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WINDOW& FACADE
MAGAZINE



EXTERIOR WALL CLADDING
Options, Solutions & Guidelines

Face to Face
Ar. Tony Joseph
Principal Architect,
STAPATI

Applications of BIPV Technology in India
K.R. Harinarayan
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Case Study
The 42,
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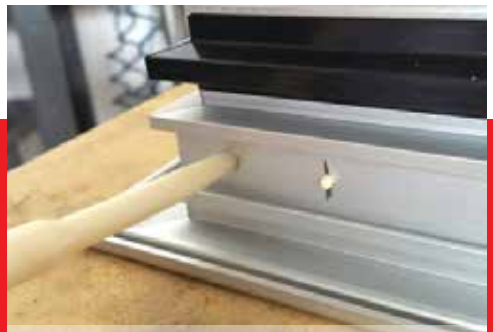
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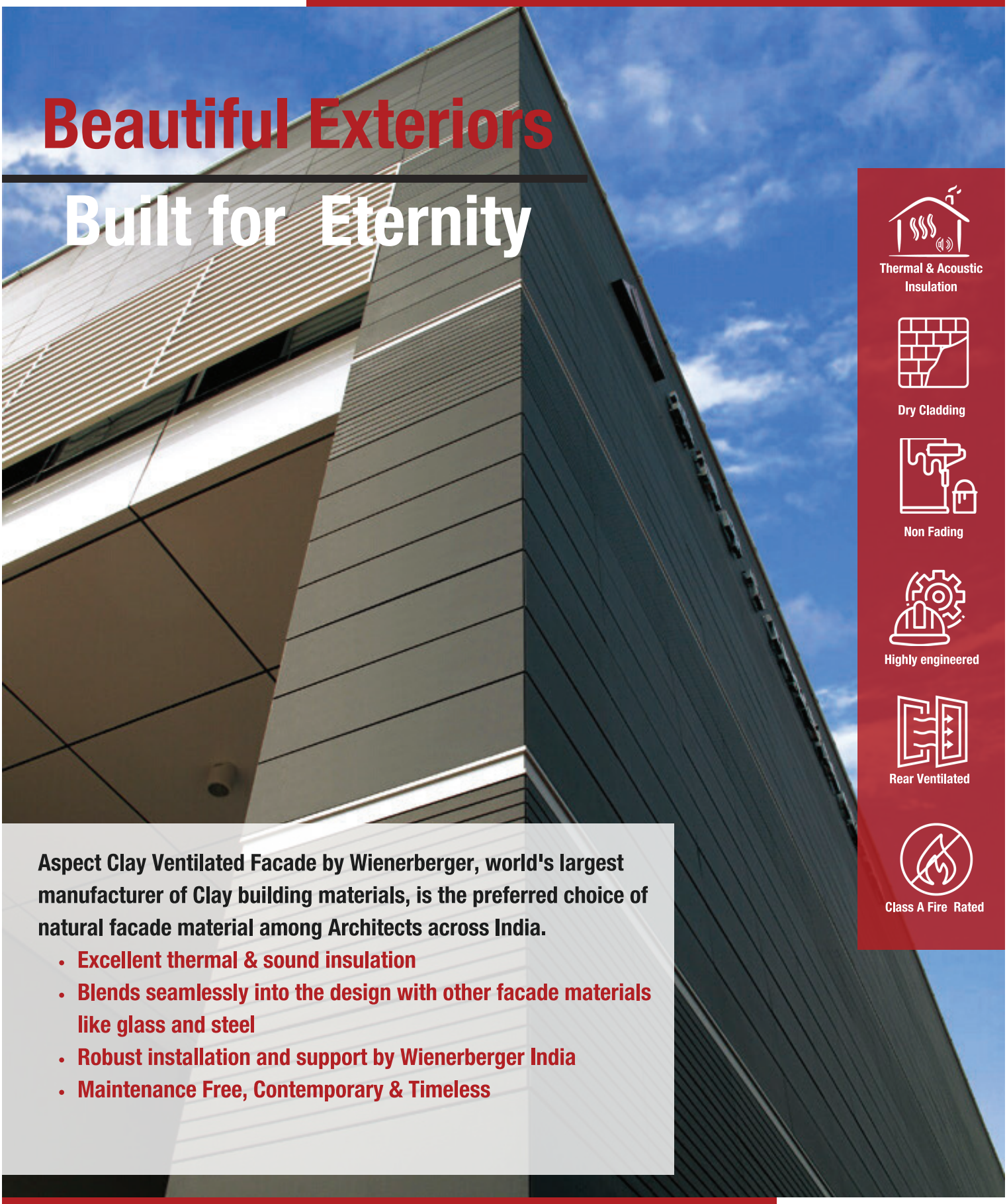
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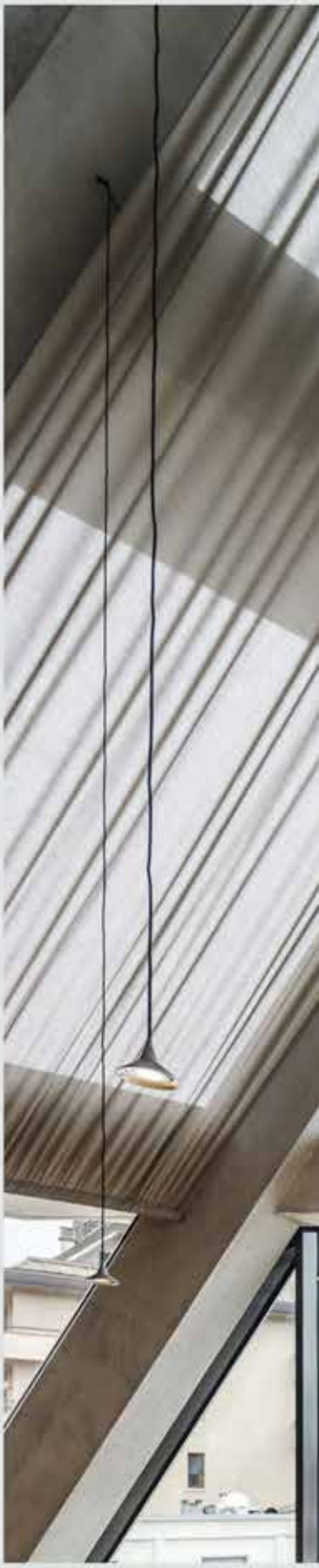
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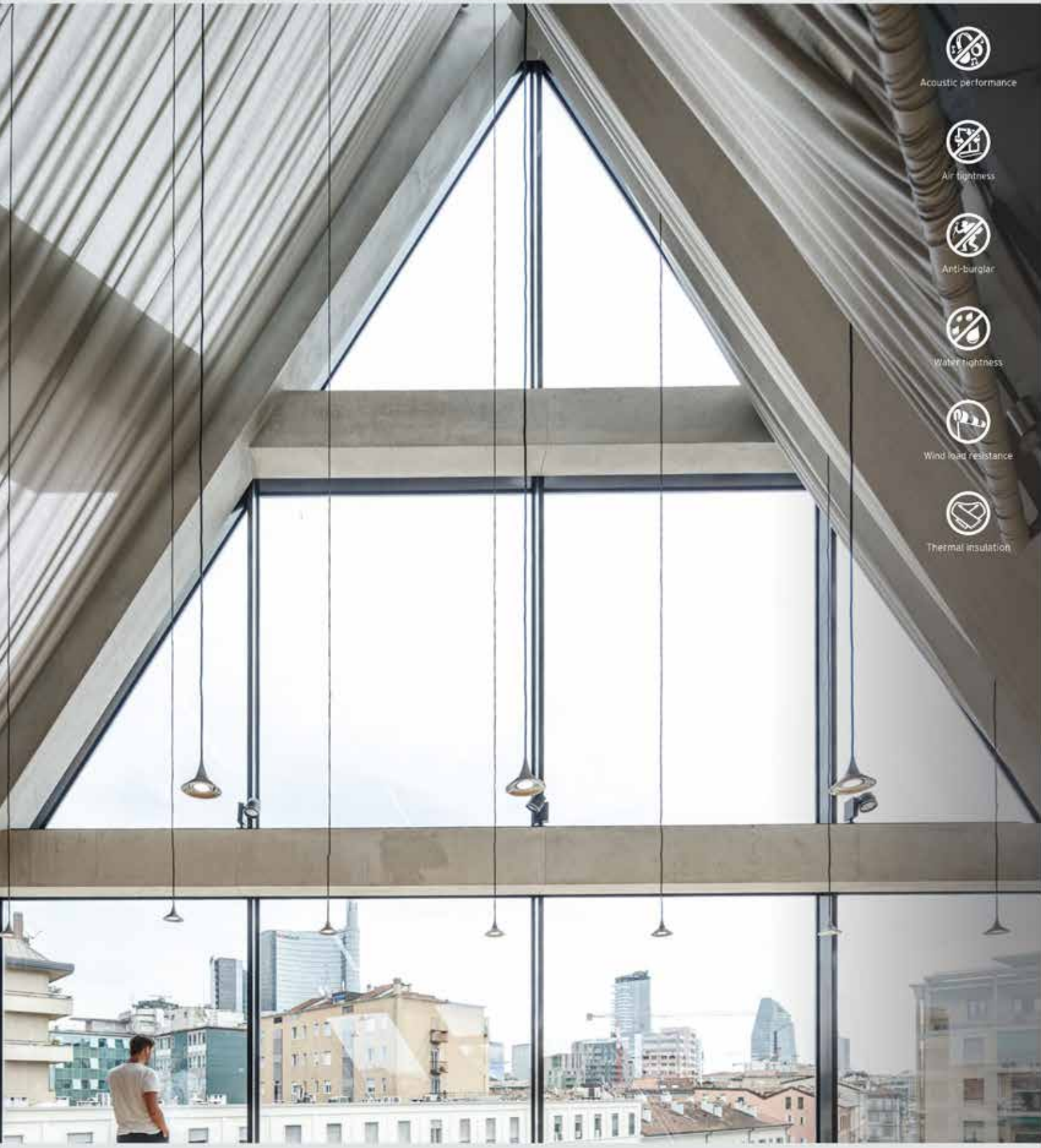
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"a defensive alliance between Australia and New Zealand"
synonyms : association, union, league, treaty, pact, compact, entente, concordat; More
bloc, confederation, federation, confederacy, coalition, consortium, combine, syndicate, affiliation, partnership;
fraternity, brotherhood, sorority, team, ring, society, club, guild, group, organization
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T: +91-11-40623356

CO-FOUNDERS
Syed Ahad Ahmed
Amit Malhotra

TECHNICAL PANEL
Mahesh Arumugam
Director
Meinhardt Façade Consultants
KR Suresh
Regional Director
Axis Façade Consulting

EDITORIAL
Renu Rajaram
renu@wfmmedia.com
+91 9312864830
Shefali Bisht
editorial@wfmmedia.com

DESIGN & CONCEPT BY
Prashant Kumar

MARKETING & OPERATIONS
Kapil Girotra
kapil@wfmmedia.com
+91 9560925255

SUBSCRIPTION & CIRCULATION
Devagya Behl
support@wfmmedia.com
+91 9871151112
Mukesh Kumar
mukesh@wfmmedia.com
+91 9560088995

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Cover image courtesy: STAPATI ARCHITECTS, Project: Malabar Headquarters, Calicut, Kerala

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EDITOR'S NOTE

As you all know, the world is experiencing the largest healthcare crisis. People are asked to stay indoors as much as possible to avoid spreading the deadly COVID-19 virus. Lifestyles are being redefined with the 'New Normals', and the same is happening with the daily office chores and shopping errands. For some of those who are living in quarantine, the only visual connection with the outside world is through their balconies/ glass façades or windows, as they yearn for a little fresh air, sunlight and connect with nature.

People around the world are questioning ways to improve these aspects of health and wellness measures in the current crisis. The role played by the design of the building and materials used are very conspicuous, thus the pandemic has definitely changed the designer's take on façades and fenestrations during the lockdown times, promoting better wellness and mental health. They all are trying to design and develop adaptable façade systems, reassessing the importance of outdoor spaces, providing comfort and resilience. A typical example is the incredible innovation by the architect HofmanDujardin and developed by renowned French engineering firm Kawneer - The Bloomframe® window - a state-of-the-art product, which morphs into a balcony in seconds with the press of a button. Many designers are harnessing urban agricultural initiatives, including vertical farming with hydroponics.

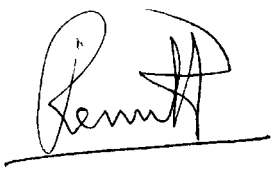
Along with such fabulous initiatives finding space in the design forefront, the choice of supporting cladding materials becomes important. This edition of the magazine discusses the various sustainable and safe options available in the Indian market, along with a few important case studies. The cover story of this edition explains the need for incorporating proper cladding materials including glass, HPL, ACP, metal, terracotta, fabric, etc., along with the need for maintaining safety and best performance.

The formula for quality, responsible and sustainable façades/cladding is constantly evolving. The industry not only has to become more conscious of the resources we use for constructing buildings, but also has to have holistic views of how those materials are going to affect our future environment. Architects have to empower the construction industry with positive changes in resource consumption and environmental impacts.

This edition is proof of our passion for presenting high-quality content with which we could guide you to find the best solution for your business needs. Our in-house team can help to build your brand and profile by connecting you with the right people.

Stay informed about our new initiatives to keep you connected with the best in the industry... the launch of the largest digital platform for the façade and fenestration industry... Connecting Brands and Influencers!

Take care and stay safe.



Renu Rajaram
renu@wfm.co.in

High-Rise Cladding and Glazing Systems



The Opus, Dubai, by Zaha Hadid Architects

The cladding aims to withstand external weathering and offer durability and sustainability to the building façade. The choice in design and material of a façade is determined by factors such as the size and type of building, its geographical location, weather conditions it is exposed to etc. Energy efficiency is the main concern, besides its appearance. Today, the market offers a variety of materials for façades with abundant choices in designs and patterns. Large size porcelain tiles and high-pressure laminates are in trend for their aesthetic value and sturdiness.

Exterior Clad Laminated (ECL) high pressure laminates, and porcelain wall clads are used for majority of structures. The products have anti-graffiti properties and offer flexibility in installation. These are high grade and high-pressure compact laminates. Inspired by the colours and patterns of natural wood, the 6mm thick, laminates come in over 200 designs in grainy bark style or plain wood patterns. Mount matt finish laminates give an antique, subtle appearance of the façade. The UV coating of the full bodied ECL gives extra protection against the harsh solar rays and extreme climates. For overall façade design, the following general parameters should be considered:

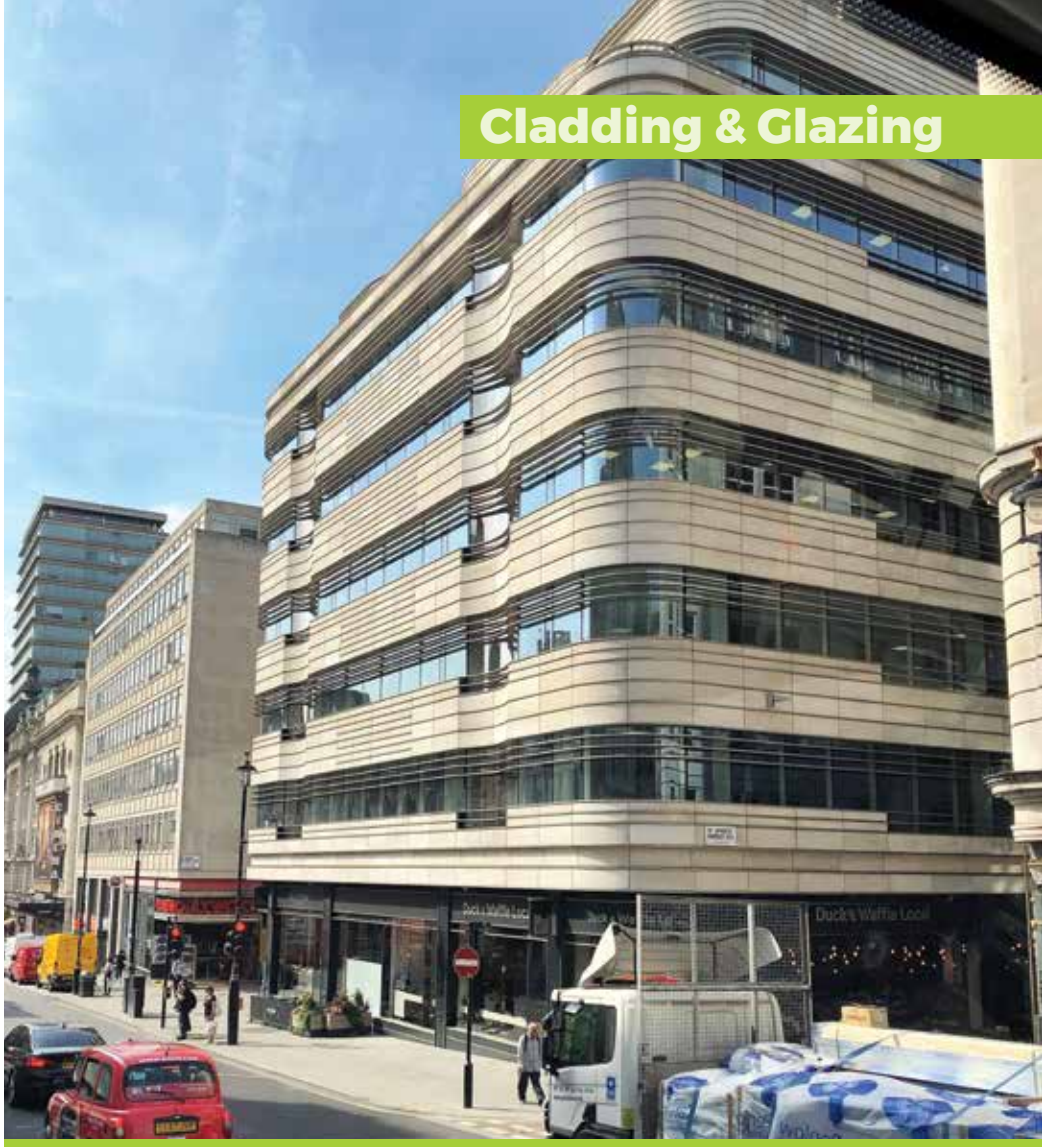
- Architectural requirement
- Thermal performance to be achieved (U-value, g-value, layer temperature)
- Flexibility (adjustable performance)
- Interaction strategy with HVAC systems (extract rate, natural ventilation)

Apart from these parameters, the following specific parameters have significant impact on design and façade performance:

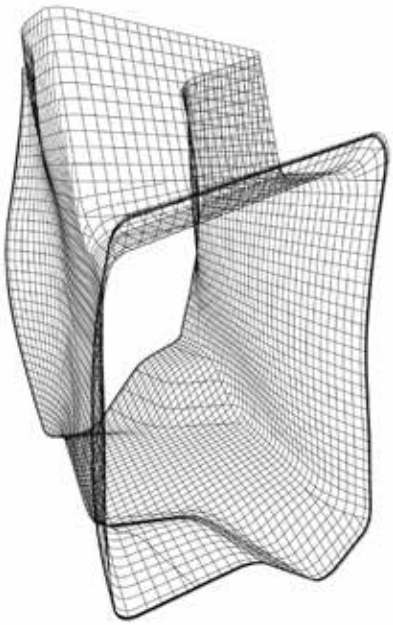
- Loads
- Maintenance (interior or exterior)
- Investment vs. running costs

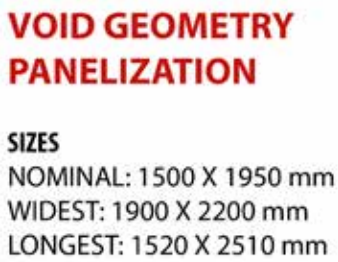
CLADDING MATERIALS

The primary function of cladding is to split the indoor environment of a building from the outside in such a way that the outdoor environment will not affect the indoors. It is also useful for regulating the light penetration and controlling the radiation and conduction of heat from the sun and prevents interiors from getting faded and dull. Additionally, sunshades and louvered panels allow for reflected light to enter the building that enhance the comfort. Considering Indian climatic conditions, one need to choose cladding having following properties:



The primary function of cladding is to split the indoor environment of a building from the outside. Image courtesy - A.K. Jain





Void surface quadrilateral modules are all unique in shape and size, Architect Zaha Hadid. Image courtesy - A.K. Jain

- **Resistance to corrosion:** Cladding materials shall have high corrosion resistance like aluminium, steel and they should be properly treated with hot dip galvanising and epoxy or PU paint.
- **Cleaning and maintenance:** The cleaning cycle of the external building envelope should be ascertained while selecting cladding. Select material which will attract less dust and with minimum horizontal surfaces. Flush seal systems must be avoided and nonbleeding sealants may be used for weather proofing. A façade which is ventilated and insulated can save up to

70 percent energy costs for heating or cooling. Cladding of a building ensures that the internal temperatures are maintained at ideal levels, reducing both the cost burden of HVAC, its impact on the ecology and the protection from water permeation. Many parts of the country experiences heavy rains and cladding serves as a coat which reduces the infiltration of water into the primary structure. Façades are designed with passive and active ventilation, such as double skinned façades that allow the warm air to rise and exhaust from the void between the two skins. Additionally, for high-rise buildings where windows cannot be opened due to high wind pressures, passive ventilators are the solution, which can be opened and closed.

The level of acoustic attenuation of the cladding material is decided based on the type of external and internal environment, with respect to the frequencies and amplitude of the ambient noise and sounds. Laminated double glazed units having a varying glass thickness, with acoustic PVB is the best choice for acoustics. There are varieties of cladding materials/ systems used these days, such as wood, concrete, glass, aluminium solid sheet, aluminium composite panels (FR grade A2), natural stones, stainless steel, terracotta, high pressure laminates (HPL), copper cladding, zinc cladding, fibre cement board cladding, Corian cladding, GFRC, etc.



Light frame structure of a public building, New York

a) **Glass:** Glass selection is the most time-consuming item, which needs to consider the following:
   - **i.** Selection parameters should be clearly defined, viz colour, U-value, light transmission, etc.
   - **ii.** Look for ideal combination of DGU or laminated or both
   - **iii.** Select proper interlayer film depending upon usage, internal or external
   - **iv.** Select glass processing as per requirement viz tempering, heat strengthening, heat soaking, etc.
   - **v.** Selection of face to be fitted in case of frit glass

b) **HPL (High Pressure Laminate)** is popular for exterior cladding, as it can be exposed to combined action of sunlight and atmospheric agents including rain, hail or wind. These are not affected by thermal shocks and have the ability to withstand extreme climate changes. Further, these reduce the amount of water that is absorbed and provide protection against chemical or air pollution.

c) **Aluminium:** Following points may be considered during finalising the aluminium extrusion:
   - **i.** Alloy and temper selection depending upon usage and bending
   - **ii.** Powder coating specs 2603/2604/2605 depending upon location of use
   - **iii.** Clearly define the acceptable dimensional tolerances criteria

d) **Zinc cladding** is an innovative system which has the qualities like long-lasting, malleable, flexible and aesthetically appealing.

e) **Stainless steel wall cladding** is commonly used in today's building creating a striking architectural effect. Unlike most other types of façade material, stainless steel is available in an array of finishes, patterns, dimpled, textured, embossed and coloured finishes. Some of these aspects enhance durability and prevent wear and tear in high traffic areas. Stainless steel is an incredibly versatile material, it can be rolled, folded or pressed into almost any shape. It is also one of the most robust and sustainable material due to its superior corrosion resistance and is recyclable.

