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GUEST ARTICLE

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GLASS FAÇADE – A BOON FOR THE FENESTRATION INDUSTRY

Experts' views on glass as a façade
material for buildings in the
Middle East

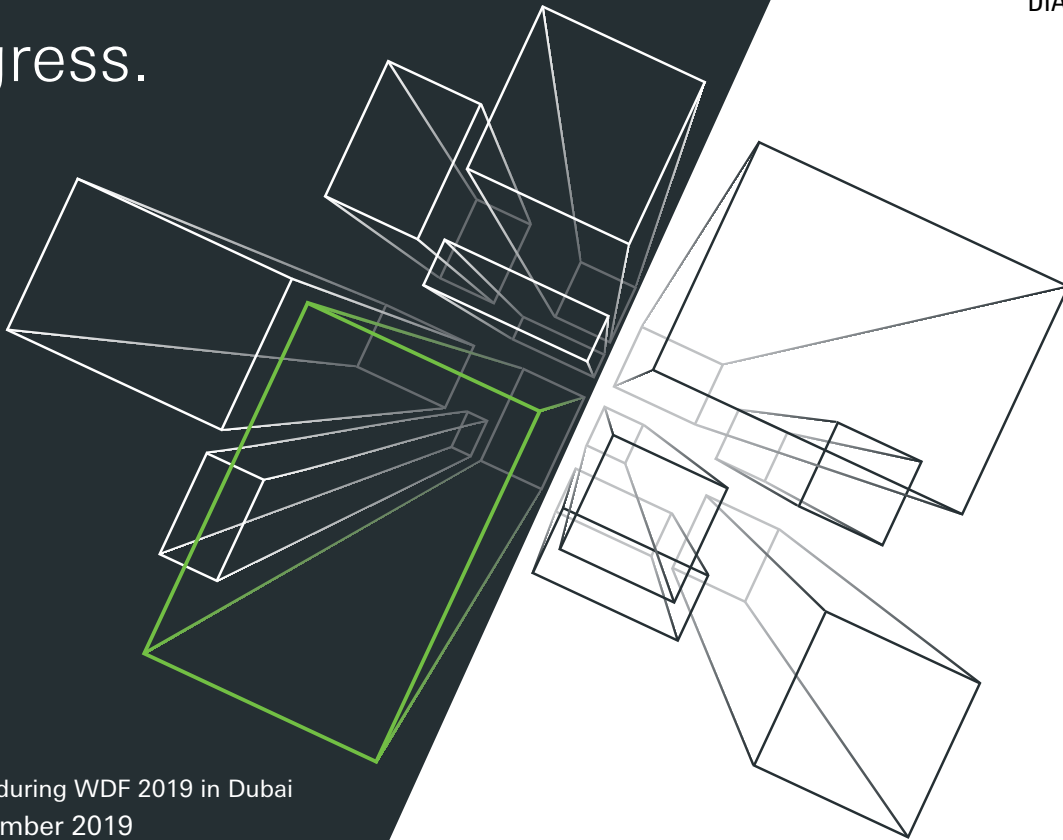
INDUSTRY SPEAKS

Bruno Mauvernay
Chief Operating Officer,
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PREFACE

BIPV Glass Façades Gaining Momentum

BIPV or Building Integrated PhotoVoltaic glass is a glazing solution which improves energy efficiency, at the same time adding to the aesthetic appearance of the building. They are used to replace conventional building materials in parts of the building envelope such as the roof, skylights, or façades.

Net zero-energy buildings have been in demand from a very long time in the Middle East. With the ever-increasing demand of energy efficient buildings, BIPV has also been enjoying a lot of limelight. BIPV has always been a proven technology to accomplish the energy-saving goal. BIPV glass reduces the amount of energy consumed by a building by producing energy from solar rays. BIPV glass façades are considered to be a better solution over the conventional building material as they are cost-effective, energy saving and also improve the building performance. The challenge for designers is to combine technological and aesthetic consideration to produce integrated applications in buildings.

In today's scenario, glass can be seen as the most popular trend in modern buildings all around the world. The future of BIPV glass façade looks bright as the demand for energy efficient and sustainable buildings will rise further in the near future.

In this edition, the façade & fenestration industry experts in the Middle East have shared their opinion on how the glass as a façade material is benefiting the buildings in the region. They also discussed technological trends and further opportunities in the BIPV glass segment. Hope this edition will inform readers of the newest updates to some of the recent technologies and materials in the façade market. We invite our readers' views and comments on the published articles in this edition.

Team WFM

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PRODUCT WATCH



Front Cover Credit: Scott Norsworthy

Back Cover Credit: Michener Museum's Glass Pavillion, Architects: Kieran Timberlake

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FAÇADE

“A Brief History of the Envelope & Evolution of Future Façades”



Stuart Clarke
Associate Director,
Middle East Façade Engineering Leader, Arup

About the Author:

Stuart Clarke is the Façade Engineering Leader for Arup in the Middle East. He has been with Arup for 23 years and has been based in Dubai since 2006, Clarke is a Fellow of the Society of Façade Engineering - a chartered structural/façade engineer, specialising in the design of façade systems and bespoke glass installations for all types of projects. The projects he has led include new build and refurbishment in the Middle East, the UK, Ireland, Mainland Europe, USA and South-East Asia. Clarke has particular specialist interest in complex geometry and in glass and has been involved in many projects from initial concept design, procurement and on-site completion all over the world.

WHERE WE HAVE BEEN

As our industry continues to evolve, harnessing and embracing new technologies and materials, our buildings morph and adapt, and our role as façade designers also changes. In the beginning it was simple; a wall that supported the roof or floor with a hole to let in the air and light. There might be a door or a shutter to keep the rain out but very simple.

Glass is a naturally occurring substance. It is disputed whether the Egyptians or the Mesopotamians developed techniques for making glass, but it was not until the Romans started to develop new ways of making glass that glass started to be used to create windows. After the fall of the Roman Empire, Venetian artisans kept skills for glass making alive during the dark ages - in parallel with those in India and China. Techniques and chemistry of glass continued to evolve through the Middle Ages by the 1100s and 1200 and this led to the craze for stained glass windows. This trend of stained glass windows influenced the master builders of cathedrals to develop buttresses and flying buttresses and other techniques for creating large areas of glazing.

The technology for the manufacturing of glass continued to evolve over the centuries. Over this time the crown glass technique became more prolific. As the industrial revolution matured into

the Victorian age methods for producing window, glass continued to develop with glass sheets cut from large blown cylinders becoming the new mass production technique. This technique supplied the hectares of glass used in the construction of the revolutionary Crystal Palace at the original Expo, the Great Exhibition of the Works of Industry of All Nations in 1851.

Mass production techniques in the 1800s used timber for window frames with some use of wrought iron frames for industrial and transport buildings. In the US, larger buildings were being developed where structural steel frames carried the building's weight in place of masonry walls. These allowed larger areas of glazing to be created. Brick and stone were still being used to form the spandrels or solid sections of wall but no longer load bearing. This form of construction continued through the US skyscraper boom of the 1930s. With the advent of modernist architecture and the elimination of decoration and the focus on functionality, architects began to explore how glazing and façade designs could create transparency, again splitting the façade from carrying vertical building loads.

This fashion led to large areas of glazing being created with minimal framing. Initially a European style, the modernist aesthetic transferred at scale

V_A Dundee, Scotland



to New York and Chicago. After the Second World War, architectural styles pulled together several new materials to develop curtain walls. In the 1950s Pilkington in the UK developed the float glass line which is still by far the most commonly used production process to this day.

Aluminium had become increasingly common in the first half of the 20th century. It was not until various alloys were developed that it became the strong and ductile material that has become common in construction. A key advantage was that aluminium could be extruded into fine and precise shapes and then tempered to give it a higher strength, making it ideal for forming window sections. As a result, this rapidly supplanted bronze that had previously been used for high end glazing. Given the challenge of high rise construction, American manufacturers developed stick curtain wall systems. These used the third new component – widely available gaskets and seals to form complete curtain wall systems. The next step in the evolution of curtain walling was the move from stick systems assembled on site to preassembled units completed in the factory. The advantages quickly became self-evident with the

speed of construction using a high-quality product, made on site.

The Drive for transparency continued using new glass processing techniques on float glass. In the 1960's, glass fins were developed and in the 1980's, as an element in UK led high-tech architectural movement, point support glazing evolved, famously developed by renowned Irish Engineer, Arup's Peter Rice.

And of course, we now have living façades, with green walls and vertical greenery – very dramatic and ecologically beneficial to our cities when used appropriately.

THE FAÇADE ENGINEER

Alongside the post-war developments in façade systems, engineering consultancies as part of their broader service might have included advice on cladding systems and some early façade engineering – example includes glazing to the Sydney Opera House. As façade systems continued to evolve in complexity, and the role of it forming a robust future, the sealed envelope became for a while separated and less integrated with the rest



© Iwan Baan

Bombay Sapphire Distillery, London



AI Bahr Towers, Abu Dhabi



King's Cross Triplet, London

of the building fabric, it became the realm solely of specialist sub-contractors. In the late eighties, engineering consultancies began to offer façade consultancy services independently, to design and advise on cladding and curtain wall systems.

We are now in 21st century and in the world of multifaceted building envelope design. Projecting the identity for the development whilst creating comfort for those inside means that the walls and windows must work very hard and in a relatively small space. The façade zone is only a few centimetres thick, but in that space the façade should be to able to stand up, withstand the wind and any earthquakes, accommodate the building behind moving, keep water and pollution out, insulate from the heat or cold, let the warming sun and cooling breezes through, or keep the warm air and heat energy out, give views out and let the right amount of daylight in, cut noise from outside yet let people connect to birdsong and the sound of the street

if desired, stop conversations and fire spreading through the building and protect us from intrusion and blasts. A tall order for walls and windows that should provide us with delight inside and out.

Due to the myriad of performance requirements and aesthetic ambitions, a broad palette of materials and systems are being used to form our façades including stone, ceramics, brick, concrete, GRC, insulation and timber which all play their part together with the gaskets, seals, adhesives, fixings and brackets to form walls and windows.

To work successfully in the field of façade design, we need to be masters of how the façade performs and its materials are used. And we also need to know how to bring these components together. Mindful of fabrication, erection, installation, financing and contractors' and suppliers' roles. Façade design is an intriguing and inspiring discipline where all of the skills and hard work are on display for the world to see and are tested daily by the environment.



Crystal Palace, London



La Villette, Paris

And indeed, façades are always evolving. It is a rich area for innovation. New materials are continuously being offered to designer's keen to find a new aesthetic or the next wonder material.

As a result, progress is quick and new norms are continuously being established, yet somehow the underlying systems and strategies are more constant.

The façade design needs to start early as it clearly plays a key role in the design of any building. Although having its greatest impact on the perimeter zone of a building, a well-designed façade can have a greater impact on overall ambience, and help to create a comfortable space. This of course helps with improving energy consumption and makes a big step towards achieving green targets where energy is the biggest façade design driver now.

Façades often have a large ecological impact. Embodied carbon, and impact of extraction and fabrication processes are all issues. Exploring the type of materials to be used in a façade and developing a strategy is best done at the very earliest stages of a project. Perhaps timber framed curtain walls could be adopted as an alternative.

Only at the very start of a project, before any marks have been put down, you can ask the questions to decide what the façade should be:

- Is the building shape and orientation right for views, daylight and sun-path?
- Should the form of the façade or the building be self-shading?
- What is the right portion of windows to solid wall?
- How to make the most of daylight?
- What should the façade be made of to reduce ecological impact?
- How could the façade be reused or recycled at the end of its life?

These are all very fundamental questions that might drive the performance, appearance and fabric of the façade in very different directions. Even if a particular aesthetic is maintained, an early assessment of these aspects may still have a significant impact.

EVOLUTION OF FUTURE OF FAÇADE DESIGN

We have gone through some exciting years of harnessing the potential of software to imagine, design and define some spectacular building and façade forms. The façade industry is finally harnessing recent digital developments, however, for us at Arup having something quick and easy to use, that can display and record information is our aim. To this end, we have used gaming software to develop tools that allow users to navigate around

Sydney Opera House



a digital twin of their façade. All sorts of design information, construction records or progress photos can be loaded onto that digital twin.

The key with this digital twin is that it needs to be easy to use for those that do not code or draw in the digital space and rather than an alternative to a BIM model, this practical way to access and interact with the information that these models contain. Our aim is that the digital twin with all the information and records will eventually be passed on to the building owner and those who will operate and maintain the building.

We also see that the design phase will use tools that both simplify and enrich the process. By combining different skills, analysis programmes and IT platforms, we are developing interactive apps that allow designers to explore design options on the fly whilst avoiding lengthy iterative loops.

When it comes to glass, we have nearly reached the point where glass selectivity can no longer be improved, the only way to reduce energy coming in will be to reduce the amount of daylight. To avoid this and get better performance from glazing in our façades, they are becoming responsive such as the huge umbrellas that we designed for the Al Bahr towers in Abu Dhabi. Shading the building from outside only when needed.

OUR ROLE IN THE FUTURE

So how will the façade designer's role and focus change through the 21st century? The focus on environmental impact will become an ever increasing driver. The ecological impact of the materials we choose will soon be influencing and driving our designs. Apart from counting and measuring embodied carbon and water, assessing pollution and other impacts we will also plan for the future use of materials once these have served their purpose. It is inevitable that the role of the façade designer will continue to evolve and morph as more and more considerations will need to be addressed and balanced.

The key skill, though will be the ability to create an enjoyable journey from concept to handover to the operation and repurposing of the façade for all participants. This will be enabled through embracing and harnessing new tools and applying our intellect underpinned by our collective experience in the industry.

Yet for all this focus on performance and ecological impact, we all aspire for our buildings to have an identity, to take their place in the cityscape and to bring delight to their surroundings and to the people who pass by or walk inside to work, live and play. The façade designer will orchestrate the materials, systems and geometry to realise this vision.

Lloyds of London



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ENERGY EFFICIENT FAÇADE

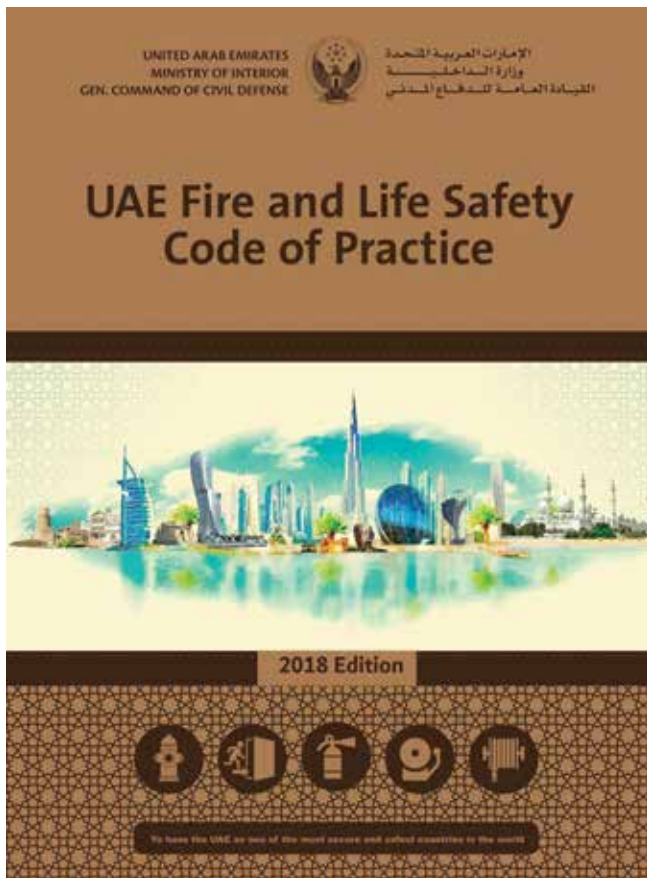
Design Considerations for Sustainable and Energy Efficient Façade



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General Manager,
Knauf Insulation,
Middle East and South Asia

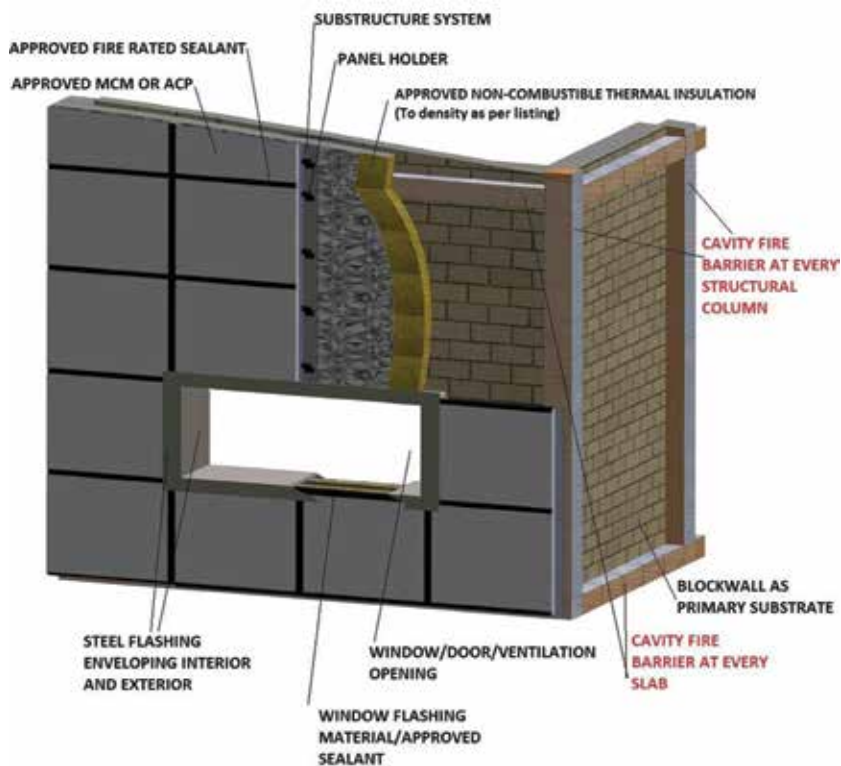
About the Author:

Ashhad Iqbal holds a master's degree in Economics and is a fellow member of the Association of Chartered Certified Accountants in UK. He started his career in 2003 with Ernst & Young, working in Assurance & Advisory in Pakistan and the UAE, covering a range of industries. In 2007 he joined Sino Gulf, a DFSA regulated asset management company with Category-3 licence. Iqbal grew to the role of the Chief Financial Officer and in 2014 joined Knauf Insulation - a UAE based German JV. He helmed the organisation as Head of Finance which in 2018 transcended into a General Manager role, overseeing general management, business development, market diversifications, legal affairs and CRM. Iqbal was appointed to spearhead company operations in Pakistan. His market exposure includes GCC, India and Pakistan.



