WHITE ALUMINIUM
glass processing














REFLECTING ARCHITECTURAL ACHIEVEMENT

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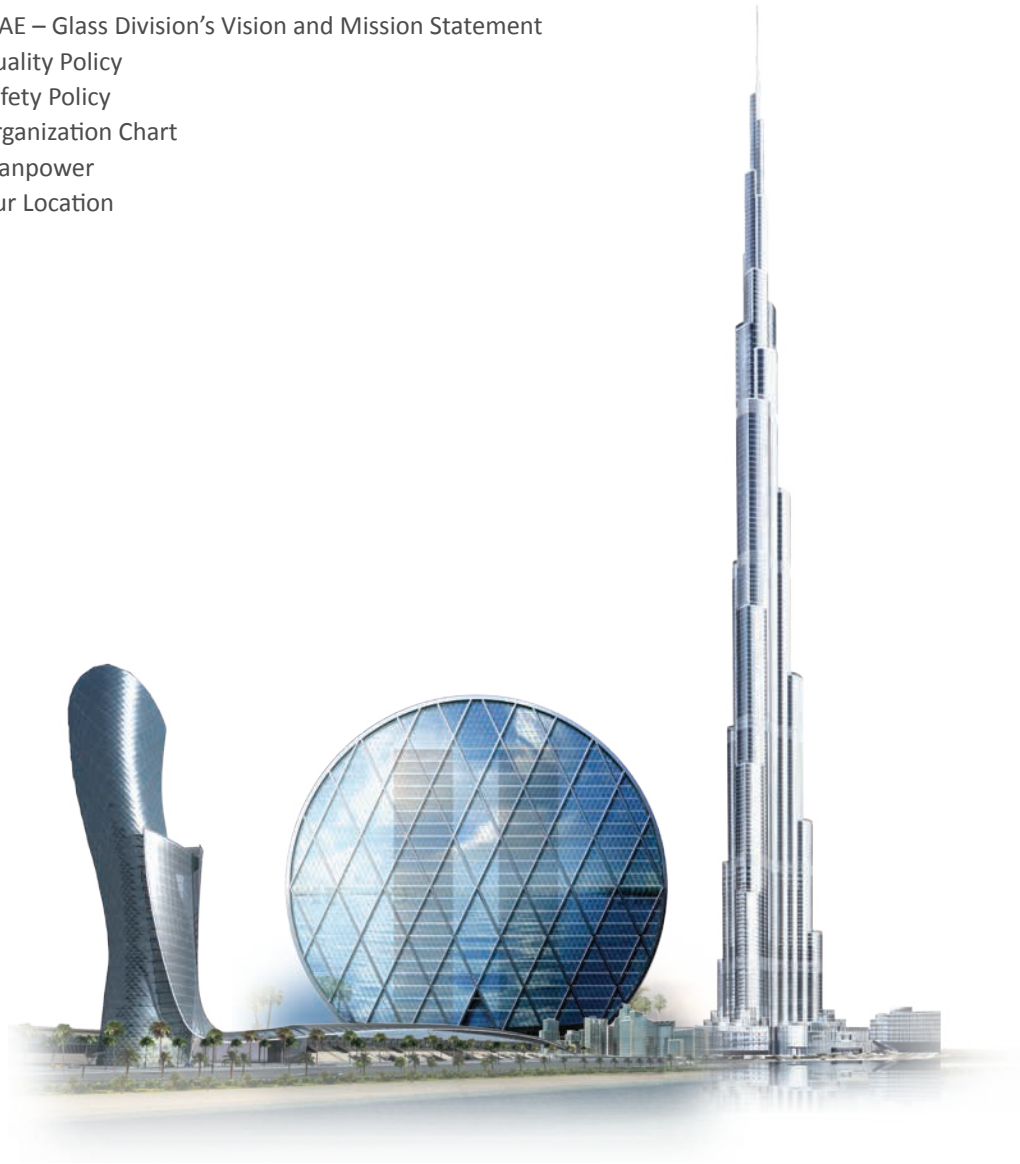
CHAPTER 1

White Aluminium Enterprises LLC - Glass Processing Division Company Profile



CHAPTER 1

White Aluminium Enterprises LLC - Glass Processing Company Profile

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1.01 The White Aluminium Group

White Aluminium Group is a success story that has been 35 years in the making and continues to be a key player in the UAE's construction market. White Aluminium Group was established in 1973 as one of the first aluminium and glass groups in the UA and has grown over the years into one of the leading companies in its sector offering a unique range of products and services. White Aluminium Groups' activities are summarized below:

1. **Distribution:** WA holds one of the largest stock in several locations throughout the UAE, of aluminium profiles, glass stock sheets hardware and many other items required by aluminium fabricators for the production of doors, windows, curtain walls, balustrades, etc.

2. **Coating:** WA Coating is a multiple line business unit offering coatings such as Polyester Powder Coating, PVDF (Kynar) Coating and exclusively the NATURALL Wooden Effect Technology primarily on aluminium profiles and sheets.

3. **Glass Processing:** One of the best equipped Glass Processing Units in the Middle East boasting a sizable capacity as well as iconic references such as BURJ KHALIFA, ALDAR HQ, CAPITAL GATE TOWER, etc. WA Glass processing supplies ready to install architectural glass units as per required project specifications.

4. **Automation:** One of the newer business units we have. We offer automatic sliding doors, sliding/swing gates, rolling shutters, garag doors and many other automated access products.

5. **Aluminium Kitchens:** We are the pioneers of the aluminium kitchen concept in the UAE and have always been many steps ahead of the market. We offer unique kitchen solutions of high quality and durability while combining beauty and elegance.

6. **WA Extrusion LLC:** WA Extrusion is a leading aluminium extruder serving the entire Middle East market. This is a 50:50 Joint Venture with Masharie LLC which is wholly owned by Dubai Investments.

7. **Architectural Aluminium Fabrication:** We provide turnkey solutions, design, fabrication and installation of doors, windows, curtain walls, balustrades, etc. With the resources available in WA Group, we can offer high quality fabricated products with superior performance.

White Aluminium built its early reputation as a reliable supplier of aluminium extrusions, coatings, hardware and glass products. Since its inception, White Aluminium took to carving out a name for itself - a name that is today synonymous with superior quality products, dedicated service and performance excellence.

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1.02 Glass Processing Division

White Aluminium Glass Processing is one the most equipped as well as most experienced glass processing units in the area. Our 20,000 m2 facility houses state of the art production lines sourced from the world leading suppliers in their field. Furthermore, our experienced staff at all level, follow a strict Quality Management System for which our company has become very well known for at local, regional and even international levels. This QMS setup has allowed us to be chosen as suppliers for High Performance glazing to iconic projects all over the area.

1.02.1 Our Markets

White Aluminium Enterprises LLC – Glass Processing Division has long dominated the supply of architectural glass products to the domestic market. With its recent expansions in production capacity and product range, WAE Glass Processing has set its sights beyond the UAE and is undertaking strategic measures to expand its reach. The company relies on its superior quality products, adherence to international standards and continuous product and process development to further its vision of becoming the region's leading, high-tech manufacturer and supplier of premium glass.

1.02.2 Our Production Process

White Aluminium Enterprises LLC - Glass Processing Division is considered to be the most advanced glass processor in the Middle East and North Africa, and has been consistently investing in sophisticated equipment and machinery from the most technologically advanced suppliers worldwide. The production capacities of these machines are just as impressive as their technology, thus enhancing the company's ability to mass-produce high quality glass units.

Today, White Aluminium Enterprises LLC - Glass Processing Division is categorized as one of the most high-tech glass processor in the region. White Aluminium's architectural glass products include:

- Optimized glass cutting
- CNC Edge Worked Glasses (Grinding, Beveling, Polishing, etc.)
- Tempered / Heat Strengthened Glass
- Heat Soak Tested Fully Tempered Glass
- Laminated Glasses
- High Performance Insulating Glass
- Decorative Glazing
- Spandrel Glazing
- Screen Printing (Ceramic Frit)
- Solar Control Glass
- Sand Blasted Glass (Plain and Designed)

White Aluminium Enterprises LLC - Glass Processing Division uses highly automated and technologically advanced machinery from the best suppliers around the world. Only proven, high quality raw materials go into the production of our wide product range.

1.02.3 WAE Glass Division's Vision and Mission Statement

Vision

- To maintain our position as a leading processor of architectural glass in the Middle East
- To enhance industry service and product offerings
- To export our products to other regional and global markets

Mission

- To continuously enhance our products and processes through the utilization of cutting-edge technology and innovative production techniques
- To emphasize on innovation and care for the environment in the corporate culture

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1.02.4 Quality Policy

It is the policy of White Aluminium Glass Processing Division to manufacture and deliver products to the highest quality levels and which confirm to the specified standards of quality reliability and performance with the best manufacturing techniques to ensure competitive advantage.

Our quality policy is committed to continual process improvement involving all employees with the objective of satisfying the needs of our customers while meeting our financial goals. The strength of this policy is based on:

- Full management commitment to communication of the policy to all employees
- Education and training of employees to assure active participation in the continual improvement of the quality system with emphasis on defect prevention.
- Internal Quality System Audits and timely corrective actions for system elements that are found to be "non-conforming"
- Periodic evaluation of the quality system to ensure efficiency and productivity.

Our Quality Objectives are:

- To meet or exceed Customer delivery expectations
- Usage of best raw material
- Quality checking at every stage
- Immediate action upon customer complaints
- Adoption of up to date know-how for the enhancement of performance

These quality policy and objectives are reviewed annually by top management and where deemed necessary will be amended and reissued. Previous versions of this policy are archived. This policy is available to relevant interested parties, upon reasonable request.

1.02.5 Environment, Health and Safety Policy

White Aluminium Enterprises LLC. – Glass Processing Division is categorized as one of the most high-tech glass processor in the region. WAE Glass Division aims not only to be known by the quality of its products but also aims to be known by its commitment to Health, Safety and Environment.

WAE Glass Processing recognizes that prioritizing the protection of the Environment, Health and Safety of all employees will not only result in the good image of the company but it will also increase the employee's morale which impacts the productivity, quality and efficiency.