Consider the following points for steel cladding:

- **i.** Define grade of steel
- **ii.** Specify the coating required, viz. galvanising, sand blasting, PU coated with minimum dry film thickness expected
- **iii.** Specify the dimensional tolerances expected
- **iv.** Ensure all critical weld test are witnessed by professional third-party QC
- **v.** Get a sample approved for external finish of architectural exposed steel works

vi. Always select proven brands for external application of cladding works
vii. Sizes should be optimised prior to ordering so as to reduce the wastage

Consider stainless steel anchors for all externally exposed anchors and fasteners. GI can be used for internal concealed application. Ensure minimum embedment are carried out as specified and if the structure is having big tolerance, then better to have longer lengths.

Specify the hardness and elongation criteria for the gasket. Prefer EPDM over PVC gasket. Ensure the dyes are checked with respect to extrusions and are approved by the designer.

f) **Stone & porcelain tiles:** Consider the following points while choosing stone and porcelain tiles for building envelope:
i. Ensure the entire materials are supplied from a single block
ii. Veins should be in one direction
iii. Colour variations in natural stone should be benchmarked with acceptable criteria



Dynamic façades using modern technology

iv. Emphasis to be given on getting smooth edges
v. Ensure criteria for tolerances in holes and grooves are clearly defined

NEW MATERIALS FOR BUILDING ENVELOPE AND GLAZING

Continuous innovation in cladding materials towards performance have been able to deliver new products which are efficient, economical and attractive. These include:

- High strength hollow block masonry units using natural mineral based geopolymers help in reducing the load on the building at the same time give a better thermal performance.
- Light, responsive façade that breathes. This façade is made up of series of faceted fiberglass rosettes, which open and close in response to the temperature of the façade thereby avoiding excess of heat to ingress the building.
- Double screen façade made from special tiles that can clean the air around it. UV light activated free radicals from the tiles destroy any existing pollutants from the air leaving it cleaner for the people inside the building.
- Dynamic façades using modern technology, which transform itself in response to the changing sun positions, lighting conditions and the functional requirements.

The world is moving towards dynamic façades with endless possibilities, which are energy efficient. The traditional products like stone, aluminium composites are not enough to take care of the emerging needs of architecture as there is a continuous demand for the material which can provide appearance, performance and take care of extreme Indian climate, dust, humidity and pollution. The cladding industry in India has developed new range of cladding products, which are sustainable and are available in a wide design range of colours, shapes and sizes.

Demand for more efficient, responsive façades had led to the replacement of conventional glazing by a new generation of high performance, intelligent façade system that meets the comfort, performance and environmental parameters.

The material palette of façades is evolving rapidly, ranging from ceramics, multilayer aluminium/metals, to ETFE (ethylene tetrafluoroethylene copolymer) cushion fabric, multilayer ETICS (external thermal insulation cladding system) to green vegetated façade systems. New generation façades are self-cleaning, environmentally dynamic, information sensitive and communicating. The new generation hi-tech glass is transparent (but photo chromatic), light weight (but strong), safe (without additional processing) and energy generating. The fully responsive parametric façades are non-static, but kinetic addressing varied issues including sustainability, power generation, and vertical farming. The façades, far from being static elements are getting responsive and communicative. However, the biggest challenge is to balance the cost to performance. The façade is a living organ like our skin, which will respond in real time to its surroundings and will be capable of adapting to it. The façade will be able to heat and cool itself and a building will no longer depend on artificial climate management. There are interesting

glass products available, including PV modules, di-chronic glazing, glazing with integrated louvers, intelligent glazing systems, electro-chromic glass that changes from clear to opaque in a second.

CURTAIN GLAZING SYSTEM

Transparency, sustainability and protection from heat make glass an attractive façade material for high-rise buildings, where the need is for lightweight but strong material. Glass weighs less than concrete, offers views of the outside, and is sustainable too. New glass products have many benefits such as solar control and advanced thermal insulation. These have a coating that protects against UV rays penetrating the interiors, offers energy efficiency, and minimum visual glare. The glass can be engineered to provide maximum daylight indoors while keeping the interior cool.

Curtain glazing is a versatile cladding option with glass as the primary material. In modern high-rise building, the exterior walls are often suspended from the concrete floor slabs, curtain walls and precast concrete walls. The curtain wall is characterised by colored and spandrel glass, a grid of aluminium caps, stainless steel, and stone spandrel covers. The curtain glazing is designed to resist wind and earthquake loads, air leakage, and excessive heat loss. Installation of DGU (Double Glazed Unit) is preferred as it makes curtain glazing system one of the most efficient insulators against heat loss, energy efficient and high aesthetic value. Its disadvantages are that it is relatively expensive and there are issues of safety and glare.

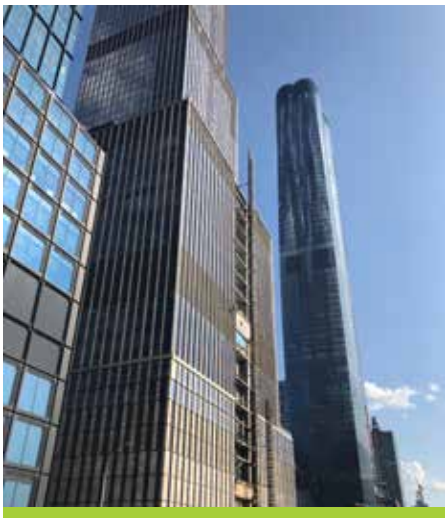
DOUBLE SKIN FAÇADE

The building form, the height of the high-rise, high wind velocities and pressure differences on the external façade, are the prime issues in the design of façade. A double-skin façade is the preferred for following reasons:

- To decrease the U-value of the façade below 1.0 W/m^{2}K;
- To enable permanent activation of the shading system to prevent increased cooling loads and high wind loads
- To ensure ventilation through controlled openings in the external skin.

A double-skin façade helps to reduce the pressure differences in a building in the façade cavity. For example, the dynamic wind pressure, which is the result of the gust, can be reduced by closing the openings in the external façade.

The external double-skin façade consists of single glazing with uncoated white glass and the lowest possible iron oxide content. Together with reflective shading, this configuration ensures that a maximum percentage of the solar radiation is reflected back to the outside and does not contribute to heating of the interior space. The internal façade is constructed with gas-filled thermopane glazing (U-value = 1.1 W/m^{2}K., g-value = 60%) which is the true thermal boundary of the skin. The double skin façade is characterised by ascending air currents as a result of the solar heat gain and the transmission losses. Ideally, a horizontal thermal gradient should develop in the air cavity in hot weather conditions, with relatively high temperature between the single glazing and the shading system and lower temperatures between the shading system and the thermopane glazing. The supply-air façade offers the advantage that the transmission losses through the thermopane glazing are regained with the supply air. The solar gains pre-treat the supply air, and the external glass skin offers protection during ventilation in rainy weather. The double-skin façade can serve as a quasi-fresh air stack, eliminating the need for air stacks in the building. This is a considerable advantage in high-rises. The air temperatures in the space between the façade layers may be



Chrome and glossy buildings in New York. Image courtesy - A.K. Jain



Distorted shape of the façade does not appeal. Image courtesy - A.K. Jain

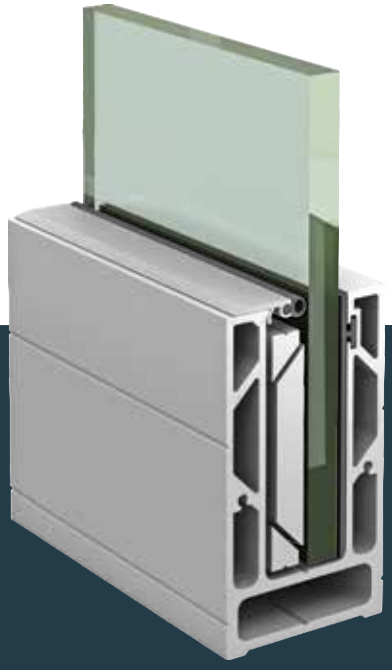
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considerably higher than outside temperatures in hot weather, which can be a disadvantage. To tackle this, it is important to integrate it with the ventilation system, exhaust air system and subsidiary air-conditioning.

SELECTION OF GLAZING

The term "glazing" has a very wide range of meanings in architectural vocabulary, including transparent, translucent and opaque material in its range. Low maintenance glass is only a commercial term. There are coatings available which reduce the dust accumulation on glass surface and thus require less maintenance. The market has a variety of options of glazing materials, which can be selected considering the following:

- The direct sunlight diffused through the material or transparency,
- The amount of light that comes through or visible transmittance,
- The amount of radiant heat transmitted through the material measured by solar heat gain coefficient
- The amount of heat from the air that will pass through the material, measured by the U-value of the assembly.



The Vessel, New York. Image courtesy - A.K. Jain

The supporting system or assembly design should be done considering factors such as available sizes of glazing material, span, structural strength of assembly, ease of installation, maintenance and pleasing aesthetics. A glazing material with a low Solar Heat Gain Coefficient (SHGC), low U value, high visible transmittance, and appropriate transparency based on location and layout would be ideal. Other factors to consider are strength of the glazing material, maintenance, resistance to breaking or cracking and how the material will age over time. In India, major problem with skylights is the potential greenhouse effect in the space enclosed rather than heat-loss. Along with orientation of skylight, heavy tinting of glass or polycarbonate glazing also reduces daylight, contradicting the prime objective of having a skylight. During selection of glass or polycarbonate glazing, it is critical to optimise light versus heat gain characteristics. Glazing should be primarily of Low E Glass (low emittance). DGU (Double glazed units) with thermal barrier are a must in extreme hot climates. Ceramic fritting, staining are other kinds of treatment options for façade glazing.

Glass installation should be done skilfully. Due to thermal stress, glass breakage occurs when there is a temperature variance in different parts of the glass. It is most common in large pieces of sealed insulating glass with heavy heat-absorbing or reflective coatings. The outside of the glass heats up more than the inside as the coating converts radiant heat from the sun into sensible heat. The outer glass expands and bends and when held in place in a rigid assembly, it cracks. As the breakage is not covered by manufactures warranties, it should be considered at the design stage itself.

FENESTRATION

Fenestrations protect the inhabitants in a building from the natural elements-high wind, rains, sound, fire, termites, humidity and security issues. For high-rise buildings in particular, the wind loads play a significant role in dictating the structural strength and in determining the thickness of the cladding material and the support structures used. All these parameters must be considered and their impact calculated prior to the fabrication of cladding panels. Winds load is calculated as per IS 875. Additional static profiles (hurricane bars) are chosen according to the requirement as per the IS norms. The profiles are designed for using double glazing and if natural shading is not provided, thermal control glass is used. When selecting windows for energy efficiency, it is important to consider their energy performance ratings. This will help the selection of windows with both low U-factor and low SHGC to maximise energy savings in climates with cold and hot seasons. Whole unit U-factors and SHGCs are considered rather than centre-of-glass (COG) U-factors and SHGC. Whole-unit numbers more accurately reflect the energy performance of the product. When properly selected and installed, energy efficient windows can help minimise

heating, cooling and lighting costs. Improving window performance involves design, selection and installation. For the Indian climatic conditions, uPVC profiles, which are multi-chambered, should have a minimum 2.5 mm thickness. 18 mm thickness of clear glass and multi-locking system hardware are recommended. These systems are tough to withstand intensive solar radiations, extreme heat and humidity. This means no discoloration and deterioration of uPVC window and door system for many years. Also, with multi-chamber design, superior sound control and thermal insulation can be obtained. It also removes the possibility of air, water, and sound leakages with its twin sealing gaskets.

Sustainable, innovative, reliable and aesthetically pleasing door/ window systems for both internal and external applications, combine a mix of form, function, ease of use, security and performance. The solution should allow natural light to ingress, while keeping weather, noise, dust, rain, air and pollution out. Residential and commercial spaces have different requirements in terms of design, use function and performance.

Fittings need to be of higher specifications and must be able to prevent accidents due to strong winds. There can be a stay arm for windows called anti slam stay arm, which is very useful to prevent window shutters shutting with force due to strong winds. There is a growing trend for ventilated façades. High density laminates are one of the most preferred choice for ventilated façades where there are dead walls. Ventilated façades give a cooling effect to the dead wall of structure and allow the structure to breathe, which is essential for all RCC structures for longevity.



Laminated glass with specialised PVB interlayer and glass

LAMINATED GLASS

There are two types of laminated glass:

a) PVB Lamination
b) EVA Lamination

A range of laminated glass with specialised PVB interlayer provides high level of security and safety. It eliminates the need for grills or shutters and gives the ability for crystal surveillance.

THE BREATHING AND GREEN FAÇADE

The breathing and green façade in a high-rise structure aims to create green spaces closer to the users. The offices overlooking the gardens are equipped with openable windows to allow fresh breeze from these greens. Façade planting creates microclimate, which is less prone to heat gain from solar radiation than metal-or mineral-clad surfaces. Evaporation effects result in temperature that tend to be lower than those in the surroundings. Wind resistant plants can also be employed as wind breaks. This idea has been pursued by the Malaysian architect Ken Yeang with his “green” façades, for example on the Menara Boustead Tower in Kuala Lumpur. The green wall with deciduous climbing plants, can reduce the solar gain inside the building, reduce the street noise and reduce energy

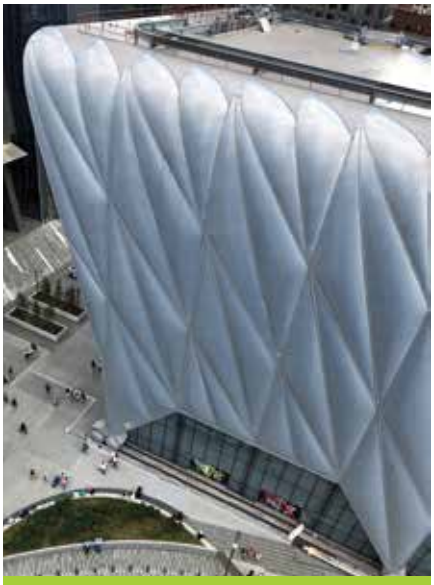


Green façade of proposed Edible Hotel, London, Dexter Moren, Architects

load. It also produces a stack effect between the planted façade and the building exterior, channelling the heat away from the building. The façade vertical garden can be seen from the outside of the building as well as from the inside. The system is made up of two main elements: the planter and the trellis. The dimension of the long, continuous planter is 1-meter-deep and 1.4-meter-wide to the façade. It is made of lightweight concrete and is wide enough for easy access by maintenance staff. The trellis consists of an aluminium structure composed of horizontal mullions and slats. The waterproofing consists of gravel and a geotextile mesh laid over 2-millimeter thick fiberglass.

The planting medium consists of 70% earth, mixed with 10% river sand and 20% compost. The structural system is designed to account for the additional loading the green wall soil, water and other loads (people, wind, seismic, etc.).

Green walls should be protected from high wind speeds, wherever possible, and especially potential vortex shedding at building



Pneumatic envelope of a commercial centre, New York. Image courtesy - A.K. Jain

corners and other hazard prone areas. Sufficient space should be allowed for the planting to grow without interruption, and also for maintenance staff to work.

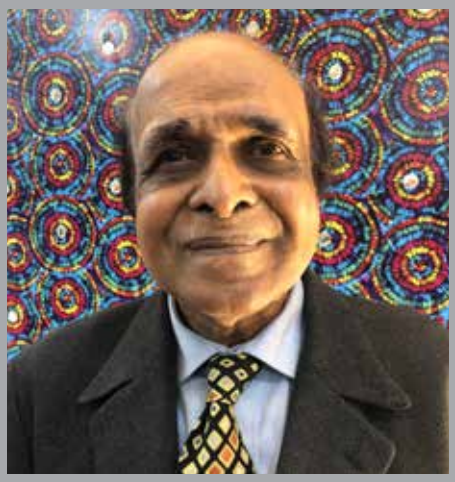
BUILDING ENVELOPE AS AN ENVIRONMENT MODERATOR

The building envelopes are designed to communicate an image of contemporaneity. This must be conceived by understanding the complexity of the economy, ecology, climate and the technology which together act as environmental moderators. A skin system aims to achieve sustainability as well as synthesizing various facets of a project such as materiality, constructability and budget. It focuses on performance and spatial optimisation. All façades are composed of two orders, the first one is the main structure attending to all static conditions and the other is the structural system. The precast panels can be made of steel, concrete or light weight GRC sandwich panel systems. Curtain wall can be thermally insulated and supported on self-supporting aluminium façade system which is self-cleansing and easy to maintain. For example, the bronze strips, an alloy made of copper and tin, under weathering exhibits warm auburn colour on its surface. After oxidation of the surface, the material shows a dark-brown anthracite colour.

CONCLUSIONS

Cladding and glazing serve many purposes in creating a controlled internal environment, protecting the building from external conditions, preventing the transmission of sound, thermal insulation and appearance of buildings. Cladding maintains privacy and security of exteriors, provides access to ventilation and hygienic environment and prevents the spread of fire. Its properties like termite resistance, waterproofing, environment friendliness, and wide range of colours and designs make cladding a trend.

Exterior cladding plays an important role in the structural stability. It helps in natural ventilation, sun screening and dissipating heat absorption. It helps to absorb water during rainfall and keep out the rain infiltration and keep building secure and safe. A properly tested, installed and maintained cladding also provides fire safety.



A.K. JAIN
Former Commissioner,
Delhi Development Authority

ABOUT THE AUTHOR:

A. K. Jain worked as Commissioner (Planning), Delhi Development Authority and as a member of the Committee of the Ministry of Urban Development on the DDA (2015). He was member of UN Habitat (2007-12), a member of Editorial Board of International Journal of Environmental Studies (UK), and has authored several books including Tall Buildings and Vertical Urbanism, (Discovery Publishing House, New Delhi, 2020). He was awarded second Urban Professional Award (2014) at World Urban Forum in Medellin, Colombia and IBC Lifetime Achievement Award (2016).

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METAL FAÇADES



Façades determine visual identity, character and expression of architecture. The design and enchanting exteriors of a building impart a character to it and is a huge parameter for building performance. Building façades lie at the convergence of the outward and inward environment, forming an integral part of the building. They are the most difficult to design since the perception of iconic and technologically advanced façades is changing frequently. Besides technology, materials like metal, glass, concrete etc., used for the building skin are an integral yet singular aspect of the façade design.

It is often seen that whenever an architect is talking about metal in façade, it is always correlated with commercial or institutional architecture and few of the examples which will come to our mind will be the Guggenheim Museum Bilbao, designed by the well-known architect Frank O Gehry, done in titanium; Riverside Museum by Zaha Hadid or maybe the Sage Gateshead in UK by Norman Foster. But no residence done in metal will come to our mind and if the same is proposed in a residence by an architect, most of the clients' apprehension will be, "I hope it won't look 'commercial'".

The façade combines attributes







The distinctive combination of seamless zinc panels with aluminium louvers and leather finished stone leaves an everlasting impression



The convergence of the building with the sky was achieved by the use of *Fibre Optics* lighting integrated with the white painted wall on the front façade



The bold corten steel look imitated in aluminium, grants the façade a distinctive character

of both appearance as well as superior performance in a manner unlike any other building system. I emphasise on the use of metal façades in residences due to the extremely beneficial properties of metal. Aesthetically speaking, metal offers a unique modern rhythmic aesthetic to compliment any building. Easily bent and configured to the specific design, it can be used as a lightweight decorative element or as a structural component in buildings. Metal roofs and wall panels can also be curved to create a unique and dynamic building appearance, hence amplifying its versatility. Not only can metal withstand harsh weather environments, it can also resource depletion due to its recyclability. Being an eco-friendly entity, metal minimizes energy use, promotes sustainability, and invites innovation and creativity in terms of design. The concept is fast catching up in India but the changes go beyond skin deep alterations or a facelift. Apart from aesthetics, they also offer better functions.

Looking at the materials used for metal façades, let's see how metal cladding encompasses a plethora



The corner cube composed out of zinc panelling serves as the showstopper for this façade





Amalgamating customised zinc panels and pigmento brown, and the wooden frames used for glazing, glass and metal railings gives the structure a sense of harmony and subtlety

of different materials, each with its own unique strengths and weaknesses. The choice of material will be influenced by a number of project-specific factors, including desired aesthetic, climatic conditions, chosen structural system, the nature of adjacent materials and the construction budget. The most common material options for metal cladding are galvanized steel, aluminium, stainless steel, zinc, copper, titanium etc. Designers are researching and experimenting with new and complex façade and fenestration technologies. Along with the materials that furnish the look and feel of a building, technologies applied to façades are also changing. Investing in technologies like BIM allows designers distil options down to a set of criteria that meet the aesthetic ambitions of the project and its tactical requirements, ensuring that these are met with optimised environmental parameters. There has been a slow but very perceptible shift from the use of traditional masonry towards the use of compelling automation in façade and fenestration. Motorized shades; switchable windows that modulate daylight and solar



An ideological retreat with robust attributes and voluminous light-filled living spaces



The stunning composition of zinc side-lit panels give the facade a dramatic look during the day as well as night



The showstopper of the Project was the weathered or the *corten steel*



A vibrant terrace garden

heat transmissions; model predictive controls for optimised performance end-user comfort and satisfaction; and acceptance of automated façade systems are the various ways automation is incorporated in façades. These tools enable designers to explore the forms, real-time and derive key insights into the thermal, daylight and solar performance informing decisions pertaining to the building orientation, solar shading, glazing, etc. and also saves the cost. Thus, metal façades combined with the right dose of technology can uplift the exterior of spaces and multiply their utility.



Omitting smaller cubes from the bigger ones provided the building with openings and punctures allowing natural light inside the house



This elegant facade fabricated in small modules of *Pigmento Grey Zinc*, with mouldings creating a monolithic impression



AR. SUMIT DHAWAN
Founder & Principal Architect,
Cityspace '82 Architects

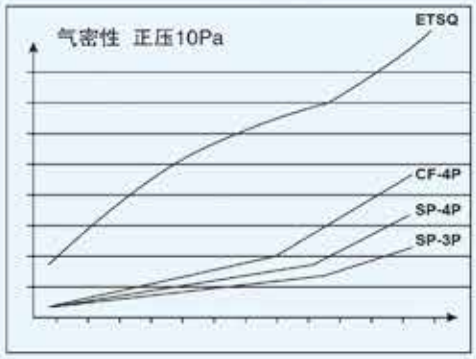
ABOUT THE AUTHOR:

Having experience of almost two decades, Ar. Sumit Dhavan has single-handedly nurtured this firm and given it a position where it stands today. His architect father Satish Dhawan worked with CPWD and had a great exposure to the international market. Having said that, he has done projects for politicians, bureaucrats, lawyers, the residence of famous cricketers Yuvraj Singh and Gautam Gambhir, and many more. Also, his work is appreciated by developers whom he has collaborated with including DLF, Ansal Group, Orchid, MGF to name a few.