UAE Fire Code Engineering September 2018

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Energy consumption in the Middle East countries has been rising over last four decades. The residential building sector alone accounts for more than 50% of all delivered energy consumption, and half of this is attributed to use of air conditioning for cooling. Better building design triggered by better façade performance could drive down this energy use considerably.

In recent years, ventilated façade systems have found widespread use in various climatic zones due to their high energy performance, rich variety of available design solutions, reduced effect of solar radiation on indoor micro climate, good noise reduction properties, and possibility of rapid building repair and reconstruction.

The ventilated cladding however, is just the façade. From an insulation perspective we are interested in making sure that beneath that façade, there is something working hard to ensure the building you are designing stays durable, useful and beautiful. Selecting products can often become habitual, particularly if those products are never going to be 'seen'. But, if you want your insulation to quietly do its job for decades to come, it is important to consider all of the elements that will impact on the performance of the system. Specifying the right cladding system then, should not

just be about what will look the best, it should be about making sure the hardest-working part of the cladding system - the insulation - is performing to its optimal level, delivering thermal performance, acoustic comfort and peace of mind when it comes to reaction to fire.

HOW VENTILATED FAÇADE SYSTEM WORK

Ventilated façade systems are usually designed using one or two methods, the choice of which will determine how you specify the insulation solution:

Drained and vented: Drained and vented ventilated façade systems are not weathertight, with an open cavity to the top and the bottom. The top air cavity is protected with an overhang to minimise moisture entering and a moisture barrier is used to protect the building structure.

Vented and pressure-equalised: Vented and pressure-equalised ventilated façade systems are most commonly used on tall commercial buildings. They are designed to prevent moisture from entering into the air gap between the façade and the internal structure. This works by sealing the top section of the façade and creating separate ventilation cavities. When wind tries to drive moisture into the ventilation gap, the air in the cavity resists - equalising the pressure. The ventilation gaps also allow moisture to drain from the cladding system.

In addition to the air gap which acts as a water barrier, other important elements of a typical ventilated façade include:

- An inner leaf usually comprising a 200 mm block wall
- A vapour control layer
- Non-combustible insulation
- Insulation close - butted and fixed independently against the building substrate using proprietary insulation fasteners
- Aluminum support brackets fixed back to the steel studs with a thermal break pad incorporated between the brackets and the sheathing board
- Support rails fixed to the brackets to support the final cladding layer
- The façade

THERMAL PERFORMANCE

Working hard beneath the surface

Thermally, aluminium bracketry used in ventilated systems is over 4,500 times more efficient at conducting heat than the insulation it penetrates.

It is therefore no surprise that the heat flow paths through ventilated façade systems are complex and cannot be accurately quantified by the normal calculation methods used to establish the U-value of a construction element, namely BS EN ISO6946 (building components and building elements - thermal resistance and thermal transmittance - calculation method).

Not only does this make the thermal performance of the insulation you incorporate into your ventilated system more important, it also makes the way it is calculated that much more complicated.

BS EN ISO6946 states “when an insulation layer, or part of an insulation layer, is penetrated by a metal component, other techniques (for calculating the U-value) should be used”.

The following methods are available for the façade designer:

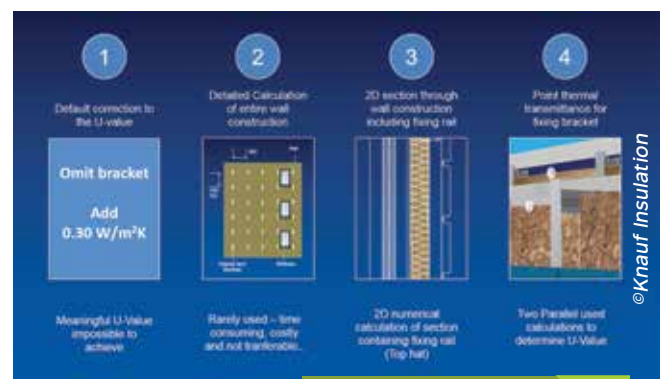
- Detailed calculation for the whole wall: The first of your options is to numerically model the full ventilated façade elevation or elevations. This method is rarely, if ever, favoured due to i) cost, ii) time, iii) lack of transferability.
- Linear thermal transmittance for a fixing rail that penetrates an insulation layer: This involves a 2D numerical calculation on a section through the wall containing the fixing rail. This methodology is specific to ventilated systems, such as those that employ a ‘Top Hat’ section
- Point thermal transmittance for a discrete fixing bracket that penetrates an insulation layer: In this option parallel calculations are carried out:
 - o 3-D numerical calculation of a section through the wall containing a representative fixing bracket
 - o Calculation without the fixing brackets.

This enables the point thermal transmittance of the bracket to be calculated (and easily replicated in calculations using the same bracket and insulation combination)

- Complete a default correction to the U-value: Without numerical modelling, the U-value is calculated without brackets and increased by $0.30 \text{ W/m}^2\text{K}$ to compensate. Any meaningful U-value is therefore impossible to achieve.



Type of Ventilated systems



U Value approach



Cladding Systems

As an example, a system involving fully filled 150mm light steel frame studs, 100mm of mineral wool insulation, and brackets at 1200 x 600mm centres, correctly calculated would give a U-value of 0.19 W/m²K. Using the default calculation the value would be increased to 0.49 W/m²K.

EXPOSURE TO THE ELEMENTS DURING INSTALLATION

It is relatively common for the insulation to be left open to the elements before the cladding is applied. This leaves insulation vulnerable to rain and weather damage regardless of the material used.

According to Metal Cladding and Roofing Manufacturers Association (MCRMA):

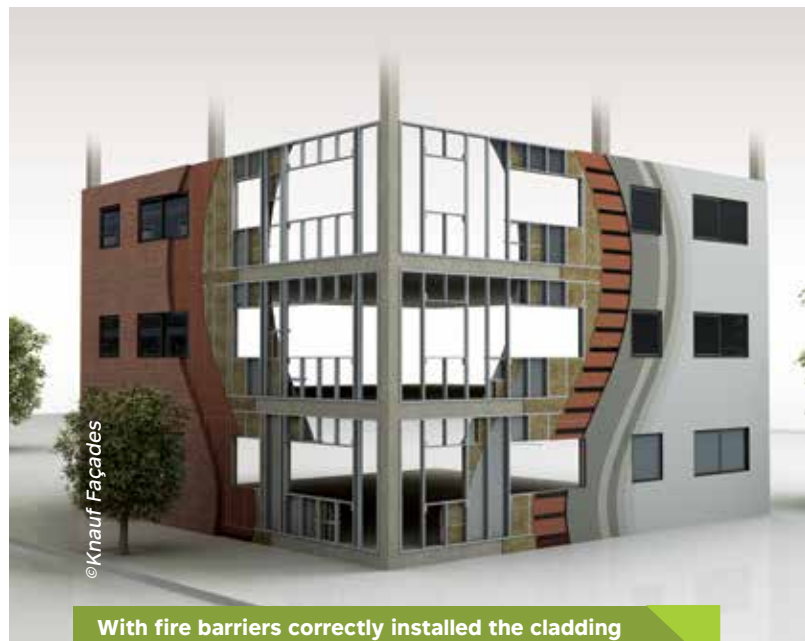
- 'Insulation products should not be installed while wet or into constructions which have become wet'.
- 'Where the product is being stored for any length of time, the product must be protected from the elements'.
- 'It is good building practice to ensure insulation products should be installed in a dry state'.

FIRE

Fire performance standards are detailed in UAE Fire Life and Safety Code 2018, Chapter 1, Part 4 Façade and Exterior Wall Covering Systems, and this contains specific guidance on the fire performance testing of ventilated cladding systems.

Why Fire Spread is Significant?

If the fire spreads through the cavity unchecked, it can spread rapidly through the building, reaching other floors via window openings and repeat the process.



With fire barriers correctly installed the cladding system does not contribute to flame spread

Fire Spread through Cavities

In some circumstances, fire can spread through cavities within external cladding systems. These cavities can be part of the system design, such as ventilated cladding, or be formed by the delamination or differential movement caused by the fire itself.

The fire performance of the façade itself is an area of contention currently. Some industry players suggesting that ADB 12.7 should apply i.e. at or above 18m the façade should be Euroclass A2 or better. Others citing Diagram 40 and observing Euroclass B. The CWCT (Centre for Window and Cladding Technology) is due to publish a multi-party statement on this topic shortly. For absolute confidence the façade should be Euroclass A2, limited combustibility (or better).

In the event of a fire, whilst the original flame length may be fairly short, it can extend a long way into a



cavity. Non-combustible insulants (e.g. rock mineral wool) provide a further degree of safety if, for instance, cavity barriers have not been installed, or if they have been incorrectly installed and fail to work in the intended manner.

Regardless of insulant type, cavity barriers are critical to the fire performance of any ventilated façade and are addressed in UAE Fire Life and Safety code “Fire Stopping” chapter.

Cavity barriers should be made from non-combustible material and should:

- Be at least 100mm high
- Penetrate the full depth of the insulation
- Form a continuous barrier through the insulation layer
- Provide at least 120 minutes fire resistance and Insulation

A number of cavity barriers are available in the market, which employ the use of intumescent strips or coatings in order to seal cavities. Typically fire barriers are manufactured from rock mineral wool, the same material that can be used to insulate the building.

As a ventilated system relies on the provision of a ventilated airspace in order to function properly, the cavity barrier cannot fill the full width of the cavity. Proprietary cavity barriers exist that, typically, comprise of a foil faced intumescent strip attached to a strip of rock mineral wool. In the event of a fire the intumescent strip expands to fill the ventilated airspace and restrict the movement of hot gases and smoke as far as is practicable.

Restricted Fire Spread

With fire barriers correctly installed, the cladding system does not contribute to flame spread and the risk of secondary fires is significantly limited.

High Rise and Super High-Rise Buildings

The UAE Fire Life and Safety Code specifies, ‘the minimum requirements for the classification, combustibility, surface burning and flame spread ratings, design, installation, inspection, and maintenance of exterior façade wall cladding, balcony coverings and components such as, metal composite panels, aluminum composite panels, polycarbonate panels, EIFS, ETICS, glazing, insulation, sealants, etc.’

The code goes on to say “The external envelope of a building should not provide a medium for fire spread if it is likely to be a risk to health and safety. The use of combustible materials in the cladding system and extensive cavities may present such a risk.”

Special consideration is given to super high rise and public buildings. To satisfy the requirements of the building regulations, designers have to comply to with below:

- “In a building with a storey 18 metres or more above ground level, any insulation product, filler material (not including gaskets, sealants and similar) etc. used in the external wall construction should be noncombustible.”
- Meet the performance criteria given in an “Assembly Test”. This criterion uses full scale test data from BS 8414-1:2002 (masonry substrate) and BS 8414-2:2005 (lightweight systems) or NFPA 285:2019 (lightweight system). Upon selecting this route, it’s critical that you are designing and constructing the exact build-up that has been tested, being mindful that variances in any element, such as insulation thickness, sheathing board and façade will compromise system compliance with potentially significant ramifications in performance, time and cost.

Typical External Wall Insulation



Typical Wall Cladding System



- UAE Fire Life and Safety code offers a third option stating, 'Engineering Judgments (EJ), if any, shall be permitted where Civil Defence has no objections. Such engineering judgment submissions to Civil Defence shall be prepared and stamped jointly by main consultant, house of expertise, cladding component, façade system manufacturers and façade installers'.

The report should be supported by test data which the test-house already has in its possession and so this option may not be of benefit if the products have not already been tested in multiple situations / arrangements. The report should also specifically reference the tests which they have carried out on the product.

With this and the previous method of compliance, any damage to the system in use or later modification of the building may have an impact on the relevance of the fire test results and the criteria that were considered when undertaking a desk study.

ACOUSTICS

Thermal performance is usually the first consideration when an insulation solution is being considered. However, its reaction to fire, especially within ventilated systems is assuming equal importance. Also increasing in significance is the acoustic performance, and its ability to reduce noise from passing through the system. Designing a quiet internal working environment is a particularly important element of building design for schools to enhance learning, offices to maximise productivity, and hospitals to aid patient rest and recovery.

When considering the acoustic performance of the ventilated system, and choosing an appropriate insulant, it is important for the designer to consider sound absorption as well as sound insulation.

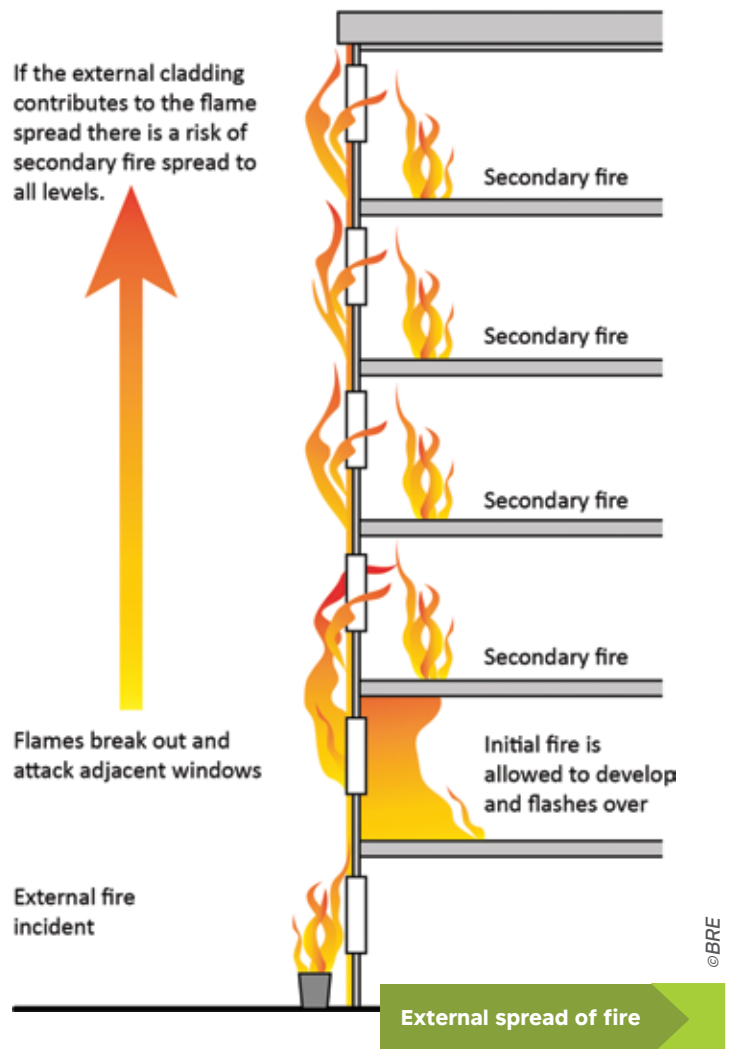
Sound Insulation

Sound insulation is important where internal working environments require external noise sources to be reduced, or where the use of a building generates a significant amount of noise which needs to be prevented from breaking out to the external environment.

Most of the sound reduction provided by a ventilated façade system is achieved by reflecting the sound back towards its source - whether that be to prevent external noise from entering the internal environment, or by reflecting the noise generated inside a building, and preventing it from breaking out of the building to the surrounding area.

