integrate numerous functions into one profile. Rolled products may be manufactured flat, curved, shaped into cassettes, or sandwiched with other materials. In addition, aluminium can be sawed, drilled, riveted, screwed, bent, welded and soldered in the workshop or on the building site.

FORM MEETS FUNCTION

It is the material of choice for an exterior façade of the

building due to its properties and the design freedom it provides to architects. Amardeep Gulri, founder & principal designer, Deco-Arte, says, "Aluminium is a tool for unlimited creativity in the hands of the architect or interior designer, making it possible to create structures that cannot be made from wood, plastic, or steel. Thanks to its low specific weight, an aluminium plate constitutes half the weight of steel with the same stiffness. So, the weight of aluminium structures is one-half to two-thirds the weight of steel structures and up to one-seventh the weight of reinforced concrete structures with the same bearing capacity, making it a new age element in the field of construction. That is why aluminium is today used in high-rise buildings and skyscrapers. Window frames, panels, domed roofs and other wide-span constructions and ornaments are increasingly made with aluminium. Today, it is used for roofs, siding, translucent panes, window and door frames, staircases, air-conditioning systems, solar protection, heating systems, furniture and many other things."

Santhosh Garudanagiri Lingappaiah, partner, KK & GL Partners, adds, "As the material is lightweight and durable, it leads to a new architectural and structural flexibility of designing large scale and span structures with less time. It requires less onsite fabrication compared to steel and adds to the simplicity of fabrication. Also, it's ideal to build for both low temperature and high moisture conditions."

TECH EDGE

Aluminium, as a material, has an edge over steel and other metals, due to its properties such as its light weight, corrosion-resistance and functionality in shape and size. It also offers reduced load on the building and helps in reducing the carbon footprint.

Edwin R Saldanha, MD, Doors & Doors System, says, "3D

modeling has enhanced the visualisation of architectural designs and structures. The 3D model helps in making a better plan, which helps avoid rectification and rework at the time of execution. Also, it enables a sales executive to market the product and design in a better way." There has been a rapid increase in the usage of ACPs (Aluminium Composite Panels) over the years for all modern structural designs.

"Aluminium can be shaped into myriad forms while still maintaining the strength and durability of the frames. It's also more weather-resistant than traditional wood, which helps it stand up against even the harshest conditions. All the world's

8. Deco-Arte uses aluminum and glass as a partition in an office, making the space fluidic.

9. Aluminium windows used as part of the façade lend a minimalistic look, while also bringing in a lot of natural light at this Deco-Arte project.



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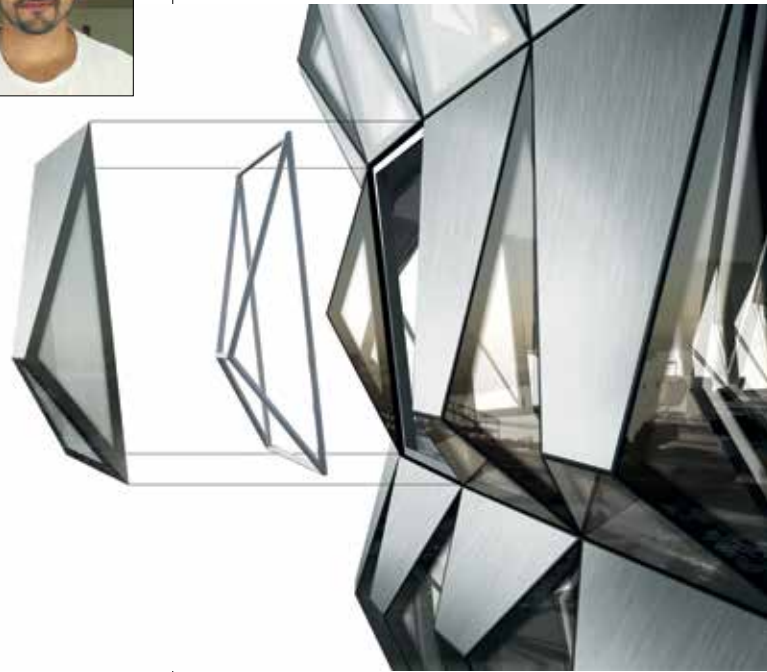
10. Rupin Suchak, an art and interior designer.