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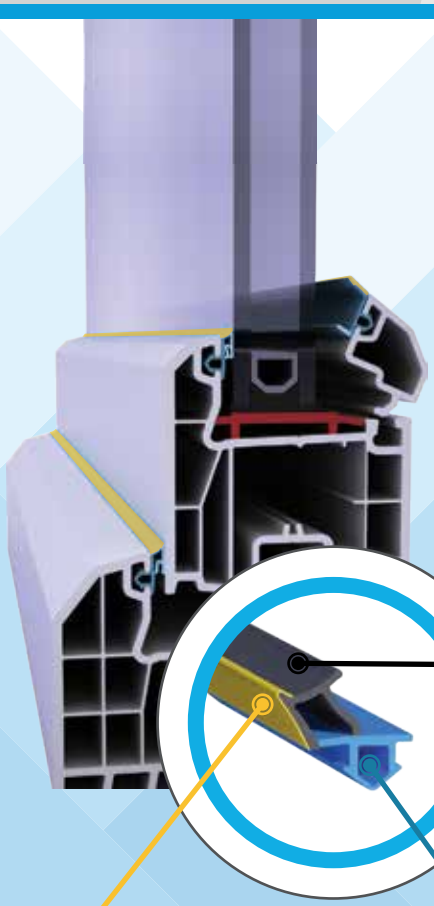
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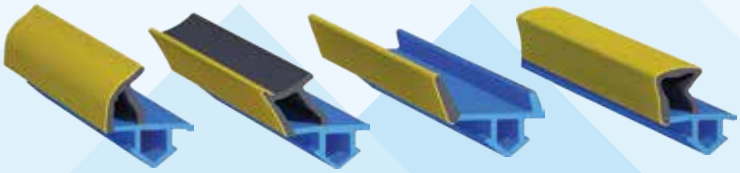
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Applications of BIPV Technology in India

World's Largest BIPV Project & Commercial Viability for Future

BUILDING INTEGRATED PHOTO-VOLTAICS - GLOBAL CONTEXT

The BIPV (Building Integrated Photovoltaics) method includes the replacement of the traditional construction element with materials incorporating solar modules. This offers a dual function, namely to produce energy and to provide a functional and aesthetic construction element for the finished building. It has been proven by the European commission that introducing photovoltaics improves the energy efficiency of the building, if done properly. Moreover, as of now the market has matured for the technology in regions like USA, Europe, China so far so that the market for BIPV modules could be worth $5 billion in USA alone. There are various methods by which BIPV can be used in buildings, viz. glazes, tiles, façades, and cladding. India has to some extent or the other used all of these methods to integrate solar PV into building features. The installations in the west are now proving the feasibility of the technology by i) improvement in ventilation for BIPV installations to reduce panel temperature and ii) development of new thin film technology that are better suited for integration.



Solar façades - GDF Suez at Dijon, Bourgogne (Source - ISSOL; Atelier Phileas)

INTRODUCTION OF BIPV IN INDIA, LARGEST IN THE WORLD

CtrlS Datacentre Ltd., Mumbai

Many BIPV projects started coming up in India since 2017 onwards. These were mainly for smaller solar projects such as homes. In 2019,





GDF Suez at Dijon, Bourgogne – another view of solar façades (Source - ISSOL; Atelier Phileas)



CtrlS Datacentres Ltd, Mumbai - India's Largest BIPV Datacentre

a project which made history in Mumbai, as the largest BIPV plant in India, and possibly in the world, was commissioned. The first ever such system was constructed for a data centre done by CtrlS Datacentres Ltd. As the building is cemented on all four sides, a glass façade was considered essential to add to its aesthetic appeal. But instead of applying regular façade covering glass, the client chose to install 2,466 high-efficiency mono-crystalline-Building Integrated Photovoltaic (BIPV) series WSM 350 Wp Waaree frameless solar panels and module level optimisations was carried out to with the help of MPPT optimizers.

The misconception about low generation for BIPV can be proven wrong, with results achieved by introducing smart technology such as Solar Edge inverters, as used in our installation at the datacentre can substantially increase energy generation and allow for module level monitoring. Custom designed aluminium rails were used as the module mounting structure. The result is a 863.1 kWp capacity solar power generating façade. The solar power plant has a Performance Ratio of 75%, which is well higher than the simulated PV Syst report when it was planned. With an average generation of 40,000 – 55,000 kWh per month, the solar power plant is able to offset enough carbon to sequester 7000 trees per year. More buildings can choose to integrate this technology on their structures, with a generation of 6,00,000 units per MWp it is possible to offset the lighting loads with clean energy. Green building certification codes also include solar power as a metric, which is beneficial in case a company uses BIPV technology. As BIPV installation is quite challenging and







CtrlS Datacentres Ltd, Mumbai – with the installation of 2,466 high-efficiency mono-crystalline-Building Integrated Photovoltaic (BIPV) series WSM 350 Wp Waaree frameless solar panels





Installation details - CtrlS Datacentre Ltd

FACT FILE:

Project Name: India's Largest BIPV Datacentre - CtrlS Datacentre Ltd

Location: Mumbai, India

Client: CtrlS Datacentre Ltd.

Inverter Supplier: Solar Edge

Module Supplier: Waaree

Materials used for façade & fenestration: Aluminium façade

Commencement Date & Completion Date: August 2019 - December 2019

needs expert design experience to integrate as a façade glass the project would have to be planned at the initial designing with the architect or modelling stage to avoid any rework.

COMMERCIAL VIABILITY AND NZEB TECHNOLOGY

The BAPV* (Building Applied Photovoltaics) method consists of fitting modules to existing surfaces via superimposition once construction has been completed, such as during an energy renovation project. This is currently the trend in Europe and North America, wherein the older buildings are being renovated and retro-fitted with PV panels. Thin film and coloured glass photovoltaic panels allow architects the ability to design aesthetically pleasing buildings, such examples can be seen in the La Cub building at Bordeaux or GDF Suzon in Dijon (see pictures attached). The debate around commercial viability is based on the one-time cost of the installation and does not account into the benefit provided by energy generation, energy efficiency and sustainability value. For a commercial building/ urban structure build to last over 50 years, it is better to have a solar power plant that adds value to the structure for half its lifetime. A BIPV installation typically has a payback of approximately 5 years (depending on the DISCOM tariff) and it will generate free electricity for the remainder of its lifetime for approximately 20 years. As better panels are introduced in the market, we estimate that the lifetime of a solar power plant will also increase. Moreover, a good operations and maintenance contract will allow for better performance of





La Cub Building, GDF Suzon Building (Source: SUPCI)

the system over time. Providing energy efficiency reports in many developed countries is the norm for contractors, which acts as an incentive to adopt the technology. There are also subsidies for procurement of these modules as well as façades provided by various governments to promote the integration into urban, industrial, institutional and agricultural buildings. The increasing popularity of net zero buildings (nZEB) are a motivation for many to look into adopting BIPV technology, architects are closely working with energy companies in Dubai, Singapore and China to make world class nZEB facilities. Trailing close behind, is India...
(*both terms BIPV and BAPV are used interchangeably)

TYPES BIPV/BAPV APPLICATION IN BUILDINGS

Application techniques may vary depending on the architecture of the building, so BIPV is usually developed with multiple designers working together. Tiles and glazes are used in smaller projects, where the roof can be replaced with a BIPV panel or the glass can be replaced with a BIPV glass. Both of these technologies are not yet feasible in India as we do not currently have manufacturers producing large quantum of translucent or transparent colored glass. However, we estimate that within the next two years there will be European entrants who will provide these to the Indian market. However, with respect to opaque BIPV panels, India does have a few manufacturers who are competing in a niche space. Solar glass as a replacement for façade glass will be the next-generation BIPV as façade glass technology. Since fixing structure and glass installation is already planned, replacing with solar glass makes it techno-commercially viable. These (modules or glass) can be fitted into framed façades as a replacement for spandrel or vision glass respectively, inside window frames to reduce glare as well as retrofit applications where external mounting is possible.

1. **Cladding-based application:** These PV spandrels are fitted into a façade that is designed based on the specifications and have the panels mounted onto them. Trenches will have to be developed to maintain consistent wiring for ease of remote monitoring and electrical maintenance. Based on the amount of natural light required the panel can be placed*.
2. **Curtain wall application:** This is a BIPV system which can replace all of the glass in the façade but uses a different kind of panel that allows maximum penetration of wall. It is extremely aesthetic and can find applications in many kinds of structures such as office spaces, museums, malls, public offices and many more developmental buildings.
3. **Window-based application:** Solar panels can also replace window glass, called transparent skylight or PV canopy types of installations allow more light to pass through and are a very good replacement for vision glass in buildings. Generally used in urban buildings and homes window based BIPV have a huge potential to disrupt the way we view modern construction.
4. **Retrofitting application:** Many design aspects of a building can accommodate the integration of PV, which are not direct to replacing glass or windows. Some of these can include thin film PV placed on walls. Surfaces that can be covered with a BIPV glass over carbon fibre, steel, or concrete structures, especially in modern designs.
5. **PV rooftop application:** The more popular technology known as rooftop solar plants can be integrated into a building through its structure. There are methods to replace the roofing material with a concrete PV panel acting as both the roof as well as the solar power plant. This is one of the best ways to get facilities in



Curtain wall, ventilated façade (Source: Onyx Solar)

the industrial sector to adopt BIPV.

(*In buildings where the brightness is mandated, there are also ways to use zig-zag frames to allow light penetration.)

FUTURE OF BIPV IN INDIA: TECHNOLOGY & SUPPORT

U-Solar Clean Energy has been working with façade consultants, knowledge partners and architects to develop more of these kinds of project in India. U-Solar's experience and expertise in working with cross functional teams in their previous project will allow smooth designing and installation. With the learnings from existing implementation around the world they hope to bring this technology to India by working with the best in the industry. As accredited installers for Onyx Solar (a global leader in the development and manufacture of photovoltaic glass for buildings), the company is confident that more of these one-of-a-kind installations shall emerge in the near future. With the right support from the Government of India, the BIPV market can take off like it has abroad. There is huge scope for implementing this technology as India has a dense population that forces construction of high-rise buildings in its metropolitan cities. They also hope that the commercials will become more attractive as more developers begin to adopt the technology as the scale at which manufacturing and installation will drive costs down as technology improves.



PV rooftop application



Dubai Frame (Source: Onyx Solar)



K.R. HARINARAYAN
CEO & Founder,
U-Solar Clean Energy

ABOUT THE AUTHOR:

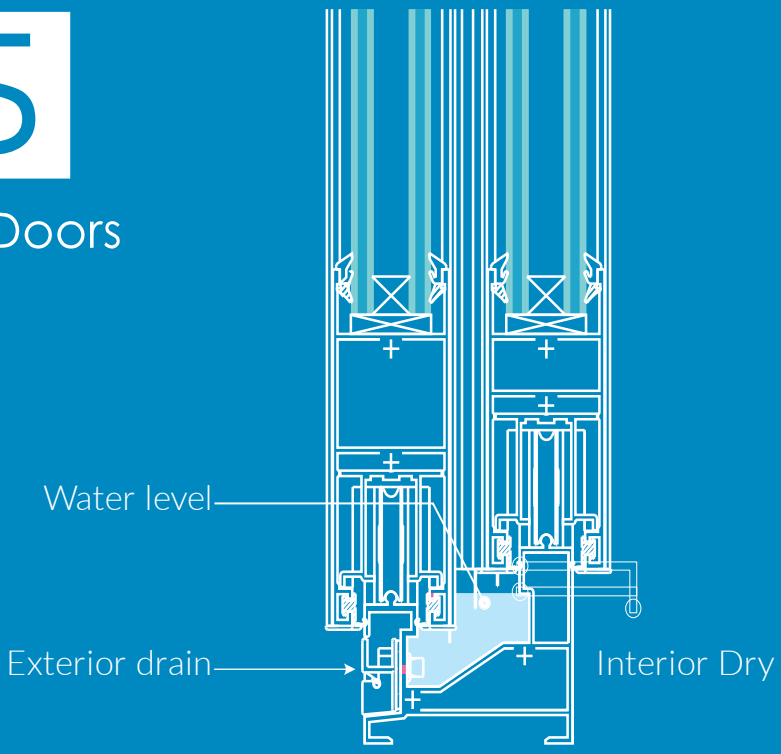
Driven by a desire to start a socially relevant enterprise, K.R. Harinarayan founded U-Solar Clean Energy in 2010. With a strong vision for a renewable energy-focused future U-Solar holds on a deep and abiding belief that renewable energy with its advantages in distributed generation, short turnaround times, clean origins is the answer to a multitude of problems ailing the power sector in India. Leading a team of 60 engineers and managers to push the envelope in the solar rooftop market. Operating across India, the company has installed 100 MWp solar projects. Since 2018, the company has installed 5 MWp of their own assets and officially became an independent power producer. U-Solar works with innovative solar integration technologies by constantly pushing the envelope for adoption of distributed captive power plants and hopes to achieve 500 MWp by 2025, positioning itself as one of India's premiere clean energy providers for distributed renewable energy.

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The 42

Slender & Unique | Chowringhee, Kolkata



The 42 rises to be one of the tall buildings in India and the tallest in the east of India.

The entire project finalised after numerous options being a project of such prestige and for the most elite. Situated in the most prominent location in Kolkata on the Chowringhee road, the site was a prime property with many structures which had to be demolished in a phased manner for making ground clear for the new development. In order to make a statement, it was decided to keep the tower independent of the multilevel car park, unlike many other residential projects which have residential towers





The 42 is a 65 floors tower with triple-height entrance lobby

placed over parking podiums. This provided larger areas to design a lavish club with multiple amenities. However, the tower structure still had a few regularly used club amenities for the comfort of the residents. The independent parking structure with the club and large swimming pool on top is connected to the tower structure above the grand entrance lobby and foyer with a steel bridge.

The 42 is a 65 floors tower with triple-height entrance lobby, 1 club level and 60 apartment floors and 3 service floors, comprising of one flat per floor of 4-5 BHK apartments. There are 10 floors in between consisting of 5 duplex and 4BHK compact apartments.

The entrance lobby is 12m high with clear fixed glass openings on all sides supported by 12 m long one-piece aluminium extruded members giving a grand look, which is one of a kind.

The architectural design of The 42 is a perfect 'square' in plan rising high to 250m in height aligned to the cardinal axis. The 42 captures the best views on all sides with all prominent structures and landmarks of Kolkata city. The 42 has a core with 4 high-speed elevators for owners and guests and 1 service lift for support staff. This core occupies the east side of the building while the other 3 sides give panoramic views of the city.

All apartments are designed by *vaastu* principles and flexibility in planning has been created by moving the columns to the periphery. Further the corners of the building are opened up to give 270 degrees views. The corners have fixed glazing and large openable windows between columns give perfect picture framed views of the city.

All windows and glass openings have green-tinted toughened glass with double glazing (DGU) thereby making each apartment soundproof and tamper-proof. It also gives strength to the large glass panels to withstand the high wind speeds prevalent in Kolkata. The green-tinted glass gives minimum shade variations from natural colours in addition to cutting the glare and providing ambient light conditions reducing solar and UV radiations. The openable panels in the windows are 4 feet high from the ground and open only about15 degrees, thereby giving safety to its inhabitants and children.

All apartments have triple height terraces alternating on the north, south and west side. The large terraces have 1.5m high clear glass railings. The railings



The 42 is a very slender building with a slenderness ratio of 1:10





The architectural design of The 42 is a perfect 'square' in plan rising high to 250m in height

are made with clear laminated, toughened glass supported with SS hollow sections.

All apartments in The 42 have centralised air conditioning, dedicated to each apartment. The single ODU is located on the east side which has been smartly camouflaged with a decorative GRC *jaali* painted in white colour. The external finish of the entire building is in textured paint of fawn shade, while all terraces are painted in white colour.

The 42 is a very slender building with a slenderness ratio of 1:10. This makes it very important for the structural system to be robust to withstand the seismic loads and high wind pressures. The concrete is high grade (M50/60) with flat slab to give maximum height without beams. Each floor is 4.2m in height. The 2 service floors have full floor height girders giving stability to this tall structure. The 42 has a unique two damper tanks on the topmost portion of the building to control the sway due to its slenderness due to earthquake and wind forces.

This feature has its biggest test when the building withstood the recent cyclone 'Amphan' which hit Kolkata in May 2020.

There is a cleaning system housed on the terrace for maintenance. The cleaning system with its telescopic boom covers all surfaces on all sides of the building, especially the corner glazing.

QUICK FACTS:

Project Name: The 42

Location: Chowringhee, Kolkata

Client: Alcove Realty

Architect: Architect Hafeez Contractor

Commencement Date: 2008

Completion Date: 2019



AR. PUSHYAMITRA LONDHE
Senior Associate Architect,
Architect Hafeez Contractor

ABOUT THE AUTHOR:

Pushyamitra Londhe has been a practising Architect for the last 22 years at Architect Hafeez Contractor as Senior Associate Architect. Graduated from Nagpur University in 1998, he has worked in many streams of architecture, including master planning, residential, commercial, IT parks, hospitality, etc. The residential portfolio includes luxury/mid-segment/mass and affordable housing - from super-tall buildings to Low rise developments, all sizes and scale - super luxurious to mid-segment to affordable. With Sahara Amby Valley and Lavasa projects, he had the opportunity to work in hilly terrain with its unique design criteria and challenges. The Imperial, Mumbai - India's tallest super luxury residential project being the highlight and off recently, The 42 in Kolkata, which now stands as the tallest building.

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The 42

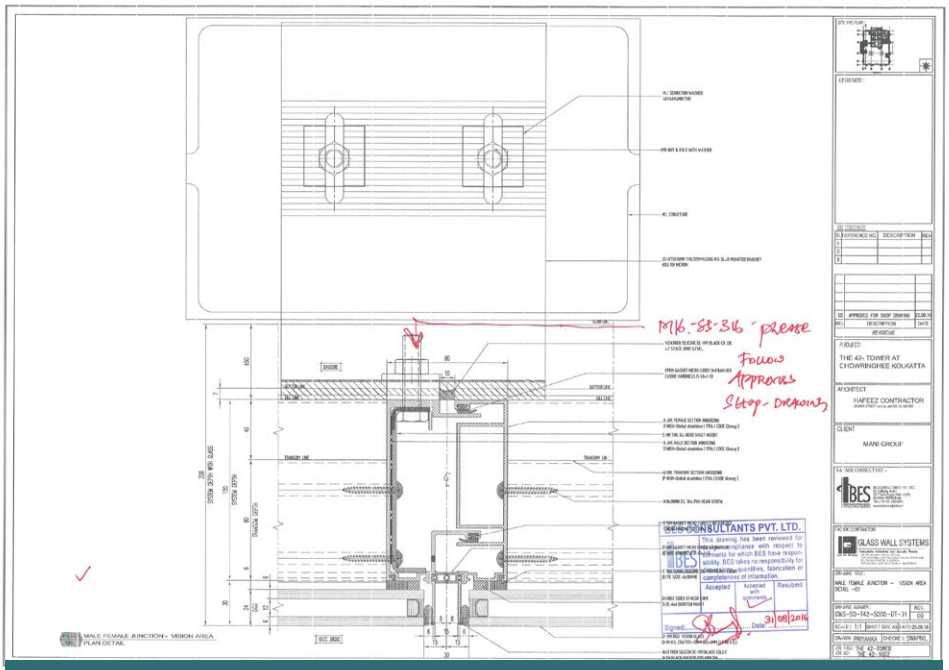
Performance Test for Façade Systems

The 42 is a 268 m tall (65 story) high-end residential tower. Currently it is the tallest building in Kolkata. The work on façades of this iconic tower is complete and it is built using high-performance building envelope/façade systems.

BES has been appointed by the developer for façade engineering & consultancy from concept to site completion including site phase design approvals, quality control and site inspection for the residential tower façades. BES' scope covers all glass façade designs and overall buildings envelope for the tower, lobby and entrances.

Following are key design elements of the tower:

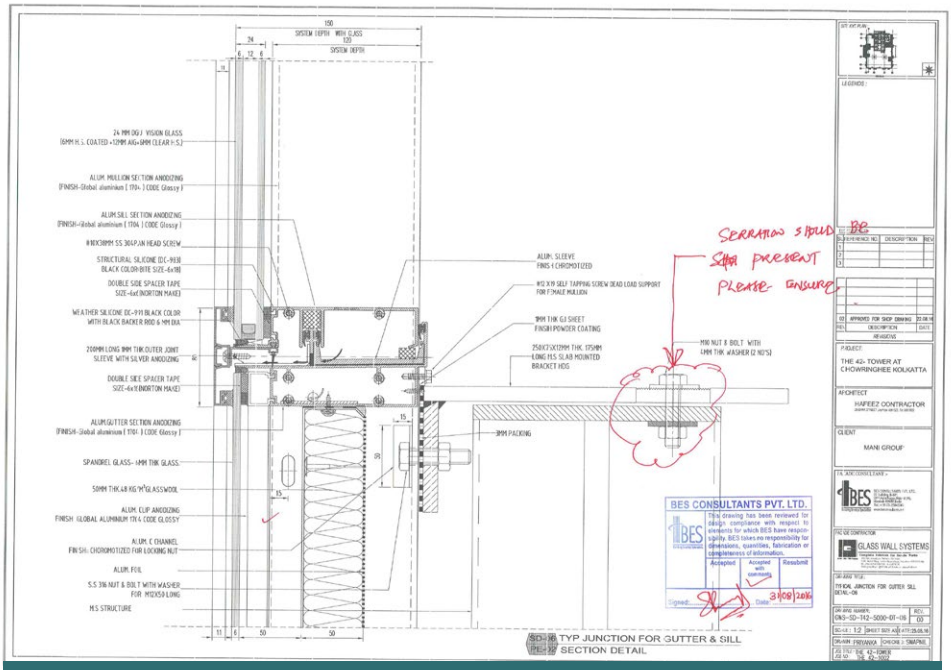
- Unitised bespoke glass façade system with high performance DGU
- Glass railing for terrace balconies
- Triple height entrance lobby façade using bespoke designs by BES
- Large cantilevered canopies with steel structure and cladded
- Steel canopy structure engineered and detailed by BES



Mullion plan details

PROJECT TEAM

- **Client : Alcove Realty**
- **Architect : Hafeez Contractor**
- **Project Status : Competed**
- **Scope : Building Envelope design and Consultancy**



Floor details



Pic. 1: Test specimen

THE 42 TOWER, KOLKATA

The 42 is a 268 m tall (65 sty) high-end residential tower completed and currently is the tallest building in Kolkata. It is an iconic tower using high performance façades and cladding systems, BES scope covering concept to completion.

BES value add:

- Structural design as per wind pressures derived from wind tunnel reports
- Robust façade designs to withstand frequent regional storms
- Detailed engineering design to arrive economical design yet robust design
- Advance engineering to meet highly challenging design requirements such as high wind pressures and weather proof conditions
- Bespoke Lobby façade for triple height (12 m high) using vertical member only, without horizontal

BES has developed bespoke façades using Unitised Curtain Wall system to suit building geometry. Simplified and well resolved pre-construction details have greatly helped successful implementation.

PERFORMANCE TEST FOR FAÇADE SYSTEMS

As a part of the design verification process, typical tower façade system has been tested to make sure that the designs are meeting most stringent criteria and extreme weather conditions. This is full scale performance testing carried out at an external test laboratory, which tests for structural, safety and weather performances of the system.