RAPID FIRE SPREAD

Cladding system contributes to flame spread resulting in risk of multiple simultaneous secondary fires.



Sound Absorption

Sound absorption occurs where sound energy is absorbed by 'acoustically soft' materials which take in sound energy and transform it into heat, as opposed to being reflected by 'acoustically hard' materials.

Sound absorption is particularly important where the internal environment may generate noise which should be prevented from reverberating within the building. Mineral wool insulation provides a high level of absorption and is often used to absorb the sound energy within the construction.

Ventilated façade systems can be easily designed to accommodate acoustic absorption, by simply including a mineral wool insulation slab within the build-up, typically with the light steel frame, enhancing not only the acoustic performance but thermal performance in a cost-efficient way.

FAÇADE

Practical Approach for Complex Geometry Façades



Michelle Bacellar
Technical Director,
Meinhardt

About the Author:

Michelle Bacellar graduated as an architect with PUC-PR University - Brazil. In the first years of her career, she gained experience as an architect working in Brazil and Australia. In 2004, she completed a Master's Degree in Structural and Construction Engineering with Griffith University -Australia. She furthered her engineering experience working as a structural engineer in Australia, UK and the Middle East. In 2008, she joined the growing field of façade engineering. Working as a façade consultant, she combined her experience in the architectural and structural fields. In 2011, she moved to façade contracting where she gained hands on experience on façade design and construction before going back to façade consulting in 2019.

Due to the progression of computer aided design and development of 3D softwares, it is now relatively easy for designers to develop fluid shapes and surfaces. These can be applied to developments in the design of the external façade surface. In general principals a surface that does not follow any sequence is considered as a complex geometry.

In the past, complex geometries were not very commonly used, in fact, they were generally avoided due to the difficulty in the design and detailing as there was no direct mathematical solution to derive these geometries.

Nowadays, complex geometries are very common in architectural design and their digital creation is well supported by a wide range of computer software's. However, fabrication and execution of façades with complex geometries is still a very specialised task.

For this reason, architectural designs incorporating

complex envelope surfaces, have challenged the façade industry to be very innovative and creative when designing and detailing façade solutions that can fulfil the architectural intent and achieve these complex shaped façades successfully as well as economically.

To provide some insight into how we can approach such geometries, we will discuss some of the design approaches to achieve a free form geometry building skin using the most optimum method, being of the utilisation of flat façade panels.

The first step in the façade design process, is to establish the façade panels modulation and the cladding material to be used. Generally, a good starting point for the façade modulation exercise, is proposing modules that are in line with cladding material available sizes in the market. The modulation phase usually undergoes a forward and backward process, in order to find a balance between market availability of materials and architectural

**Park Towers, Dubai, UAE -
Unitised curtain wall system
using triangular panels**



**Shanghai XJH Lot 1 - Canopy,
Shanghai, China - Triangulated
skylight cassette system**



aesthetics and design intent. It usually takes a few interactions before the final modulation is established. During this stage we will work very closely with the architect to achieve the most desired aesthetic solution based on the material and geometry constraints.

Once the proposed modulation is defined, a surface geometry study is carried out to stipulate the shape of the panels: flat, curved or double curved (developable or non-developable surfaces).

A developable surface is a surface that can be flattened onto a plane. A non-developable surface needs stretching or tearing in order to be flattened onto a plane. As such, a non-developable surface cannot be formed by a flat panel without distorting the surface.

The simplest way of dealing with free form surfaces is by using triangular panels. By definition, a plane is defined by 3 points, so the vertices of a triangle will always be within one plane. This means that if the surface is modulated with a triangular grid, all the panels will be flat.

Another option to achieve a free form surface with rectangular flat panels is by creating steps on the frame which will result on a fish scale like surface. The steeper the curvature of the surface the larger will be the steps between panels.

Fish Scale pressure equalised unitised curtain wall systems can be achieved by having stack joints with adjustable middle leg and different mullions profiles, including adaptor frames to accommodate the different steps on the frame.

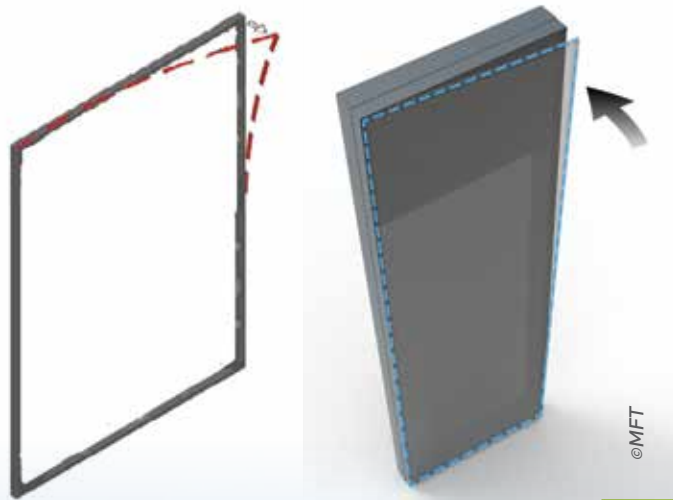
**Park Place Tower, Dubai, UAE -
Fish scaled unitised curtain wall**



**Sama Tower, Dubai, UAE - Unitised curtain
wall system incorporating a shift at every
floor level to take the tower twisted shape**

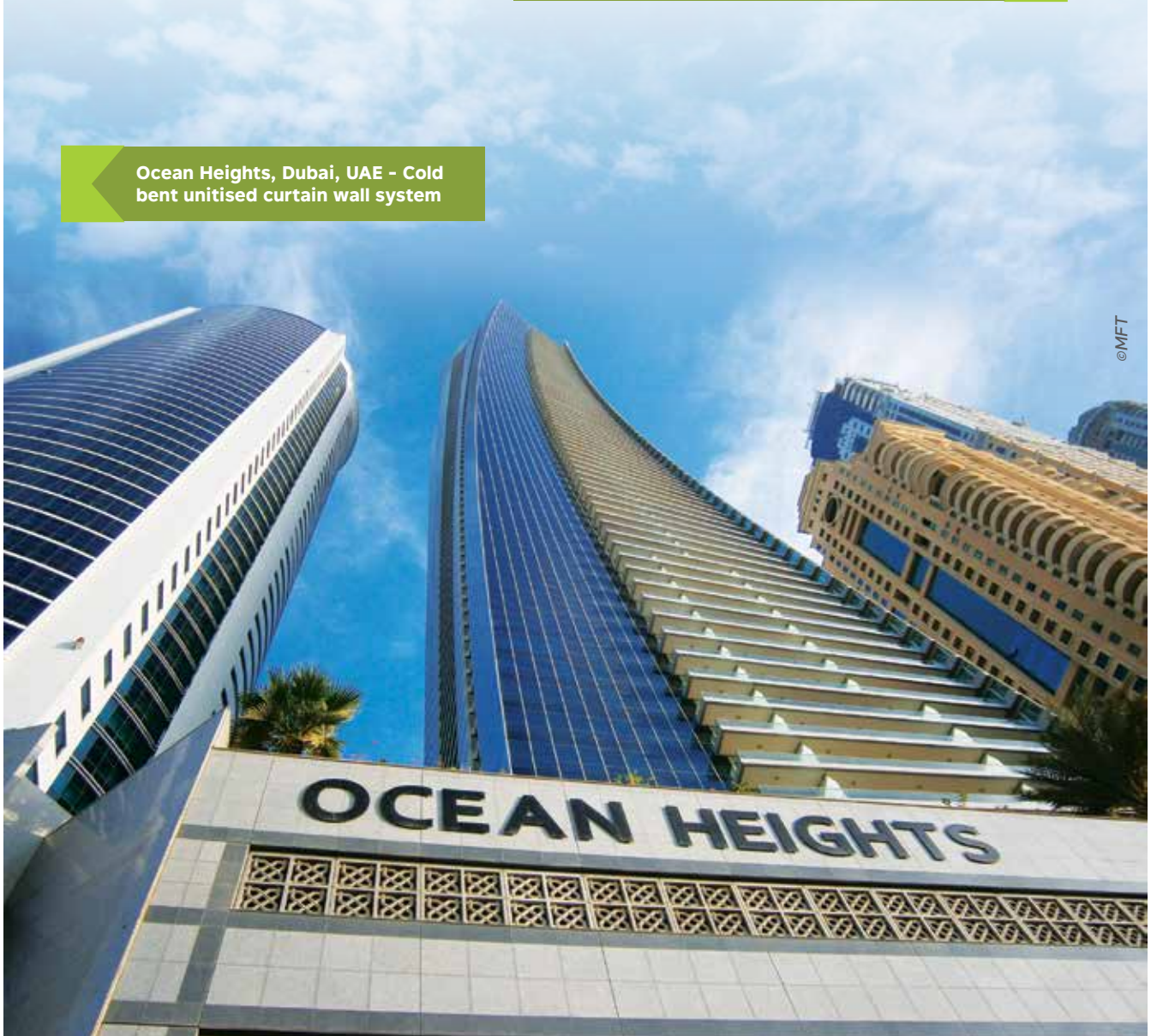


One other method that is now being widely used and proposed by consultants is cold bending. In this method the panel is fabricated flat and installed by fixing 3 corners of the surface into the plane and forcing the last corner of the panel into position to take the shape of the surface. The panel will bend along its diagonal so that the 4 corners of the panel can fit the surface.

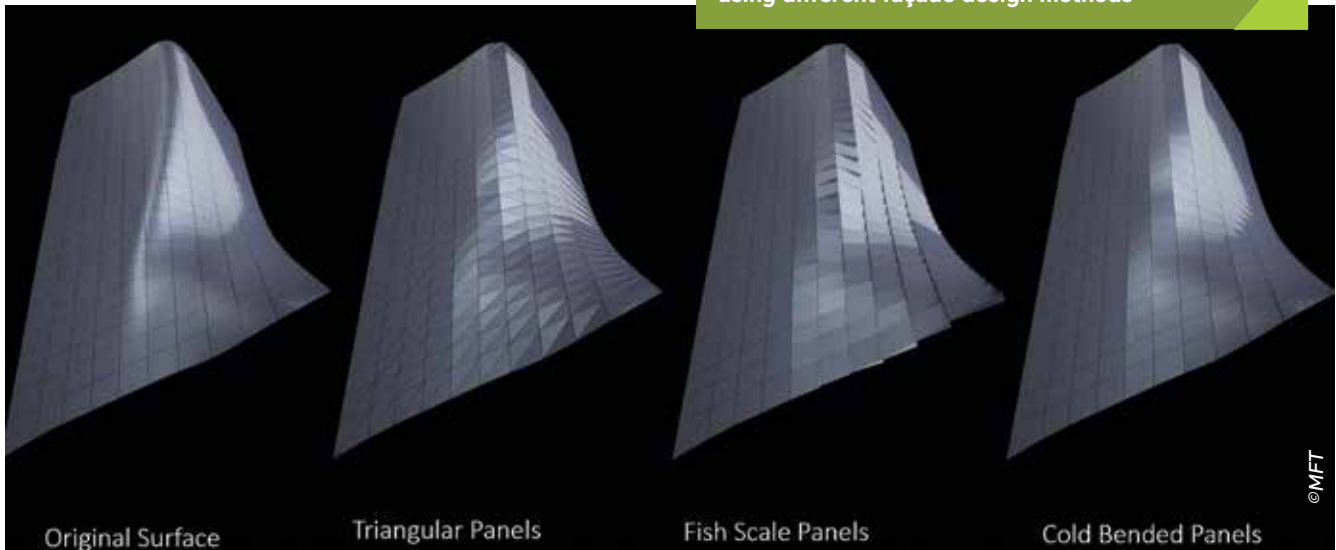


Cold bend principle: 3 corners of the panel are fixed, and the fourth corner is forced into position to fit within the surface

Ocean Heights, Dubai, UAE - Cold bent unitised curtain wall system



Comparison of resultant geometry of surface using different façade design methods



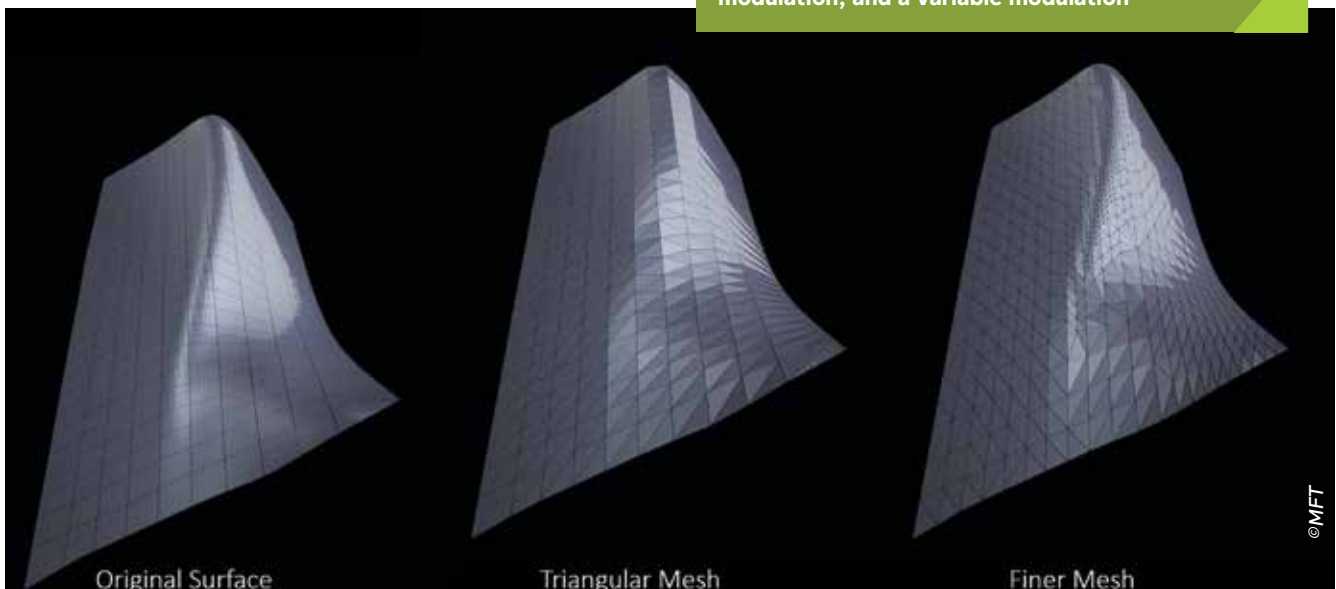
Each of the options will result in different surface appearance. Curved lines on a free form surface will be faceted on a façade surface that is built from flat panels. Non-developable areas (with double curvature) will have a less smooth transition at the panel's interfaces.

The surface curvature smoothness and aesthetic will also depend on the size of the modulation grid. Smooth transitions can be achieved by reducing the panel sizes. However, reducing panel sizes is not

always a feasible solution in terms of fabrication and installation. Accordingly, there is a balance to be found between a practical panel size and surface aesthetics.

The image below shows a comparison between a constant triangular modulation, and a variable modulation with finer mesh at the locations of steeper curvature and double curvature. It is possible to see the degree of how fine the mesh would need to be in order to achieve a smooth surface with flat triangular panels.

Comparison between a constant triangular modulation, and a variable modulation



In summary, all the façade design methods that deals with free form geometries presented have their advantages and disadvantages as described in the table below:

The triangular panels will obviously have the advantage of using standard flat panels. However, when compared to a rectangular panelling system, there will be more framing members and more complex joints with more risk of compromising the system performance. Also a triangular panel yields a higher wastage of material due to the shape, as all stock material is supplied in a rectangular format. Thus, this option will have a higher material cost.

The fish scale method also has the advantage of using standard flat panels, however, the frame design becomes more complex in order to accommodate the required steps between the panels.

The cold bent method has the advantage of using standard framing system, however, it requires more advanced engineering and additional testing to verify stresses of cold bended panels and bonding silicones. It will also require the suppliers to provide special warranties for the cold bent panels and

components, thus limiting the number of suppliers that can be used.

The challenges associated with complex surface geometries will generally come with an associated cost. The increased cost when compared to a standard façade can be related to the material, fabrication or installation costs. The design methods utilised can also influence on the final cost, however, it is only possible to establish the most economical method when linked to a specific design.

To summarise, there is no set rules or principles that can be applied to these types of façades. One method can be cost effective for one particular design, but not for another. Therefore, it is important to monitor the proposed system cost during the design stage in order to ensure that the most feasible façade design methodology is selected not just in terms of aesthetics, but also in terms of cost.

We encourage the challenge of these complex geometry façades and working with architects to deliver the best façade options for all stakeholders.