Similarly, WAE Glass Processing must also do what is reasonable to avoid or to minimize any adverse environmental impacts from its activities, promote and adopt environmental sustainability initiatives.

WAE Glass Processing is committed to:

- Ensure that all legal compliance with OSHAD SF, National Government and International Bodies are achieved.
- Ensure that all workplaces, equipment, machineries and processes are safe and without risk to health.
- Ensure the access to basic facilities and health care to all employees.
- Ensure that all employees are competent to perform their duties by providing adequate Information, Instructions and Training with Practical and Theoretical Assessments.
- Ensure that all work processes are risk assessed in order to minimize or totally eliminate the hazards that exist in the workplace.
- Maintain all work equipment in a safe state and provide safe systems of work and a safe working environment to employees and all contractors who work in WAE.
- Make every effort to protect the environment, prevent pollution, minimize consumption of materials, promote reuse and recycling of wastes and adopt best practice on waste management.
- Strive to achieve continual improvement through implementation and review of the EHS management system and related performance.
- EHS Policy will be reviewed regularly at least annually and to be communicated to all production employees, staffs and persons working on its behalf, and make it available to interested parties.

The successful implementation of this policy requires the full support and active cooperation of all employees from Top Management to production workers.

WAE is committed to protect the Health and Safety of its employees, customers, visitors and the community at large and protect the physical environment in which the company activities are carried out.

Our Target:

- ZERO Lost Time Accidents
- Reduction in the accident or ill-health rate
- To have higher standard set by the Law
- To create a strong, positive safety culture

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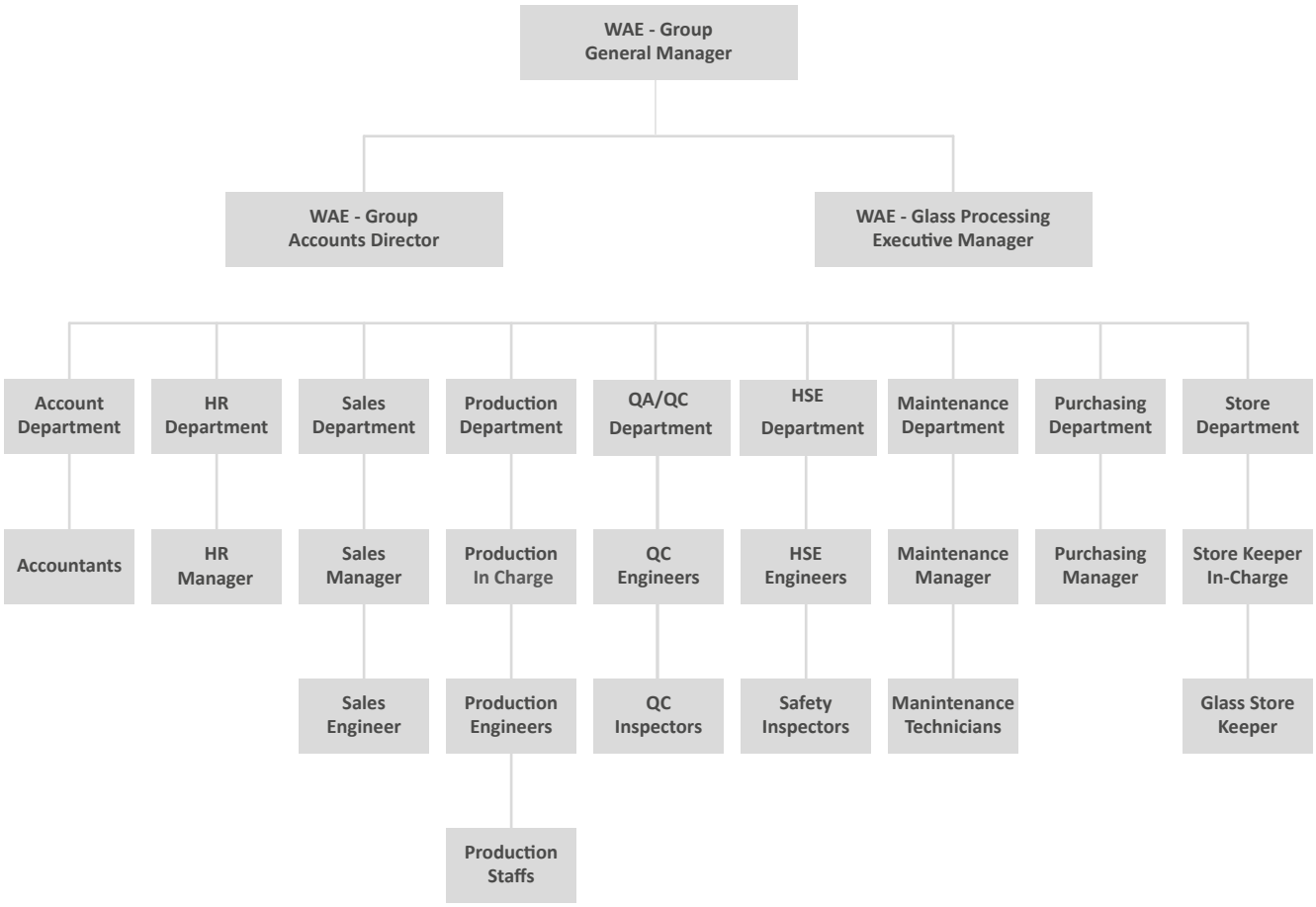
1.02.6 Organization Chart



1.02.7 Manpower

Division	Office Staff	Laborers	Total
Glass Division	71	205	276
Fabrication Division	50	225	275
Automation Division	11	19	30
Aluminium Extrusion	18	112	130
Kitchen Division	15	67	82
Commercial Division	25	210	235
TOTAL	**190**	**838**	**1,028**

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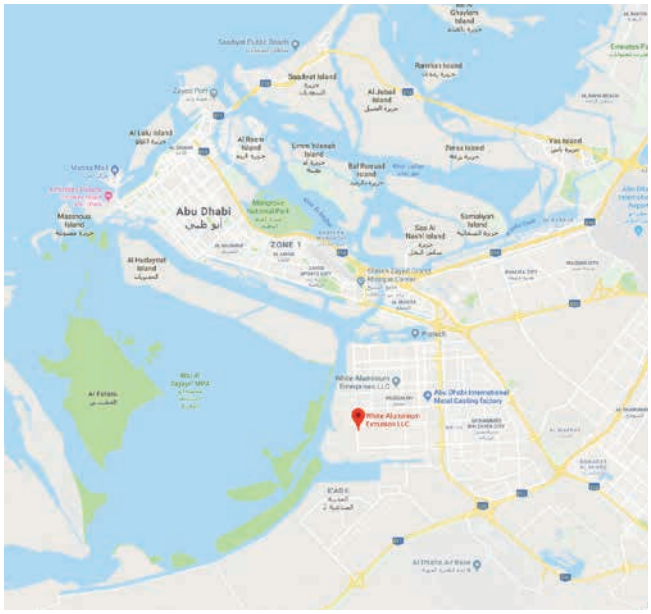
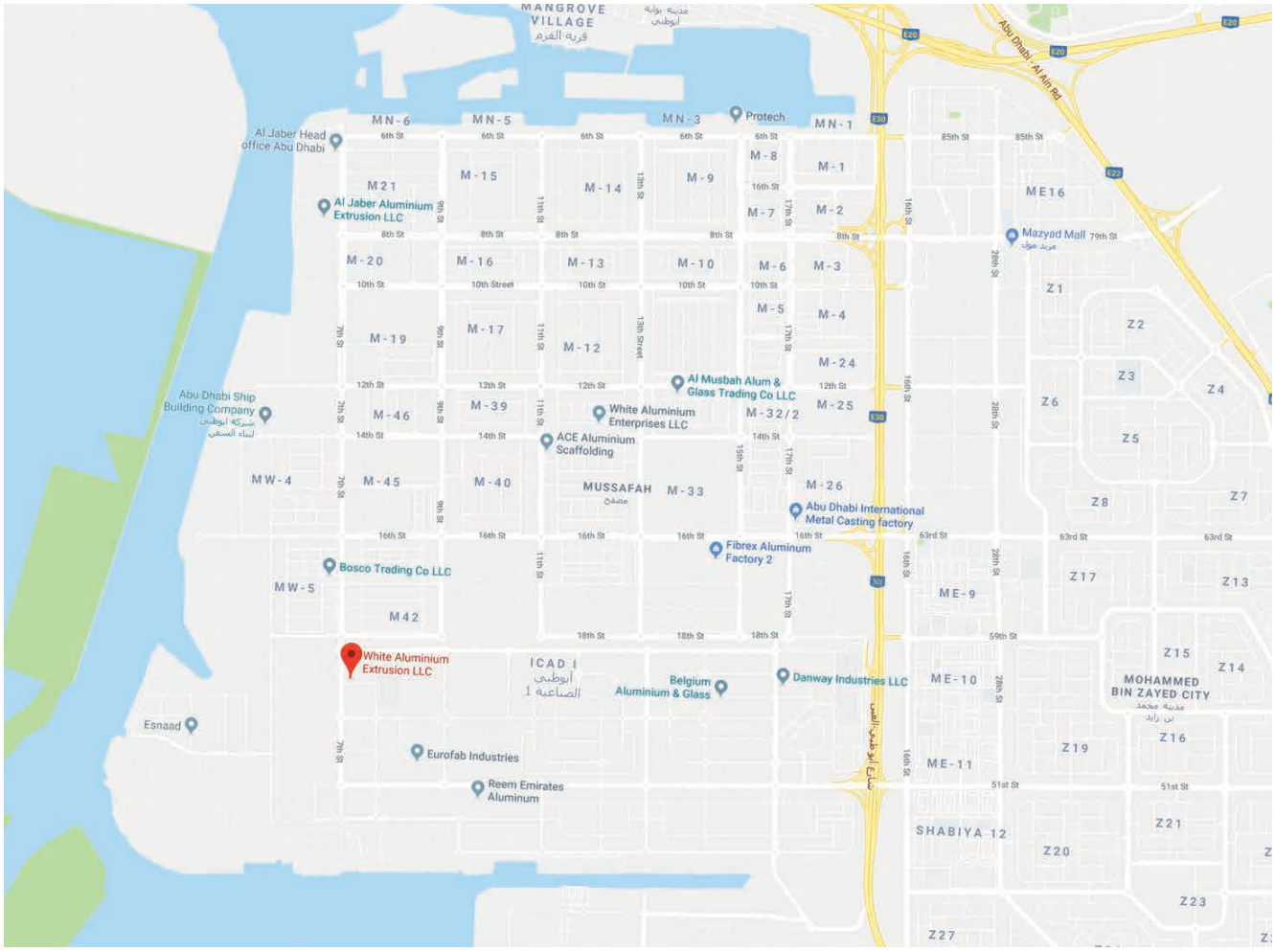
1.02.8 Our Location