Static water test



Dynamic water test



Window details



Deflection reading

TEST CRITERIA
Following are key test criteria and test methods as developed by BES:

Performance Tests	Test Methods & Standards	Remarks & Test Results
Air Infiltration Test at +ve 300 Pa	ASTM-E-283	Air leakage was within permissible limit, **Test Pass**
Air Exfiltration Test at -ve 300 Pa	ASTM-E-283	Air leakage within permissible limit, **Test Pass**
Structural Load Test at 100% Design Wind Pressure ± ve 4000 Pa	ASTM E 330 / 330M-14	No permanent deformation noted, hence **Test Pass**
	Mullion- Deflection	Deflection within permissible limit, **Test Pass**
	Mid-Transom- Deflection	Deflection within permissible limit, **Test Pass**
	Split Transom - Deflection	Deflection within permissible limit, **Test Pass**
	Vision & Spandrel Glass- Deflection	Deflection within permissible limit, **Test Pass**
	Bracket-- Deflection	Deflection within permissible limit, **Test Pass**
Static Water Penetrance Test at +ve 450 Pa (Suction)	ASTM-E-331	No water leakage noted, **Test Pass**
Dynamic Water Penetration Test at +ve 450 Pa	AAMA-501.1	No water leakage noted, **Test Pass**
Structural proof load test with safety factor	ASTM E 330 / 330M-14	No permanent deformation noted, Hence **Test Pass**
Structural proof load test with safety	ASTM E 330 / 330M-14	No permanent deformation noted, Hence **Test Pass**



Test specimen for water test

WITHSTANDING AMPHAN CYCLONE - TESTIMONY OF FAÇADE DESIGN

Recent event of Amphan Cyclone has made a devastating impact on Kolkata and West Bengal State, The tallest building of Kolkata (250 m tall) "The 42 at Chowringhee" left intact with its building envelope withstood more than 150 kM/h wind speed. Happy to realise that the building developer statement aftermath of the cyclone appreciated the façade performances during the extreme weather conditions. Performance of The 42 building during the Amphan cyclone has been published in a leading newspapers.

Façades were designed to withstand wind speed approx. 250 Km/h, robust façade engineering designs by BES, were proven with natures test.

To know more about the structural details and testing done, visit this site: https://www.besconsultants.net/projects/the-42-residential-tower/



RAJAN GOVIND
Director, Façade Specialist,
BES Consultants Pvt. Ltd.

ABOUT THE AUTHOR:

Rajan Govind has more than 27 years of international experience within the façade industry. He has served more than 11 years at Arup. With structural engineering background, Rajan has gained working experiences in regions such as Asia, Middle East and Australia. He has successfully delivered several prestigious projects with integrated façade designs, involving 3D design, complex engineering and building integration. He is a Certified SGMM (Singapore Green Mark Manager), which enable him to understand sustainable design requirements. He has delivered several large projects including Mondeal Heights, The Park, Brigade Tech Garden, Pan Pacific Hotel (Singapore), ASPTM Hospital (Vietnam), etc. Govind has taken various efforts to adopt technology to improve the efficiency in design and construction aspects.



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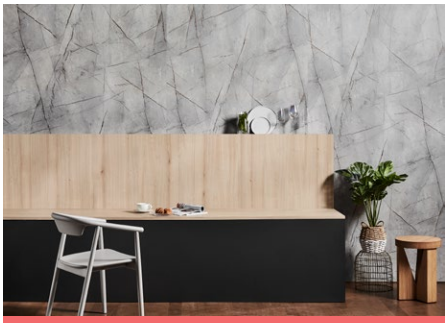
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Greenlam Industries

Develops Laminates Certified with Antivirus Attributes

Greenlam Industries Ltd.'s in-house R&D team has developed a revolutionary product with antivirus attributes. Greenlam Laminates, one of the top most companies in surfacing solutions brand, with this new feature, will retard and kill up to 99.99% of viruses that come in contact with the surface. This has been tested and certified under Antiviral Efficacy Test as per ISO21702:2019 International Standard, by Biotech Testing Services (BTS) Mumbai.

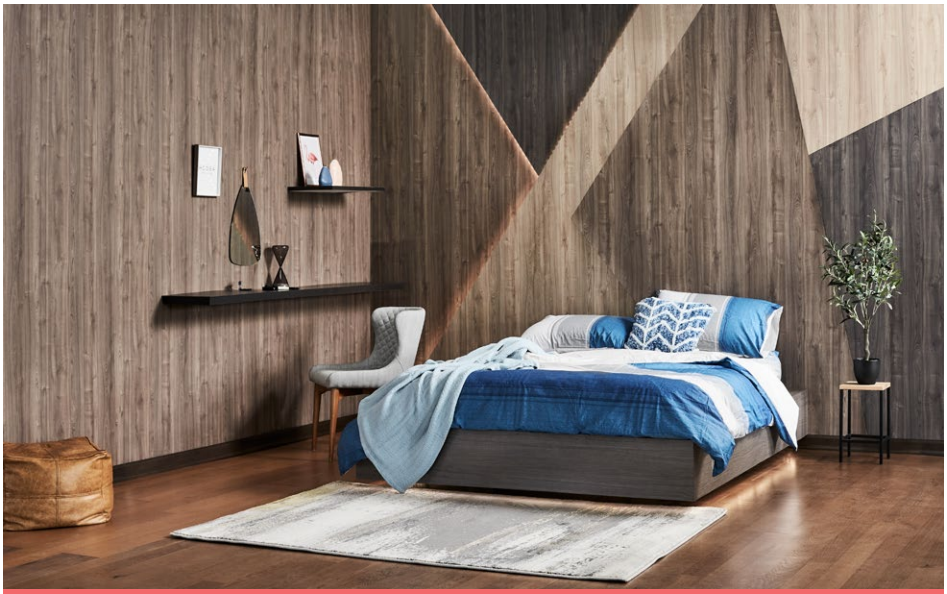
Speaking on the occasion, Saurabh Mittal, Managing Director and Chief Executive Officer, Greenlam Industries Ltd. said, "The entire world has been talking about different ways of maintaining hygiene both indoors and outdoors since the pandemic started. With a vision to help our customers build a safe environment, we are excited to announce that our laminates have been certified with antivirus attributes. This achievement is also a testament of our expertise and commitment to create best-in-class laminates. We would like to take this opportunity to thank our R&D team who relentlessly provides innovative technologies and creative solutions to our customers."



The company has been producing laminates and compacts with antibacterial and antifungal attributes

The company has been producing laminates and compacts with antibacterial and antifungal attributes for several years. With this new certification, Greenlam will now be able to offer laminates with triple health & hygiene features - AntiVirus, AntiBacterial and AntiFungal. The above attributes last throughout the lifecycle of the entire range of Greenlam laminates.

For more information, please visit: www.greenlamindustries.com



Greenlam laminates have been tested and certified under Antiviral Efficacy Test



Greenlam offer laminates with health & hygiene features



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Wienerberger Commissions Natural Gas

for Brick Kiln Operations at its Kunigal Manufacturing Unit

Wienerberger India has announced that it has gone a step further in its endeavour to achieve sustainability in production by switching to natural gas from conventional solid fuel for the brick kiln firing process at its factory operations in Kunigal near Bangalore. This conversion will help to reduce carbon emissions by more than 40%, bringing higher efficiencies and enhance product quality.

This announcement follows the commitment made by the company in December 2019 on the occasion of its 10th anniversary in India. One of the key investment plans outlined was the conversion to natural gas as a fuel to enable manufacturing of Porotherm Perforated Clay Blocks. Porotherm Smart Bricks are 60% lighter than conventional walling material, thus allowing substantial savings on structural cost due to reduction in dead load. This also allows for faster construction and ease of handling.

Wienerberger AG is consistently pursuing projects that involve converting to low-emission energy sources wherever possible. In 2020, the target has been for the production process at India to be converted from coal to natural gas in line with Wienerberger's corporate philosophy of providing sustainable solutions to all stakeholders.

On this endeavour, Monnanda Appaiah, Managing Director, Wienerberger India, said that this change in technology will almost eliminate the particulate matters emitted from the kiln during the firing process. "We are certain that our Kunigal factory emission norms will match world class norms in emission and would be substantially better than the emission norms laid out as per the Indian environmental standards".

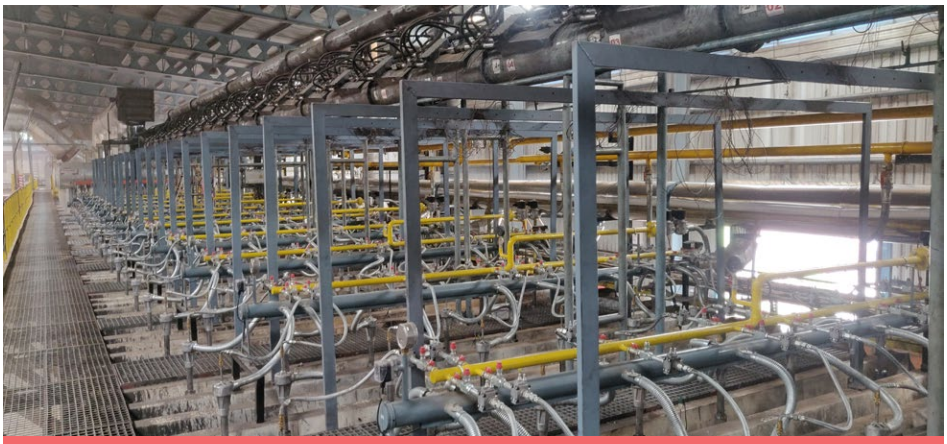
The company has already rolled out its new Sustainability Strategy 2020+, which will provide the basis for the sustainability program from 2021 onwards. Decarbonisation will be one of the three central action areas.

The Kunigal factory affirms the usage of robotics and state-of-the-art technology and has an extremely energy-efficient manufacturing processes. The factory is also highly equipped with a full-fledged in-house laboratory and product development facilities. The latest technology for the new installation (gas firing) is provided by Beralmar Technologic S.A., a European company (Spain), specialised in manufacturing of firing and drying equipment for clay roof tiles and bricks.

For more details on the company and its products, visit - https://www.wienerberger.in/

Benefits of the conversion initiative:
The key benefits of the newer firing technology for its brick klin firing (gas firing) at Wienerberger's production facility in Kunigal are:

- Higher fuel efficiency, reducing carbon monoxide emission by >75%
- Reduction in Carbon dioxide emissions by >40%
- Zero particulate matter emission during firing process
- Consistent and higher quality of the fired bricks



Kunigal factory of Wienerberger AG uses state-of-the-art technology and has an extremely energy-efficient manufacturing processes

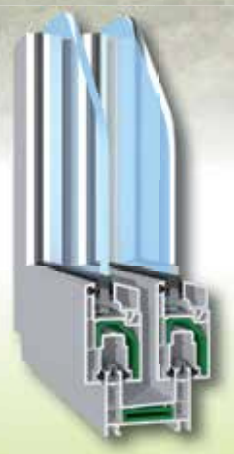
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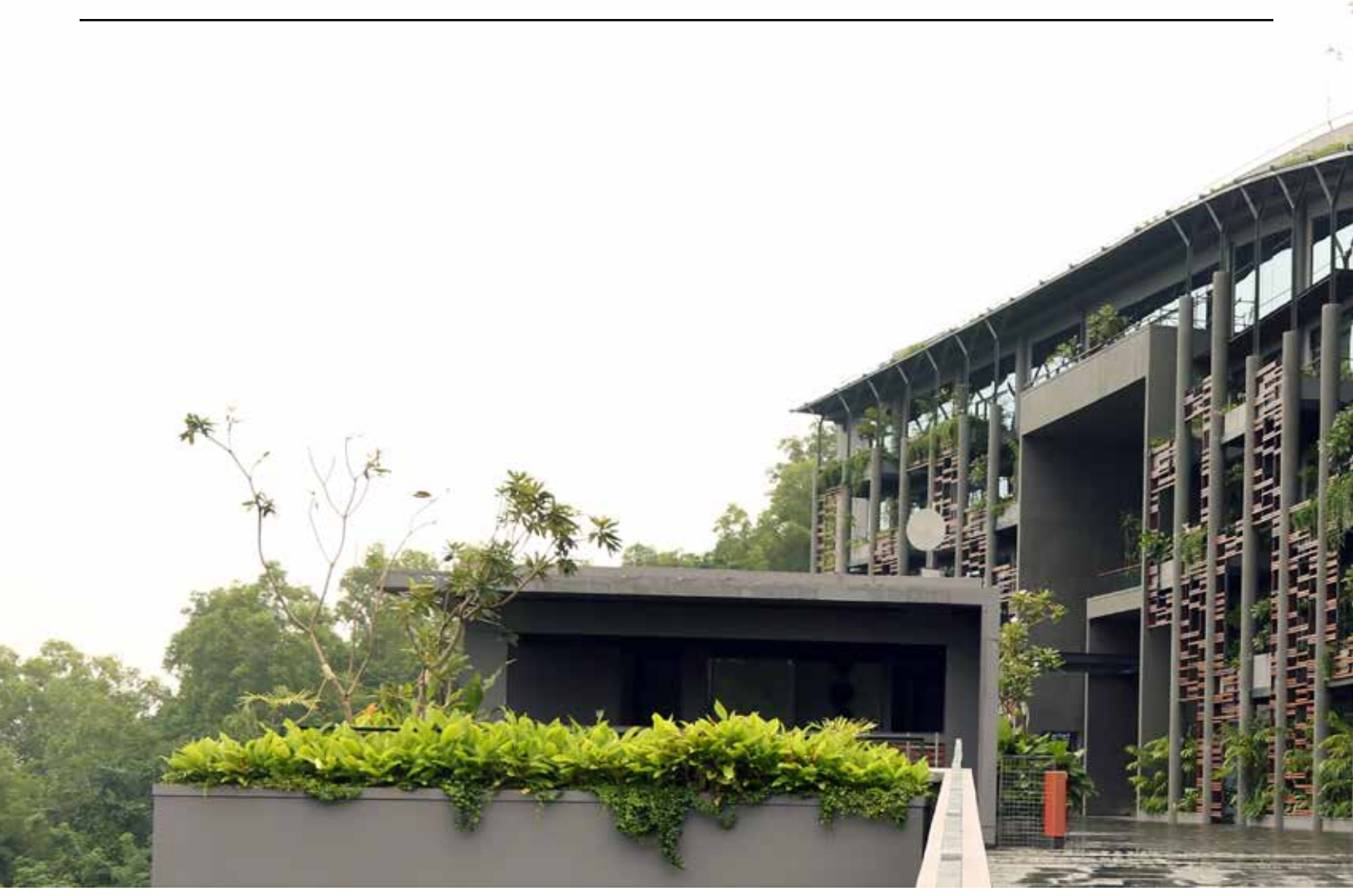
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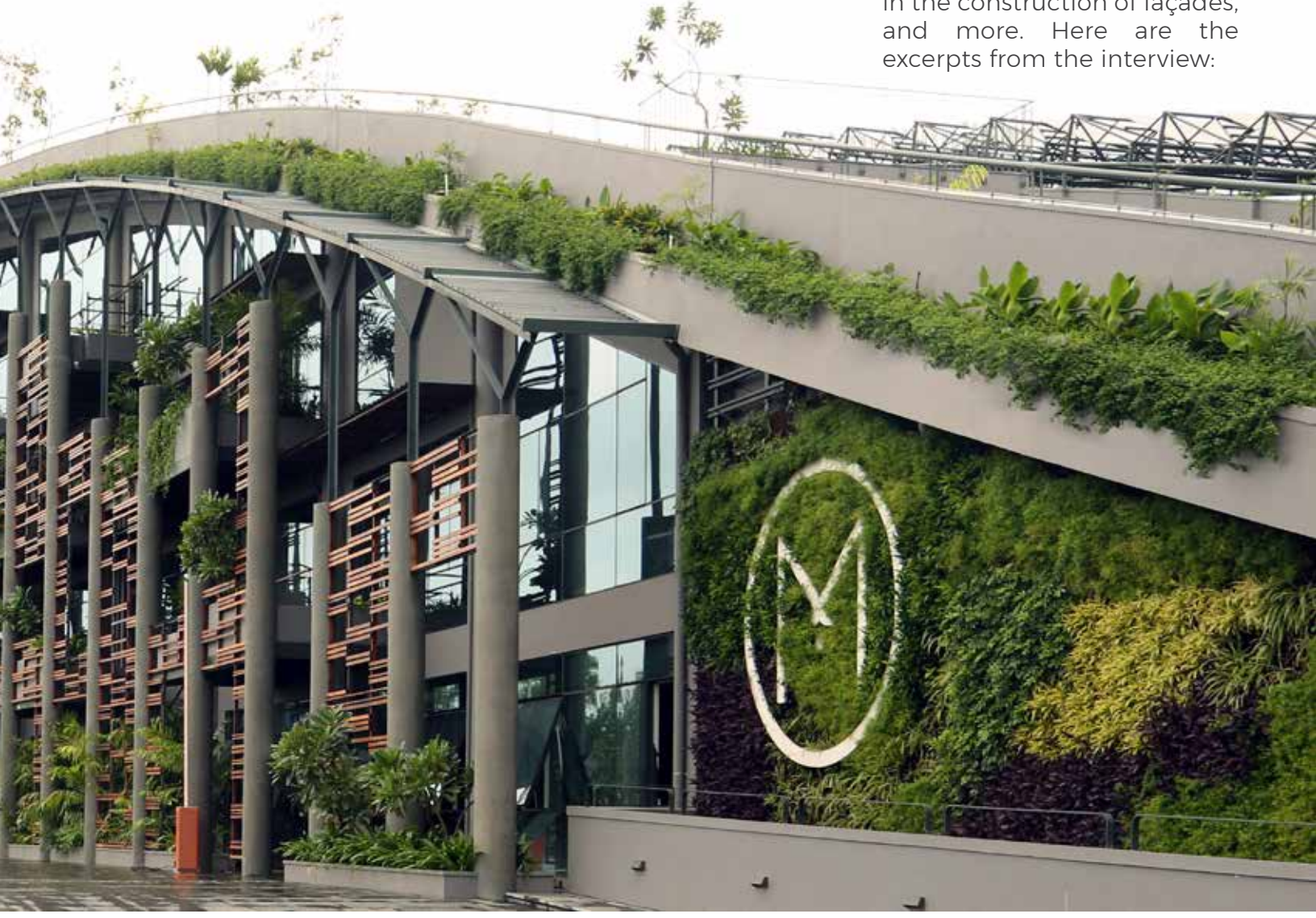
AR. TONY JOSEPH
Principal Architect,
STAPATI



Tony Joseph is the Principal of Stapati (www.stapati.com), an award-winning multi-disciplinary practice, emphasising the values of integrity, sustainability and innovation. Stapati's architecture emerges from a sensitive understanding of the context; one where the evolution of design is firmly rooted in the region's traditional narratives, while interpreting the elements in a modern context.

Tony is also the Founder Chairman of Avani Institute of Design, a Center of Excellence in architecture and design education located in Calicut, promoting a holistic approach to design education to develop well-rounded professionals equipped with the sensitivity, empathy, social and technical skill sets to address the ever-evolving concerns of our environment. Tony was an invited artist in the Kochi-Muziris Biennale 2016, and had designed the Biennale Pavilion.

Ar. Tony Joseph, in his interesting conversations with the magazine editor, elaborates on his views on architecture, his design firm's growth from its inception, his architectural journey of over 30 years, completed and ongoing projects, the evolution of façade and cladding designs, technologies and materials, his insights on sustainability in the construction of façades, and more. Here are the excerpts from the interview:



Please tell us about your practice?

Stapati is an architecture practice established in 1989. I graduated from MIT Manipal and completed my masters in design from the University of Texas, Austin, in the Charles Moore program. Interactions and travels with Moore and his views on regional architecture had a strong influence in the direction of my design. I returned to India and started Stapati, which has steadily grown into a multi-disciplinary practice, emphasising the values of integrity, sustainability and innovation.

Stapati's architecture emerges from a sensitive understanding of the context; one where the evolution of design is firmly rooted in the region's traditional narratives, while interpreting the elements in a modern context. There is an underlying acuity in the design approach, which responds to the site uniquely, rendering it relevant and timeless.

Stapati, has won numerous awards and recognitions over the years and has been selected as one of the Top 100 most influential design firms in South Asia by Architectural Digest for six years continuously, from 2014 to 2019. The Enchanted Island Resort designed has been chosen as World's Leading Private Island Resort 2019 by the World Travel Awards. In 2015, ORO Editions from San Francisco had brought out a monograph on the hospitality projects designed by Stapati. Entitled 'Timeless Resorts', the book examines the evolution of eleven captivating hospitality projects. ORO is one of the reputed international publishers of art and design books, and 'Timeless Resorts' is one of the few monographs of an Indian architect published by ORO.

What inspired you to become an architect?

I was always interested in arts and built-forms, which when combined with mathematics, which was one of my favourite subjects, pushed me towards architecture.



Mandalay Hall, Mattancherry, Kerala

Could you please talk about a few of your ongoing projects?

In addition to the key focus areas of master planning for large scale developments and premier hospitality projects, we are presently working on assignments over a wide repertoire – institutional buildings, commercial complexes, senior living facilities, individual residences as well as housing & interior design projects.

Tell us about your completed projects featuring innovative façade and fenestration design?

The response to each project is contextual. We've designed a corporate office for Team Thai where we've designed a trellis on the southern façade to cut out the intensity of the sun. These vertical trellises while being functional are one of the most identifiable features of the building.

Again, for the Malabar Headquarters in Calicut, we have designed the west-facing façade as a green buffer to cut out the intensity of the sun. These have spill-out balconies with dense planting, including trees and creepers, along with an innovatively designed wooden trellis, which reduces



Ar.Tony's residence in Calicut

the glare and solar radiation considerably, while not obstructing the views from the office spaces behind.

Façades and cladding industry in India has gone through a sea change in the past decade. Tell us about the trends in façade & cladding material and technologies in India and those used in your projects?
It is true that the façade and cladding industry have changed considerably. If anything, I see façades with a more sensitive response to the context, which does not blindly copy international trends, but are suitable to the function, climatic considerations, etc. I would also suggest that designers would see the façade as an integral part of the design and not as something that is added later for aesthetic purposes alone.

What are the key factors to consider while designing and installing façades & fenestration?
The functional requirements of the space would be of primary importance, which will guide the amount of area for fenestrations, signage requirements for commercial buildings, etc. Also, the orientation of the façade will be crucial in dealing with the sun – reducing the glare and protecting the interiors from heat gain, while opening up views if required.

Please brief on the technical benefits of a well-managed façade and how it helps the building to be energy efficient at the same time provide a better interior environment?
Naturally, as I said earlier, a well-designed façade with proper fenestrations would go a long way in creating a comfortable space in the interiors. This is especially relevant today when the need to connect with the exteriors and nature is increasingly important in maintaining the well-being of the inhabitants. Also, a good design would let in plenty of natural light, which would reduce the need for artificial lighting. Likewise, energy gains can be optimised through reduced cooling requirements if the façade is kept out the solar radiation.


The Biennale Pavilion-PC-Kochi Biennale Foundation, Kochi, Kerala

According to you, what is an intelligent façade? How can intelligent façades bring in the greenhouse effect and also restricting intensive use of air conditioners?
I think more than an intelligent façade; the need of the hour is for sensitively designed architecture and consequently façades, which would inherently reduce the air-conditioning and energy needs.

What about sustainability and environmental considerations when choosing the façade/ cladding material?
The material choices would go a long way in impacting the overall sustainability of a project. But it is not a standalone thing. Materiality has to work along with the overall design to make spaces truly sustainable.