11. Parametric system 3D modelling used by Schueco India.

12. Schueco India's Shivalik Shilp building in Ahmedabad.



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leading modern architectural masterpieces heavily rely on the metal," says Rupin Suchak, an art and interior designer.

Pratik Doshi, national façade manager, Schueco India, explains, "From the idea through to implementation, Schueco digital solutions support, as a reliable partner, at every stage. We are continuously improving our digital services like Virtual Reality, Augmented Reality and hologram technologies to get our products in line with the technical possibilities as well as customer needs. 3D modelling is a very good tool to showcase our product to decision makers, especially during COVID-19 times, when we can't show our real samples, etc. to clients, as most meetings happen virtually. So, with the help of 3D modelling, we are showing our products to our prospective customers."

CHALLENGE FACTOR

Crucial, in this scenario, is the lack of awareness amongst builders about the cutting-edge properties of aluminium, resulting in environmental issues being pushed to the back burner in favour of short-term cost savings.

"They are reluctant to incur minor additional expenditure on aluminium façade and fenestration, which could decrease the overall operational cost in the long-term, bringing down energy expenses and increasing longevity of the structure, with no adverse impact to the environment. Rural and semi-urban areas usually prefer timber, owing to the differential cost, despite its adverse environmental impact, followed by mild steel. The market is, therefore, inundated with low-priced traditional materials to cater to the bottom of the pyramid. Aluminium's great strength-to-weight ratio can easily replace a lot of traditional materials. In an energy-conscious world, aluminium – the green metal – can contribute significantly as it is green in its entire value chain, right from mining to its infinite recyclability," says Ajay Kapur, CEO, Aluminium & Power, Vedanta Limited.

In the absence of industry standards and regulatory bodies, the industry naturally remains fragmented and unorganised. India is yet to recognise the importance of façade consultants along with architects, structural engineers and mechanical, electrical & plumbing (MEP) consultants. Their expertise is crucial to assessing structural stability and keeping a check on inferior products and designs. With the industry being unorganised and fragmented, there is a dearth of talent and deep domain expertise in façade and fenestration, which, added to a lack of awareness, compounds the problem.

GOING GREEN

With greater migration into cities, there is the need for tall buildings, which can house people while contributing to efficient land use. Aluminium frames allow for gravity-defying buildings that are, at the same time, more energy-



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efficient and environment-friendly, with less CO2 emissions.

"In our quest for a sustainable future, there is a growing emphasis on green buildings. Aluminium is one of the most energy-efficient and sustainable materials. It can withstand various climatic conditions, and the insulation technology used for aluminium fenestration applications in developed markets helps meet low energy requirements. Aluminium reduces the construction time owing to availability of prefabricated structures and increases portability of the structure. It is easily customisable, durable and less complex as compared to conventional building structures. With applications ranging from warehouses and exhibition set-ups to storage units, aluminium structures are a preferred choice for portable structures," opines Kapur.

For buildings which demand a high degree of absorption of structure-borne and airborne noise, aluminium has proven its worth for support purposes. Furthermore, at the end of the life cycle, aluminium can be easily recycled with minimal energy into new forms without any loss of quality.

LOOKING AHEAD

The future lies in intelligent façade systems; in other words, systems that are characterised by automation and control of the façade elements, thereby providing the best possible light conditions, air flow, solar shading, and energy storage and distribution. Aluminium is the perfect material for such systems, suitable for large-surface use and extreme loading.

Sarabjit Singh, architectural designer and founder, Villa Ortega Design Studio, says, "Trends in aluminium structures tend to push the boundaries of window openings; less frames and more glass make expanses seem endless.



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13. Vedanta offers high-quality aluminium products for downstream manufacturers/ extruders like the billets seen here.

14. Vedanta has a variety of products including aluminium ingots.

15. Ajay Kapur, CEO, Aluminium & Power, Vedanta Limited.

Seamless integration of façade and openings is possible only because of aluminium structures. As technology develops, they will get more lightweight and easier to install and find their way to all elements of building design. The day we start using aluminium doors, bathroom fittings and even aluminium furniture, is not far away."

Aluminium-intensive buildings are already front runners in the global race for green buildings, with numerous sustainable building awards like LEED Platinum and Gold to their name. Globally, aluminium is already a game changer in the world of architecture, and India is yet to catch up. ■