	Advantages	Disadvantages
Triangular Panels	<ul style="list-style-type: none"> ● Use of standard flat panels ● Can be used in any free form geometry 	<ul style="list-style-type: none"> ● Additional framing members ● The joints are more complex- 6 panel meeting at one point
Fish Scale	<ul style="list-style-type: none"> ● Use of standard flat panels 	<ul style="list-style-type: none"> ● Framing design is complex ● Complex fabrication with several joints to be sealed
Cold Bending	<ul style="list-style-type: none"> ● Use of standard framing system ● Use of flat panels 	<ul style="list-style-type: none"> ● Advanced engineering required to compute glass and silicone stresses due to the cold bending ● There are limitations to what the panels can be cold bent to ● Additional testing is required ● Installation more time consuming due to site cold bending ● Special equipment might be required to achieve cold bending on site ● Special warranties required due to long term permanent stresses on glass and seals ● Limited number of suppliers

FIRE SAFETY

NFPA 285 Test Method and its 2019 Revision



Abhishek Chhabra
Market Development Manager,
Thomas Bell-Wright International Consultants

About the Authors:

Abhishek Chhabra joined Thomas Bell-Wright International Consultants in 2013. He is the driving force behind the expansion of the fire compliance activities into new markets. An engineer with a post-graduate diploma in finance, Abhishek brings with him valuable experience from other, larger TIC (Testing, Inspection & Certification) companies. He has been advocating the need for compliance to standards for improved safety and quality across industries for most of the last 17 years.



Brett Shinn
Fire Engineer,
Thomas Bell- Wright International Consultants

Brett Shinn joined as a Fire Engineer in Thomas Bell-Wright International Consultants. He has spent over 4 years conducting large number of fire tests across British, American and European standards. Along with conducting the fire propagation tests on the NFPA 285 test, he also focuses on resistance to fire tests for partition wall systems, glazing and door systems among other systems. He has recently been involved in expanding the accreditation to undertake several new products using the 5 m by 4 m horizontal and vertical load bearing furnaces the laboratory has added.

Designing and implementing fire safety into buildings can be a complicated task as it requires architects, design & fire consultants, contractors & material suppliers to be aligned in several ways. Fire codes provide the minimum requirements based on learning from past incidents and observation. These requirements provide the framework & boundaries to architects & consultants designing buildings. The codes also help: material suppliers to produce standard materials, contractors to objectively price and plan for construction work, and authorities and regulators to objectively look at buildings to evaluate how fire safety will be implemented for buildings which are competing to differentiate themselves from other buildings.

One such code is the UAE Fire and Life Safety Code of Practice whose 2018 revision, takes a slightly different approach as compared to highly prescriptive codes often used around the world. The code uses several international standards to avoid alienating materials from prominent supply chains. The code also references (test) standards without their year of publication and mandates the latest revisions to be used. Both these steps create unique challenges in construction projects as architects; design & fire consultants, contractors & material suppliers are not used to such an approach. The code now includes a chapter on the responsibilities of stakeholders to not only address this unique approach but also to handle the growing need to bring out responsibility / liability in the construction industry and to offer a clear path for performance-based approach to fire safety.

While façade fire safety continues to be a topic of debate across the world, one of the key tools to quantify the effectiveness of fire safe designs is the NFPA 285 test method which is a ‘Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components’. Earlier this year, the 2019 version was released updating the standard after 7 years.

As the UAE code could be the earliest adopters of the new test method, the article aims to bring about better understanding of the differences between the superseded 2012 version and the 2019 version to help users of this test method make better decisions to help them avoid potential liabilities in the future.

USE OF THE NFPA 285 TEST METHOD IN THE UAE FLS CODE

The test method documents the resultant fire propagation response of specific cladding details (a combination of materials brought together in a unique design) under laboratory conditions by installing a mock-up of the cladding detail in a very specifically designed mock-up rig. Figures 1, 2, 3 and 4 showing mock-up rig dimensions, a test in-progress, an example of installation in progress, and details of thermocouples (temperature sensing devices) respectively.

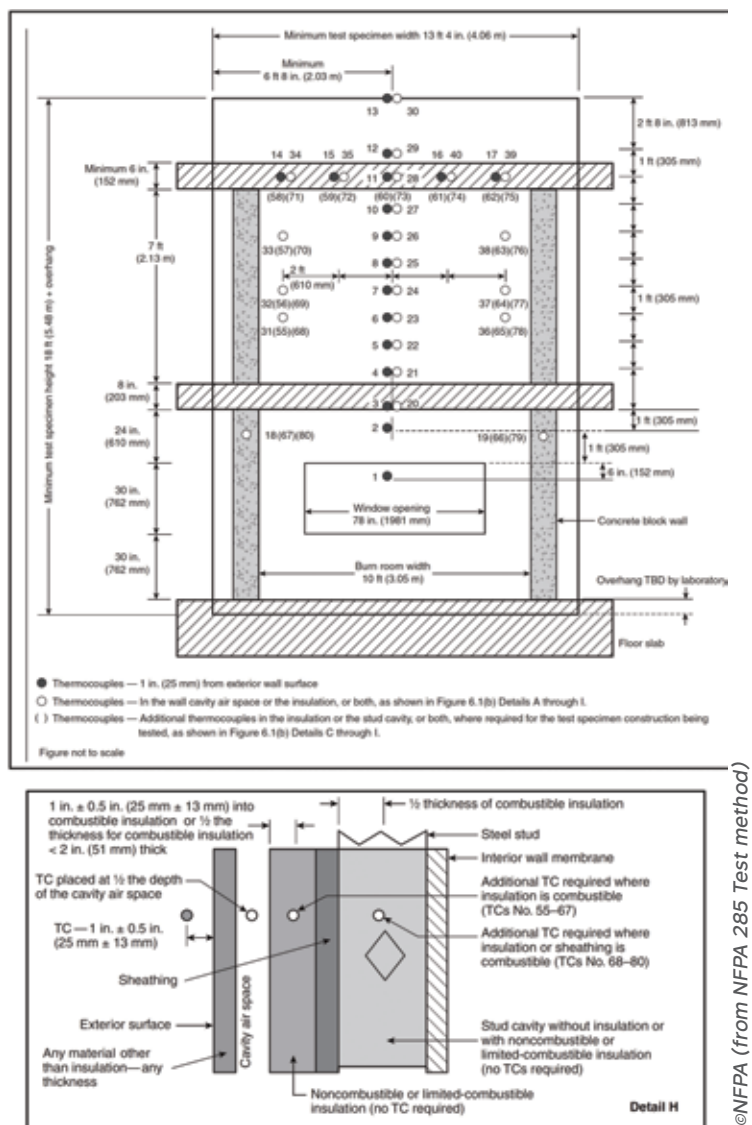


Figure 1: Details and positions of thermocouples, in the bottom is a typical cross section detail of how thermocouples are places

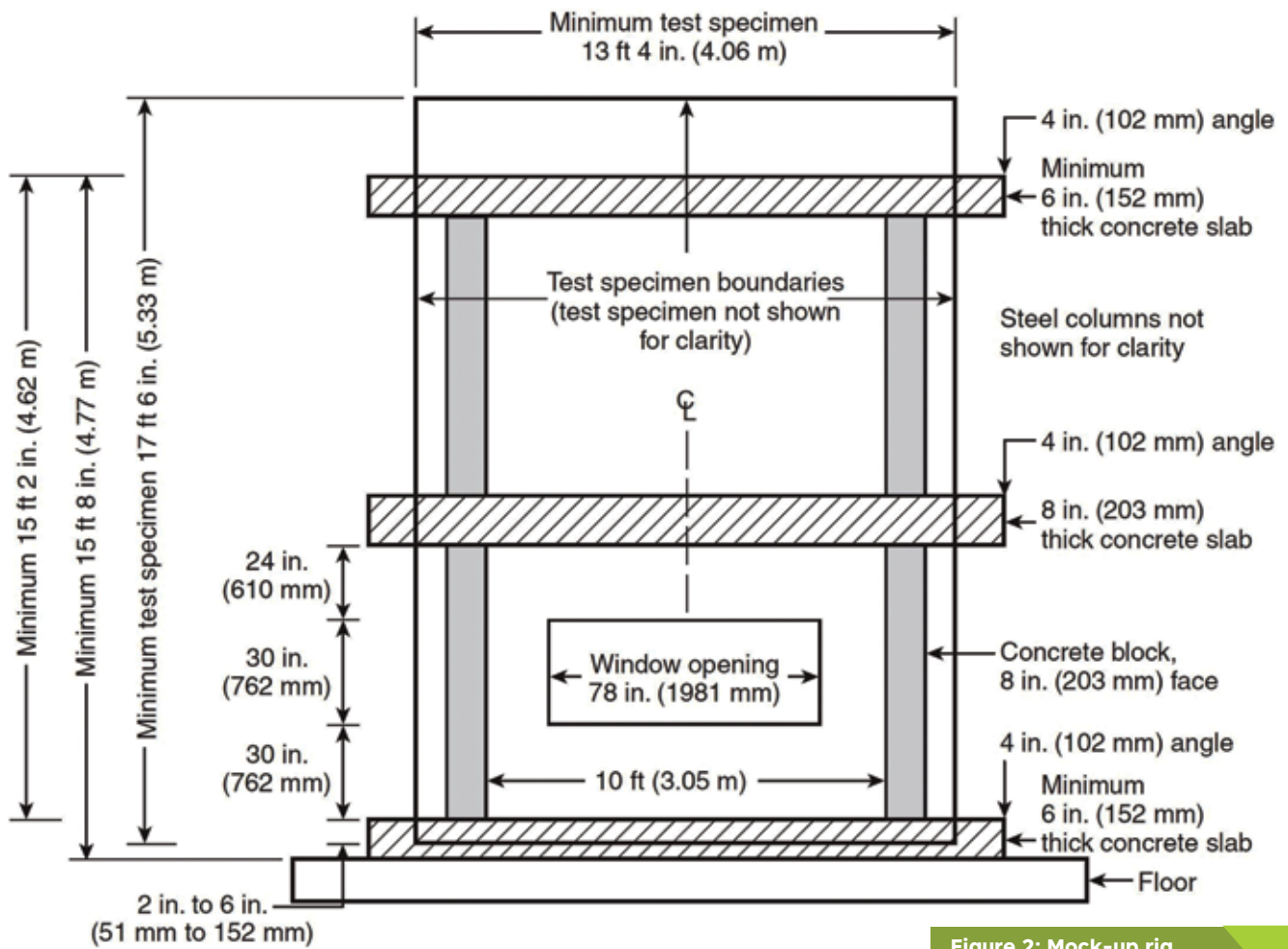


Figure 2: Mock-up rig dimensions for the published standard

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Figure 3: Test in Progress





Figure 4: First few minutes of a test where mock-up has joints

The UAE code uses this test method in two ways:

- Setting minimum compliance requirements for use of specific materials to be used as key façade elements. This is done using a combination of tests validating their individual reaction to fire properties and using the NFPA 285 test to bring about evidence of the successful use of a material in the mock-up one possible detail of a cladding system. The NFPA 285 test also helps material manufacturers provide a proven system design to façade engineers who want to avoid designing new systems for their projects.
- To create evidence of the behaviour of one or more potential high-risk cladding buildups for a specific project. Such evidence is used by fire consultants / façade engineers to confidently take on the risk / liability detailed in the code. Unlike the testing laboratories or

manufacturers who may not have a full picture of all possible fire risks in the cladding of a building and understand occupancy related fire safety and its related risk mitigation plan. These are known well to fire consultants / façade engineers who need to understand, interpret and use the results of such tests effectively. Figure 5 shows a typical approach for quality assurance and how a given cladding could have several details which may need to be validated using one or more NFPA 285 tests.

WHAT HAS CHANGED?

There are three key changes:

Bearing and non-load bearing: By removing the word non-load-bearing from the title and various clauses of the test standard the new version has been revised to include both bearing and non-load-bearing assemblies. The test does not evaluate the load-bearing or non-load bearing characteristic of the mock-up built on the G+1

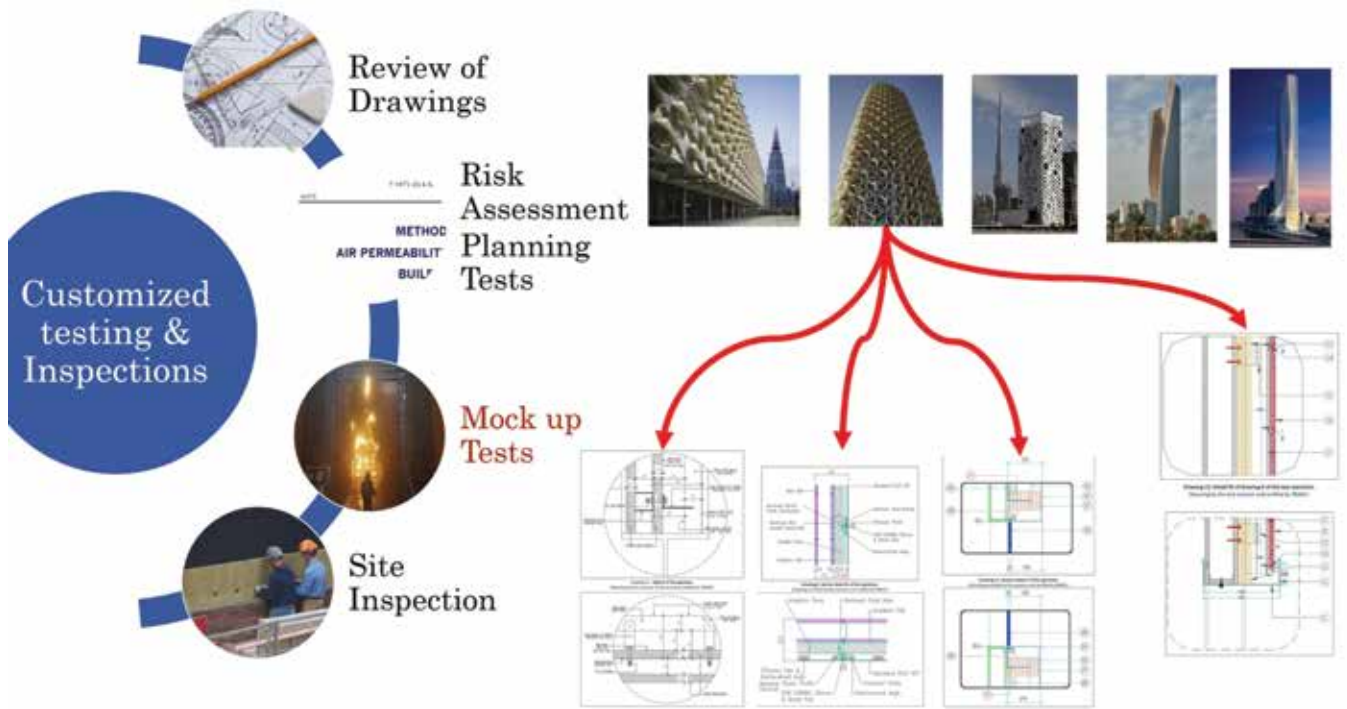


Figure 5: Explaining approach for unique cladding designs

©Thomas Bell-Wright International Consultants

test rig. The cladding system does not support a building element other than itself, like a floor slab, being self-supporting and is different than other non-loadbearing elements like partitions. The test method only documents the resultant behaviour of the potential fire propagation of an installed mock-up under laboratory conditions.

Horizontal and vertical panel joints: While evaluating a cladding assembly under NFPA 285, both horizontal and vertical joints, their specific locations with respect to the window opening (hence, their proximity to direct flame impingement from the window burner); provided a good understanding of the resultant system behaviour. The 2012 edition, allowed subjective decisions to be taken by the user of the report to establish limitations. As an example, when tested with joints with a given proximity to the window burner; indicating a worst-case scenario allowed the interpreter of the test to draw a very broad 'Field of Application'. The 2019 edition now requires a continuous, vertical panel joint within 1 foot of the vertical centre line of the window head and an additional horizontal panel

joint between 1 and 3 feet of the window head. This reduces the degree of subjective decisions of the limitations between tested and installed configurations. These could previously be stated or established at the discretion or interpretation of the user of the test report. Figure 6 to see an example of joints.

There are exceptions to this rule. Firstly, there are systems using continuous materials like Exterior Insulation Finishing Systems (EIFS) and plaster

Field of Application means use of technical justifications to state that an alternative design/ configuration/ material combination will pass the same test without have to conduct it again. This is done by establishing that the system that has been tested is the worst possible scenario from a fire risk standpoint and alternative scenarios which would be less risky and would hence pass a test.

based systems which do not incorporate joints of any type. Additionally, there are sites or application specific tests which do not have an intention to extrapolate the results to factor in the variation of joints.

Window head detailing:

The window head is the most impinged upon area of the specimen by the heat radiated from the room and window burners and is the most vulnerable point of the mock-up. Specifically for isolation from scenarios that may lead up to the chimney effect and resultant cavity flaming causing the failure of the mock-up/ design. The requirement of the window opening in a test mock-up is often difficult for users to relate to many system designers as the building may not have a window opening. The test method aims to address several potential fire risk scenarios by creating and exposing such an opening.