United Arab Emirates





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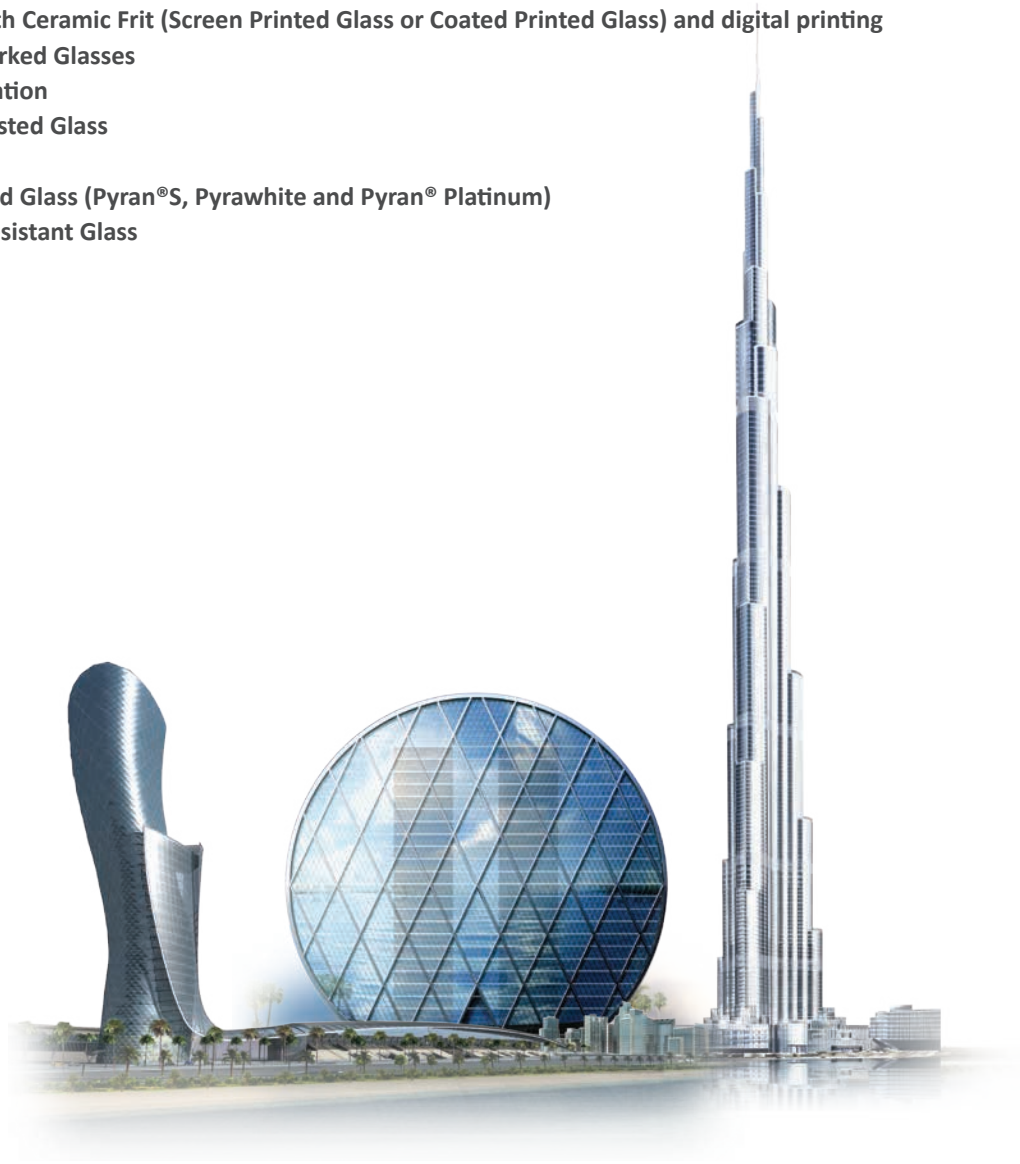
CHAPTER 2

Glass Processing Manual



CHAPTER 2

Glass Processing Manual

2.01 What is Glass?

Glass may be defined, physically, as a rigid, undercooled liquid having no definite melting point and a sufficiently high viscosity (greater than 1012 Pa s) to prevent crystallization; and chemically, as the union of the non-volatile inorganic oxides resulting from the decomposition and fusion of alkali and alkaline earth compounds, sand and other glass constituents, ending in a product with random atomic structure.
-Shreve's Chemical Process Industries, 5th Edition. Page 193

Flat glass used in buildings is a soda lime silicate obtained by melting the mixture at high temperature. Soda lime silicate glass is made up of:

- Silicate sand, which gives the glass its texture; it is known as the glass former or SiO2 network former.
- Calcium carbonate, used as a melting agent to lower the melting temperature of the silica and as a fining agent to homogenise the melting mixture and to eliminate bubbles.
- Lime, used as a stabilizer giving the glass its chemical resistance
- Fining agents, which are designed to agitate the melting mixture, thereby releasing glasses and standardising quality.
- Various metal oxides, which enhance the mechanical characteristics of the glass, its resistance to atmospheric agents and give it any colouring it might have.

2.01.1 Properties of Glass

Specific Gravity: Approximately 2.60.
2.40 ~ 2.80 (Table 2-118 Perry's Chemical Engineering Handbook, 7th Edition)
Density: 2,600 kg/m3
Young's Modulus (E): 70,000 N/mm2
Poisson's Ratio (v): 0.2
Softening Point: Approximately 600°C
Linear Expansion Coefficient (α): 9.10-6 m/(m.K)
Thermal Conductivity (λ): Approximately 1.05 W/m °C
Specific Heat Capacity (c): 720 J/(kg.K)
Thermal Transmittance (single glazed 4mm): 5.8 W/(m2.K)
Refractive Index: 1.52
Light Transmission (single glazed 4mm): 0.90
Normal Emissivity: 0.89

2.01.2 Float Glass

The float glass process was introduced in 1959. This unique glass making process revolutionized the flat glass industry. In the float process, molten glass from the furnace flows by gravity and displacement onto a bath of molten tin where a continuous ribbon is formed. This glass ribbon is pulled or drawn through the tin bath and upon exiting is guided on rollers through an annealing lehr where it is cooled, under controlled conditions, until it emerges at essentially room temperature.

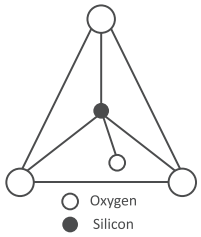


Figure 2.01.3 Molecular structure of glass

2.01.3 Tinted / Heat Absorbing Glass

Tinted or Heat Absorbing glass is made by adding various colorants to the normal, clear glass batch to create a desired color. The typical colors produced domestically include bronze, gray, dark grey, aquamarine, green, deep green, blue, deep blue and black. Visible light transmittance will vary from 14% to 85% depending on the color and thickness. The color density is also a function of thickness. As the thickness increases, visible light transmittance will decrease. Tinting increase the solar transmittance of glass and increases solar heat absorption. Because of this heat buildup, heat treating is sometimes required for tinted glass.

2.01.4 Coated Glass

As the demand for better performing glass products increased, flat glass products are coated with one or more coatings of inorganic materials to enhance its thermal and optical performance characteristics (solar factor, emissivity, colour, light transmission, light reflection, etc.).

Standard EN 1096-1 listed the various classes of coated glass according to their uses and properties:

Class A: Coated glass may be used either internally or externally
Class B: Coated glass may be used in monolithic form but the coated side must be inside the building
Class C: Coated glass may only be used in insulating glazing and must be on the spacer side

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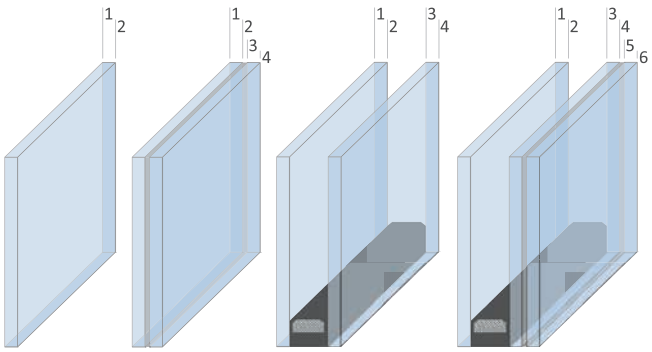
Class D: Coated glass may only be used in insulating glazing and must be on the spacer side.; The insulating glazing must be assembled directly after manufacture of the coating; There coatings are therefore not available in monolithic form.
Class S: Coated glass may be used internally or externally but only for certain well-defined applications (For example shop windows)

2.01.5 Glass Surface Numbers



(A) (B) (C) (D)

Note: From the figures above, surface 1 and 2 are from outer glass while surface 3 and above is in inner glass.

(A) Single Glass
(B) Laminated Glass
(C) Insulated Glass
(D) Insulated Glass with Inner Glass Laminated

2.01.6 Coated glasses

Flat glass is coated to enhance its thermal and optical performance in residential and commercial buildings. The flat glass can be categorized in to two based on the method it was coated.