There are many cladding materials available in the market. How do you choose the apt one for your project? What are the criteria?
As far as possible, we go with natural materials, that too, those available locally since they are more contextually relevant and sustainable.

What is your advice to young, aspiring architects?
I think it is important that all of us are even more conscious about the environment. Sustainability is not a choice anymore. It is something that is indispensable for our built environment and our future generations and should be an integral aspect to be considered for all designs.


Alila Diwa, Goa


Enchanted Island Resort, Seychelles

Malabar Headquarters

Calicut, Kerala



Malabar Headquarters, Calicut, Kerala

A steep sloping site, facing the west presented a unique challenge for the design of the Malabar Group Headquarters at Calicut, in the tropical context of Kerala, India. The design is resolved as a series of levels along the contours which reduces the intervention on-site to a minimum.

The lower four levels accommodate the parking and service areas, with an interesting pattern of terracotta jaalis and greenery defining the façade. Office spaces rise up from the large landscaped podium above this, which serves as the main entry-level. The podium level is accessed



The roof is designed as a landscaped gathering space which slopes all the way down to the ground



The reception lounge for the executive wing on the upper floor

through an interestingly designed bridge and has thoughtfully done landscaping which helps create a sense of arrival. To take advantage of the wonderful views all around, the office areas are designed as transparent, open plans and rise up four floors above the podium. Responding to the sloping site, the office spaces are resolved as two separate blocks with a green landscape spine in between. Strategically placed balconies with large trees and vegetations on the western façade cut out the intense sun, creating a green buffer. They also serve as gardens in the sky, providing spill out spaces that can be accessed from various floor levels. Intermittently placed wooden trellises allow climbers to grow, which helps in cutting out the harsh sunlight, along with the double glazed units on the western façade.

The roof is designed as a landscaped gathering space that slopes all the way down to the ground and has amphitheaters, lounges, pavilions and plenty of vegetation, serving as a space to get together and unwind. The green roof slopes down to the ground on the South to reduce the intensity of the southern sun and also acts as insulation to the office spaces below. There are cutouts in between, which allow the employees to move out onto the green roof.

The interiors are an expression of a contemporary design aesthetic with exposed materials like polished concrete flooring and cement board finishes which contrast with the sleekness of glass and mild steel. Innovatively designed furniture and artworks accentuate the vibrancy of the space. A conscious decision was taken to avoid using false ceilings to reduce material usage. The services are thus exposed and are completely finished in black above the eye level, creating a raw industrial aesthetic in the interiors, which is contrasted with the bright colours of the furniture and the artworks.



Natural vegetation comes into the interiors through spill out balconies and the central landscaped spine

Natural vegetation comes into the interiors through spill out balconies and the central landscaped spine with dense greenery, providing opportunities for social interactions and enhances the psychological well being of the employees. The central landscape has a solar screen roof on top which helps in meeting the energy demands of the building. Rainwater collected on the roof and other surfaces are channelised to percolation pits and help in recharging the groundwater. The inherent honesty in the use of materials along with the contextually relevant design helps in creating a highly sustainable building, one which is integrally connected to nature.

QUICK FACTS:

Project: Malabar Headquarters

Location: Calicut, Kerala

Client: Malabar Group

Architect: Tony Joseph, Mohandas.P, Sujith.G.S, Kiran Satheesh, Renjith Sukumaran, Deepak.M.L

Other Consultants:

- o Structure – Design Spectrum
- o MEP – SEED Engineering

Materials used for façade & fenestration: Wooden trellis with vegetation forms the green buffer.

Completion date: December 2016

Corporate Office for Team Thai

Calicut, Kerala



The front façade is designed as an interesting pattern of trellises to cut out the harsh sun, while allowing plenty of ventilation into the spaces.

A linear sloping site facing the southwest, along a busy highway, defined the context for this Corporate office in Calicut. The functional areas of the building are deliberately raised up from the ground, leaving the ground floor free as a multifunctional space. Thus the external landscape continues into the building and onto the raised portion of the land on the rear, which is articulated as an informal extension of the office space. This continuous space is resolved as a series of levels that allows the landscape to move in & out and form the spine around which all activities are organised.

The functional spaces are protected from the harsh western sun by a high barrier wall on the periphery, which has got breakout spaces in between. Triple height spaces further aid in the movement of air. The office spaces are further sheltered from





Corporate Office for Team Thai, Calicut, Kerala

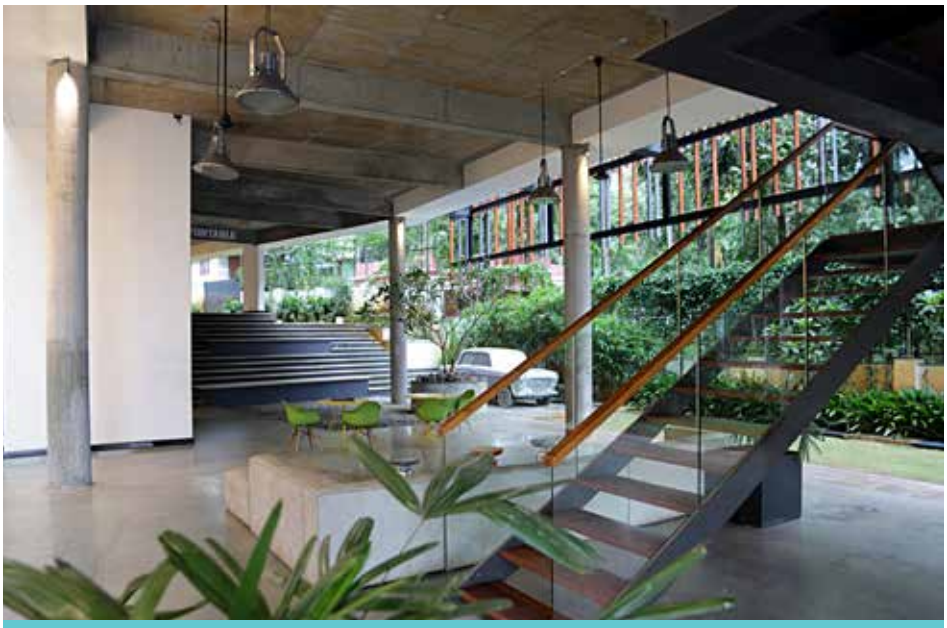
glare by a screen wall on the front and side. The terrace is converted into a garden and lounge which adds another layer against the hot tropical climate and helps keep the interiors cool.

The front façade is designed as an interesting pattern of trellises to cut out the harsh sun, while at the same time allowing plenty of ventilation into the spaces. The open planning of





The external landscape continues into the building



The functional areas are deliberately raised up from the ground, creating a multifunctional space into which the landscape seamlessly flows into

the interiors further accentuates the overall openness of the office and sets the tone for a vibrant working atmosphere. There is an inherent truthfulness in the use of materials, most of which are left exposed – polished concrete flooring, cement board partitions and exposed concrete ceiling. This rustic theme is contrasted well with the sleekness of glass and the surrounding greenery, which creates an ambience of working amidst nature.

QUICK FACTS:

Project: Corporate Office for Team Thai

Location: Calicut, Kerala

Client: Team Thai Group

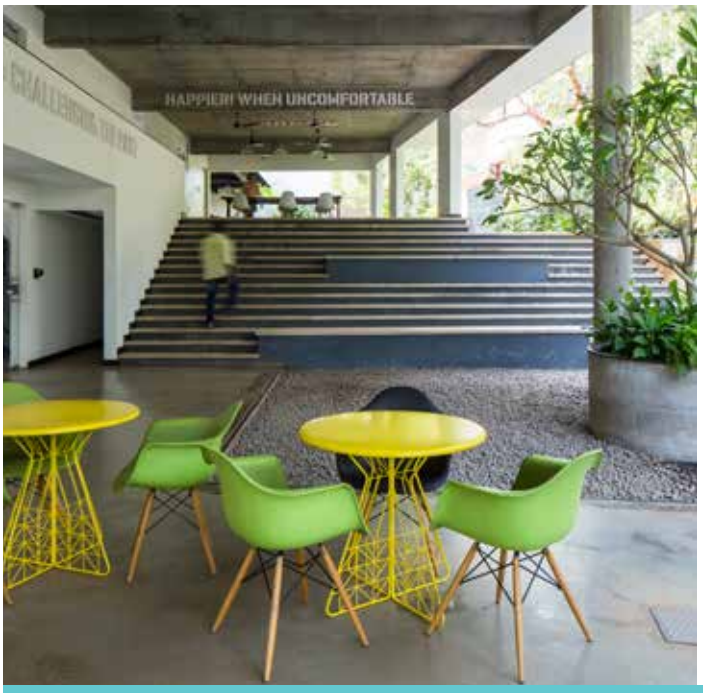
Design Team: Tony Joseph, George Seemon, Anupama, Priya Pillai, Ankita

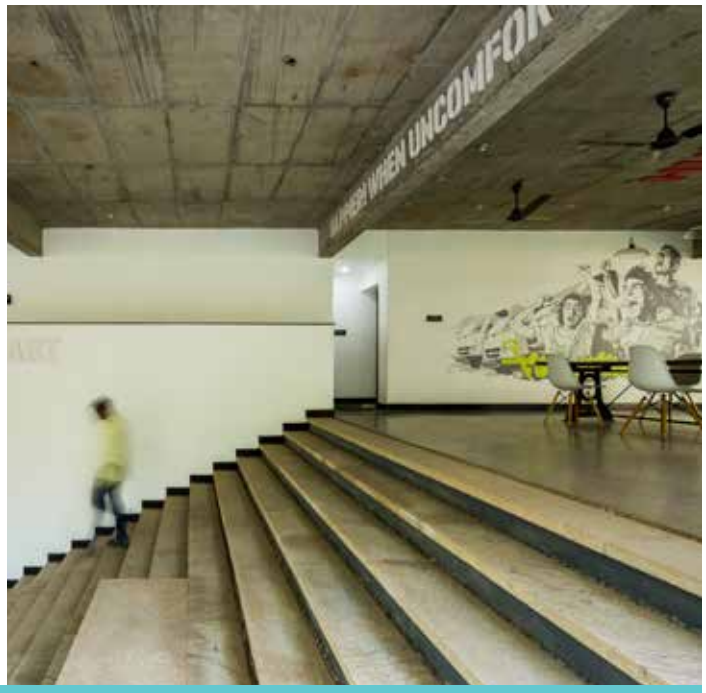
Other Consultants:

- Structure – Design Spectrum
- Plumbing – Bhavani Consultants
- Electrical – EC Centre

Materials used for façade & fenestration: Aluminium trellis with glass behind.

Completion Date: June 2015





The open planning of the interiors and the triple-height spaces further accentuates the overall openness of the office

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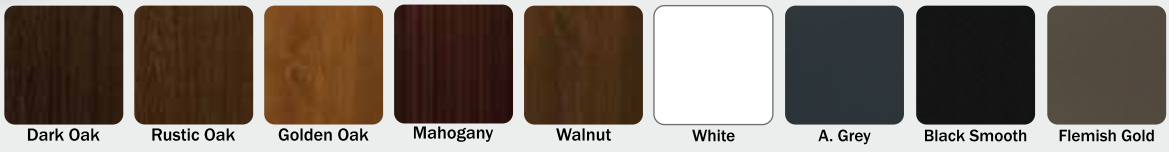
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One of the latest trends in materials ruling the exterior cladding is High Pressure Laminate - a project by Greenlam

Exterior Wall Cladding

Options, Solutions & Guidelines

Cladding in construction is a material applied on the exterior walls to provide a skin or layer. It provides a degree of thermal insulation and weather resistance and also improves the appearance of buildings. Cladding can be made of any of a wide range of materials available in the market, including wood, metal, stone, brick, vinyl, and composite materials that can comprise aluminium, wood, stones, blends of cement and recycled polystyrene, etc.

The wall cladding market in India is still evolving and the future for the same definitely holds much promise with the high demands in the construction industry. In this edition's cover story, we discuss the trends in cladding materials and technologies, intelligent and responsive cladding solutions, future cladding materials and designs, testing for the wall clads for strength and durability, standards and norms while procuring and installing cladding materials, and much more.





AR. JASVINDER LAL
Architect, Design2Occupancy Services LLP.



AR. GAURAV GOEL
Principal Architect, Studio Parametric Curiosity India



Façade with varying colours and textures

4 KEY TRENDS IN EXTERIOR WALL CLADDING

Building cladding is the exterior skin, or envelope of a building, and includes all moisture barriers and siding materials used to cover the outside of the structure. If you want to add wow-factor to your building, then you will need to think carefully about specifying the best cladding and external finishes. Over the years, cladding has become a preferred solution for giving a protective layer and identity to both residential and commercial buildings.

There is a marvellous range of materials out there to fire the imagination, from the traditional stone and brick finishes to shiny metallic finishes. In trends of cladding material, brick wall finishes, brick slips, uPVC cladding, wood cladding, stone tiles, metal cladding, fibre-cement are available in the market, says **Ar. Jasvinder Lal, Architect, Design2Occupancy Services LLP**.

Current claddings portray inclination towards following trends to select an apt cladding material, points out **Ar. Gaurav Goel, Principal Architect, Studio Parametric Curiosity India**. Firstly, cladding material properties that define the visual and performative aspects of the cladding are vital. The material can be aesthetically pleasing, but if it fails to perform in extreme climates and fire scenarios, it would not be the best choice. Secondly, lighter weight claddings are trending due to the lesser weight upon application to the existing structure. Rapid assembly and cost-effective local manufactured materials for cladding are in trend. Due to the fast and easy assembling of the cladding modules, there is a decline in construction time and labour costs, whereas if materials are local and mass-produced, they are cheap and economically viable for a project.

According to Ar. Lal, the key factors influencing cladding selection are colours and textures, cost-effectiveness and sustainability.

Colours & textures: Material and colour are one possible starting point for façade design. The façade of a building plays a key role in making a great first impression. They also express the personality of its occupants and the space it holds inside.

Cost-effective cladding: Cost-effectiveness is right up there among the top considerations while choosing from a large range of available options. The durability is of greater importance too. Initial cost plays an important role when looking for the best cladding solution. The cost-effectiveness of cladding depended upon the number



Material and colour are one possible starting point for façade design





AR. NILESH GANDHI
Principal Architect, Metadesign



ALEX JOSEPH
Sr. Vice President – Marketing, Greenlam



A building in Moscow, Russia

of factors to consider when weighing up types of cladding. The location of the building is important, but also thermal efficiency, fire rating, and the sustainability of the materials.

Sustainability: Sustainable choice in eco-friendly building exterior cladding includes wooden cladding, rock panel, super-thin steel, and solar concrete.

According to **Ar. Nilesh Gandhi, Principal Architect, Metadesign (I) Pvt Ltd**, from mid-50's to late last century, the exterior envelope consisted of majorly natural materials like brick and stones, not specifically as cladding materials but the core material. This got completely overshadowed by the dot com boom in the early part of this century, with glass becoming the preferred choice. We see a strong trend of ACP, across structures.

The key trends, according to Ar. Gandhi, are:

1. Glass (cost-effective or sustainable only if used correctly)
2. Aluminium composite panels
3. Stone cladding (expensive, lot of colours and textures, sustainable only if used appropriately
4. Texture paint / Marble chips (most cost-effective, most sustainable, variety of colours and textures).

According to **Alex Joseph, Sr. Vice President - Marketing, Greenlam Industries Ltd.**, the latest trends in materials ruling this space is High Pressure Laminate Cladding (HPL). The reasons for the same are:

a. HPL provides a sustainable solution and is used in isolation or in a combination with ACP or glazing or both. This range comes in a variety of colours, patterns and textures. Some of the finishes that bear a stylish and polished look include suede and high gloss.
b. HPL clads are all fire-retardant by default and are intended for severe outdoor conditions, for instance, applications involving long term exposure to strong sunlight or extreme cold weather. This single variant, which is the highest performing grade as per the standard provides a foolproof solution for all types of applications.

According to Joseph, HPL maintains its superiority over ACP, metal or dry clay-based cladding solutions available in the market for the following reasons:

1. ACP, though competitive and aesthetic, the surface is too soft to resist impact loads and tend to develop irreparable dents. This product suffers from other issues like colour fading over prolonged



Façade cladding - using CenturyPly



SHANKHO CHOWDHURY
President, Decoratives Division, CenturyPly



GAURAV SANGHAVI
Co-Founder Principal Architect, Pentaspace Design Studio



Roshan residency at Jaipur - cladding from Greenlam

use and calls for replacement. The replacement does not assure colour matching on all occasions.

2. Terracotta clay tile dry cladding is made with clay tile and the aluminium substructure in isolation or in combination with glass. This is a more expensive option than ACP and the colour options are limited. The material is brittle and carries the perils of being so.

On the other hand, metal cladding like zinc & copper is quite expensive than any other material available. However, aesthetically it looks good and different types of surface finish can be achieved with limited colour options, adds Joseph.

Shankho Chowdhury, President, Decoratives Division, CenturyPly notes that digitally printed HPL panels, which can be customised according to the need of the customer, is one of the key trends. With this option, one can simulate any image or impression on the panels which suits the requirement. Different kinds of new and pioneering installations like under-cut or hinged applications are also in trend. The other key trends are customised perforations with a background LED lighting scheme, and non-linear, sloped & tilted installations, adds Chowdhury.

Gaurav Sanghavi (Co- Founder) Pentaspace Design Studio, spoke about the 4 key trends:

1. Perforated, parametric designs are the trends in façade panelling. Taking into account sun paths, wind directions, shading coefficients, etc.; Façades are screens, which can be shaped with multiple algorithms to make it more sustainable and efficient. Vibrant colours are the new norms of expressive façades.
2. Fibre-reinforced materials exhibit high thermal insulation and corrosion resistance, making them cutting edge over the traditional materials. These properties of the fibre-reinforced polymer are gaining huge traction in the façade material market.
3. Vegetation - Vegetated walls, landscape walls, and vertical gardens are few of the green façade techniques that are gaining huge prominence in the façades market.
4. Solar cells - Photovoltaic cells or solar cells are quite prominent in building energy-efficient building façade.

Cost and scalability are the two primary factors of new façade technology to be successful and accepted commercially.

USE OF CLADDING TECHNOLOGIES & MATERIALS TO REGULATE DAYLIGHT & VENTILATION

Exterior façades allow natural daylight indoors. The daylight needs to be controlled so that it is useful, without creating glare or other unwanted outcomes for occupants, notes Ar. Lal. Smooth, even, glare-controlled daylight passing through translucent glazing provides numerous benefits to people, from energy conservation to reduced reliance on electric lights.

Only if the cladding is the core or the envelope, it will have an impact on daylight, observes Ar. Gandhi. If the cladding is a transparent material, the visual light transmittance (VLT) of the glass will impact the daylight or the privacy. If the building envelope material is porous, it will impact the ventilation. Automation, motorised or movable or interchangeable envelopes can regulate the daylight, ventilation and privacy parameters, he adds.

The façades also contribute towards enhancing a building's thermal performance, says Ar. Lal. Firstly, the ventilated façade panels provide a (small) benefit to the U-value of the wall behind due to the fact that they shield the building from direct wind and sun. Secondly, the large panel format and the resulting shielding effect help to reduce the number of thermal bridges - anything that goes through the wall's outer insulation layer - thus, maximising the performance of the insulation.

Ventilated cladding system creates a gap in between the wall and cladding product lining, providing a layer of

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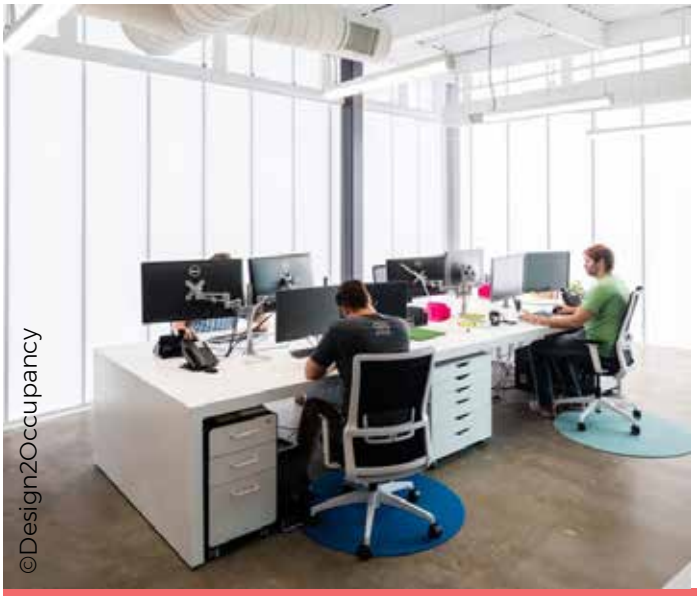
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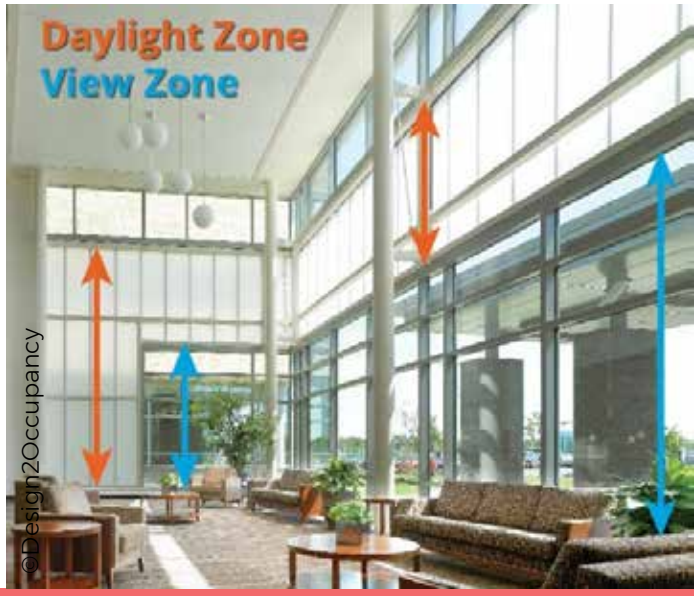
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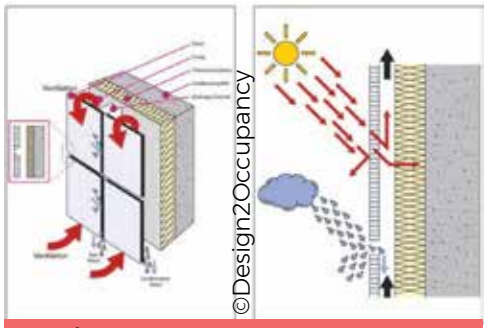




Daylight façade



HARSH POTE
Co-Founder Principal Architect - Pentaspace Design Studio



Ventilated façade panels



Terracotta façade system

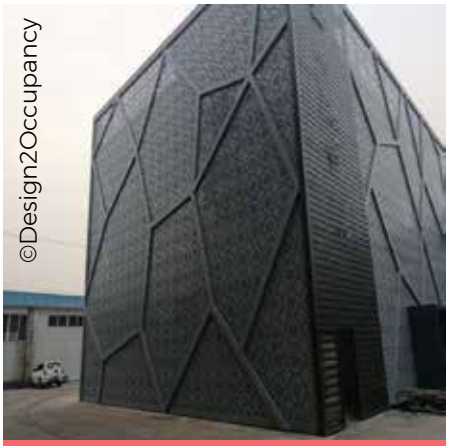
air cushion that acts as a thermal barrier by regulating the sunlight, says Chowdhury, also making the building more energy-efficient.