In a typical cladding system, there is a gap between the panels / cladding fascia of the system and the substrate on which it is applied. This gap is an opening into the air cavity behind the panels which, if breached, allows flame impingement on both



Figure 6: Installation in progress with insets showing details captured

sides of a system, instead of from only the exterior. The older editions of the standard did not give guidance on the use of methods to isolate the air cavity (like galvanised steel, insulation materials, etc.). This cavity would thus become protected and the potential risks in the design do not get fully evaluated, shown in Figure 7.

The 2019 edition of the standard sets a requirement to close the air gap at the head of a window with a single sheet of 1mm thick aluminium, with zero overlaps on the exterior face, limited fixing points, and no extra insulation near the window head. This not only provides a limited amount of protection, and a more onerous condition, but also homogenises test configurations. This helps mitigating ambiguities in a 'Field of Application' and reduces opportunities for manipulation.

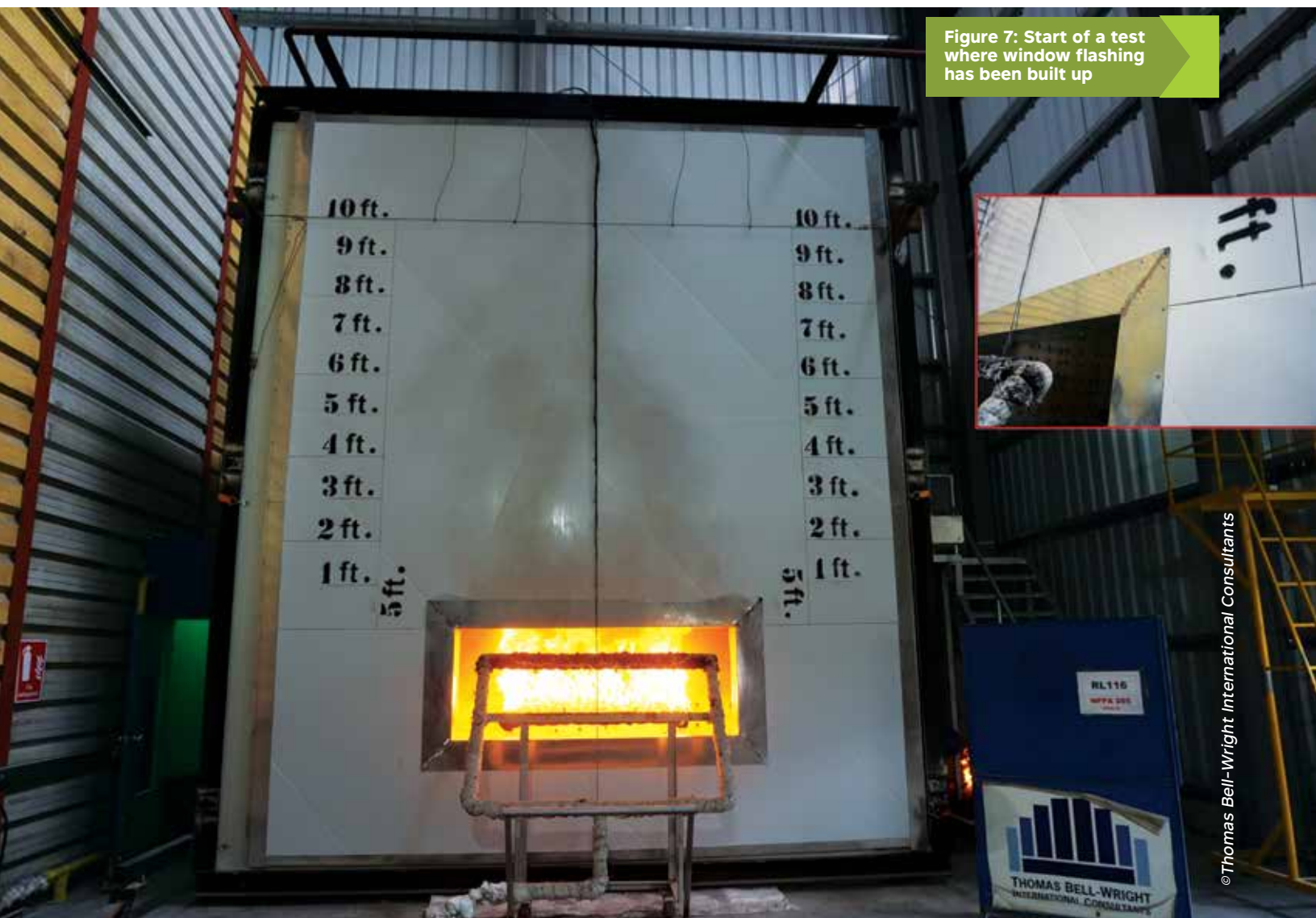
USING NEW KNOWLEDGE

When test standards are published, different users react differently. Manufacturers will innovate further to comply with requirements more cost-effectively; consultants would use the data available to make better decisions and regulators need to relook at implementation of technical regulations.

While materials and designs change over the years, they continued to get evaluated to test standards developed in the past. With the knowledge of new materials and design methodologies, standards revised. Data generated from accidents and innovations give critical inputs to such revisions.

The 2019 version of the NFPA 285 test is one such revision. Users relying on the data generated from this test to reduce their liability can now be empowered with the capability to take more informed decisions.

Figure 7: Start of a test where window flashing has been built up





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COVER STORY

Glass Façade – A Boon for the Fenestration Industry

Glass is one of the oldest and most popular material in building construction. Over the years, it has emerged as one of the widely used façade materials around the world. Glass when used as a façade material, makes the building look more beautiful. One of the most important benefits of glass is that it allows natural light to enter the building, thus saving the electricity costs. Glass also offers extraordinary flexibility, which makes it the most preferred choice amongst the architects, builders and consultants.

In this cover story, the experts have given their opinions on how glass is revolutionising the building industry in the Middle East. Through this cover story, you will also get to know about the new technological trends in the glass as a façade and how they benefit the buildings in the region.

Etihad Museum, Dubai (Future Architectural Glass LLC)



©RTA



Ahmed Baker
Sales & Marketing Manager,
AGC Obeikan Glass

DEMAND OF GLASS IN BUILDING ENVELOPE

Over the centuries, the glass has evolved dramatically. For years, the glass remained a hardly available fragile material with poor optical and energy properties, and limited ability to provide enough light into the buildings. Contemporary architectural glass turned into an eco-friendly, chemically durable and robust construction material, which brings us light and protects from the elements, ensuring high levels of solar control, thermal insulation, safety and security, comfort when it comes to sound insulation, daylight and glare control and other aspects. Glass with its main unique property - transparency - allows architects and designers to unleash their creativity and provide a better harmony between the nature and the human being. Moreover, glass buildings look visually attractive during both daytime and nighttime, says **Ahmed Baker, Sales & Marketing Manager, AGC Obeikan Glass.**



Alain Garnier
Manager, Sales & Business
Development Middle East,
Saint-Gobain SageGlass

According to **Alain Garnier, Manager, Sales & Business Development Middle East, Saint-Gobain SageGlass,** there is a strong trend to increase the glass and glazing surface in the building envelope, especially in the Middle East. Architects and designers really love this material because of its great architectural and aesthetical properties. Glass is the perfect solution to bring natural daylight into the building and allow the building occupants to enjoy the view to the outside. As we spend most of our time in buildings, it is very important to have the access to natural light. The biophilic design responds to this trend. According to the World Green Building Council, there is "overwhelming evidence" that demonstrates the design of a building impacts the health and well-being of its occupants. In particular, daylighting and views to outdoors have been the subject of a large body of research, revealing their key role in creating more comfortable and healthy spaces. While glazing constitutes the ideal material for bringing daylight and connection to the outside indoors, they can also have unwanted counter effects such as overheating and glare, thus impacting both the energy and comfort performances of the building.



Julian J. Pollmann
Special Products Sales &
Marketing Manager,
Emirates Glass LLC

The demand for glass is somewhat similar to recent years. However, architects and consultants demand better performing glazing and more complex compositions - and this increases the energy efficiency of buildings and satisfies today's stricter regulations, says **Julian J. Pollmann, Special Products Sales & Marketing Manager, Emirates Glass LLC.**

Firoz Kachwala, Director, Future Architectural Glass LLC opines that glass is an ideal choice of material for developers to clad their building façade, being a maintenance-free material, easy to install, enabling fast construction and creating aesthetically appealing building skins. The market is buoyant today, in the whole region a multitude of projects are being executed right now. In the UAE in particular, there are a lot of projects that are in the tender or construction stage, which aims to be finalised by 2020. A major challenge is, therefore, completing the projects in time for the Expo 2020 Dubai.

CHOICE OF GLASS FOR WINDOWS FOR EFFECTIVE FENESTRATION

Baker believes that in addition to the colour, safety and comfort related factors such as sound insulation, thermal insulation and glare control, are important when it comes to choosing the glass. We see a lot of improvement in the industry in terms of implementation of local regulations, and particularly, solar control & thermal insulation requirements. The right amount of light and heat passing through the window is crucial to the comfort of the building occupants, therefore it is essential to choose the high performance glass solutions. Such innovative climate control solutions help to minimise energy costs, making it the right choice for effective fenestration.



Firoz Kachwala
Director,
Future Architectural Glass LLC

Garnier notes that the best choice of glazing is the one that offers the best solar control and insulation performances. There are great high-performance glazing in the market that can fulfill these requirements and the best solution is dynamic electrochromic glass. It offers an environmentally friendly and energy-efficient alternative to blinds or shades, and provides reliable indoor comfort, whilst at the same time ensuring the long-term sustainability of the building. Dynamic electrochromic glass can be silently tinted and made fully clear again either automatically or manually at the touch of a button, using an app on a smart phone or tablet, or even voice activated. The dynamic electrochromic glass has an unsurpassed optical and solar performance, providing significant energy savings, thermal comfort at 1% visible light transmission, glares control and all without losing the view to the outside. When dark, SageGlass blocks 99% of the light and 95% of the heat.

According to Pollmann, the choice of glass has always been a much discussed topic and effectiveness depends mainly on the application and the geography of the building. While the industry is looking for high light and heat transmission and



**Georgian College
Barrie, Ontario**

©Scott Norsworthy

best possible insulation to passively heat buildings in Central Europe, particularly during winter, here in the Middle East we have to focus mainly on heat

**Hilton Riyadh Hotel Residences,
by Omrania Associates, KSA**



©AGC Obeikan Glass

rejection at reasonably high light transmission, or in other words high selectivity. The most effective fenestration will match the application and design intent, and is best chosen together with the competent glass processor.

According to Kachwala, glass, as a material, has evolved over the years since its invention 5000 years back. Over the years, the usage of glass in a building has increased and has driven up the demand for higher energy efficiencies on the fenestration, and architects want more to achieve better window glazing standards. Especially in the Middle East, a high level of insulation is needed on the fenestration to maintain comfortable interior spaces and work environment. This has resulted in increasing use of high-performance coatings on the glass makeup that provide Shading Coefficient (SC) of 0.25 or lower while allowing for light transmittance of 40% or higher. Local and international coated glass manufacturers have upped their game and introduced high-performance double and triple silver Low-E coatings to keep up with the building code regulations.

He adds, that high performance glass has become the choice of architects/developers for effective glazed façades bringing comfort to the occupants and enhancing the value of their asset.

LIMITATIONS COMPLETE GLASS WALLS, CONSIDERING UAE CLIMATIC CONDITIONS

According to Baker, despite of the hot climate in the UAE, the limitations of having complete glass walls are minimised due to locally available innovative sputter coating technology. The sputter-coated glass allows engineers to use glass in a large scale for high-rise towers. Apart from great aesthetics, complete glass walls are able to provide safety and comfort for buildings' occupants. We can see it in the UAE market a lot - fully glazed high rise towers without compromising on the energy saving and comfort. Glass is very friendly to any design and can be used as an independent material or in combination with any cladding material. The only limit is our creativity.

Garnier says, in the UAE climate conditions, the main issues for full glass façades are heat and glare. One challenge is that heat and glare are coming together with the natural light. It is important to use a solution that can help control the amount of light, heat and glare into space. Reducing heat and glare is a key target in the Middle East region. Glass, especially dynamic glass, can offer a very high level of performances that can match the highest level of performance of claddings. Views provide a psychological effect through the connection with

Façade at the Swiss International School in Dubai, UAE



other groups of people and the surroundings while in a safe space. Views allow the eyes to adjust, re-focus and relax, and so reduce eye strain and induced fatigue. It provides a link with daylight that affects the physical health of the human body through regulating circadian rhythms. An attractive view, whether of a built or natural scene, might promote cognitive, effective, and physiological restoration. Although blinds and shades could help minimise heat gain and glare, they would obstruct the view. Blinds and shades would also attract dust and require constant cleaning.

Pollmann says, from the perspective of the glazing manufacturer and processor, there are no limitations, and in fact, we would wish for a lot more glass being used in buildings. Sure, other non-transparent materials such as cladding have a less direct transmission, which reduces the cooling loads, but at the same time, they limit the amount of natural light within the space.

Kachwala states, glass is a maintenance free construction material that is the material of choice for developers. Architects also prefer the use of glass on façades as it allows them to create well-lit interior

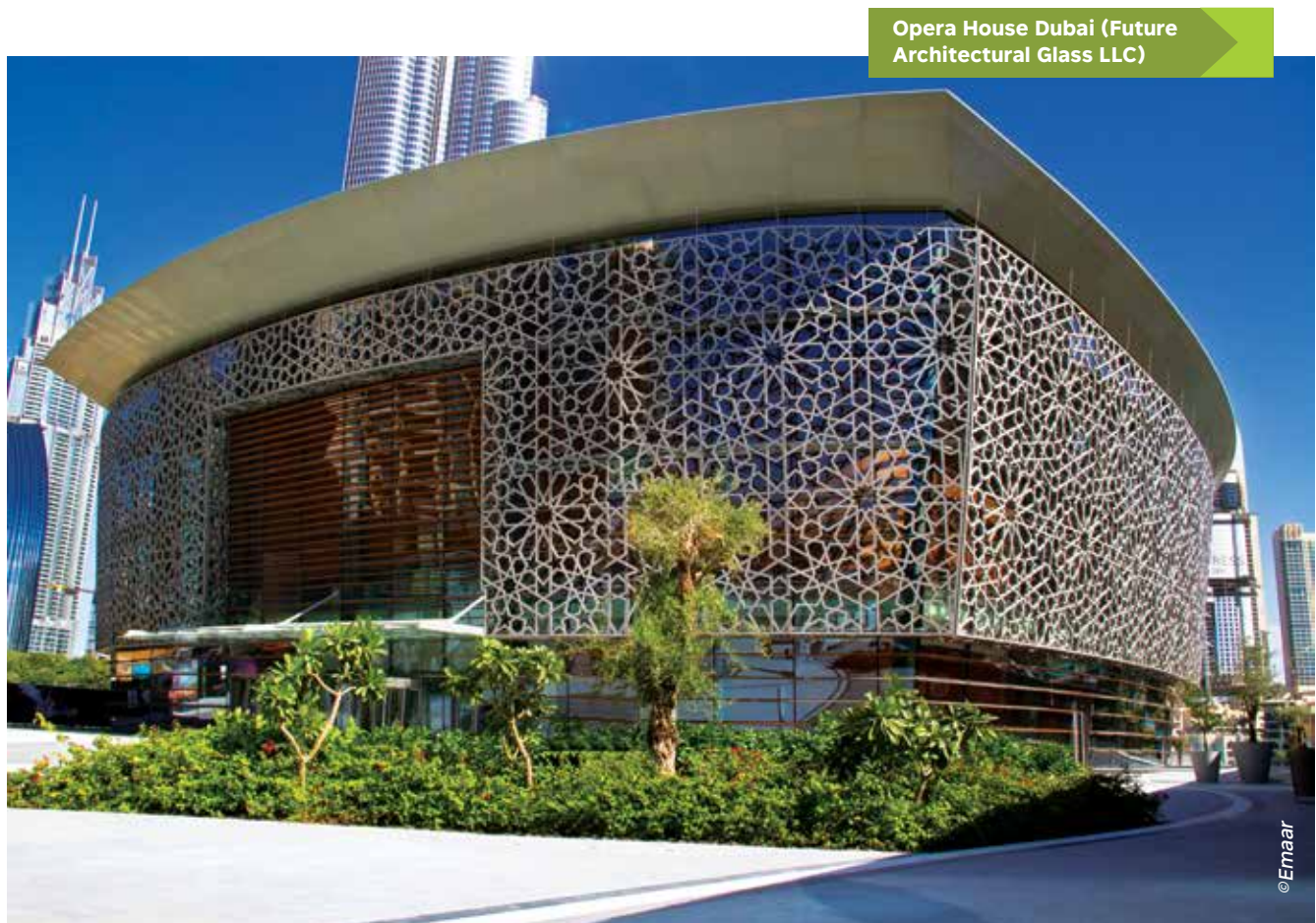
spaces and provide occupants a visual connection to the outside world. However, it needs to be used responsibly and specified as per the site conditions/building code regulations. The Government of Dubai, along with DEWA and Dubai Municipality, has set fourth green building regulations and specifications that provide a guide for the usage of glazed elements on the fenestration. For example:

- If the total area of fenestration is 40% or less than the SC should not exceed 0.4.
- If the total area of fenestration is 60% or more then the SC should not exceed 0.25

Architects can find unique ways of incorporating other cladding materials like aluminum, terracotta, stone, composite panels, GFRC and others. Combining other cladding elements greatly enhances the aesthetics/functionality and complements the use of glass on façades, he adds.