Pyrolytic Deposition
Pyrolytic glass is produced by depositing a metallic oxide onto the glass surface during the float manufacturing process. The result is a series of reflective coatings that are hard and durable. Glasses coated on this manner are often referred to as 'hard-coated', because the coating is less susceptible to damage than with soft-coated glass

Vacuum Deposition
Vacuum deposition applies coatings to glass products in a large vacuum chamber. This method which is used to produce thin films and coatings in the off-line process is also referred
to as magnetron sputtering, which indicates the spraying on of a coating to a glass surface. When performed off the float-line, the glass passes through a series of vacuum chambers where metal oxide coatings are deposited onto the glass surface. The process works by passing an electrical current through ionized gas, thus bombarding the surface of a metal

cathode with ions. The atoms of the desired metal are vaporized and then deposited in a thin film on the surface of glass. Glasses coated on this manner are often referred to as 'soft-coated', because the coating is more susceptible to damage than with hard-coated glass

Vacuum deposition and pyrolytic deposition solar control coated products can be heat treated and fabricated into insulating units or laminated glass. Pyrolytic glasses can be used monolithically while the vacuum deposition low-E coated products cannot.

2.01.7 Low-E Glasses

All materials lose heat, but the rate differs from one material to another. The rate of heat loss depends on the surface emissivity of the material. Emissivity is defined as the rate of emitting (radiating) absorbed energy.

A perfect emitter of heat which is referred to as a black body has an emissivity of 1.0. Comparatively, ordinary clear glass has a surface emissivity level of around 0.89, meaning 89% of the absorbed heat is emitted from the surface. The lower the surface emissivity, the better the glass reduces heat gain or heat loss. For assessment purposes, heat gain or loss is measured in U-value (W/m2K) with the lower the number, the better the performance of the glass.

2.01.8 Approved Glass Suppliers

White Aluminium Enterprises LLC – Glass Processing Division (WAE-GLASS) only used the best quality glasses available in the market.

Equipped with top of the line machineries and equipments, White Aluminium Enterprises LLC – Glass Processing Division is able to process even the most sophisticated low-emissivity coated glass available on the marker right now. Below are

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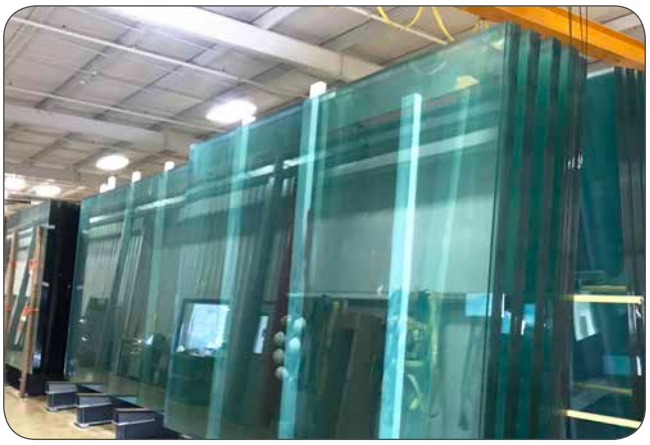
the approved glass suppliers being processed in WAE - Glass Processing Division:

Manufacturer	Country
GUARDIAN	Luxembourg, Europe
Cardinal® Company	United State of America
PILKINGTON	United State of America
SAINT-GOBAIN GLASS	Benelux, Europ
PPG	United State of America
GUARDIAN	Thalheim, Germany
INTERPANE Glass For Life	United State of America
arcon perfektion in glas	Germany
glaströsch	Switzerland
Visteon®	United State of America
AGC	Brussels, Belgium
VIRACON	United State of America
الامـــارات للزجـــاج Emirates Glass	United Arab Emirates

Manufacturer	Country
GUARDIAN	United State of America
SG CSG GROUP	Chengdu City, China
Shanghai Yaohua Pilkington Glass Co. Ltd.	China
SCHOTT glass made of ideas	Germany
solarstop sanam glass	Jordan
Trakya Cam Sanayii A.Ş.	Turkey



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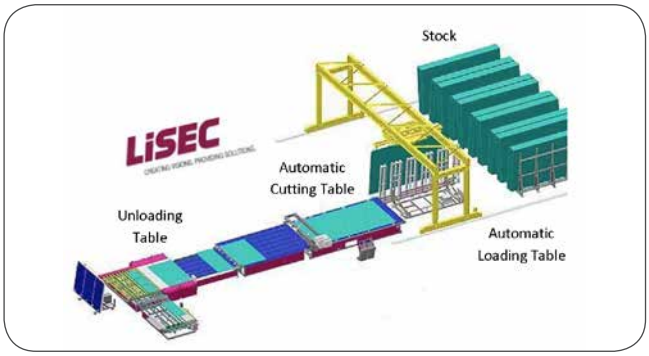
2.02 Cutting Process

Glasses are received from the supplier in sheet sizes. These sheets are cut in accordance to the customer defined sizes.

White Aluminium Enterprises LLC – Glass Processing Division (WAE – GLASS) is equipped with three (3) automatic cutting machines from LISEC Austria.

Below are the cutting machines installed in WAE – Glass Processing Division with the corresponding machine limitations.



The sheet is automatically loaded on the cutting line by the use of computer-controlled suction cranes. The machine is designed to take the sheet from the non-coated surface of the glass, thus, avoiding potential problem in damaging the coating of the glass.

With the use of the software developed by LISEC Austria, the ordered glasses are optimized in a manner wherein the required number of sheets with minimum wastage are calculated and transferred to the cutting machine through local area network. Each cut-to-size glass is labelled on the unloading area.

Below are the cutting machines installed in WAE – Glass Processing Division with the corresponding machine limitations.

Fabricator	Model	Thickness Range (mm)	Max. Size (mm)	Min. Size (mm)
LISEC, Austria	ESL-60/30 RS	3 ~ 19	6000 x 3300	1600 x 1600
LISEC, Austria	GFB- 60/30 RE	3 ~ 19	6000 x 3300	1600 x 1600
LISEC, Austria	ESL-35/25	3 ~ 19	3500 x 2500	1600 x 1600

Computer Cutting Capacity: 6,861 m2 per day

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2.03 Heat Treated Glass

Normal window glass (also called annealed glass) is a brittle material. Annealed glass can resist high compressive stress but it breaks when subjected to tensile stress. The brittleness is due to the microscopic cracks on the surface of the glass and they open when the surface is put under tensile stress. Tensile stresses on the surface can be caused by bending the glass sheet or by change in temperature.
Annealed float glass is subjected to a heat treating process to provide greater resistance to thermal and mechanical stresses and achieve specific break patterns for safety glazing applications. Heat treated glass is separated in to two products, heat strengthened glass and fully tempered glass, by definition of the degree of the residual surface compression or edge compression. White Aluminium Enterprises LLC - Glass Processing Division offers both Heat Strengthened (HS) and Fully Tempered (FT) glass for applications requiring added strength or resistance to mechanical and thermal stresses.

2.03.1 Fully Tempered Glass

Tempered glass or sometimes referred to as toughened glass is produced by using a method of controlled heating and cooling which locks the surface of the glass in a state of compression. The cut-to-size glass sheets are fed from the loading conveyor into the furnace where it oscillates back and forth on ceramic rollers until it reaches approximately 620°C then the glass moves into the quench where it is rapidly cooled inducing compressive stresses to the surface while the centre remains in tension.

The physical characteristics of the glass remains unchanged but the additional stresses created increases its strength by four (4) to five (5) times greater than that of the annealed glass of the same thickness.

Properties of Tempered Glass

- Up to 5x stronger than annealed glass of the same thickness
- In the event of breakage, all the stored energy is released at once and the glass breaks into a relatively small harmless particles.
- Greater resistance to thermal stress compared to annealed glass (Can be subjected to temperatures ranging from 70°C to 290°C)

Disadvantages

- Glass which has been thermally toughened cannot be sawn, cut, drilled or edge worked.
- Tempered glass may sometimes break “spontaneously” due to the presence of inclusions, typically nickel sulphide (NiS) which can occur during the production of raw float glass.

Typical Break Pattern of Tempered Glass

White Aluminium Enterprises LLC – Glass Processing Division is an accredited member of the Safety Glass Certification Council (SGCC) for tempered 6mm and 8mm glass thickness. Insulating Glass Certification Council (IGCC) and is certified by CE Marking complying with BS 12150-2.

2.03.2 Heat Strengthened Glass

The process of producing a heat strengthened glass is similar to that of tempering except that it was quenched at a slower rate. The result is lower compressive stress, increasing the strength to only twice that of annealed glass of the same thickness.

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Properties of Heat Strengthened Glass

- Twice as strong as annealed glass of the same thickness
- Greater resistance to thermal stress compared to annealed glass.
- Breaks into large pieces, which tends to remain in the opening
- The risk for spontaneous breakage is negligible

Disadvantages

- Glass which has been thermally heat strengthened cannot be sawn, cut, drilled or edge worked
- Not designated as a safety glass

2.03.3 Heat Treatment Logo

Glasses heat treated (Tempered, Heat Strengthened and Tempered - Heat Soak Tested) by White Aluminium Enterprises LLC – Glass Processing Division is marked with WAE logo visible at the bottom right corner when viewed from outside of the building. The White Aluminium logo will appear just like below:

White Aluminium Enterprises LLC – Glass Processing Division ensures that the heat treated glasses complies with ASTM 1048 and/or EN 12150 and EN 1863.

2.03.4 White Aluminium's Machineries for Heat Treatment

White Aluminium Enterprises LLC - Glass Processing Division is equipped with three state of the art horizontal roller type heat treating furnace. Horizontal heat treatment process transport glass on horizontal rollers through the heating and quenching process.

2.03.4.1 Tamglass' Sonic - 2442

The special challenges set by the handling and tempering of Low-E glass products have considerably affected the whole production chain. The new Sonic™ system is designed especially for the tempering of Super Low-E (E=0.02-0.04) products mainly for IG units and other architectural glass applications. While the new glass types demand more from a technological point of view they also bring the issue of economy strongly into the picture.

The convection heating system in itself brings important advantages that add up to increased capacity. The efficiency of the Sonic™ heating system, always a key consideration with Low-E glass, has been measured to bring up to +60% more capacity than traditional machinery.