Terracotta façade System is a kind of new curtain wall system, adorned with terracotta panels as a decorative surface and functions based on the main screen principle. It is a perfect and smart combination of traditional materials and modern architecture, featuring large format panels, functionality and a complete provide privacy.

According to **Ar. Harsh Pote, Co-Founder, Pentaspace Design Studio**, parametric designs are now evolving in 3-dimensions and this gives us the ability to regulate light and ventilation in said space. According to him, the façade is not skin anymore. It is a membrane, which reacts with the outside algorithms, which then translates into design and creates a comfortable interior space.

MOST PREFERRED CLADDING MATERIAL

Demand for the cladding solutions market can be credited to the high growth of the construction industry across the globe. Demand for fire resistance, thermal resistance, and water resistance, soundproof cladding systems are growing in the market. Innovative, eco-friendly cladding materials are preferred in the market as a consumer is becoming more environmentally concerned, observes Ar. Lal. For more than a decade, glass, stone, wood, metal/ACP has always been the traditional choice of material for exterior cladding. Ar. Goel and Ar. Gandhi too agrees with the dominance of the said materials. The reason for choosing these materials is their cost, availability, easy installation and variety of choices in terms of colour and texture to customise a façade. Ar. Gandhi adds that these materials are preferred primarily on account of speed of construction, ease of availability of manpower labour, and maintenance. More importantly, it is the "westernisation" leading to this domination, he



External wall cladding panels as decorative metal screen wall dividers



Protecting buildings with metal cladding systems

Why HPL for Cladding?

ACP cladding

- Degradation of the core material (recycled LDPE*) and ultimate failure of the panel
- Delamination
- Paint finish is not durable, comes away from the aluminium substrate
- ACP Product is highly susceptible to dents and torn off corners
- Contributes in of ozone layer depletion & maximum in global warming
- Shade variation is a common phenomenon
- Colour gets faded easily, especially in oceanic climates
- The sealant fluxes out of its place and gives a patchy look on the panels

Stone & ceramic tiles cladding

- Stones are expensive
- Labour-intensive installation process
- Heavy & fragile
- Tiles are prone to crack and drop away
- Prone to algae and fungal attack

HPL Cladding

- No distortion even in extreme climatic
- Highly UV resistant with almost no shade fading even after years of installation
- Resistant to extreme weather conditions
- Suitable for installation as a ventilated façade system
- Colour stable – optimal lightfastness
- Self-supporting
- Impact-resistant – wind and other elements
- Scratch resistant
- Fire retardant
- Easy & rapid installation
- Low-cost maintenance
- Heat insulation and wall protection – protects buildings from excess temperature in summer to excess cold in winter & aiding removal of heat and moisture from rain or condensation
- Lightweight compared to any rocky product
- Suitable for all exterior cladding applications

(Shankho Chowdhury, President, Decoratives Division, CenturyPly)

adds. According to Ar. Pote, glass, aluminium, zinc, copper, exposed concrete panels, sandwich panels, etc. are most preferred since they are cost-effective.

In the case of commercial buildings, primarily ACP, clay tile, glass, HPL cladding or a mix and match of these materials are being widely used, adds Joseph. For residential purposes - stone, HPL cladding, ceramic, fibre cement boards, Korean and wood amongst others are usually preferred.

Nowadays architects tend to utilise contemporary moderate material to make a straightforward, uncluttered façade, notes Ar. Lal. With regard to materials, metal cladding offers excellent options. He too agrees that zinc titanium, aluminium, claddings materials are dominating the industries. Apart from standard systems, these offer customised façade options as well. Further, the Zinc-Titanium alloy is a material that can be folded, bent, curved and profiled into customised panels to meet the design intent of the architect.

Days were there when exterior grade HPL was used to be confined within a certain kind of applications, says Chowdhury from CenturyPly. But now more

and more people are yearning for the authentic wooden, stone or abstract look for their façades and the demand of the exterior grade laminate is increasing considerably.

CLADDING MATERIAL FOR FUTURE FAÇADES

Although the traditional wet façade elements such as bricks, stones, and wood are still widely used and have a ready market, futuristic new-age elements and composites, including ceramic, vinyl, fibre cements, are rapidly gaining ground. Technological advancements and novelties in the industry are aiding in evolving consumer preference. "We have seen that currently HPL cladding and stone veneers are few of the most popular cladding options in India. Other than this, metal claddings are also in trend for most commercial buildings and factories. Using fibre cement as a cladding element is still a new concept in India and we believe it has a huge scope and its market is growing rapidly," says Chowdhury. Joseph too agrees that metal cladding is gaining popularity.

According to Ar. Goel, Glass takes the leading position as the trendiest future cladding material. "These days, glass can be manufactured to specific energy standards along with moulding it to organic shapes including double curvature skins. Such workability along with mass manufacturing and fast installation makes it a material for future that is open to further design experimentation," adds Goel.



The entirely transparent façade of a high-end flagship store on Amsterdam's upmarket shopping street, PC Hooftstraat, uses glass bricks, glass windows frames and glass architraves in a way to evoke the vernacular of the area with the goal to maintain the character of the site

Precast wall panels, if developed well to address Indian conditions and challenges, can prove to be trendy and can be termed as the future of façades, says Ar. Gandhi.

The most futuristic cladding materials are those that can be crafted into a unique pattern that would otherwise be impossible with traditional materials, points out Ar. Lal, like cladding material with a unique geometric patterned design. It should be stable, lightweight, and can withstand the rigours of the natural environment, for instance, Prefa FX12 panel, fiber C3D cladding, Venetian glass bricks, etc.

According to Ar. Sanghavi, photovoltaic cells on façades are the new trend so that the buildings can generate energy and can become self-sustainable in power requirement. But, at present, the system seems to be very expensive. As the costs decrease, these on-site power systems will be integrated within the glass skin and these façades will become local, non-polluting energy suppliers to generate enough energy. Ar. Sanghavi adds that the green façade created by green walls and urban farming, which makes the structure self-sufficient and creates a healthy microclimate, could be the future trend.



Fiber C3D cladding



Prefa FX12 Panel

INTELLIGENT & RESPONSIVE CLADDING

Chowdhury notes that in the last two decades, the areas of advanced materials and technologies have progressed rapidly. New researches on a nanomaterial, biomaterial and smart and intelligent composites imitating natural nanostructures

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and processes are tried almost every day within the radical technologies. In the architectural field, and especially in the sector of building cladding, only a trivial amount of such advanced technologies have settled. As an alternative to the traditional mechanisms and techniques, architects and civil engineers are nowadays using enhanced composite materials to provide crafted and efficient façades.

An intelligent cladding is one that is responsive to the requirements of the occupant, organisation, and society. It is sustainable in terms of energy besides being lowly polluting in terms of emissions and waste, healthy in terms of well-being for the people living and working within it, and functional according to the user needs, notes Joseph. This can be achieved by deploying an appropriate, reliable and proven technology.

A cladding or envelope, which breathes and adapts is agile, and is responding to the climate and nature is intelligent and responsive, observes Ar. Gandhi.

Cladding materials that respond to the sun and wind to maintain favourable thermal comfort along with optimal light levels and energy consumption can be referred as intelligent and responsive, says Ar. Goel. Such cladding systems are generally kinetic and adapt to different configurations based on the weather data obtained by electronic sensors. On the contrary, some smart materials like thermo bimetals have also been explored for such intelligence in façades recently, adds Ar. Goel. These alloy metals deform themselves from the sun's heat and allow more ventilation into the buildings without any need for sensors by using their mechanical expansion properties.



Climate-responsive kinetic façade and a triangular form

Agreeing with Ar. Goel, Ar. Lal adds that the ability for a building envelope to change and adapt its configuration relative to the sun (either by blocking its rays to prevent overheating and/or glare or by allowing them to penetrate for passive heat gain and/or daylighting), has been a primary source of formal and technological innovations in intelligent building skins.

The need of the hour is "Smart Buildings" or "Intelligent Buildings". "Intelligent Façade" plays a key role as it is essential in making it truly smart and it is the primary defensive line for the building against the environmental and climatic variation, points out Ar. Sanghavi. Responsive building façades facilitate interaction between the environment, the indoor space and the occupant in a meaningful way. High-performance envelopes are assessed based on energy optimisation and reduction in the use of resources and their inhabitants.

SMART CLADDING TECHNOLOGIES & SUSTAINABLE BUILDINGS

A rapidly changing environment is affecting building users as well as building performance. Despite the fact that the climatic characteristics have variable parameters, traditional façades are largely static; so, we use large amounts of energy in order to control internal comfort. The application of smart materials technologies in the field of architecture mainly depends on the ability of these materials to change their shapes and characteristics based on passive form, under the influence of external stimuli such as humidity, temperature, solar radiation, light, air movement and pollution, says Ar. Lal.

Presently, building design criteria focuses primarily on sustainability as people are mostly looking for eco-friendly cladding solutions. Therefore, cost-saving materials could help reduce the carbon footprint and save energy, are creating more demand with each passing year, says Joseph. Apart from this, a flexible system



Bi thermal metal panel on facade of installation bloom by Doris Kim Sun in USA - Studio Parametric Curiosity India



Italian pavilion smog eating concrete facade - Studio Parametric Curiosity India



A restaurant in Australia with VIG modules - Studio Parametric Curiosity India

with respect to façade design like louvers with MS fabrication techniques and similar processes can be a smart cladding solution. Lastly, non-flammable and code-approved materials also apply to retrofit for the need to ensure the energy efficiency of the building, he adds.

According to Ar. Goel, smart cladding technologies can be of greater value than just shielding the built structure. Many R&Ds are taking place in the smart cladding domain to meet sustainable and energy performance goals. Some materials that are innovative and smart include algae bioreactor panels that generate heat and electricity from producing algae in double glass façades, vertically integrated greenhouse modules (VIG) that provide for landscaping vertical surfaces for heat insulation and evaporative cooling, vertical farm cladding systems that provide food using hydroponics, and pollution-eating concrete panels that consist of Titanium dioxide to stick pollutants in the environment to its surface.



Algae bioreactor panels for appartments in Hamburg - Studio Parametric Curiosity India

Ar. Gandhi concludes that sustainable buildings can't be made by smart claddings alone, however, cladding technologies can play an important and crucial role in defining the sustainability quotient of any building.

TESTING OF CLADDING - NORMS AND STANDARDS

According to Ar. Pote, the norms and standards to be followed is the one by the Bureau of Indian Standards (BIS). Generally, the cladding material, which is selected, is based on the test and quality certificate provided by the vendors. If further quality control is required, independent labs have to confirm the materials test the physical samples.

However, both BIS standards and Energy Conservation Building Codes (ECBC) have not been formulated for clads at the moment. However, the use of cladding materials does not affect adversely in maintaining the WWR of the building, says Joseph.

For cladding materials, the U-factor and SHGC are important criteria, those are governed and mandated by ECBC as well. The ECBC norms specify that a building can be up to 60% covered with glass, in which case a superior quality glass is preferred that is good for thermal performance, notes Ar. Pote. ECBC standards are incorporated in the design by making the simulation model in the software's, which help the project to make it energy efficient. All parameters of the façade are checked, and solutions are created to check the maximum efficiency.

BIS standards for cladding materials follow the British norms of material classification for fire safety, to be rated as Class 1 as per BS 476 part 7.

The testing depends on the material chosen for cladding - Bricks, stones, panels, glass, fabrics, metals, all have specific compression, tensile, weathering, tests and standards that need to be followed, says Ar. Gandhi. Expert's conduct testing on a variety of

The Following Tests are Performed on Cladding Materials:

AAMA 501.1-17 – Standard test method for water penetration of windows, curtain walls and doors using dynamic pressure

AAMA 501.5 – Test method for thermal cycling of exterior walls

AAMA 508 – The test is to evaluate the ability of the wall cavity to achieve pressure-equalisation with the exterior

AAMA 509 – Test and classification method for drained and back ventilated rain screen wall cladding systems

An efficient cladding can also help maximise thermal performance, improving the energy efficiency in the building.

(Ar. Jasvinder Lal, Architect, Design2Occupancy Services LLP)

products and cladding materials, both at the pre-construction phase for design validation and on-site. Cladding and façades are tested for air leakage, water penetration, and structural characteristics including racking.

Apart from meeting the mechanical and dimensional stability tests, the products are tested for water absorption and boiling water resistance, says Joseph. Tests are conducted to verify their resistance to colour change on exposure to artificial weathering and resistance to climatic shock which predominantly indicates the performance characteristics of the product upon prolonged exposure. The product should also pass the fire behaviour requirements (Clads supplied by companies including Greenlam conform to EN 438-Part 6 standard and meets the requirements of EDF which is the highest-rated grade in this class).

Chowdhury spoke on different official and Government approved norms and standards stipulated for different kinds of cladding members. For exterior grade high preferred laminates, the most preferred and globally accepted standards are EN-438, Part 6 and ASTM-E84.

CHOOSING FIRE-SAFE CLADDING MATERIAL

When we talk about fire-safe materials, natural materials form the first choices - like clay tile, stone or HPL organic cladding materials. Metals and metal composites should be avoided because during a fire, the metal layer will conduct heat in either direction and may start melting depending on the nature of fire, simultaneously releasing toxic gases when metal composites burn. They may also release droplet which acts as carrier of fire and spread the flames to newer vicinities. Hence, a cladding material that does not ignite easily, emit obnoxious smoke and droplets should be chosen, says Joseph.

Façade engineers designing fire-safe cladding systems need to know the fire properties of the material being used and their key reaction to fire like ignitability, combustibility, flame spread, and reactions of droplets and smoke, says Ar. Pote. Emphasising the importance of fire-resistant materials, so that a façade must not propagate fire, it must also not let the fire or heat travel from one area to another and it should not disintegrate in the presence of fire for a reasonable amount of time, he adds.

Two important parameters that define the performance of fire-safe façade materials are their combustibility and smoke production. If façade material is combustible, it will contribute to the spread of fire to other parts of the building. Façade materials may also produce toxic smoke which causes more deaths, and the toxic content of the smoke will depend upon the materials that they are fire safe or not.

Ar. Lal comments on the international standards: Those which are widely referred for cladding materials are EN 13501, ASTM E84, BS 476 Part 6 & 7 and BS 8414. These standards specify fire and smoke spread characteristics and acceptable norms with testing standards. He points out that the bedrock of all modern fire regulations is confining it to a single floor. A fire spreading from one floor to the next completely undermines all the elements of protection and control that make egress routes and firefighting viable.

Composite cladding and ACPs have, up until recently, been hailed as a cheaper alternative to other cladding products. These are flammable materials, combusting easily as soon as it is hit by fire, and thus allowing flames to race up the sides of buildings. Solid aluminium is a safe alternative.

Is Aluminium a Highly Combustible Material?

Aluminium itself is a non-combustible material with good thermal conductivity. It is only when combined with flammable materials such as a polyethylene core or a wet paint finish that aluminium claddings can pose a fire hazard. Solid aluminium cladding is usually made from extruded, powder-coated aluminium, which dissipates heat, and if it is exposed to fire for a long period it will melt, not burn, preventing the spread of flames. Powder coatings will also only char, again keeping flames from moving rapidly across the surface. Solid aluminium contains no combustible materials or core, and is, therefore, a far safer cladding option for residential buildings. On top of this, solid, powder-coated aluminium has the added advantages of being a flexible, lightweight, and corrosion-resistant cladding type.

Solid aluminium contains no combustible materials or core, and is, therefore, a far safer cladding option for residential buildings. On top of this, solid, powder-coated aluminium has the added advantages of being a flexible, lightweight and corrosion-resistant cladding type.

(Ar. Jasvinder Lal, Architect, Design2Occupancy Services LLP)

According to Chowdhury, consumer awareness on fire-resistant cladding is growing rapidly in India and this is imparting a positive impact on the market. Evolving requirements are influencing the available choices of fire-retardant cladding options which are not combustible. At present, the market has varied variants of fire retardant cladding materials like EN-438 and ASTM-E84 (Flame spread & smoke development index) qualified HPL panels, which also comes with Green-guard certification. This qualifies these products to be used in 'Green Buildings' and in other delicate environments such as schools and healthcare institutions.

NBC part IV specifies the fire code for India, with calorific values and the applications, along with CBRI Roorkee, certification, which can be benchmarked for selection, adds Ar. Gandhi.

FUTURE EXTERIOR CLADDING DESIGNS AND MATERIALS

The global scenario of the building façade industry is undergoing several changes and developments in terms of performance deliverables. Going beyond mere aesthetic appeal, architectural designing elements are now concentrating more on the essential functionalities like energy conservation, fire safety, lessening of chemical emission etc., which have become extremely crucial around the world. Architects are deploying cladding materials to optimise their capabilities. Green composite materials like high-pressure laminates and other less known elements are being adopted for ventilated façade solutions and help projects achieve high levels of building sustainability certifications, says Chowdhury. The future of cladding lies in products with non-superficial and intrinsic features which reduces or eliminates negative impacts and can create positive impacts, on our climate and natural environment.

There is a bright future for cladding design and materials ahead due to cutting edge research and innovation happening today. Traditional dogmas of façade are dealt with innovative solutions to produce new ways of protecting buildings. Moreover, the rapid development of computational

Innovative Cladding Solutions for the Future Façades

The innovative façade designs will be interactive, the environment is responsive as well as cost-effective - like drawing moisture from outside to collect water, capturing solar energy to the building self-sustainable. Façades could filter the polluted air and provide fresh air for the occupants. The façade could warm or cool the building depending on the climatic condition and requirement. We might see façades, which could expand, and contract as per the space requirement. Façades could be reused from an old building to new construction.

Some of the future façades systems are:

Façades generating power or photovoltaic glass unit (PGU): Façade captures solar radiation and turns it into energy.

Thermally dynamic façades or Phase change materials (PCM): These façades can respond to variations in outdoor conditions. TDF use phase change material wherein a layer of salt crystals capture the heat radiated by the sun and release it back to the environment during non-operational hours.

Biomimicry in façades as living buildings: The envelope of the buildings in the future may react to external stimuli, opening and closing throughout the day through a system of cellular openings that allow natural light and ventilation to pass.

Façades enhancing the outdoor environment controlling microclimate impact: Growing vegetation can create a positive microclimate around the structure, which helps in reducing the temperature around it.

Façades enhancing indoor environment leading to fresh air: With growing pollution around the world, using green walls on the façade can filter all the potential toxins in the air acting as an air purifier.

Façades addressing fuel crises by creating building façades by using algae: The technology of BIQ building algae panels are used to generate power by burning the algae on the façade to generate alternative energy sources.

Façades addressing food crises or Hydroponics: The increase in urban sprawl is reducing the farmlands. This technique, where urban farming is done on the façade of the built for, not only makes the building self-sustaining, but also has numerous advantages like controlling pollution and creating a healthier microenvironment.

(Ar.Gaurav Sanghavi, Co-Founder, Pentaspace Design Studio)

power coupled with mechatronics and robotics holds a new future for façades. Artificial Intelligence (AI) is another field that has been explored in the built environment today. Therefore, future façades are likely to be comprised of materials that can facilitate more interactive façade systems that are integrated with the power of sustainability, technological innovation and material science, predicts Ar. Goel.

Considering the global warming scenario, cladding is going to be the most important product for any building. Amidst constantly changing weather conditions, the nature of the material should be a bad conductor of heat, and it should be a ventilated façade system. Therefore, clay tiles along with seasoned wood or wood composite and HPL cladding should be the sought after material in the future, says Joseph.

Ar. Gandhi is sure that static fenestrations or façades will be a passé. And the buildings will be more mobile and dynamic. Moveable, rotatable, louvers, fins, and shading devices that move in sync with the sun/ rain, will become common. Glass windows no more shall be glass but once that generates solar energy. Would also like to see the use of earthen and generic natural materials that have lived the test of time, and ones with a high life cycle, in line with the life of the structure. Materials that self-degrade and just need to be replaced without the need to take care of disposal to landfills, would be interesting, notes Ar. Gandhi. Fabrics could also make an entry into façades!



Bio material façade (Basket Apartments in Paris)



Cylindrical façade

CONCLUSION

The cladding systems market is projected to grow from USD 224.4 billion in 2018 to USD 292.5 billion by 2023, at a CAGR of 5.44% from 2018 to 2023, says a report by MarketsandMarkets™. Demand for the cladding solutions market can be credited to the high growth of the construction industry across the globe. Factors such as increasing residential and non-residential construction and infrastructure activities, its high durability, and ability to enhance the aesthetic appearance of the buildings drives the demand for cladding systems. Based on materials, ceramic cladding systems dominated the market.

We need to develop cladding technologies and materials with future perspectives. By 2050, it is anticipated that there will be an extra two billion city dwellers across the globe and the consensus is that sustainability can only be achieved if both developed and developing countries take the same, or a similar, course of action. The year 2050 will mark a generation of internet-natives adults who will have lived all their lives engaging with smart devices and materials. They will have experienced technological breakthroughs that will redefine how human beings will interact-not only with each other, but with their surrounding environments too.

The innovative façade designs will be interactive, environmentally responsive as well as cost-effective like drawing moisture from outside to collect water, or capturing solar energy in order to make the building self-sustainable. The façade could warm or cool the building depending on the climatic condition and requirement. We might see façades, which could expand, and contract as per the space requirement. Façades could be reused from an old building to a new construction. There is no limit for imaginations and ideations.

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“Kinematic Façades are the Future”

What are the 4 key trends in exterior wall cladding?

Modern and innovative materials such as exterior grade laminates (as per EN438-6), fibre reinforced concrete, metal claddings (zinc, copper, and steel) are creating a healthy disruption in the market apart from available traditional materials.

Exterior grade laminates (such as Max Exterior from the original FunderMax) offer 121 decors, which gives high design freedom for people who create. They are also available in various surfaces like matt, glossy and textured. The installation follows the sustainable and acclaimed rear ventilated principle that can help keep the heat at bay and enhance the occupant comfort of the building. With the current trend towards passive architecture, we see the growth of usage in sun-shading systems.

Systems like FunderMax’s new shading system - Max Lato, which is a louver system - are specifically aimed at improving daylighting, glare mitigation and energy-efficiency, without compromising on occupant comfort.

How would clever use of cladding technologies and materials regulate daylight and ventilation as well as provide privacy?

Most buildings today seek certified products and prefer green-rated buildings with innovative designs. They are willing to explore and experiment to learn about newer cladding systems and this will significantly increase the market demand for efficient cladding materials.

Sun path analysis, wind loading patterns, dynamic sun shading, and thermally efficient materials are some of the factors that are computed to achieve the best functional output from a façade.



ASHWANI KHANNA
AVP Marketing, Fundermax

Technology also plays a very important role in the manufacturing stage. The original FunderMax panels are manufactured using patented NT technology and are in accordance with EN438-6 and CE certified. The panels are installed following the rear ventilated principle using the installation system developed by the company.



Letting in the sun: Project – Navodaya Education Trust, Raichur



Liberating fins: Project - NITTE Meenakshi College of Architecture, Bengaluru

According to you what is the most preferred cladding material dominating this industry at present and why?

The rear-ventilated façade system and the sun-shading system are trending and in demand today. These systems use exterior grade high-pressure laminates that are extremely durable. Apart from offering contemporary aesthetics and design, these systems are sustainable and functional. These systems can also be easily implemented in combination with various other cladding materials. They offer thermal comfort, daylight mitigation and reduce the energy consumption load.