USE OF GLASS FOR CONTEMPORARY FAÇADE & FENESTRATION

Glass is one of the oldest man-made material used in the world. I see the glass as one of the most elegant materials used for modern building's architecture,





Citywalk, Dubai (Future Architectural Glass LLC)

as it has been used since the 17th century for iconic historical buildings. Architects and specifiers love glass. The multifaceted functions and aesthetic properties of glass are incorporated into modern designs more often than almost any other material, says Baker.

According to Garnier, glass is a great material that offers a lot of design flexibility to architects and designers. As outlined before, there are no technical limitations in the use of glass and glazing for façades as it can be as performant or even more performant than blocks or claddings. Electronically tintable glass, also known as electrochromic (EC) glass, allows the building façade to become dynamic, changing the transmission of the solar heat and light in response to the exterior environment and the needs of the building's occupants, while always remaining transparent. It thus offers an innovative and elegant solution to address the design challenge of creating both energy efficient and comfortable well daylight spaces. New developments in the EC technology show that dynamic glass allows to achieve sustainable design goals, without compromising on aesthetic choices.

Pollmann opines that the R&D of glass and coatings allow us to have exciting architecture and uniquely shaped buildings, while still keeping most of the heat

outside. Only through the combined usage of target materials with high infrared-reflectance and newly developed metal-oxides to enhance performance as well as the durability of the coating, it is possible to create sustainable and comfortable living and working places while minimising energy usage.

Kachwala believes that although glass is in use for centuries, it has found its use extensively as a modern cladding material in the last few decades. Today, contemporary façades feel incomplete without effective use of glass on them. Bespoke specialty glass options are available in the industry that brings life to the building. While the inherent properties of glass, it adds tremendous aesthetic value to any space, specialty glass products redefine the boundaries of architectural design. Specialty glass producers offer a range of products that include energy-generating photovoltaic glass, vivid metallic mesh glass, amazing colour laminates and infinite possibilities with digital ceramic prints. Glass can also be combined with other cladding materials like terracotta/stone/composite panels to create bespoke façades and make a style statement.

FACTORS AFFECTING SOLAR HEAT GAIN

Solar heat through fenestration plays a major role in determining the thermal performance of any building. It is always a challenge to balance between



Vivanta Tower by Arch Group,
Jumeirah Lakes Towers, Dubai, UAE

the right amount of the light, glare and heat affecting the building HVAC (heating, ventilation and air conditioning) systems. Coated glass is one of the flexible materials, providing such balance, and is relevant to the different high-performance coatings available in the market, says Baker.

According to Garnier, summer temperature can be very harsh in the UAE. So it is necessary to offer a very good solar heat gain coefficient. Dynamic electrochromic glass, when it is dark, can offer a level of solar heat gain coefficient of 0.05, effectively blocking 95% of the heat and glare. An attractive view, whether of a built or natural scene, promotes cognitive, affective, and physiological restoration. Of these three forms of restoration, the cognitive effects are better understood. The opportunity to relax attentional focus by visually exploring a view of nature restores depleted capacity.

Pollmann says, solar heat gain is mainly affected by direct transmission, conduction, energy absorption and re-radiation, and all of these happen to any type of glazing in varying intensity. What the market wants is high selectivity and a high visible light to solar heat gain ratio. But in this region, due to the high intensity of natural sunlight, façade consultants opt for moderate light transmission while aiming to achieve the lowest possible solar heat gain. In the end, it is up to the architect and specific application (façades, skylights, atriums, etc.) But the glass industry is surely able to provide the best product.

Kachwala opines, harnessing the sun's abundant light is a challenge. Avoiding glare, solar heat gain and uncontrolled illumination patterns are a designer's aspiration. Day lighting is a powerful design element. Proper execution results in sustainable and energy efficient buildings. Heat gain inside a building is a combination of direct & indirect solar radiation. Heat gain due to direct solar radiation is calculated as a summation of directly transmitted energy and absorbed energy re-emitted to the interiors. Indirect solar radiation is the amount of heat transferred through a glass panel due to temperature imbalance between the inside and outside. Designers should study the sun-path diagram and define the placement of vision glass on buildings effectively. Specifying the right glazing can be critical to the success of a project. Innovative glass products that incorporate shading elements like mesh/glass



Musaffah Garden,
Abu Dhabi

fiber veils/louvers inside their construct can assist in effective light and heat management.

PERFORMANCE OF GLASS IN ACOUSTIC INSULATION

Baker says, acoustic insulation is a demand to provide a comfortable and healthy environment inside the building, which sometimes is a challenge. The glass by itself is a weak sound insulator, but the glass industry offers a wide range of solutions where the system of glass elastic membranes can provide a sound insulation index comparable to the one of a concrete wall.

According to Garnier, glass offers very good acoustical insulation if it has the right combination. Standard double glazing units have acoustical insulation level (Rw) of 31 to 32dB. But much higher levels can be achieved with the right combination of laminated glass panes with acoustical PVB interlayers and additional spacer thickness. For airports, acoustical insulation levels of 55dB can be achieved.

Pollmann says that while glass, especially double and

triple glazing, has the benefit of air cavities, which acts as a natural sound insulator. We are also able to laminate glass with special purpose interlayers that significantly improve acoustic attenuation through



Al Fattan Towers,
Marina, Dubai



Skylights at the Mall of
America, Minneapolis, USA

the panels. However, it is the entire system and structure of a building, namely glazing, frames, walls and even floors and ceiling intersections that need to be considered for optimal acoustic performance. Sound waves, similar to water, will travel along the path of least resistance. It is crucial that all construction elements and materials are of similar acoustic grade to achieve a good result.

Kachwala opines, with an increase in road/air traffic and greater settlement density, noise nuisance to the occupants has increased sharply. Consultants are incorporating noise mitigation in building design and actively specifying acoustic requirements for glazed façades. Insulated glass units with a combination of laminated panes and different glass thicknesses help in improving sound control. Special sound control films in a laminate can improve sound insulation value by almost 5dB. Based on sound reduction requirements, the exact glass constructs can be achieved with required inner/outer pane laminates and the thickness of the insulated glass cavity.

GLASS FOR BUILDING INTELLIGENT FUTURISTIC FAÇADES

Baker notes that the demand for glass for external façade keeps growing along with the increasing demand for using renewable energy. The next step in building intelligent futuristic façades to use façade glass as a transparent solar cells for

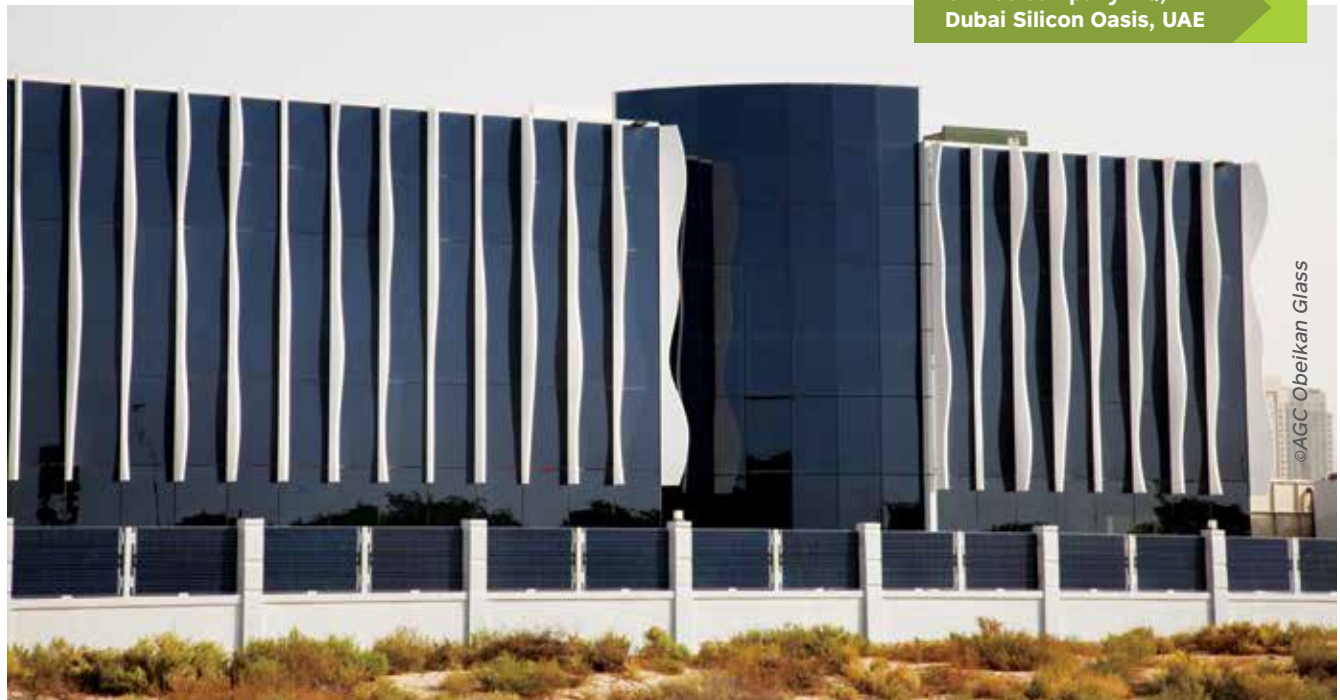


King Abdullah Financial District (KAJD), Parcel near 5.08, Riyadh, KSA, by Omrania Associates

©AGC Obeikan Glass

generating the power. Once the architect selects the glass, it stays with him for the next 25-30 years with its static properties. The future of the glass façade is in dynamic solutions, when the glass will smoothly adapt to the changing environment and the mood of the building occupant. Along with that, due to limited natural resources, large surfaces of glass façades should also serve as an efficient fully transparent renewable energy sources.

The possibilities offered by the dynamic electrochromic glass and glazing for future intelligent façades in enormous. Electrochromic



Chinese company HQ, Dubai Silicon Oasis, UAE

©AGC Obeikan Glass

glass can be controlled by light sensors that will determine the right amount of tinting to keep the interior of the building cooler. It means that these glazings can be connected to the internet directly or through the building management system. The opportunities offered by connected façades are immense. The performance of the dynamic glass façade can be monitored to ensure the optimal use of daylight while limiting the amount of heat and glare. Connected dynamic glass façades open a completely new field of applications and possibilities that will be developed in the near future, says Garnier.

Pollmann believes that the next biggest thing will be glazing with the ability to passively generate energy. Currently available are products like Kromatix, an alternative façade cladding for non-vision panels and spandrel, which have integrated photovoltaic capabilities. Surely, the next evolutionary step should be fully transparent glazing elements that generate energy at high efficiencies and help buildings to achieve net-zero carbon emission.

With the advent of technology, glass has become a responsive building element. It can respond to user inputs and a façade can be converted into a medium for stunning interactive media content. By combining transparent qualities of glass and the media display properties of LED technology, developers can create a smart building that is interactive and excite people in whole new ways, points out Kachwala. Glass can respond to the climatic conductions and new dynamic glazing technologies have taken the front stage in fenestration. Static shading devices limit the functionality and cause difficulty to maintain a

comfortable environment at all times. Dynamic tinting glass technologies are now available that can adjust the light/heat instantly to suit user requirements. As sunlight intensifies or diminishes over time, this intelligent glass fine-tunes the shade to protect from solar glare and instantly regulate the temperature to bring optimal comfort, he further added.

GLASS AS FAÇADE FOR CARBON-NEUTRAL BUILDINGS WITH ECO-FRIENDLY FEATURES

Sputter coating technology is able to provide eco-friendly glass solutions, helping to save the environment without compromising on living comfort. Visionary architecture requires high-tech glass solutions matching the energy-saving requirements and constantly evolving eco-friendly features, says Baker.

Indeed, dynamic electrochromic glass and glazings offer the best possible solution for energy efficient façades. Glass is no more a passive element that is installed in the façade. It is a connecting element that adapts constantly to the outside conditions and offers the best compromise for energy savings and net-zero energy buildings. In comparison to alternative glazing with or without blinds or shades, the use of electrochromic dynamic glass leads to a reduction in cooling energy use by 30% to 40%. The LCA (Life Cycle Analysis) and EPD (Environmental Product Declaration) enable the user to know the environmental impacts of electrochromic glass during its life cycle. It is available to customers so that they can make objective comparisons of the carbon footprint of different materials integrated into the building's façade. The LCA and EPD also help to analyse and reduce further our impacts and eco-innovate by



Welcome displayed on the dynamic façade
at the SISD Sports Center, Dubai, UAE

©Saint Gobain

creating new solutions and optimise current solutions with a reduced environmental impact, says Garnier.

Pollman says, luckily for the construction industry, technology and materials will never cease to evolve. What seemed to be the ultimate product ten years ago is old and outdated today. Continuous research and development is the only way to make sure that we stay on the right path to providing the best solutions for any given time in history. This is certainly true for architectural glazing - while we are on the right track, we have not reached the optimum in terms of heat gain vs. light transmission.

Glass has existed for long, replacing the other building materials. Over the years we have seen glass performance, improve considerably with the introduction of double and triple silver coatings. Yes, these coatings are suitable for local conditions, however, we still have research on-going for further improvements, says Kachwala. In line with the UAE's vision for carbon-neutral buildings, a variety of specialty glass products are being introduced in the market to enhance functionality. Glass constructs with U-value as low as 0.6 W/SqmK, are now available locally to prevent the transfer of heat from outside

and reduce HVAC loads in the building, he added.

SOLAR SHADING, DOUBLE-SKIN FAÇADES AND VENTILATED FAÇADES

Baker says, as the glass becomes more important and frequently used material in the modern building, the façade engineers and glass manufacturers are working together to provide better awareness to the users and authorities. As of today, there are a lot of improvements in local regulations, it became obvious to the consumers to use high-efficient glass in their facilities/buildings.

Garnier believes that the various stakeholders in the building industry, such as architects, designers, consultant, general contractors and façade contractors know these design possibilities such as ventilated façades and double skin façades very well. There is a constant need for training and education, and professional associations have an important role to play together with the material suppliers. Education of the building end users and investors is a more challenging theme as there are very different levels of awareness amongst the public. I think it is the role of all the professionals in the value chain to inform and educate the public.

Dubai-Frame, Dubai (Future Architectural Glass LLC)



IPIC Tower, Abu Dhabi





Landmark HQ, Dubai, UAE,
by Arch Group

Architects and façade consultants have developed fantastic concepts. If by a consumer you mean the consultant, then the awareness level is very high. If you are referring to the occupant, the awareness level is generally low. Important is that we as a glass specialists and experts are able to guide, educate, support and assist architects and façade consultants in trying and simulating new concepts and help in selecting and designing the right type of product - as we continuously do, says Pollmann.

Consumers are well aware of solar shading requirements in façade. Local building regulations are strictly in place and ensure developers use the right glazing on their buildings. However, the use of double-skin façades and ventilated façades is not very common since the local building codes can be achieved with single skin façades. On some bespoke projects, developers aim for higher energy efficiency and LEED ratings, which may require the incorporation of double-skin façades, but such projects are limited, points out Kachwala.

EFFECT OF UAE FIRE & LIFE SAFETY CODE OF PRACTICE - 2018

According to Baker, architects and engineers working together should remember about their social responsibilities, all their technical solutions have to be challenged for passive safety & security aspects. The Natural constant evolution of building codes towards fire & life safety is very important, but the entire construction industry has to improve a lot still.

The UAE Fire & Life Safety Code requirements are aligned with the European and American

regulations and aim to harmonise the global framework of regulations, which most leading glass manufacturers and processors are already complying with for a long time. However, the new code of practice eliminates interpretations of which exact standard is to be used in our region, points out Pollmann.

Kachwala believes that the UAE Life & Fire Safety code - 2018 is made for the betterment of the construction industry and it helps in achieving global safety standards. The process was conducted in all the fairness where industry experts from various fields were invited to present their views and ideas for establishing good codes. Being part of the committee, we were also able to contribute towards the Fire & Life Safety code and abide by its requirements.

Since it is being implemented, there is some uncertainty in the procedures and sometimes results in the stoppage of work, but I am hopeful the concerned authorities will define clear rules and guidelines to make the process easier for all, he adds.

CONCLUSION

Glass is used as an aesthetical material to beautify the look of the buildings. In the Middle East, the trend of glass buildings is not so new. There are several glass buildings in the region which are considered as the masterpieces. Glass offers several benefits to the buildings and its occupants.