2.03.4.2 Tamglass' Pro-E

The concept of the ProE™ is based on the core know-how of Tamglass. The ProE™ has been developed to answer the growing need to produce multifunctional Low-E and Super Low-E glass as well as traditional glass in all sizes. In order to achieve the required production flexibility Tamglass has utilized its unique know-how of temperature- and convection profiled heating to create a top-of-the-line furnace.

ProE™ produces high optical glass quality with a patented built-in focused convection system including Super Low-E. In addition, it enables real savings in operating cost due to its low peak power, small transformer size and flexible layout with small footprint. With ProE™ you ensure technical leadership, reliability and future upgrading with new built-in features that fulfill changing market requirements.

WAE's ProE™ heat treatment line is equipped with an online digital rollerwave measurement system. The high resolution cameras of the online digital system detect and process the reflected or transmitted image providing measurement of distortion.

2.03.4.3 Tamglass HTF-2448

Tamglass' HTF is the most sold flat tempering system in the glass business. It is a highly flexible flat glass tempering furnace in terms of glass types and furnace operation.

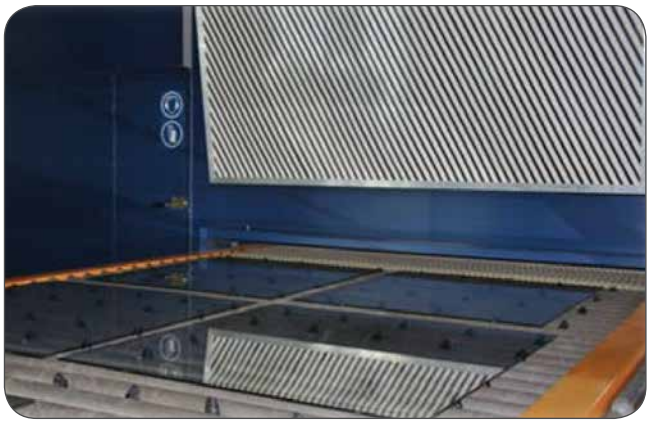
All safety glass processors have come to know the "HTF quality", which has been given the status of a high quality standard in the safety glass business.

2.03.5 Availability of Heat Treated Products

White Aluminium Enterprises LLC – Glass Processing Division offers the heat treated glass on the following thickness and sizes:

Process	Thickness Range (mm)	Minimum Glass Size (mm)	Glass Size Lamination (mm)
Tempered	3 ~ 19	300 x 300	2800 x 6000
Heat Strengthened	3 ~ 12	300 x 300	2800 x 6000

- Maximum size that can be processed depends on thickness, shape and glass type
- Equipment limitation noted on the table above is not



the maximum glass size that can be processed.

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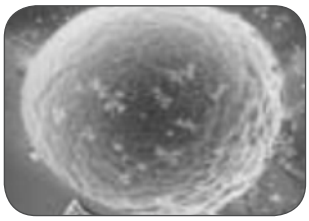
2.03.6 Heat Soaked Glass

As mentioned in section 2.03.1,
"Tempered glass may sometimes break spontaneously due to the presence of inclusions, typically nickel sulphide (NiS) which can occur during the production of raw float glass."

Most of spontaneous breakages are caused by the volume expansion of nickel sulphide (NiS) with phase transformation from unstable alpha (α) to stable beta (β) form. Since it is proved by many laboratory results that the allotropic transformation of the dangerous inclusion is critically influenced by temperature, a destructive process was developed called the Heat Soak Test wherein the NiS inclusion is forced to transform at higher temperature.

Heat Soak Test (HST) is very useful to avoid spontaneous breakage of tempered glass. The process is consist of (1) heating up the panes to a certain temperature (290 ± 10 °C) (2) Holding this temperature for some hours (at least 2 hours) (3) Cooling down to room temperature.

Breakage due to NIS Inclusion



NIS viewed from SEM

Heat soak Test however does not gurantee a 100% breakage free product due to NiS inclusion but the level of risk for spontaneous breakage is reduced to no more than one breakage per 400 tonnes of heat soaked thermally toughened soda lime silicate safety glass if carried out according to EN 14179 (section 3.2 of EN 14179).

Process	Thickness Range (mm)	Minimum Glass Size (mm)	Glass Size Lamination (mm)
Heat Soak	3 ~ 25	200 x 550	2500 x 6000

2.03.7 Manufacturing Guidelines and Considerations

- Section 4.01.1 and Section 4.01.2 mentioned that heat treated glass (Fully tempered and Heat Strengthened) cannot be sawn, cut, drilled or edge worked in any way, it is important to ensure that the ordered sizes are final and correct. If a template is required, it should be full size and of a rigid material such as plywood.
- Due to the heat process involved, toughened and heat strengthened glass will contain localized and overall warp or bow causing the reflected image to be distorted. White Aluminium Enterprises LLC - Glass Processing Division however ensures that the heat treated products will comply with the international standards.
- To avoid confusion, manufacturing delays and costly replacements for glasses which requires holes, notches, ceramic fritting, sand blasting and other related works, accurate and detailed diagram are essential. The diagram must comply with the following:
  1. Each item must be drawn separately on A4 sized paper
  2. Dimensions must be clearly indicated from a distinct reference point.
  3. Clearly mention the hole, cut-out and notch position and dimension.
  4. Glass thickness and type must be indicated
  5. Edgework requirement must be indicated to all individual edges
- The stress zones, which arise from the thermal process leads to double refraction of the light (anisotropy). These can be seen in the presence of polarized light as slight clouds or rings in spectral colours. It is a characteristic of heat treated glasses that should not be mistaken as discoloration or non-uniform tint or colour (Section 7.1 of ASTM C1048).
- There is deformation in the surface of the heat treated glass because of the contact of the glass with the rollers during the horizontal thermal tempering or heat stregnthening which leads to the reduction of the surface smoothness. This surface deformation which also known as roller-waves depends on the glass thickness.
- Heat Soak Test (HST) on toughened glass is done only when the customer includes the process in their order. In case of spontaneous breakage for any orders of non-heat soaked toughened glass, White Aluminium Enterprises LLC - Glass Processing Division will not replace the glass free of cost.

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2.04 Laminated Glasses

Laminated glass is consist of at least two single panes of glass which are joined together by a strong, tear-resistant polyvinylbutyral film (PVB) or an ionoplast interlayer (SGP). In the event of breaking, the interlayer keeps the layers of the glass bonded together reducing the risk of injury or harm. Laminated glass is normally used when there is a possibility of human impact or where the glass could fall and shatter.

It was Edouard Benedictus, a French chemist, who "discovered" the lamination principle in 1903 when he accidentally dropped a collodium-line flask and noticed that the fragments of glass clung to the "plastic" lining, so the flask cracked but did not shatter. In 1906, the first patent for laminated safety glass was issued to an Englishman named John Crewe.Today, the need for safety glasses continuous to grow so is the need for further development and innovations for the laminated glass products.

Depending on the design needs, White Aluminium Enterprises LLC – Glass Processing Division offers laminated glasses made with sheets of annealed, tempered, heat strengthened and/or tempered-heat soak tested uncoated and coated glasses which exhibits important structural performance and safety features along with other benefits.

2.04.1 Benefits of Laminated Glass

White Aluminium Enterprises LLC – Glass Processing Division offers durable and versatile laminated products conforming to the Industry standards with a wide range of benefits:

Safety

The American Standard for Testing and Materials (ASTM) defined safety glass as:

Two or more lites of flat glass, bonded by interlayer material. In the case of breakage, the interlayer serves to retain the glass fragments, limit the size of the opening and reduce the risk of cutting or piercing injury. (Section 3.2.20 ASTM C1172)

While the British Standard (BS) defined safety glass as:

Material that, when tested in accordance to EN 12600 either does not break or else breaks safely. (Section 3.2 and 5.3)

Laminated glass with PVB interlayers or SGP Interlayers are generally 75% to 100% as strong as annealed glass of the same thickness depending on exposed temperatures, aspect ratio, plate size, stiffness and load duration. When the laminated glass is subjected to accidental human impact, the force of the impact is absorbed by the glass and the interlayer which makes it stronger than a single flat glass with the same thickness.

If the impact is sufficient to break the glass, the resulting fragment typically remain intact, firmly adhered to the PVB or SGP interlayer. This is the most important characteristic of the interlayer/s which provides increased protection against fall-out and penetration of the opening.

Security

Laminated glass offers greater protection for people and property over other glass products by providing an effective barrier when under attack. Although glass will break if hit with a hammer, brick or similar objects, the interlayer will resist penetration when subjected to an attempt for force entry. Also, the glass will remain in the opening keeping rain and wind out of the building until it can be replaced at a convenient time.

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Sound Control

Sound is a fluctuation of air pressure that can be detected by human ear. Sound travels through any fluid (e.g., the air) as a compression/expansion wave. This wave travels radially outward in all directions from the sound source. The pressure wave induces an oscillating motion in the transmitting medium that is superimposed on any other net motion it may have. These waves are reflected, refracted, scattered, and absorbed as they encounter solid objects. Sound is transmitted through solids in a complex array of types of elastic waves. Sound is characterized by its amplitude, frequency, phase, and direction of propagation.

Noise is a group of sounds with many non-harmonic frequency components of varying amplitudes and random phase. It is commonly defined as any type of sound that is considered disturbing, annoying or painful.

For most applications, laminated glass provides an effective, low cost method of reducing noise transmission to the glass which is achieved because of the viscoelastic properties of the polyvinylbutyral (PVB) film or ionoplast (SGP) interlayer. The interlayer reduces the coincidence dip in the 1000 to 2000 Hz range common to glass products. To the human ear, this equates to approximately a 50% reduction in perceived noise. In many instances, laminated glass is often overlooked as an acoustic glass.

Elimination of Ultraviolet Radiation

The short-wave ultra-violet radiation from the sun can damage furniture, carpets, curtains, etc. White Aluminium Enterprises LLC – Glass Processing Division offers a laminated glass product that will protect the furnitures from the short-wave UV radiation through the outstanding performance of the interlayer. The PVB interlayer or SGP Interlayer filters the sun rays eliminating up to 99% of UV rays while allowing the important visible light to pass through.

Solar Control

Transparency is one of the magnificent properties of glass. It allows more natural light into homes and buildings but more light often means more heat entering the interior.