Sustainable buildings take into account the sun path analysis, wind loading patterns, dynamic sun shading, and thermally efficient materials to achieve the best functional output from a green-certified façade.



Optical & mesmerising: Project – KNA Plaza, Kochi

What is the trendiest cladding material which can be called as the material for the future façades?

Exterior grade panels are extremely robust, have a long useful life, require less maintenance and, in economic terms, are an extremely advantageous solution for increasing the value of a building. They are the future.

What do you mean by intelligent & responsive cladding?

An intelligent façade refers to kinetic façades that are adaptive to the surrounding environment. They can be sun-shading systems based on the elastic kinematic principle. The primary objective is to reduce solar heat gain and adequate ventilation.

How to choose fire-safe cladding material?

As NBC stipulated, the flame spread index (FSI) on the surface of the cladding material has to be considered. Exterior grade laminates are flame retardant material that does not propagate fire. Windows and glazing junction areas are vulnerable areas from which fire can spread into the overall building. Covering them with fire seal reduces the scope of fire spread on the façade or into the building.

Every country or region follows different fire classification. The class of the cladding material under standard fire classification norms must be considered while choosing. Max Exterior cladding systems are certified according to ASTM E 84, BS 476 Part 7, NFPA 285, BBA certification, etc.

Please brief on BIS Standards & ECBC norms for safe Cladding Materials?

BIS 875 part 3 (Bureau of Indian Standards) deals with wind load, National Building Code (NBC) deals with fire safety norms for cladding. Energy Conservation Building Code (ECBC) deals with u-value or energy efficiency, which includes the cladding performance of a building.

The NBC specifies that the surface flame spread index of cladding material should be less than 25 as per ASTM E 84, Class I. BIS standards for cladding materials follow the British norms of material classification for fire safety, to be rated as Class 1 as per BS 476 part 7.

Please throw some light on future cladding designs and materials for exterior claddings

Kinematic façades are the future. They are dynamic and adaptive and can be made up of materials such as exterior grade laminates. They can be sun-shading systems based on the elastic kinematic principle.



Sunset: Project – Arogya Bhavan, Bangalore

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AR. PRASHANT DESHMUKH
Principal Architect,
Prashant Deshmukh & Associates, Pune

What are the 4 key trends in exterior wall cladding?
Cladding, besides decorative appeal, is beneficial with its isolating characteristics of the soundproof and thermal insulation. While considering all aspects given above, glass façades, ACP cladding, metal claddings and GFRC cladding panels, etc. are the most trending solutions for cladding which are now improvised and used.

How would clever use of cladding technologies and materials regulate daylight and ventilation as well as provide privacy?
As an architect it's our responsibility to make the building more climate responsive and hence the façade to be intelligent and adaptive. Such façades include rear ventilated, double skin, kinetic, etc. which show better performance index in varied aspects.

According to you what is the most preferred and dominant cladding material in this industry at present and why?
Glass has been the foremost choice across the country, although bemoaned by many architects. But the understanding that glass as a complete façade solution may not be ideal, has paved the way for other trends. On the other hand, the ACP cladding sheet is also the most preferred material along with glass. The availability of this material in its economic manner makes it easily accessible and also weather proof, stain resistant and highly durable. The panels retain their colour, shape and size even after exposure to sunlight and weather changes making it ideal for all seasons.

What is the trendiest cladding material which can be called as the material for the future façades?
Glass Fibre Reinforced Concrete (GFRC) is an ideal material for building envelopes because it is durable, it can resist fire, and the environmental impact is low compared to other materials because the base materials used in the production of GFRC are widely available throughout the world. It is prefabricated, reducing the construction cost and time, non-corrosive, lightweight and complex shapes can be worked out well.

Now, pneumatic façade technology has come into the industry with the interesting concept of flexible adjusting skins operated by soft robotics, one of the best examples of adaptive and responsive cladding.

What do you mean by intelligent & responsive cladding?
An intelligent and responsive building envelope adapts itself



An office for Hager



IRICEN hostel building

to its environment by means of perception, reasoning and action. This adaptability enables an intelligent building envelope to cope with new situations and solve problems that arise in its interaction with the environment. An intelligent façade is not characterised primarily by how much it is driven by technology, but instead by the interaction between the façade, the buildings, services and the environment.

Please brief on some of the smartest cladding technologies & sustainable buildings

More and more building façades offer particular aesthetic geometries, breaking the convention of a flat-glass box structure, and buildings with complex curves and surface treatments are achieving artistic forms. There is also an increased focus on sustainability. This means façades need to be designed to reduce interior energy costs by using sunshades and low-emissivity glass that allows natural lighting in without loss of thermal energy. There is an increased application of passive ventilation like employing double-skinned façades and other techniques, improving user experience without compromising on energy costs.

Library of CEPT building designed by RMA Architects is best example of smart cladding. Complete with an operating manual for students, the building's modulated, louvered façade can be manually adjusted to allow less light or more ventilation in response to Ahmedabad's severely hot and dry climate.

Tell us about the testing of cladding - the norms and standards to be followed?

There are some common testing standards used in carrying out off-site performance test, which affects the structural performance, air-tightness and water-tightness before any mass production and subsequent installation on site which include: air infiltration test, water penetration test, and structural load test. Few of the additional tests include: the dynamic water penetration test, the seismic test, and the thermal cyclic test.

How to choose fire-safe cladding material?

Developments in material technology, changing design tastes, cost factors and specialisation of production have resulted in a situation where external walls are made up of many different components, manufactured and installed by multiple different parties. Modern construction products are highly dependent on organic materials derived from oil.





CEPT Library, Ahmedabad (designed by RMA Architects)

Private and social landlords, building owners and other property stakeholders, have placed a renewed emphasis on fire safety, particularly in respect to high-rise buildings, to ensure residents feel safe and are safe. Over the past years, this has resulted in an increase in concerns about the fire safety ratings of different cladding systems. A modern non-load-bearing façade system has three main sections: the external cladding, thermal insulation and the backing wall. All three parts may promote fire spread, and even combinations that have been demonstrated in tests to be safe might be problematic depending on the kind of materials used and their extent, arrangement and installation. To identify the products in the façade and exterior cladding to be fire proof, the product should have valid certifications of lab tests conducted with respect to fire norms.

Please brief on standards & norms for safe cladding by ECBC and BEE?

Energy Conservation Building Code (ECBC) was developed by the Bureau of Energy Efficiency (BEE) which sets minimum energy performance standards of the various components of the building, while taking into the account the climatic zone in which it is located. The code is applicable to large commercial buildings having a connected load of 100 KW and above or contract demand 120 kVA and above and covers the following building systems:

- Building envelope
- Lighting
- Heating ventilation and air-conditioners
- Service water heating
- Electric power and distributions

The code provides for energy-efficient design for commercial building such that it reduces the use of energy without affecting the building function, comfort, health or productivity of the occupants and with appropriate regard for economic considerations. The code eliminates building design practices that lead to unnecessarily high building energy use and associated costs.



An office building for S-Forms

While the code has been developed at the central level, the state governments have the flexibility to modify ECBC to suit local or regional needs and notify them in its enforcement.

A minimum energy performance standard for building envelopes is an integral part of ECBC. Coefficient of performance for Solar Heat Gain Coefficient (SHGC), U-values, Visible Light Transmittance (VLT) and air-leakage for windows and skylights have been prescribed in the code for the various climatic zones of the country. It is important to note that the ECBC is a designed standard and does not prescribe any technology or product.

Please throw some light on future cladding designs and materials for exterior claddings

Future façade can be defined as fully responsive parametric façade that are non-static, but kinetic addressing varied issues including sustainability, power generation, vertical farming and are informative and transformational.



Kurduwadi Railway station



"Our Sustainable, Future-ready Solutions are Setting Trends in New-age Constructions"

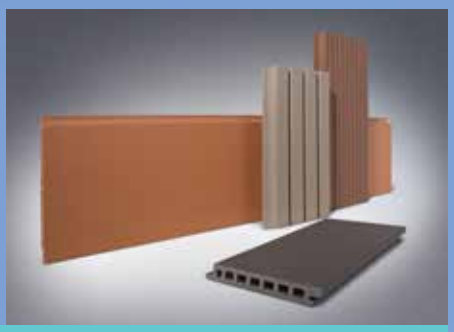


MONNANDA APPAIAH
Managing Director,
Wienerberger India

Monnanda Appaiah has over two decades of experience in the manufacturing space. He started his career with the Canadian multinational, Alcan in Montreal and worked in various functions ranging from product development, production planning, business development, and sales & marketing across the country. In the year 2000, Appaiah joined the Aditya Birla Group based in Mumbai and was responsible for the Alumina chemicals export business of Hindalco. In this role he was in charge of the business operations to 35 countries. Appaiah assumed the role of Managing Director, of Wienerberger, India in July 2010. He is a BE from NIT, Surthakal and completed Executive Management Program from Montreal, Canada.

In an interview with the editor of Window and Façade Magazine, Monnanda Appaiah spoke about his company Wienerberger, their business in the Indian market, their sustainable and future-ready solutions for new-age constructions, manufacturing facility, a few significant projects in which their products are used, and on the future of façade and cladding industry in India. Here are the excerpts from the interview:





Wienerberger is the world's largest producer of bricks (Porotherm, Terca) and the market leader in clay roof tiles (Koramic, Tondach)

Please tell us about your company Wienerberger, and yourself? How long the company has been in this business in the Indian market?

The Wienerberger Group, headquartered in Vienna, Austria, is a leading international provider of smart solutions for the entire building envelope and infrastructure. Wienerberger is the world's largest producer of bricks (Porotherm, Terca) and the market leader in clay roof tiles (Koramic, Tondach) in Europe.

Wienerberger started its operations in India in the year 2009 by setting the first-ever state-of-the-art manufacturing plant in Asia at Kunigal, 70 Kms from Bangalore. It's been a fantastic journey as I have had the opportunity to lead the India operations since 2010.

Our organisation in India has grown organically over the years while marking several milestones and setting benchmarks in product development, process innovation and market expansion. Our sustainable, future-ready solutions are setting trends in new-age constructions while improving people's quality of life.

Porotherm clay perforated blocks are manufactured in Kunigal and these offer significant technical advantages over conventional walling materials apart from being environmentally friendly and cost-effective. Since its inception, the company has provided walling materials to build more than 45,000+ apartments across South India and 20,000+ independent houses in addition to building many other prominent and prestigious hospitality, commercial complexes and educational institutions.

The company is also strongly associated with several CSR activities like providing primary healthcare facilities and affordable housing in the vicinity of the factory.

Tell us briefly about your journey with the company over the years, also about your major success stories in India?

To understand a bit about our journey so far in India, here are some of the milestones to consider. This would also give you an idea of how we have consistently developed and introduced new product lines in India, keeping in line with the market requirements.



Bagmane IT park, Bengaluru

2009 - the launch of Porotherm HP for non-load bearing construction
2010 - the launch of Koramic clay roof tiles; Launch of Argeton clay façade tiles
2011 - the launch of Porotherm VP for load bearing construction
2012 - the launch of Porotherm thermo bricks, best in class for thermal insulation
2014 - the launch of Porotherm HPG+ Dryfix System, a super glue that eliminates mortar and speeds up construction significantly
2015 - the launch of Aspect clay façade tiles
2016 - the launch of Tondach roof tiles
2018 - the launch of Koramic roof component system to provide complete roofing for Indian climatic conditions
2019 - completed 10 years of operation in India

Over the years, Wienerberger products have received accreditation by the Indian Green Building Council, IGBC, and by GRIHA (Green Rating for Integrated Habitat Assessment).



Orchid Hotel, Pune

In fact, as an affirmation to our commitment to sustainability, we recently switched over to natural gas from solid fuel, thus reducing the carbon emission by >40%.

What are the product categories offered by Wienerberger?

Wienerberger's India product portfolio currently includes clay building materials solutions for walls, roofs, and façades. Wall solutions include products like Porotherm HP, VP Load Bearing, Thermobrick, HP Grinded + Dryfix System; roof solutions include Koramic and Tondach; and façade solutions include Aspect and Argeton.

The company is also constantly looking at new growth opportunities in the Indian market including the launch of new sustainable and future-ready solutions for construction.

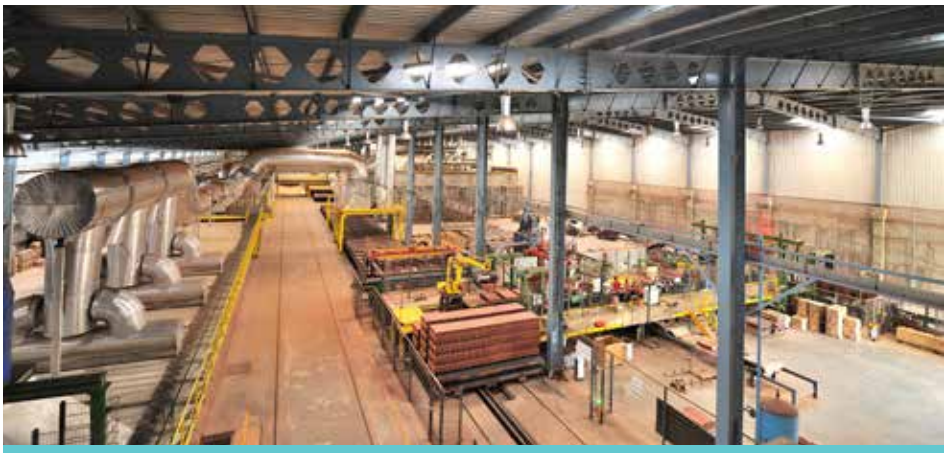


ESIC Coimbatore, Tamil Nadu

Please tell us about your company's facilities and structure?

In terms of facility and structure, our biggest investment is our manufacturing facility, spread across 32 acres, the manufacturing process began in 2009. The fully automated factory performs specialised production methodology with a view of achieving quality and operational excellence and efficient use of locally available raw materials, including clay silted from dead water tanks in the vicinity.

The factory has the distinction of running 365 days a year, 24/7 with a production capacity unmatched by any other brick industry in southeast Asia. This one-of-a-kind production unit also houses



Interiors of the factory



Payload operator M410IB



Brick stamping









Wienerberger headquarters in Bengaluru houses a dedicated showroom for our product range



Stock yard



Robots in action



Wienerberger factory - Admin block

a state-of-the-art laboratory and testing facility.

Apart from that, we have our Headquarters in Bengaluru, which also houses a dedicated showroom for our product range. Here, customers are free to walk-in to see our product range and from walling material to roofing and façades. Our in-house sales representatives and technical experts are also available for consultations. We also have sales teams spread across the various major markets that we operate in – Kerala, Tamil Nadu, Telangana and Andhra Pradesh. This is complemented by a network of dealers across major and non-metro southern cities.

Our application and product development teams are also constantly working on new product development and innovative solutions to address our customer needs and provide timely support on-site.

What has been your or your organisation's contribution to bringing about the current revolution in the cladding sector?

Good architecture implies an unending creative quest for new applications. The use of clay for façade cladding is perfectly attuned to this philosophy. Clay façade tiles have already been in use for protecting dormer windows, gable ends and blind facades. However, they also offer major technical and architectural advantages as facade cladding. Wienerberger offers an exquisite range of clay façade tiles under two brands Aspect and Argeton.

We were one of the earliest players in the building materials industry to launch clay ventilated façade tiles for cladding. Both the façade brands provide the visual impact of a timeless modern façade with the distinctive character of natural clay.

Wienerberger's clay façade solutions have created a union between natural aesthetics and state-of-the-art technology. High strength and tested safety make Argeton and Aspect façades suitable for homes, offices and public buildings while providing the architect an opportunity to experiment with colour, styles and finishes to lend a touch of singular beauty to any building.

Please tell us about a few of your iconic and innovative products?

Ingenuity and sophistication are the hallmarks of our façade offering. Its appeal when combined with steel, glass and wood lie in its subtlety, symmetry, natural elegance and timeless perfection.

Wienerberger's clay façade panels are weatherproof, high impact resistance and require absolutely no maintenance. Our 3D print tiles are one of the innovative products available in the market today to achieve any design or pattern created by architects. Our glazing finish made with a double firing process can offer any colour as per the design intent. Aspect's louver range has innumerable shapes and sizes which creates a unique character to the building.

Our customised tiles are available in every imaginable colour, shape and surface, these factors have significantly contributed to the major shift in the cladding segment towards the clay façade tiles.

Finally, a patented robust dry installation system for our range of façade tiles are capable of withstanding high wind loads.

Please tell us about a few significant projects in which your products are used?

We have completed more than 150 projects pan India across public



Bescom, Bengaluru Natural red clay tiles applied on façade





Dial 100 – Lucknow

and private sectors. The notable among them being Delhi Metro stations, ESI Hospital – Chennai & Coimbatore, Dial 100 - Lucknow, Mangalore Airport, and many other IT buildings around the country.

As per your view, how important is the role of the right material in cladding?

Façade and curtain wall systems are of paramount importance while considering issues of green building and sustainable design. It becomes imperative for a building construction specialist to understand the importance of improving the performance and sustainability of the building envelope.

Many proponents of green design certainly believe that it is high time to move away from the conventional façade formats mostly visible in high-rise buildings for the past half-century. Some of the world's most prominent "green" skyscrapers are looking at greener options to envelope their buildings.

Well-executed façade cladding, with clay façade tiles, is an excellent heat insulator. Thanks to its mass, ceramic has a high heat buffering capacity. The effect is as if the house were sheathed in a continuous second skin. This minimises heat loss in winter and prevents overheating during summer.

Clay is an ideal building material due to its ultimate properties of longevity, non-colour fading, low maintenance and design flexibility. Another significant feature is the water-tightness of the building envelope and also natural ventilation.

Wienerberger's clay façade tiles are highly engineered with high flexural strength and are vitreous in nature with very low water absorption. In addition, clay helps moderate internal temperature ensuring comfortable working conditions throughout the year. The voids on the clay tiles further enhance the insulating properties of the product. Even in terms of aesthetics, our range of natural façade tiles ensures nil fungus or algae formation.

There is an assumption that clay façade panel system can't be used in high-rise buildings. What is your say on it?

This is a prevalent myth. There are many references of high rises (>60 m) buildings which have been successfully cladded with clay tiles in their façade and our robust installation system has been tested for high wind loads (3.5 kPa).







Delhi metro station

How well aware do you think the decision-makers are in general about the availability, use and installation of the products for cladding? How to gauge their functionality & effectiveness based on the type and geographical location of the buildings?

The preference in India is still higher for the conventional materials and we are working on educating the market about the wide range of benefits in using clay façade tiles. With regards to availability at any point of time, we maintain enough stock of the standard tiles in our Bangalore warehouse. We have trained and certified multiple installers across India on the installation process.

In terms of geography, since clay ventilated façade tiles are an all-weather product, we haven't faced any major challenge about convincing our clients on the need or even the effectiveness of our range of tiles.

However, as per the complexity of the project, we also recommend trained installers to customers. Once a project is awarded to us, we ensure through our partners and regularly conduct quality checks to ensure that the installation is as per global standards.

What is the emphasis laid on R&D, especially for the Indian market?

Our core strength is R & D, understanding the architectural trend and preferences we have been ahead in launching new products like 3D print tiles, glazed finishes and countless shapes created as per architectural intent.

Even in our other product range, primarily in walling materials, we are constantly innovating on new, effective products under the Porotherm range, helping address various applications and challenges in the construction industry.

What do you see as the main challenges faced by the cladding industry?

Current major challenges due to the COVID pandemic remain as projects are delayed and launches have been considerably reduced. Also, the Indian market is a very price-sensitive market, we are emphasising on the life cycle cost of the product. Our product is virtually maintenance free and the life cycle cost of the product turns out to be way economical as compared to other conventional façade materials.

Tell us about your channel expansion strategies in the market.

We have a pan-India presence, and currently, we are developing a new retail supply chain with dealers and installers to address the retail requirements for mid-size commercial buildings and renovation markets

What keeps your company ahead of its competitors in terms of services offered?

As you are aware, Wienerberger India is present in India from 2009 with a large manufacturing facility for Walling material and the façade products are supplied directly to the projects by Wienerberger. We offer 10 years of warranty and our consultation services support starts right from the inception of the project façade design itself where we offer tile size recommendations to optimise the wastages at the time of installation.

In addition, we also provide on-site technical support during installation. We work very closely with architects to develop customised designs and finishes.

Wienerberger India also provides architects the opportunity to design 3D models of the projects with Aspect Clay ventilated façade solutions.

Wienerberger India uses Revit® software for 3D Modelling and project representation.

Aspect façade tiles come in .RVT files which can be shared with the architects and installers who can use the files to create 3D models of individual projects in Revit®.



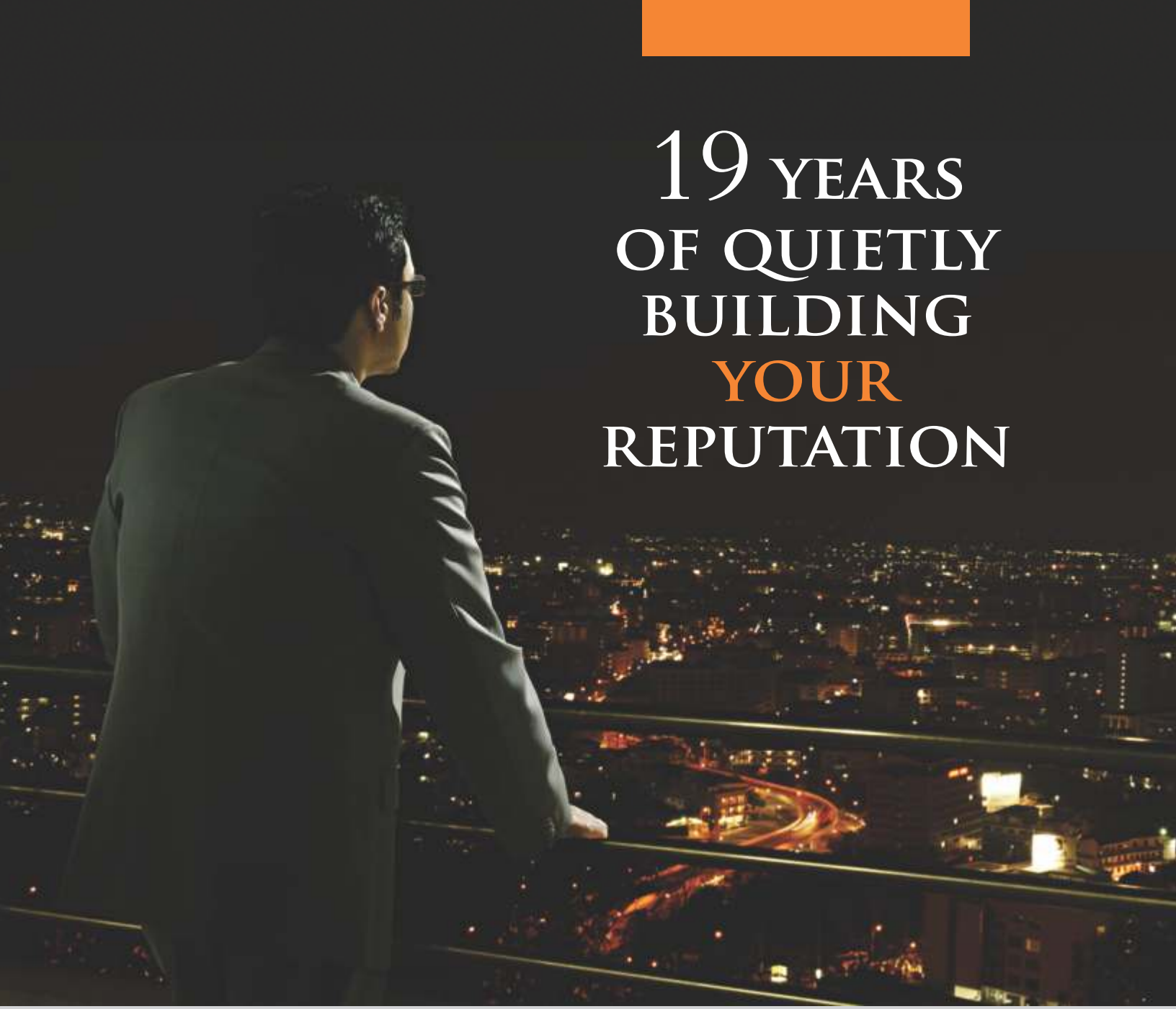
IOCL, Lucknow

How do you see the cladding and façade industry evolving in India and where do you see the façade industry evolving over the next 5 years?