Earlier, the glass was not a perfect choice for the buildings in the regions with hot climatic conditions, but now the technology has made it possible to make the glass a most preferable choice.

“Cladding Materials Should Have Resistance to Environmental Influence”



Jad Abi Ali

Marketing Communications Manager, Africa & the Middle East,
Guardian Glass

■ What are your views on the growing demand of glass in building envelope?

We are seeing more buildings with bigger windows, larger window to wall ratios and generally bigger window panels. This is because architects realise the benefit of placing importance on the wellness of the inhabitants, and how wellness is achieved by having a building with more outside vision than a building with closed box walls. With the continuous development of new glass products and innovations in glass, we are able to create a lot more options for architects to realise their vision with glass and make bolder statements in their designs, all the while meeting increasingly more stringent building codes.

■ What should be the choice of glass for windows for effective fenestration?

The specified glass should be defined in terms of performance, transparency, colour, reflectance, heat and light transmission, in order for inhabitants to feel enveloped by the surroundings. For effective fenestration, an experience of total integration is the key, and the right glass assists in achieving that.

DAMAC Towers by Paramount Hotels & Resorts Dubai is clad by a variety of Guardian Glass coated solutions, helping achieve complex aesthetic and performance requirements



©Guardian Glass



©Guardian Glass

Better optical clarity and thermal insulation are the two key items in future glass innovations

■ **Please brief on limitations of having complete glass walls, considering UAE climatic conditions. Would you combine glass with other cladding materials for better performance and why?**

It really depends on the architect's vision. We have product options to overcome any climatic condition, and we have other options for combinations. Glass experts are continuously changing the way the world experiences glass. We strive to create solutions that are positive for people and the planet, and thus, some of our premium high selectivity and low-e glass products are especially tuned for performance, helping architects achieve their vision with climatic conditions as a non-obstacle.

■ **What are your views on the use of glass for contemporary façade & fenestration?**

The opportunities to push the boundaries of design have never been greater. We make it a priority to listen to customers, identify trends and challenge conventional wisdom to build trusted products in one of the world's most important industries. In contemporary fenestration, the right glass helps make any design vision possible, no matter how unusual or contemporary it is.

■ **Natural light is beneficial and is necessary, the heat energy inside the building has to be managed especially during summer. What are the factors affecting solar heat gain? Do share your views on light and heat management in buildings with glass façades.**

Architects and building owners want high performance coated glass products that deliver abundant natural light combined with energy savings and solar protection. Multi-functional glass coatings offer high selectivity solar protection on a neutral-looking glass for a wide range of applications such as fully glazed façades, roof glazing and large framed windows. This helps minimising the need for artificial lights, while offering excellent solar protection combined with outstanding thermal insulation.

■ **Please elaborate on performance of glass in acoustic insulation.**

Acoustic performance is measured in improved sound reduction performance to control environmental noise. A combination of double glazing and PVB

Guardian Glass is dedicated to being the accessible glass expert in the region, allowing our audiences to make better decisions and realise the full potential of the glass



©Guardian Glass

lamination helps increase the acoustic insulation quality of glass.

■ **Considering glass as a material in demand for façades, what should be the next in building intelligent futuristic façades?**

The future of glass façades depends on technology and architectural visions, and it is up to glass experts around the world to constantly innovate and keep up with the demand of society and architects, and lead in an innovative way.

We are always searching for what the future façade will look like, and a better viewing experience without sacrificing light or heat transmission is seeing a rise in demand. Consequently, new innovations like low-iron glass provide a truly crisp and brilliantly neutral appearance, making it the perfect choice for residential, architectural and specialty applications that really want to take a big step into the future.

Generally speaking, better optical clarity and thermal insulation are the two key items in future glass innovations.

■ **Have we cracked the need for energy-efficient glass, the one suitable for local conditions? Your take on this? Can glass as a façade material be matched to the need for carbon-neutral buildings with eco-friendly features?**

Glass experts always look for ways to help architects on reducing a development's carbon footprint and earning LEED points by innovating coated solutions that fulfil the requirements of the most demanding architects, providing a striking appearance to their

projects while delivering comfort, functionality and energy savings.

■ **What is the awareness level of consumers on the terms such as solar shading, double-skin façades and ventilated façades?**

At the moment, there is a lot of room for educating glass enthusiasts ranging from engineering or architecture students in universities, to homeowners, and all the way to glass processors and seasoned architects alike. Guardian Glass is dedicated to being the accessible glass expert in the region, allowing our audiences to make better decisions and realise the full potential of glass. With our architectural glass workshops, we offer architects, processors and other interested parties insights on glass production and processing as well as a general overview of glass basics, products and their applications.

■ **Has the UAE Fire & Life Safety Code of Practice-2018 affected your work?**

We fully support the UAE's initiatives and continued dedication to ensuring the highest standards of safety and environmental practices. These have been and will remain our utmost priority.

For effective fenestration, an experience of total integration for its inhabitants is key



The right glass helps make any design vision possible, no matter how unusual or contemporary it is





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INDUSTRY SPEAKS

Glass - A Material of Future



Bruno Mauvernay
Chief Operating Officer,
Saint-Gobain Glass Exprover

Bruno Mauvernay is the Chief Operating Officer of Saint-Gobain Glass Exprover. Created in 1962, Glass Exprover is Saint-Gobain Glass' export business unit. Glass Exprover provides the full Saint-Gobain Flat Glass range of both basic glass and processed products, coming from the group's different factories worldwide. Having completed his PhD on infrared detection, Bruno Mauvernay started his career in Saint-Gobain group as a Research Engineer, he was in charge of solar control glazing product development. After a few years, he joined the central marketing team and is still working closely with the research department. He served different positions at European and worldwide level. In 2017, he became North America Sales Director and participated actively in the development of this market.

Saint-Gobain founded in 1665, has developed into providing high performing and innovative glass solutions: products, services and systems, helping to create great living places and improve daily life.

In an interview with Window & Façade Magazine, Mauvernay shared his views on the scenario of glass industry in the Middle East. He also talked about the plans of Saint-Gobain for the coming years. Here are the excerpts from the interview...

■ **Please elaborate on the innovations you have made in latest architectural projects you have undertaken?**

We feel privileged to be part of an industry which challenges us daily to deliver improved performance, design and service. We play our part in designing some of the world's most iconic architectural projects, offering a wide range of innovative glazing solutions for façades.

One of our projects is Quai Ouest, located in a busy road in Paris suburbs and is highly exposed to traffic noise. Major restructuring and renovation works have been undertaken and the building has now a Saint-Gobain Double Skin Façade with Contour Stadip Protect solar. This way, Quai Ouest is now a part of the modern architectural landscape with its wide façade of 150 meters and also provides better acoustic and thermal comforts for its occupants. High performances which have led to the triple certification: HQE Excellent, BREEAM Very Good and BBC-Energie Renovation.

Producing and installing over length glass panels with formats from 6 up to 18 x 3.21 meters are now possible. It opens up entirely new creative possibilities for construction actors who dream big. The Edgar N. Putman Event Pavilion is a contemporary, light-filled space, surrounded by views of the Michener Art Museum galleries. Located in Pennsylvania, in the USA, it was designed by

Quai Ouest Paris, 2017
Architect: Brenac & Gonzalez Architects



the internationally recognised Philadelphia-based architecture firm Kieran Timberlake. Saint-Gobain supplied SGG overlength glass panels, of 7 meters high. This custom made glass panels were designed to create a thin transparent wall with minimal joints. In other words, resulting in increased levels of more daylight, less restricted views and less construction.

Michener Art Museum's glass pavilion
Architect: Kieran Timberlake



■ **What are the latest technologies in glass that are developed through your R&D development center?**

Designing innovative, high performance products and solutions to improve our habitat and everyday life is at the heart of Saint-Gobain's strategy. This is a responsibility for the Group's teams, as well as a major source of motivation. Through their innovations, the teams contribute to reducing the environmental impacts of buildings, processes and the development of new high-performance solutions. In the glass segment, Saint-Gobain has moved forward with the improvement of its COOL-LITE SKN® range to achieve the neutrality & grey appearance while keeping its superior thermal and solar control properties. COOL-LITE SKN 133 II, COOL-LITE SKN 183 II, COOL-LITE XTREME 70/33 II are the latest "to be toughened or heat strengthened" products that need to be insulated in a double-glazed unit (coating on face 2).

■ **What strategies is Saint-Gobain implementing to ensure continuous product development?**

The materials science, the industrial processes understanding and the implementation of relevant tests to validate and optimise the performance of products in their end application play an integral part in our expertise. We focus on what our customers

want, we develop with them and for them the most adapted solutions at each step of the research project. New scientific profiles join our team in research centers: designers, data scientists, and sociologist. They bring new approach such as design thinking, new product development, systems and services. As these aspects truly matters to Saint-Gobain, we keep on promoting awareness and training teams in R&D and marketing to the importance of eco-innovation. During the entire course of the project, we highly consider the development of new sustainable solutions and improvement of existing solutions in areas such as health and well-being, energy and climate, water, resources and circular economy.

■ **What are Saint-Gobain's future expansion plans?**

Saint-Gobain increases its production capacity in emerging countries. The group opened a new flat glass production line on January 2019 in India located in near Chennai, at a ceremony attended by Pierre-André de Chalendar, the CEO of Saint-Gobain. This new state-of-the-art facility was built within the Saint-Gobain World Glass Complex, a 70-hectare industrial site which already includes two floats, two coaters, advanced glass processing units for the construction industry, fire safety and the automotive industry (Sekurit), as well as a mirror line.

In Saltillo, Mexico, a new flat glass (float) production line is being built. This plant, scheduled to come on stream at the beginning of 2020, will manufacture glass for the automotive and construction sectors. It will meet the growing domestic demand and supply Central America, the Caribbean and North America. It will complement its manufacturing base in the region with the Cuautla site, which was inaugurated earlier this year, the first jumbo coater of Saint-Gobain in Mexico.

In Colombia, Vidrio Andino will build a new float to meet growing demand of glass in this region. The float will be located near the city of Barranquilla, on the Caribbean Sea, and will offer a solid manufacturing base for domestic and export markets. Initial production is planned for 2021. Saint-Gobain is already operating one float in Colombia, in Soacha, near Bogota. All these investments are in line with the group's strategy of expanding its presence in emerging countries and an excellent opportunity to consolidate and strengthen Saint-Gobain's long-term position in these regions.

■ **What do you see as the main challenges faced by your industry?**

In a context of climate change, rapid urbanisation and high demographic growth, the glass industry needs to invest to find new ways to use glass, make new products, better recycling, better the energy efficiencies of the producing sites and improve the



overall performance across the product life cycle. Saint-Gobain, for a long time, has been committed to limiting the effects of climate change through its solutions.

These are very important to ensure competitiveness in the region and to satisfy the needs of the consumers in terms of quality, performance, design and environment friendly materials. Building regulations are in place in most of the region, however in some places they need to be implemented effectively.

■ **What are the changes have you seen in façade designing over the years in terms of role of glass?**

With the development of high performance glass solutions, architects and consultants could use glass for designing curtain walls fully glazed while ensuring a high level of comfort. The glass has then become a major element of the building aesthetics. Puled by regulations and industry innovation, all the different aspects of the comfort inside the building were considered when choosing the glass, including visual, thermal and acoustic comforts. Over the years, its role has been expanded to include more aspects of the building design.

In contemporary architecture, transparent building envelopes have become increasingly popular, and over length panes support this creative feature particularly effectively. Over length from Saint-Gobain is the new glazing range up to 18m in length and 3.21m wide. We also have dynamic glass (SAGEGLASS) being widely used and popular among the architects, which can change its tint and solar factor depending on the lux levels outside, eliminating the use of blinds and helping you enjoy the view!

■ **What is your view on the future façade and fenestration technologies?**

Today's architects and builders are increasingly focused on how to create structures that have less impact on the natural environment. One of the trends is climate-responsive architecture which is a design practice centered on creating buildings that function in lockstep with the local climate, not in spite of it. The goal of climate-responsive architecture is to create a comfortable interior while reducing the building's reliance on artificial energy. The design utilises data on the region's weather patterns and accounts for factors like seasonality, intensity of the sun, wind, rainfall and humidity.

The building envelope is an important mediator between the indoor and outdoor conditions. Envelopes in different climate zones require different assemblies to minimise unwanted energy loss. Smart glazing systems, offer opportunities to further the practice. SAGEGLASS - our electrochromic glass actively controls how much solar light and heat

transfer into an interior space.

■ **How to you see the scope and usage of glass in the Middle East?**

The construction market is still performing in the region, especially in the United Arab Emirates. The growth in the sector is at a high level as the demand is improving in the perspective of Expo 2020. The Dubai government invested in infrastructures to welcome this very special event. Architectural projects are under construction and require large quantity of glass. Glass is a material which is appreciated by architects in the region because of the various aesthetics and high performances it provides.

■ **Is the glass industry in the UAE / Middle East bound by any rules & regulations?**

In order to tend towards more sustainable buildings, regulation has been put in place in the UAE through certification programs. There are three main programs implemented: ESTIDAMA in Abu Dhabi, Al'Safat in Dubai and the newly launched Barjeel in Ras Al Khaimah. These programs ensure that a minimum set of specifications and guidelines are used for the buildings. In the case of the building envelope, it has implemented requirements on its thermal performance. As a consequence for the glass industry, builders have to use high performing glass and suppliers had to develop specific solutions to meet these requirements. These green building regulations have pulled the market towards the high added value products and solutions.

■ **What is your advice for young and upcoming architects?**

Use more and more glass, of course! Glass is a beautiful green building material and it is also the material of the future. The possibilities with glass are numerous, it is a key element in architecture and buildings. Glass transmits, reflects and absorbs light; making it the only building material which can be transparent, translucent and also a structural element.



INDUSTRY SPEAKS

“We are Dedicated to Drive Innovation Throughout the Middle East”



Rizwanulla Khan
Executive President,
Emirates Glass LLC,
Saudi American Glass and LumiGlass Industries

Rizwanulla Khan, a name synonymous to the Glass industry in the Middle East, is the Executive President of Emirates Glass LLC, Saudi American Glass and LumiGlass Industries. He joined the company on 20th September, 2005 as Senior Vice President - Manufacturing & Operations at Glass LLC. Since assuming the Executive President position for three glass subsidiaries on 23rd December, 2013, Rizwanulla Khan has been responsible for the company's overall vision, strategy and financial objectives. In his current role, Rizwanulla is a key architect of the company's long-term strategic plan, which is focused on increasing geographic penetration in the global and regional glass industry and delivering sustainable, long-term, profitable growth. The strategy includes prioritizing resources to the most promising opportunities by creating cost efficiencies. A loving and caring leader, who has inspired hundreds to perform and achieve results; under his leadership, the company's growth has delivered record sales and profits.

In conversation with the team of Window & Façade Magazine, Khan shared the journey of Emirates Glass and what they are planning to achieve in near future. Here are the excerpts...

■ **Please brief us on the history and objective behind the formation of your company?**

Emirates Glass was established in 1997 by Mr. Khalid Bin Kalban to become the leading provider of energy efficient architectural glass in the Middle East. Since its inception the company has been an integral part of Dubai's growth and evolution, having supplied glazing and expertise for many of the most iconic buildings across the city. However, Emirates Glass has also expanded its international presence and we are proud to have supplied our solutions to GCC countries such as Saudi Arabia, Oman and Kuwait, but also to Azerbaijan, Turkey, India, Sri Lanka, Pakistan, Bangladesh, East and South Africa and even Canada.

Building an impressive project portfolio is only possible with a focus on downstream proximity - meaning, Emirates Glass has always tried to stay close to the market and listen to what consultants, architects and developers need. This, in combination with our international and experienced team, has helped us to develop new products, coatings, methods, work procedures and processing techniques over the past 20+ years.

■ **Please highlight briefly about your products.**

Our product range includes more than 400 different and in-house developed performance coatings, from hard and solar control coatings to low-emissivity single and double silver coatings across the entire colour spectrum to meet even the most challenging requirements we receive from consultants and architects in terms of performance and aesthetics. Other than that Emirates Glass produces a wide array of double or triple glazed insulating glass units,

safety, bullet-resistant and otherwise laminated glass, non-rectangular and bent elements - or a combination of any of the above. Some more special products include glazing units with captured or suspended aesthetical or performance-enhancing elements such as honeycomb diffusers, metal and synthetic meshes or mashrabiya inserts to reflect our local heritage and ability to integrate traditional elements in modern and contemporary architecture.

■ **Where are your products manufactured?**

All of our products are developed and manufactured locally here in the UAE. Within our group of companies, we combine the entire supply and value chain of glass - from raw glass manufacturing in Abu Dhabi, over coating in Dubai Investment Park, to processing, laminating and fabrication of insulating glass units in Al Quoz. Having all of this under one roof is absolutely unique in the region.