2.04.2 Applications of Laminated Glasses

The many features and configurations of laminated glass can be combined to provide a product that has a wide and varied

range of applications such as the following:

- Overhead glazing, sloped glazing and skylights
- Vertical glazing
- Glass balustrade and lift wells
- Shower screens
- Mirrors and sliding doors
- Shopping centres, offices and banks
- Hospitals
- Schools and libraries
- Aquariums and zoos
- Jails

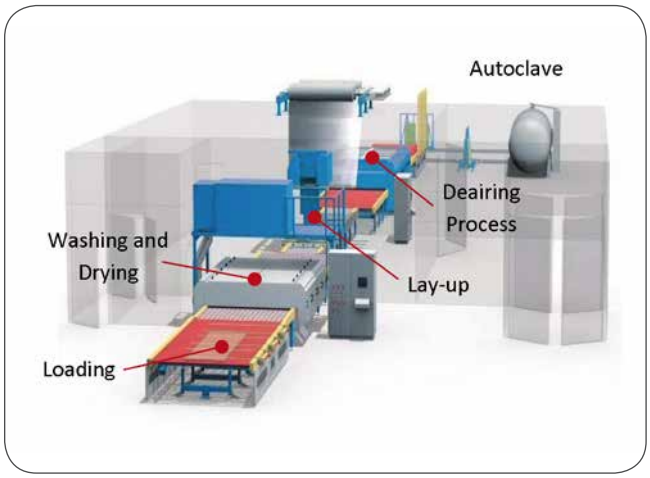
2.04.3 Burglar Resistant Glazing

White Aluminium Enterprises LLC - Glass Processing Division's burglar resistant glass is a laminated product incorporating a 1.52mm PVB interlayer or 1.52mm SGP Interlayer. The thick interlayer of burglar resistant laminated glass is designed to significantly increase the amount of time and effort required by an intruder to gain access through the glazing.

It is important that the burglar resistant laminated glass is held captive in a suitable framing system to prevent the glass evacuating the building when subjected to an attack.

2.04.4 The Lamination Process

The glass to be laminated is thoroughly washed and dried before passing into an air-conditioned "clean room". Inside the clean room, the humidity and temperature are strictly controlled while all operators are required to wear a special anti-static clean room suit to ensure that the atmosphere is free of dust, moisture and debris that may cause failure on the product.



After washing, the glass will proceed to a lay-up process wherein the initially translucent PVB or SGP is sandwiched between the glasses. The prepared glass is then passed through pressurized rollers and heating ovens. It is during this pre-nip, de-airing process where the air trapped between the

glasses are removed as well as the softening of the interlayer to give initial adhesion.

The autoclave process comes next where it is again heated and subjected to extreme pressure to permanently bond the glass and the interlayer. It is only after this process where the glass becomes completely transparent.

Autoclave Machine #1: Tamglass AK-3000

2.04.5 Availability of the Laminated Products

White Aluminium Enterprises LLC - Glass Processing Division offers the laminated glasses on the following thickness and sizes:

Process	Thickness Range (mm)	Minimum Glass Size (mm)	Glass Size Lamination (mm)
Lamination	4 ~ 80	300 x 300	2600 x 5000

- Maximum size that can be processed depends on thickness, shape, type of work and glass type
- Equipment limitation noted on the table above is not the maximum glass size that can be processed.

2.04.6 Manufacturing Guidelines and Considerations

- For laminated glasses consisting of heat treated glasses, note that as Section 2.03.1 and Section 2.03.2 mentioned, heat treated glass (Fully tempered and Heat Strengthened) cannot be sawn, cut, drilled or edge worked in any way, it is important to ensure that the ordered sizes are final and correct. If a template is required, it should be full size and of a rigid material such as plywood.
- Defects such as bubbles in the edge area of the laminated glass is an inherent characteristic of this product. Spot and linear defects must be evaluated in accordance to BS 12543-6 or ASTM C1172.
- There could be displacement or misalignment at any one edge of the constituent glass panes making up the laminated glass. Displacement is acceptable as long as it will not exceed the maximum permissible displacement stated in Table 5 of BS 12543-5 or ASTM C1172.
- Heat treated glasses (mostly coated glasses) with complex shapes are difficult to laminate (Specially shapes having an inscribed angle of <45°). White Aluminium Enterprises LLC - Glass Processing Division suggest that the acceptance criteria be discussed since most of the industry standards are based on a rectangular glass unit.
- To avoid confusion, manufacturing delays and costly replacements for glasses which requires holes, notches, ceramic fritting, sand blasting and other related works, accurate and detailed diagram are essential. The diagram must comply with the following:
  1. Each item must be drawn separately on A4 sized paper
  2. Dimensions must be clearly indicated from a distinct reference point.
  3. Clearly mention the hole, cut-out and notch position and dimension.
  4. Glass thickness and type must be indicated
  5. Edgework requirement must be indicated to all individual edges
- Displacement acceptance criteria as stated in Table 5 of BS 12543-5 or ASTM C1172 must be considered applicable as well as for the displacement of hole location between two or more glasses after lamination.

Autoclave Machine #2: Italmatic AIV

White Aluminium Enterprises LLC – Glass Processing Division is certified by CE Marking complying with BS 14449 for Laminated and Laminated Safety Glass.

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2.05 Insulated Glass Units

Insulated Glass (IG) unit is made up of two or more lites of glass enclosing a hermetically sealed air (or inert gas) in order to reduce heat gain or loss through glass. IG unit brings many benefits to curtain wall functionality. The use of IG units in façade construction allows the designers to construct buildings with large vision areas that are aesthetically appealing as well as thermally efficient.

White Aluminium Enterprises LLC - Glass Processing Division offers many types of glass (either annealed, tempered, heat strengthened, tempered - heat soak tested) that can be used as components for the insulated glass (IG) units including ordinary clear float, laminated glass, coated glass (Sputtered or pyrolytic coating), spandrel, ceramic fritted, fire rated and etc. These components are selected to meet the specific color, reflectivity, light transmission, sound transmission and other performance requirement of the IG unit.

2.05.1 Benefits of Insulated Glass Units

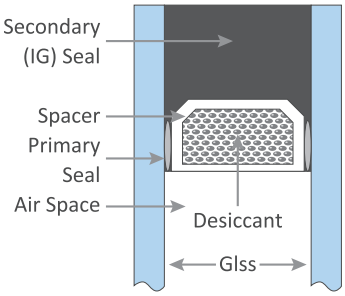
The main function of the Insulated Glass (IG) unit is to provide a higher level of thermal insulation (which can be equated to the reduction in the heating and cooling cost) and improve the building occupant's comfort. The improvement in thermal efficiency is achieved because of the airspace diffusing the transfer of heat creating insulation properties almost twice that of a single panel of glass.

Aside from the thermal insulation characteristics of the Insulated Glass (IG) unit, other properties such as sound insulation, solar control and safety can be added or combined by using the appropriate glass products as a component for the insulated glass unit.

By using Insulated Glass (IG) unit, condensation on the glass surface due to the temperature variation between the inside and outside of the building can be overcome. The Insulated Glass (IG) unit is used because the airspace works as a thermal barrier between the inside and outside environment, thereby minimizing the occurrence of condensation.

2.05.2 Elements of a Typical IG Unit Glass

On the right is a diagram showing a typical IG unit and the common elements of the design. All of these elements must work effectively to provide the expected performance of the Insulated Glass (IG) unit.



Glass

A wide variety of glass types are available for unit manufacture depending on the performance requirement. Glass component of the IG unit could be:

1. Annealed or Heat Treated
2. Normal Float Glass, Tinted or Coated Glass
3. Laminated or Single Glass
4. Edge Worked (Polished, Bevelled, etc.)
5. Ceramic Fritted, Digital Printed, Sand Blasted, etc.

White Aluminium Enterprises LLC - Glass Processing Division offers the above or a combination of the above as a component for an Insulated Glass Unit.

Spacer Bar

The spacer bar is used to provide an air space between the glasses. The common thicknesses of IG spacers readily available for production are 6mm, 8mm, 10mm, 12mm, 14mm, 16mm, 18mm, 19mm, 20mm, 22mm and 24mm. Other thicknesses are also available upon request. Spacer bar types being used in the factory are normal mill finished, black anodized, stainless steel, warm edge and Schuco spacers.

Desiccant

Desiccant plays an important role in an insulated glass unit. During manufacture, a volume of air is trapped inside the IG unit at a certain temperature and relative humidity. The moisture content of the trapped air will condense when the temperature was dropped therefore the desiccant is needed to dry the air space. The main function of the desiccant is to absorb the moisture that permeates through the seal.

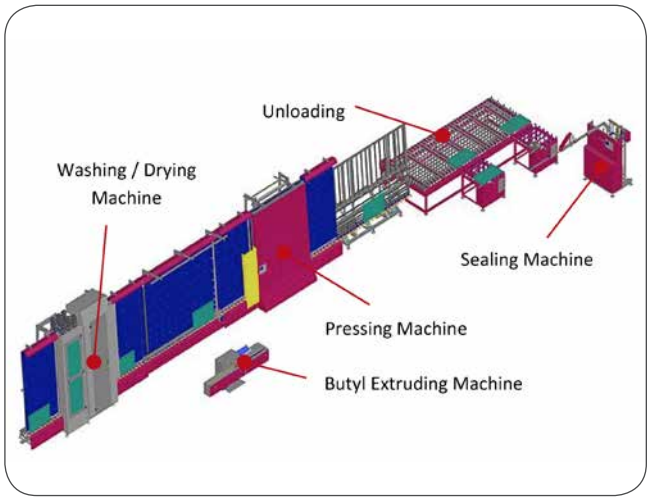
White Aluminium Enterprises LLC - Glass Processing Division uses a 3-angstorm molecular sieve desiccant which is proven by laboratory studies to be the most efficient in adsorbing only the moisture (adsorbing other gases such as N2 and O2 may cause deflection on the IG unit).

Primary Sealant

The inner or the primary sealant being used by White Aluminium Enterprises - Glass Processing Division is made up of polyisobutylene (commonly called butyl). The butyl controls the moisture vapour transmission rate into the IG unit. During processing, it is also the primary sealant (butyl) which holds the unit firmly while secondary sealant is applied.