The emerging building trends in India, provides for a great opportunity to create aspirational buildings. It is very evident, that there is a phenomenal improvement in terms of aesthetics and design intent - be it residential homes or commercial buildings.

A notable change is visible in the architecture of buildings across cities. Not just in Tier I and Tier II cities but even in Tier III cities. People are paying closer attention to the look and feel of the buildings and spending staggering amounts to make them conducive and heat insulated for the occupants as well.

As the market matures, customers will prefer products that are sustainable and compliment the climatic conditions. The comfort of the occupants will be paramount, and designers will be compelled to think about and specify products that reduce glare, heat and acoustic disturbances.



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Contemporary Abode

Jalandhar, Punjab

Uncluttered yet bold, the fluidic contemporary abode by Space Race architects stands out as an exquisite residence in Jalandhar, Punjab. Spread on 6000 Sq ft of land, this abode is a perfect example of the saying 'Simplicity is the Ultimate Sophistication' as propagated by Leonardo Da Vinci. For a family of four, this house is an elegant masterpiece.

The architect wanted the client to fly high in the sky, leaving the past behind, and so he bio mimicked bird as the concept. The rustic façade of the abode, inspired by brutalism, depicts this concept with its bold, edgy balconies shaped like wings. It is strategically designed with minimum material application of textured concrete, which depicts the architect's sense of responsibility towards functionality and the least superficiality. The glass and concrete create a sensation with its simple and pure form, keeping the truth of architecture alive. The entrance boundary is ushered by the green buffer. Classic yellow cove lighting adds on to the elegance of the whites. The unconventional elevation brings in a uniqueness that makes it one of a kind in the neighborhood.

As one enters the house, nature takes over, creating flow and continuity. The appealing water fountain, which connects the service staircase, acts as a sustainable element paving way for passive cooling. Apart from aesthetics and sustainability, the



The fluidic contemporary abode by Space Race architects





The entrance of the house, and the appealing water fountain, which connects the service staircase, acts as a sustainable element paving way for passive cooling

placement of the waterbody in the east is inspired by Hindu mythology. As the sun rises from the east, the rays fall on the water before entering the lobby, which is equivalent to offering water to the Sun God and is proven scientifically good for health. The usage of mirrors on the sidewalls of the passage uplifts the overall experience of the space. Architect's sense of space efficiency and Vastu Shastra has turned the insides truly functional and convenient.

The fluidity breaks once we enter the abode. On the ground floor, the informal sitting area opens up, with the dinning creating a space for small gatherings. The beige furniture, along with the wooden paneling gives a simple yet elegant feel, whereas the dining area exudes a sense of sophistication with a classic black marble table. The architect's choice of pastels, browns, and greys creates a sensibility in the overall interior. The wood false ceiling with antique lightings compels to look up in awe. The prayer room adjacent to the staircase is enclosed with glass to cancel outdoor noise. It is graciously lit up by the soft light from the north during the daytime, and the presence of the greens outside, surrounding it creates a peaceful environment for meditation. The insulated glass used avoids the condensation of water droplets during winter, which is also used in the walk-in closet on the first floor. The contemporary seating, metal artwork, and other embellishments are a perfect combo of aesthetics, comfort, and feast to one's eyes.

Climbing up the staircase, the first level accommodates a lobby that connects the bar which invites warmly with wooden flooring, gold design counter, and arched wall design. The elegant metal rods as bottle racks and lights hanging at various lengths make the place cordial and modern. The arch-shaped niche on the wall with beige stone-clad sets the open bar as a combo of antiquity and grace. Opening up the glass door is a balcony that has a higher wall providing privacy to the inmates





The insulated glass used avoids the condensation of water droplets during winter





This contemporary residence is a suitable exemplar of the juxtaposition of minimalism, brutalism, antiquity, luxury, and novelty

and also avoids overheating and glare. The full-height door, and windows, lets in abundant light, avoiding the artificial lights in the morning, and keeping the inhabitants healthy. The architect personally believes that windows should act as a bridge to communicate with outdoor spaces.

The architect believes that sustainability is a pre-requisite in today's time. This is evident by the least material application in the façade, which has prevented the increase of carbon content in the environment. The waterbody, in the east passage, creates a microclimate for the living and dining displaying an intelligent passive cooling technique. Fenestration plays a crucial role in the functioning of the insides. Brilliant placement of floor to ceiling windows in the bedrooms in the eastern and northern side ensures the soft light throughout the day while also cutting on heat. The southern side bears recessed windows with cantilever projections of minimum 8 to 9 feet, which capably doesn't let the direct light enter and heat up the indoors.

In this abode, aesthetics, functionality, and sustainability are directly fueled by the judicious use of locally available materials. Veneer has been used for the wooden finishes at few places as the client deals with the manufacture of the same. The use of wood has been limited to finishes only due to termites. For fixing door frames, natural stone is used instead of regular wood which depicts the architect's inclination towards conserving resources. Also, natural stone is durable and possesses high strength. Top brands that are available locally have contributed to the quality of interior and exterior fittings be it furniture, sanitary, flooring, lighting, air-conditioning, automation, or security.

This contemporary residence is a suitable exemplar of the juxtaposition of minimalism, brutalism, antiquity, luxury, and novelty. The design follows both functionality and aesthetics at its core, creating a rational and balanced architectural paragon.

QUICK FACTS:

Project: Contemporary Abode

Location: Jalandhar, Punjab, India

Architect: Udayveer Singh, Space Race Architects

Other Consultants: Schueco, Grohe, Schneider, Osram, Sirca, D décor

Materials used for façade & fenestration: Toughened glass, white marble, tiles, laminates

Commencement Date & Completion Date: 2016 - 2018



UDAYVEER SINGH
Founder & Principal Architect
Space Race Architects

ABOUT THE ARCHITECT:

Indian designer and architect Udayveer Singh started his career with MNC Arcop Associates Pvt Ltd based at Noida, where he gained a handy skillset with a competent team. To pursue a long-term dream, he moved to start his own firm 'Space Race Architects' in his native city Jalandhar. The firm offers a full range of architecture and interior design solutions in most of the building typologies, including residential, commercial, hospitality, cultural, educational, and health institutions. Udayveer strives to infuse each building with a level of aesthetic detail that is uncommon today.

Research-Oriented Development with a Sustainable Vision

Dholera Smart Housing, Dholera, Gujarat

Dholera smart housing is a research-oriented development with a sustainable vision. It is envisaged as a modular form of living spaces conceived by apartments with terraces providing intangible experiences within homes. A dynamic form has been leveraged into a system of potentialities creating inside-outside spaces that merge.

As the 'New Normal' of 'working from home' is changing how we live, the architecture plays a significant role in cohesive integration of humans with nature and social interactions, while maintaining privacy.

Dholera Smart Housing initiated with an aim to create experiential living. The design intends to create an exceptional experience of diverse spaces for users by providing resilient spaces in the mixed-use development. Architecture increasingly resembles an organism that is responsive to its own internal nature and external conditions of its surrounding.

SITE

The site is defined in the new master plan of Dholera, Gujarat with its north facing the dense forest and a river. The south and west sides are aligned with high access corridors connecting, the city to the rest of the Gujarat. An optimum density of 120 dwelling units (540 people) per hectare is achieved.



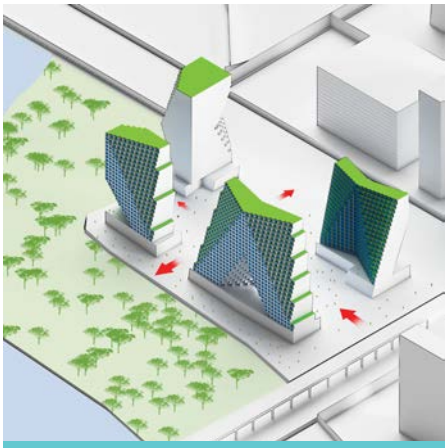
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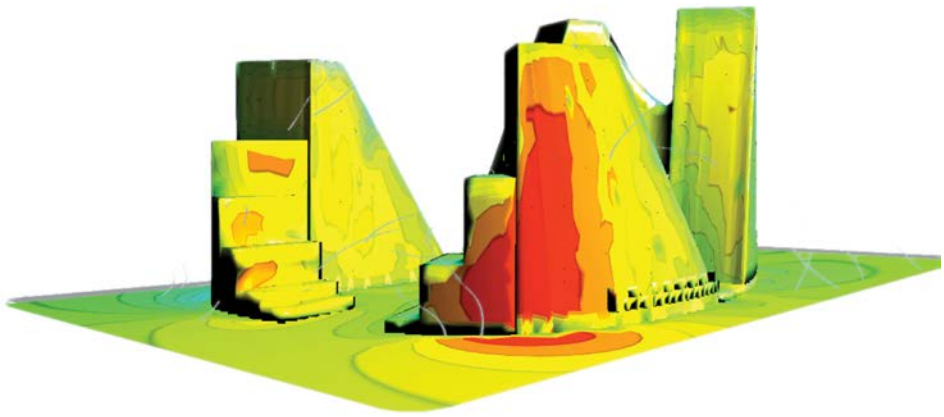
Dholera Smart Housing



The design intends to create an exceptional experience of diverse spaces for users by providing resilient spaces in the mixed-use development



Concept study



Wind analysis

CONCEPT

Initial explorations comprised of extrusions and fleeting of built-mass through simulations such as solar radiations, wind analysis and passive techniques to maximise natural light. The above analysis corresponds to determine initial massing of block arrangement. Taking advantage of the site orientation and the analysis, larger blocks face towards north and smaller blocks face towards south, helps in reducing direct surface radiation. Shadows of highest blocks help in reducing direct exposure on most part of the courtyard. Cross-ventilation plays an important role considering Gujarat's warm and dry climate.

Further, the design language to cater the needs of millennial generation, 'work from home' will trend and define a new canvas of social living during pandemic age. There will be a need for creating spaces that breathes. Open-to-sky spaces in design will positively impact user's psychology and help in providing a lively environment within the space. Blocks are chamfered strategically to maintain optimum shading and privacy. Inside-outside spaces react in a cohesive fashion and a seamless movement is experienced by the user.

Terraces ranging from 1.2m to 2m wide provide a unique proportion to apartment sizes. Fresh air from the forest flows into homes and creates positive energy. First three levels comprise of commercial space (supermarket, multiplex) aligned with inhabitants. Three-level basement parking is provided to ensure parking standards as per Dholera Smart Mission Development regulations.

FAÇADE DEVELOPMENT

The holistic approach was conceived right from the beginning in planning the project. Concept for open air terraces, with no cosmetic treatments for the façade was the dialogue that gave the initial thrust for the positive change in the design of residential buildings across the country.

Initial massing and decisions were made on the basis of digital analysis on complete building blocks to add sustainable vision in the urban fabric of the new smart development of Dholera.

Fusion of exterior and interior spaces with natural ventilation was a significant stroke in providing an appropriate decision across the plot with hot and dry climate of Gujarat.

Terraces and the openings are designed in such a way that during the hot summers, the façade provides a natural barrier for solar radiation, results in achieving more comfortable spaces inside the habitable unit.

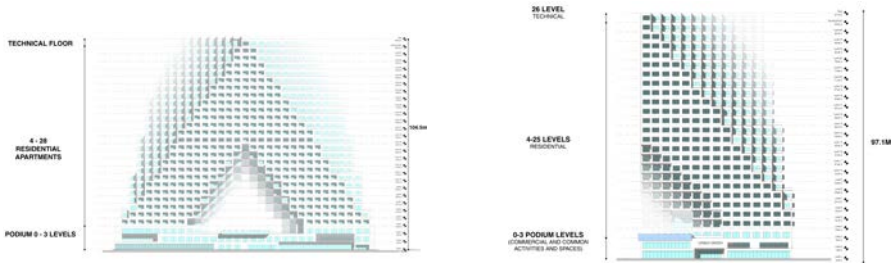
With a buffer space ranging from 1.2 to 2m, open air terraces also gives user the mesmerising view of the dense green forest with a river passing by. An evening on the terrace with fading shadows, sunsets filled with clouds, brings soothing sensation to the user, followed with stars gazing after the dinner.



The open air terraces also give user the mesmerising view of the dense green forest with a river passing by

FAÇADE MATERIALS

The material application on the façade is of UHPC panels i.e. (ultra-high-performance concrete panels), which gives the design more rigid and bold character, with modern material approach. UHPC panels have been used widely for



Sectional drawings of Tower A & B

the façade developments, as it has proven its capabilities for solar radiations and rainfall, with maintenance free character.

Use of UPVC doors and windows with UHPC panels brings an appealing aesthetic contrast in the design and provides smooth and clear finishes. Glass railing with chrome metal finish, gives the modern and minimalist finish to the overall façade.

FLATS TO HOMES

In India, the concept of living in a joint family is appreciated. Typical family structure ranges from 60 years to infant. This predominantly requires spaces that fulfills a variety of functions. Open planning gives user a canvas to lay customised furniture with flexibility. Thereby, giving a feel of "OWNING" the space. Open-to-sky terraces give a feeling of possessing a larger property with much needed privacy.

Landscaped spaces covered with shadows of built-up at different hours, provides a comfortable micro-climate for activities with amenities like tennis ground, basketball court, open gym, walking and cycle tracks. Pool and common areas like indoor game areas, gym are provided at podium (fourth floor). Designed considering forest/ river view, they improve quality of social interaction.

The design gradually transforms into a sensitive organism that has potential of being mutative to its own existence and environment as landscape slowly thrives within the complex. The architectural organism thus conceived is ready to embrace the 'ambient spheres' of life that speak about its resilience.

QUICK FACTS:

Project: Dholera Smart Mixed-Use Residential Development

Location: Dholera, Gujarat, India

Architect: Sehgal & partners (SAP designs)

Materials used for façade & fenestration: Concrete UHPC panels & UPVC fensestrations

Site area: 57,000 sqm approximately

Permissible built up area: 218,000 sqm



Towe B- render



AR. RAHUL SEHGAL
Director,
Sehgal and Partners

ABOUT THE ARCHITECT:

Ar. Rahul Sehgal completely believes and takes responsibility for sustainable architecture. He also focuses on coining a term "Informed Architecture", which promotes analysis based design concepts. With a focus on advanced technologies with digital fabrication aid in the AEC industry, gives him a different perspective within architecture and product design solutions.

Ar. Sehgal has proven experience in luxury residential, hospitality and retail design projects in Dubai, Italy, UK and Georgia. He is experienced and trained BIM manager too. A Masters' degree from Politecnico Di Milano, Italy gave him an exposure to a completely different culture and social interactions followed with an understanding of international design space philosophies with detailing capacities. His skills in designing and managing projects, while keeping the resources available have been tremendously rewarding for the client based projects.



Tata Projects to Build ₹889cr Parliament Building

Tata Projects has emerged as the lowest bidder for the construction of the new Parliament building in New Delhi involving an estimated investment of ₹889 crore. Out of the seven companies, which placed their technical bids, only two matched all the requirements. Tata Projects submitted a bid for ₹861.90 crores and Larsen & Toubro quoted a bid of ₹865 crores. The government is likely to award the contract to Tata Projects soon and is keen that construction starts after the monsoon session of Parliament, which ends on October 1. It would be a ground plus two-storey triangular-shaped building.

The new Parliament building is as part of the government's Central Vista redevelopment plans and it is likely to be awarded the contract in the next few days. The tender for the mega project is being awarded a year after the Union Ministry for Housing and Urban Affairs (MoHUA) announced a plan to build the new parliament building housing a new common central secretariat for all ministries and revamp the Central Vista running from Rashtrapati Bhawan to India Gate. The deadline for redevelopment and construction of the new parliament building is 2022. A new triangular-shaped parliament building will be constructed while the existing parliament building will be revamped and the exterior structure of the historic building will be kept intact.

According to a presentation by HCP Design Planning and Management Private Limited, which has been tasked with redeveloping Delhi's Central Vista, the current design incorporates the state emblem instead of the spire.

The new Parliament building with a built-up area of approximately 60,000 metre square, is set to come up on plot number 118 of the Parliament House Estate, which currently houses a reception, boundary walls and other temporary structures.

The central foyer has been renamed the Constitution Hall



as it is expected to display the Constitution for public viewing. A library will also come up near the central foyer.

The triangular complex is designed to include 120 offices with six separate entrances for member of the public, MPs and VIPs, including the Speaker and the vice president.

The new Parliament will house enlarged chambers for the Rajya Sabha and the Lok Sabha; the latter has been designed to accommodate 1,350 MPs in case of joint sessions. The public gallery will seat more than 336 persons. The current Parliament building is over 90 years old.

HCP, which won the bid last year, will also construct a separate building to house MP offices where the Transport Bhawan and the Shram Shakti Bhawan currently stand.

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J Kumar Infra bags MMRDA & DMRC Orders

JKumar Infraprojects on Thursday has received the Letter of Acceptance from the MMRDA for orders worth Rs49cr and from the DMRC for orders worth Rs41cr.

The company said in the filing that the order from MMRDA involves construction of an external facade works for four elevated stations for line 7 of the Mumbai Metro Rail Project. The order from DMRC too involves construction of external facade works of four elevated stations on Line 2A of the Mumbai Metro Rail Project.

The order from MMRDA include external facade works for four elevated stations viz. Aarey, Dindoshi, Kurar and Poisar of line 7 (Andheri East to Dahisar East) of Mumbai Metro Rail Project of MMRDA worth Rs49,83,15,758. The order from DMRC include external façade works of four elevated stations i.e. Goregaon, Adarsh Nagar, Shastri Nagar & D.N. Nagar of Line 2A on Dahisar (East) to DN Nagar Corridor of Mumbai Metro Rail Project, Mumbai worth Rs41,17,47,405.



Window Magic Introduces Insect Screen

WindowMagic–manufacturers of uPVC Windows and Doors - has introduced an innovative way to protect the abode and ourselves from the mosquito-borne disease by installing insect screen; an easy way to add protection to the home and the family.

One recent estimate showed 1069 cases of mosquito-borne diseases have been reported in Delhi per year, like Dengue, Malaria, Chickengunia and various others disease and no specific vaccines can keep us away from these diseases. At home, using mosquito repellent, sprays, igniting coil can be more harmful to the body and are least effective. Excessive inhalation of them or direct contact with skin can cause major health diseases. Whereas Insect screen allows enjoying fresh and natural ventilation and stops the insects, bees and flies entering the house.

Manish Bansal, Director & CEO – Window Magic said, as each house is different in itself, so the design of the insect screen is designed keeping in mind the need for the house, which protects the house from infection.

By installing Insect screen, it not only protects the house from coming flies, insects and various types of bee's but also protects the person from various diseases and flews' which comes along with them and disinfects the home. Various types of mesh are available in the market: pull-down mesh, pleated mesh, zig-zag mesh and sliding mesh and these all insect screens have the perfect finish and can be fitted or ready to install in all kinds of windows, plus all screens have an advantage of being fire resistant and dust resistant.







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A New Parametric Design Temple in Tamilnadu to Reinterpret India's Vernacular



Architecture and research firm rat[LAB] Studio and Shilpa Architects have designed a new temple in Koppur that reinterprets India's vernacular through parametric design. Called the Shirdi Sai Baba Temple, the project is located on the outskirts of Chennai on an 11-acre site at the epicenter of a 338-acre masterplan.

The design features an 11 sided polygon (hendecagon), articulated as a three-dimensional polyhedron.

Balancing sacred geometry with engineering logic, the new temple was created through an algorithmic process using spatial and structural constraints as its parameters. Embracing the "Land of Temples", Tamil Nadu, the project addresses the client brief asking to use the number 11, owing to their beliefs in numerology and Vastu - a traditional ancient Indian science. The hendecagon evolved into three-dimensional spaces while evaluating environmental aspects such as daylight, solar heat gain, and shadows.

Inside, the flooring pattern in the main hall is a mathematical looping system using 11 vertices of the hendecagon that fold to form interstitial spaces within the geometry. A recursive division of curves creates a focal point at the ground level where the pattern curves and guides the visitors for prayers and offerings. A pure white space from inside is lit by sunlight diffusing from the oculus on top. Overhead, the team explains that the double fold origami structure created a rigid structure with fluid columns that blend into the interior space while allowing a long-span shell-like structure.

Jamia Architecture Professor to Design Ayodhya's New Mosque

Professor SM Akhtar, Dean of the Faculty of Architecture at Jamia Millia Islamia (JMI) has been chosen to design the new mosque to be built on a five-acre plot in Dhannipur village in Ayodhya. The new mosque will be a contemporary architectural marvel and it will symbolize the human values, Indianess, and essence of Islam.

Akhtar will be leading a team of designers and architects, which will conceptualise and design the mosque and other facilities at the site. The Indo-Islamic Cultural Foundation (IICF) set up by the Uttar Pradesh Sunni Central Waqf Board (UPSCQB) which is overseeing the construction of the mosque has approved Akhtar's appointment for the job.

"The design of the mosque will be based on Indo-Islamic culture concept and will fairly highlight the synergy of the Indian cultures. The new mosque will be of the same size as the Babri Masjid.



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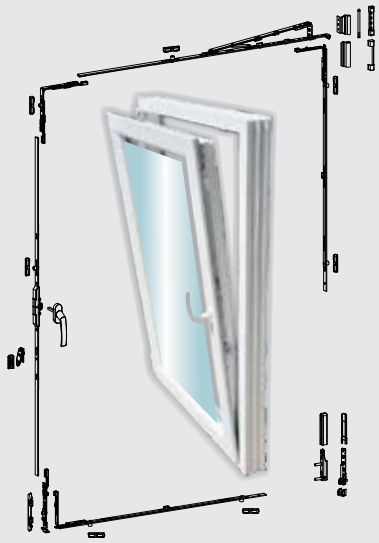
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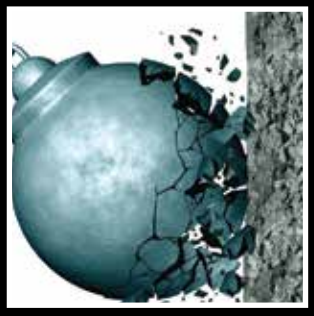
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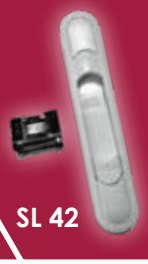

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