■ **Could you please tell us about a few of your latest prestigious projects and the innovations you have made?**

Emirates Glass is currently providing ARMAX, our very own anti-reflective coated glass to the Emaar SkyView. The walls of the so-called SkyWalk, a cantilever walkway that extends out of one of the towers more than 50 floors above ground, are made entirely out of our anti-reflective glass. The main purpose is to allow visitors an omnidirectional view of Dubai's skyline with minimal reflections from the glazing - that should be quite the experience!

Some other iconic buildings of 2018 dressed in or equipped with our products include the Kuwait Ministries Building Complex, the RTA headquarter

Heydar Aliyev Cultural Center, Azerbaijan





Yas Villas,
Abu Dhabi



Kuwait Ministries
Complex, Kuwait

in Dubai, a total of 1617 villas in Yas Acres and Yas West Villas, the Masdar Neighbourhood and Mayan buildings and the Fairmont Hotel in Abu Dhabi.

■ **What are the advantages Emirates Glass has over its competitors?**

First and foremost - being 'local' also means being geographically close to our customers and their projects which means being able to provide immediate personal support during design and construction periods but also shortest turnaround and lead times as well as delivery. Secondly, and as mentioned above, we are providing glass solutions as a one-stop-shop, so our customers have a single point of contact for every element used and every production step taken. This eliminates the oftentimes frustrating search for a responsible party should any of our customers face issues with the products supplied. Lastly, Emirates Glass is a home-grown UAE company, so everything made and supplied by us is a contribution to the local economy and industrial landscape of what we all call our home.

■ **Please elaborate on the Glass and Glazing Federation's International Architectural Glass Conference. How has the same helped Emirates Glass to become a center of learning and innovation within the Middle East region?**

The Glass and Glazing Federation, or GGF, is an internationally respected body of glass experts; being part of the GGF reflects our engagement in the architecture and glass ecosystem and also helps us to remain on top of industry trends, technical novelties and topical issues.

Being able to integrate technological advancements from Europe or the United States in our local production is a way for us to demonstrate regional thought leadership. In today's economy, it is imperative to facilitate knowledge transfer to all of our benefit - in the end, every improvement helps to reduce carbon emissions, make our homes and workplaces safer, more efficient and environmentally friendly and most of all comfortable.

EGL - Terra G Coater in DIP, Dubai





Irena Headquarters,
Abu Dhabi

©Shutterstock

Within the construction and façade industry, the GGF provides a fantastic forum to mingle and connect with likeminded professionals, but also showcase, share and discuss latest advancements. We take pride in conducting ‘Lunch & Learn’ sessions and factory tours not just for industry peers, designers, consultants, architects, aluminium subcontractors and end users, but also students and our next generation, regardless of which industry.

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

First of all, even the greatest challenges provide opportunities. In short, the main challenges are not cyclic economic downturns or fluctuations in order volumes - the main challenges these days are technical or physical limitations and finding ways to push the boundaries of what is possible with glazing and within the construction industry as a whole. Challenges should always be considered a positive sign of change. We have to realise that we are challenged to come up with a better value proposition - a challenge is a call to develop something new, something better, something with better thermal, acoustic and safety performance, improved optical appearance and enhanced durability.

Among the most apparent challenges is always selectivity; in simplified terms, selectivity describes the difference between visible light and heat - and this is particularly important in the Middle East. While developing and refining our performance coatings, we constantly have to ask ourselves ‘how can our glazing provide as much natural light as possible to interior spaces while keeping most of the heat outside?’ Over the years coatings have evolved from solar control and hard coatings to low emissivity coatings to single and multi-layer silver coatings. Each evolutionary step felt like the answer to the time’s specific challenge, but we will remain on the forefront and be among the first that will take the next evolutionary step.



Saraya Twin Towers,
Dubai

©Emirates Glass

■ **What were the biggest milestones for 2018?**

For the first time in company history Emirates Glass has produced more than 431,000 m² of not only standard, but highly complex and oversized insulated glass units over the year. This is a statement of our growth and continuous improvement of our production capabilities and efficiency.

To underline this trajectory, 2018 was also the year in which we started the construction works for the expansion of our facility's warehouse to make Emirates Glass more flexible and able to accommodate larger stock of our most popular coatings and some of the more exotic ones. This will further have a positive impact on work-in-progress and throughput, and with this the ability to better serve our expanding markets.

■ **Where do you see your company in 2020?**

Looking forward, Emirates Glass will further expand its footprint across the GCC and the Middle Eastern region. By 2020 we aim to be the preferred glazing supplier in at least three more countries, with a wide range of products fulfilling the current and upcoming green building regulations. Of course we will continue to focus on the development of energy efficient glass solutions and special products that will further transform the landscape from regular buildings to pieces of art and architectural ingenuity. We are committed and dedicated to drive innovation throughout the Middle East and beyond and strive to be even closer to the creative minds within architecture firms, while improving our service to customers and maintaining steady and stable growth.

Emirates Tower, Dubai



PRODUCT WATCH

dormakaba Introduces Argus Sensor Barriers

dormakaba's newly launched Argus sensor barriers give more freedom in form of colour and function. They combine the options of a modern access system in the supervised area in three models. From short basic versions to exquisite objects with sophisticated sensors, they offer a wide range of functions.

This new variety is expressed in the modular design elements: with a wide range of colours and materials for handrails, side and profile parts as well as drives and door leaves, previously unimagined design possibilities are opened up. Versatile aluminum as the basic material shows the way here. Argus sensor barriers from dormakaba blend harmoniously into any reception room: as a modern addition to a concept, as a discreet functional unit or as a self-confident statement.

Accessibility is already taken into account in the Argus sensor barriers. The models can be ordered in passage widths of 650 mm, 900 mm and 1,000 mm. In addition to the corresponding door leaf width, the sensor system also adapts to the respective dimensions with full functionality. An easy-to-understand user guidance system with optional chaser lights in the handrail and coloured light

signals directly on the card reader ensures a high level of convenience.

The simple installation of components, such as readers, in the Argus sensor barriers facilitates their integration into various security and access concepts and structures. The surfaces can also be modified and thus adapt to any changes in the architecture on request. The new Argus sensor barriers follow the XEA design concept and fit perfectly into dormakaba's current product portfolio. Thus, they open a broad offer for the style-safe entrance.

dormakaba's Argus sensor barriers, in XEA design language, combine both form and function. Argus' sleek body with straight lines and geometric corner radii form a single unit with glass doors that appear weightless; the colours, surfaces and operating elements render a uniform look, which can be adapted to any architecture with several variations - all seamlessly integrated with German technology. The design remains subtle, despite maximum stability.

For more enquiries contact: **info.mea@dormakaba.com** or visit: www.dormakaba.com/MEA, <https://www.argus-innovations.com/>.



Argus strikes the right note with to match varying interior aesthetics



Argus protects without restricting

PRODUCT WATCH

HIET Unveils Diamon-Fusion to Cut Maintenance Cost by 50%

HIET's newly launched Diamon-Fusion is an optically clear, protective coating that transforms ordinary glass surface into a high-performing, water-repellent surface. By filling in the microscopic peaks and valleys of the surface, Diamon-Fusion creates an ultra-thin, invisible barrier that protects surfaces from stains, corrosion, and other environmental pollutants.

Just like a non-stick cooking pan makes cleaning easier and less frequent, Diamon-Fusion reduces cleaning time and the frequency of cleanings cutting the maintenance costs by up to 50%.

When applied to exterior glazing, Diamon-Fusion protects against water stains, concrete leaching, air conditioning runoff, and other environmental damage. As a result, glass replacement can be avoided,

potentially saving thousands of dollars in time, labor and resources.

Diamon-Fusion is the first hydrophobic coating company to have its products specifically reviewed for compliance in association with USGBC's LEED rating system. The coatings reduce the frequency of maintenance, prevent glass replacement and optimise building energy efficiencies. Diamon-Fusion can contribute to LEED v4 and v4.1 BD+C: New Construction - EA Credit Renewable Energy Production. In addition, Diamon-Fusion with a Health Product Declaration (HPD) contributes one point for LEED v4 and v4.1 BD+C: New Construction - MR Credit Building Product Disclosure and Optimisation - Material Ingredients.

For more enquiries, visit: www.hiet-me.com.



Hydrophobic effect created on the glass after application of DFI



Villa with glass treated by DFI

BUZZ

First Schüco Customer Opens Showroom in Dubai



Inauguration ceremony of Petra AMM's Schüco's showroom

Petra AMM (PetraGulf), one of Schüco approved fabricators in UAE, has opened a new Schüco showroom in its Dubai National Industrial Park Offices, near the Al Maktoum Airport/Dubai. It is the first permanent Schüco showroom in UAE.

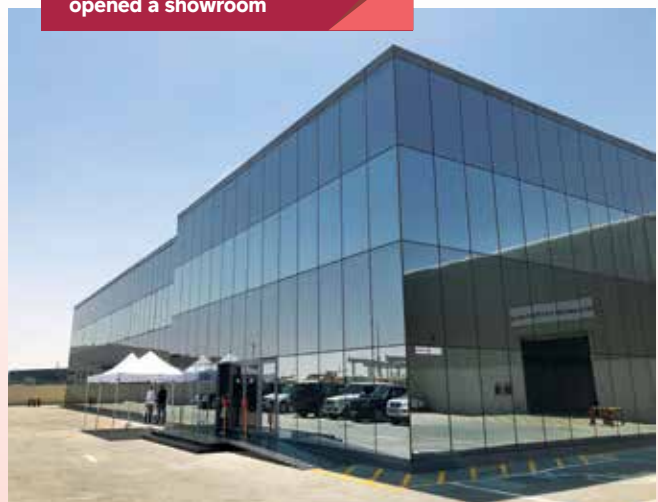
The showroom was inaugurated by Dr. Jörg Westphal, Executive Senior Vice President of Schüco International KG Germany in the presence of Mohammad Ramzi Shegem, General Manager of Petra AMM, and Ammar Alul, Managing Director of Schüco Middle East. The celebration was attended by consultants, architects, contractors, clients and suppliers.

At the opening Dr Jörg Westphal described the showroom as a “touch and feel place” especially for B2C customers/residential sector, as in our modern world of gadgets it is still very important to see and touch things. He hopes for a boost in the residential sector business, as those customers will understand what it means to purchase a high end product and to receive value for money.

In addition, the showroom is the second home

to all the architects, investors and all the people interested in Schüco and aims at continuing the growth and success of Schüco. Dr. Westphal thanked Petra AMM (PetraGulf) for their investment and effort to support Schüco.

Schüco customer in UAE opened a showroom



BUZZ

Emirates Glass Hosts the International Architectural Glass Conference

Emirates Glass, a subsidiary of Dubai Investments PJSC and one of the largest processors of flat architectural glass in the Middle East, has hosted the annual International Architectural Glass Conference at Dubai Investments House. The event was held in cooperation with the Glass and Glazing Federation MENA region (GGF). Industry experts and speakers from a range of international firms from the US, UK, Europe marked their presence and over 130 delegates participated in the conference. The conference provided an open forum of dialogue and discussion that gave glass professionals insight into a number of important industry topics including lessons from the Grenfell Tower fire tragedy, security glazing, and acoustic glazing.

One of the sessions focused on the causes and lessons learned from the Grenfell Tower fire in 2017. Other sessions were on the performance of laminated glass, sealant compatibility, adhesive backed polymeric film design and anisotropy.

Rizwanulla Khan, Executive President of Emirates Glass, said: "The International Architectural Glass Conference in Dubai is a unique event that provides an open forum of dialogue and discussion for the audience. The goal is to have all stakeholders, including architects, consultants, glass processors,

aluminium fabricators, and suppliers disseminate information and knowledge gathered from years of research and hands-on experience. The platform not only deliberates on current issues that the industry is confronted with but also lays the groundwork for the future by exploring innovations that are imperative for the glass industry to thrive in the Middle East and beyond."

Pascoal DSilva, Chairman of GGF - MENA region and Quality & Technical Manager at Gulf Glass Industries Co. LLC, said: "GGF has accumulated data over nearly 40 years from their successes and failures in the glass and glazing sector. This is the only technical conference that dissects the issues faced by GGF and gives architects, consultants, contractors, glaziers, and glass processors in the MENA region comprehensive and tried and tested information to launch from with rather than start from scratch."

Other topics covered in the conference were: safety and security glazing in the region, the increased use of laminated glass in the MENA region, the effects of acoustic pollution, new developments in silicone sealant glazing design and on anisotropy of heat-treated glass, and the benefit to energy sustainability presented by retrofit films.



Russell Day, Glass and Glazing Federation, discusses 'Grenfell Tower fire - Causes and Lessons Learned'

BUZZ

ISO Chemie Launches New 3D BIM Service



ISO Chemie - a foam tape sealing company, has announced the launch of new 3D BIM (Building Information Modelling) technology. This new 3D BIM service will help the architects and designers to integrate high quality scaled digital information around window and door sealing solutions as part of their 3D visualisations and client presentations.

Product information and specification data from the company's joint sealing tapes, multi-function joint sealing tapes and in-front-of-wall installation systems such as Winframer will be available initially for downloading free as BIM-ready items via www.portal.iso-chemie.eu, an external database.

It can also be used in CAD software such as 'Autodesk Revit', while an electronic CAD product catalogue will be available as a supplement to this as more products are at the planning stage.

The new service will facilitate the planning, delivery and management of window and door design

and installations using a common data model for all participants. All the relevant building data is digitally recorded, combined and interlinked in a model.

Andy Swift, ISO Chemie's UK national sales manager, said that the scope of 3D BIM is expected to expand as the service gains traction among existing and new customers.

"It is important that clear information is made available to those involved in the fenestration design, specification and supply sectors. Linking this to the 3D visualisation of plans and drawings delivers new levels of accuracy. If a window needs replacing in the future, it will be clearly identifiable which products were originally used and the affected component connections. Renovation and refurbishment projects can therefore be planned more efficiently and carried out under controlled conditions," said Swift.

Gulf Glass Industry Expo to be Held in Dubai in September, 2019

Gulf Glass, one of the leading glass industry events in the Middle East, will be held in Dubai at the Dubai World Trade Centre this September alongside Windows, Doors & Façades (WDF) event. Both the exhibitions will run in parallel, providing industry professionals a unique platform to source innovative products from around the world, discover the latest technologies, network and learn, said the organisers dmg events.

The well-known brands including Saint Gobain, BDF Industries, Henry F. Teichmann, Horn Glass Industries, Bucher Emhart Glass, BASF, Forma Glass, and Lizmontagens have already confirmed their participation, they stated.

The demand for green buildings, solar technologies, and eco-friendly façades innovations for both

new and retrofit projects in the Middle East are opening a wealth of opportunities to both local and international manufacturers across the glass, windows, doors and façades industries, says Muhammed Kazi (Portfolio Event Director at dmg events).

"In 2019, over 11,000 participants are expected to meet in Dubai at the Gulf Glass and the co-located WDF, where more than 300 exhibiting brands will showcase their products," he added.

Dr Elmira Ryabova, President, CEO, CTO and founder of the California-based Advenira Entreprises, is one of the confirmed speakers at Gulf Glass. She will present a workshop on "Non-metallic Solar Heat Control Coating for Automotive and Architectural Glass".

BUZZ

National Aluminium Genco's Ajman Hub Ensuring Fire-Proof Façade

UAE's National Aluminium Genco has been adopting the highest standards to ensure the steel and Aluminium panels it supplies to vital projects backed by the likes of Dubai Municipality are of the highest caliber. National Aluminium Genco is a subsidiary of the UAE's Genco Group of Companies. The company's factory is located in Ajman and is equipped with efficient machinery and dedicated workers, this base fabricates steel and Aluminium cladding that is delivered to construction sites in the UAE, as well as Africa, and Russia among others.

Expressing his views Syed Nasir, National Aluminium Genco's, Commercial Manager and the man in charge of quality, health, safety, and the environment (QHSE) said, "Fire safety here falls into two categories: products and people. The company's internal policy sets this out clearly- it states that safety will never be sacrificed for industrial progress or profitability, safety is integral. We follow the Dubai Civil Defence (DCD) regulations and Fire safety is an important part of the orientation for new employees, and regular fire safety risk assessments are carried out to "illuminate or isolate" potential hazards. If we identify anything that could become a risk,

we eliminate it. Our approach is to eliminate any fire hazards to make sure our factory is safe and secure".

When it comes to ensuring the steel and Aluminium is fireproof, the company's commitment is similarly unwavering. All new products undergo testing at the Dubai Central Laboratory, which is run by the Dubai Municipality, and the business boasts of other rigorous tests to ensure compliance with government regulations. The company did, however, face a challenge when major façades and cladding changes had to be made, following the roll out of the UAE's updated Fire and Life Safety Code in 2018.

Nasir also added that "the Fire Safety Code has increased our material costs, but by using new materials, the entire façade is more protected, so fires do not propagate to other floors. By doing it this way, we are reducing the risk of fire propagation. It is very important to fireproof Aluminium façades because if you look at the total envelope of a building in Dubai, it is mainly covered in façade items. If you do not cover it with fireproof materials it will burn quickly. This is why it is very important to use the best materials".



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