Secondary Sealant

The secondary sealant is responsible in holding the unit firmly together during its service life which is why it is very important to ensure that the sealant has an excellent adhesion to the glass and to the spacer frame. White Aluminium Enterprises - Glass Processing Division is certified by our suppliers of the edge seals which only means that all necessary guidelines and procedures are being done properly and excellently during production.



2.05.3 Other Processes for Insulated Glass Units

Gas Filled IG Unit

Sometimes the air in the cavity is partially or wholly replaced with an inert gas (such as Argon) to improve the thermal, and in some cases the acoustic properties of the insulating glass unit. Concentration of inert gas (Argon) is tested during production as per frequency of inspection to ensure that ample amount of gas is purged inside the IG unit.

2.05.4 Assembling an IG Unit

The cut-to-size glass is moved vertically along a conveyor through a washing and drying process. Inspection is being done on each glass right after the drying process ensuring that the glass is thoroughly clean and free of defects. The hollow aluminium spacer is then shaped and filled with molecular sieve (desiccant) to prevent condensation from forming after sealing. A strip of Polyisobutylene (butyl) is applied to both sides of the shaped aluminium spacer providing the primary seal and an excellent vapor barrier. The prepared spacer is positioned between the two panels of glass and then pressed together. Finally the secondary seal (Silicone) is applied to the perimeter void around the unit.

Today's automated systems such as the Lisec machines operated by White Aluminium Enterprises LLC - Glass Processing Division provides a computerized washing, drying, pressing and sealing with state-of-the-art robotic equipment. White Aluminium Enterprises LLC - Glass Processing Division is an accredited member of the Insulating Glass Certification Council (IGCC) and is certified by CE Marking complying with BS 1279-2.

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2.05.5 Availability of the Insulated Glass Unit

White Aluminium Enterprises LLC - Glass Processing Division offers the Insulated glass Units (IGU) on the following thickness and sizes:

Process	Thickness Range (mm)	Minimum Glass Size (mm)	Glass Size Lamination (mm)
Double Glazing	Up to 52	180 x 250	2500 x 5000

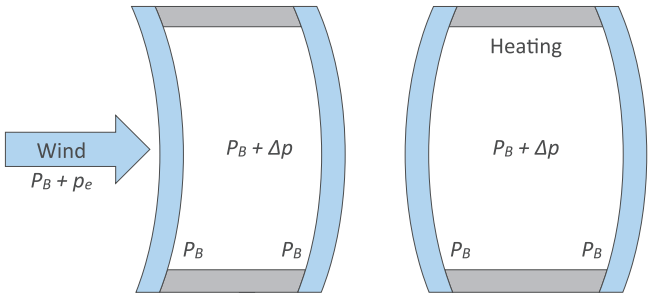
- Maximum size that can be processed depends on thickness, shape, type of work, glass type and limitations on the other processes involved.
- Equipment limitation noted on the table above is not the maximum glass size that can be processed.

2.05.6 IGU Characteristics

Distortion

It is an accepted fact that all buildings are subject to constant interior and exterior changes in temperature and pressure. These changes in the IG unit's environment condition affects the images viewed in reflection.

The moment the IG unit is sealed, the air (or gas) sealed within the unit will respond to the gas laws of physics (Combined Gas Law) which govern the gas volume as it relates to changes in temperature and pressure. As the barometric pressure falls or rises, the gas likewise expands or contracts causing the two lites to bow away or towards each other. Because of this deflection, objects viewed in reflection will be distorted. This "un-avoidable" effect is more apparent in IG units with reflective type glasses.



Newton Rings

With changes in atmospheric pressure and temperature, the glass in large units may deflect to the extreme where they touch in the center of the unit. The optical effect is a series of concentric colored rings with the center being in the point of contact / near contact of the two panes. The rings are roughly circular or elliptical. Once the unit pressure has equalized, the effect of Newton Rings will disappear however it can be avoided by limiting the size of the unit and/or using thicker glass.

Brewster's Fringes

As stated in EN 1279-1 : Annex C.1.1: When the glass pane surfaces exhibit near perfect parallelism and the surface quality is high; the insulating glass shows interference coloration. These are lines varying in colour as a result of decomposition of the light spectrum. When the sun is the light source, the colours vary from red to blue. This phenomenon is not a failure; it is inherent to the insulating glass unit construction.

2.05.7 Manufacturing Guidelines

- For Insulated Glass Units (IGU) consisting of heat treated glasses, note that as Section 2.03.1 and Section 2.03.2 mentioned, heat treated glass (Fully Tempered and Heat Strengthened) cannot be sawn, cut, drilled or edge worked in any way, it is important to ensure that the ordered sizes are final and correct. If a template is required, it should be full size and of a rigid material such as plywood.
- To avoid confusion, manufacturing delays and costly replacements for glasses which requires holes, notches, ceramic fritting, sand blasting and other related works, accurate and detailed diagram are essential. The diagram must comply with the following:
  1. Each item must be drawn separately on A4 sized paper
  2. Dimensions must be clearly indicated from a distinct reference point.
  3. Clearly mention the hole, cut-out and notch position and dimension.
  4. Glass thickness and type must be indicated
  5. Edgework requirement must be indicated to all individual edges
- Sealant depth must be clearly mentioned prior to the confirmation of the order. White Aluminium Enterprises - Glass Processing Division normally process IG units using 6mm sealant depth.

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2.06 Curved / Bent Glass

White Aluminium Enterprises - Glass Processing Division is offering an annealed bent glass. Bent glass is fabricated from flat glass, which has been heated to between 538°C and 593°C, gravity or mechanically formed, and then allowed to cool to the desired shape.

2.06.1 Availability of the Curved / Bent Glass

White Aluminium Enterprises LLC – Glass Processing Division offers the curved / bent glass on the following thickness and

Process	Thickness Range (mm)	Minimum Glass Size (mm)	Glass Size Lamination (mm)
Bending	4 ~ 19	400 x 400	1300 x 2800

- Maximum size that can be processed depends on thickness, shape, type of work, glass type and limitations on the other processes involved.
- Equipment limitation noted on the table above is not the maximum glass size that can be processed.

2.07 Glass with Ceramic Frit (Screen Printed Glass or Roll Coated Glass) or Digital Printed Glass

By definition, screen printed or roll coated ceramic fritted glass or digital printed glass is either tempered or heat strengthened glass, one face of which is coated, either partially or totally, with a ceramic paint or ink colours. The ceramic paint or ink colours are permanently attached to the glass by means of a special manufacturing process. In addition to its decorative function, the colours also fulfill additional function such as reduction in the radiation level from the sun. Ceramic Printed glass or Digital Printed Glass is used for glazing and for cladding for façade and roofs. It can also be assembled into laminated or an insulated glass.

2.07.1 Available Colour Coating

White Aluminium Enterprises - Glass Processing Division offers a wide variety of colours to choose from. The selection of colours influences the light transmitting capacity and the energy transmission. In general, darker colours have lower transmitting capacity than lighter colours. Glasses coated with light colours also have an advantage of reflecting greater energy which thereby result to lower heat absorption than dark glasses.

The following are the colours which the planner can choose from in designing the ceramic fritted glasses:

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Note: Other colours are available upon request.

2.07.2 Screen Printing Process

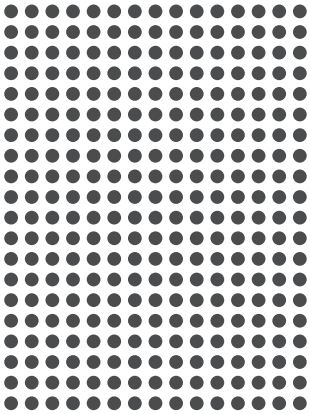
The ceramic screen printed glass is created by silk-screening the selected color and pattern onto one surface of the glass. Screen printing produces an especially uniform and fine surface, which generates excellent light scatter when a floodlight is shone through it. Once the pattern has been applied, the glass is then either toughened or heat strengthened (approx. 650°C), with the heat generated within the furnace sufficient to melt the ceramic paint permanently fusing the pattern onto the glass substrate.

2.07.3 Degree of Printing

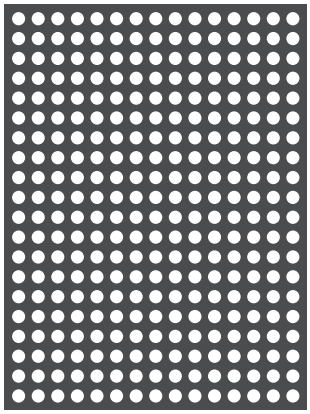
The degree of printing is defined as the ratio of the printed surface with respect to the whole surface. The unit and information on the degree of printing is given in percentage (%).

Degree of Printing = Printed Surface (area) / Whole surface (Area)

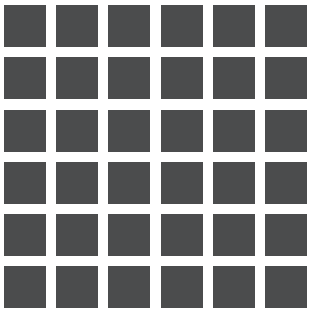
The design of the ceramic printed glasses is usually expressed in degree of printing (as %). Examples are as follows:



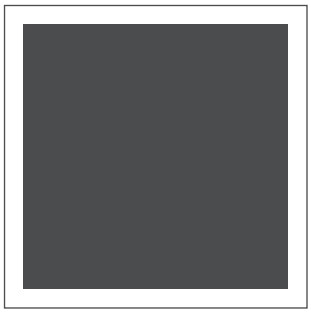
4mm dots, 40% covered



4mm reverse dote, 60% covered



15mm squares, 35% covered



Plain Frit, 100% covered

2.07.4 Availability of Screen Printed Glass

White Aluminium Enterprises LLC – Glass Processing Division offers the ceramic fritted glass on the following thickness and sizes:

Process	Thickness Range (mm)	Minimum Glass Size (mm)	Glass Size Lamination (mm)
Screen Printing	3 ~ 19	300 x 300	2500 x 4500

- Maximum size that can be processed depends on thickness, shape, type of work, glass type and limitations on the other processes involved.
- Equipment limitation noted on the table above is not the maximum glass size that can be processed.

2.07.5 Roll Coating Process

Ceramic frit coating may be also applied to the glass using a horizontal roller-coater and then heated in an oven at approximately 302 °F (150 °C) for paint drying prior heat treatment process. The heat treatment process fuses the ceramic frit to the surface of the glass and makes it extremely durable and resists to cracks, scratches, discoloration and harsh chemicals.

Roll coating is used for plain ceramic fritted glass. The degree of opacity and paint thickness (in µmm) may be controlled through the use of different roller types to suit the Customer's requirements. Customer specifies what degree of opacity (normal or high) is required for their order for plain ceramic fritted glasses by roll coating.

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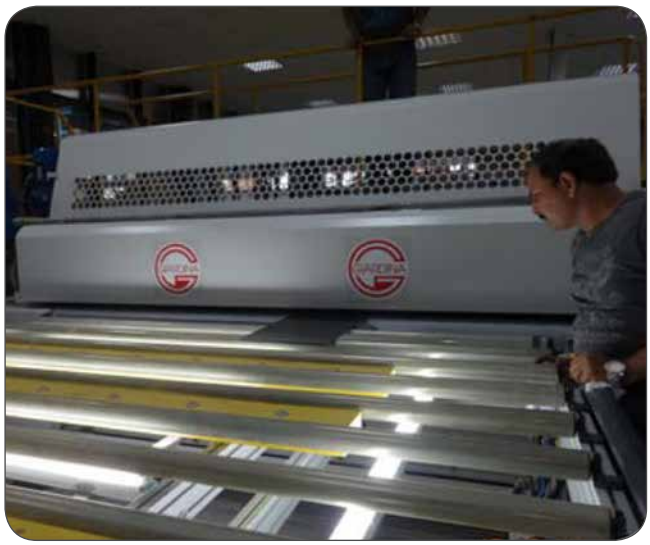


2.07.6 Digital Printing Process

Digital printing on glass is done mostly for glasses ideal for interior design and exterior architectural glass, automotive, marine, appliance and artwork. In this process, graphic preparation of the image is done and converted to printer language (color management, scale, etc.) Patterns used are either by inside graphic illustrations, architectural coverage specifications and transparency pattern over an image or double vision print. The printing machine uses the digital ceramic inks to process the images on the glass surface. Printing may be one color, several spot colors or multi-colors depending upon application or Customer's need.

Printed glass is then dried properly and sent to tempering line to permanently fuse the design on the glass surface. Tempered digital printed glass may be further process to Lamination or Curve/Bending process as per Customer's order.

Digital printed glass adds functionality such as solar control, light diffusion and transmission to glass.

2.07.7 Manufacturing Guidelines

- For ceramic fritted glasses which is either heat strengthened or toughened, note that as Section 2.03.1 and Section 2.03.2 mentioned, heat treated glass (Fully tempered and Heat Strengthened) cannot be sawn, cut, drilled or edge worked in any way, it is important to ensure that the ordered sizes final and correct. If a template is required, it should be full size and of a rigid material such as plywood.
- To avoid confusion, manufacturing delays and costly replacements for glasses which requires holes, notches, ceramic fritting, sand blasting and other related works, accurate and detailed diagram are essential. The diagram must comply with the following:
  1. Each item must be drawn separately on A4 sized paper
  2. Dimensions must be clearly indicated from a distinct reference point.
  3. Clearly mention the hole, cut-out and notch position and dimension.
  4. Glass thickness and type must be indicated
  5. Edgework requirement must be indicated to all individual edges
- The diagram must clearly mention the design of the ceramic frit and its dimension and the color to be used. It should also clearly mention on which surface the ceramic frit should be applied.

2.08 Edge Worked Glasses

White Aluminium Enterprises – Glass Processing Division offers a wide variety of processing options with a comprehensive range of glass processing equipment, including the newly installed double edger machine from Bavelloni.. This equipment is capable of automatically and accurately processing edges, holes, notches and cut-outs – the complexity of which would be very difficult by hand.

2.08.1 Edge Finishes

Clean Cut Edges

These are the edges which are cut with no further processing

Rough Arrise

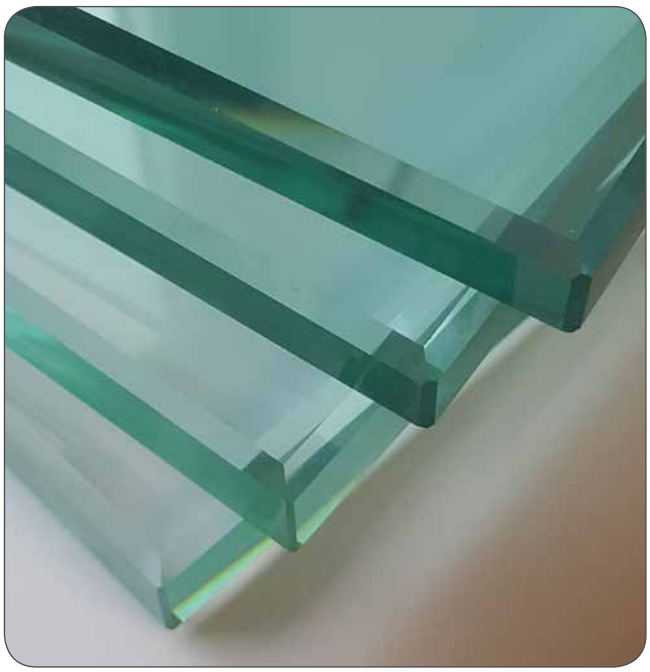
This is the most common edge finish for heat treated glasses which is produced by a rough stone and wet belt which leaves a white arrised edge.

Flat Grinded Edge

This edge is produced on a straight line rectilinear machine with the polishing wheels retracted. It leaves a diamond smooth unpolished finish to the edge and arrises.

Polished Edges

This is the standard edge produced by a straight line rectilinear machine and produces a fine polish to the edge and arrises. This edge is suitable for all furniture glass or wherever glass edges are exposed



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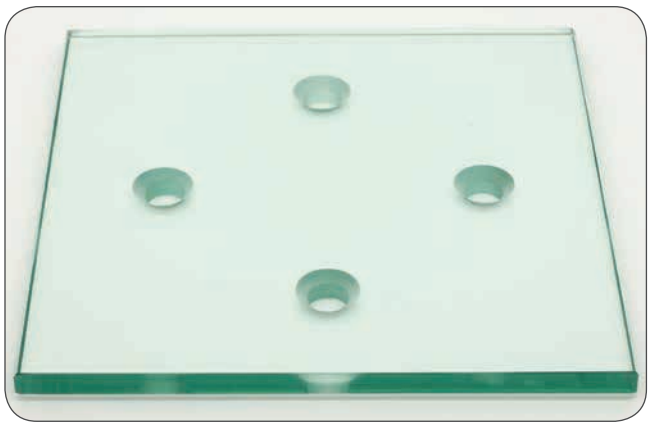
With straight line and shaped beveling machines, a decorative touch can be added to mirrors, table tops and glass panels in doors. All bevelled glass has a clean cut edge as a standard finish, flat polishing is an optional extra

2.08.2 Holes and Notches

Holes and Countersunk

Holes can be drilled in the glass with up to 25mm thickness. The holes can be countersunk before heat treatment to accommodate mechanical fittings.



2.08.3 White Aluminium Machineries

White Aluminium - Glass Processing Division is equipped with high performance double edging machine manufactured by Glaston / Z. Bavelloni. HDM, a computer operated holedrilling and milling machine is working with the double edging machine to produce a good quality product with high precision dimensions.

SB-10 is a horizontal, semi-automatic edging / beveling machine that can grind, polish and bevel the edge of shaped glass. It is equipped with an electronic wheel position regulation and memorization system for rapid production changes and a servo system for tool consumption recovery

Z. Bavelloni's SB-10

HDM, Automatic Hole Drilling

Glaston - Max 80

Glaston - Gemy V10

2.08.4 Availability of Edge Worked Glass

White Aluminium Enterprises LLC – Glass Processing Division offers the edge worked glasses on the following thickness and sizes:

Process	Thickness Range (mm)	Minimum Glass Size (mm)	Glass Size Lamination (mm)
Grinded Polished Edge	4 ~ 19	200 x 200	2600 x 5000
Bevelled Edges	4 ~ 19	200 x 200	3210 x 2250
Hole Drilled Glasses	4 ~ 19	200 x 200	2600 x 5000

- Maximum size that can be processed depends on thickness, shape, type of work, glass type and limitations on the other processes involved.
- Equipment limitation noted on the table above is not the maximum glass size that can be processed.

2.08.5 Manufacturing Guidelines

- For Edge worked glasses which is either heat strengthened or toughened, note that as Section 4.01.1 and Section 4.01.2 mentioned, heat treated glass (Fully tempered and Heat Strengthened) cannot be sawn, cut, drilled or edge worked in any way, it is important to ensure that the ordered sizes final and correct. If a template is required, it should be full size and of a rigid material such as plywood.
- To avoid confusion, manufacturing delays and costly replacements for glasses which requires holes, notches, ceramic fritting, sand blasting and other related works, accurate and detailed diagram are essential. The diagram must comply with the following:
  1. Each item must be drawn separately on A4 sized paper
  2. Dimensions must be clearly indicated from a distinct reference point.
  3. Clearly mention the hole, cut-out and notch position and dimension.
  4. Glass thickness and type must be indicated
  5. Edgework requirement must be indicated to all individual edges

WHITE ALUMINIUM
glass processing

2.09 Opacification

Opacification is done by covering one face of the glass either partially or totally, with an opaque adhesive film. Glasses made which are made opaque with the use of the black opaque adhesive film is suggested for use on reflective architectural glass spandrel panels when surface protection, opacification and safety protection is desired.

The adhesive film features a thin black polyester carrier film which offers superior abrasion and chemical resistance. The adhesive system is a pigmented UV light resistant acrylic with excellent environmental and age stability properties..

2.09.1 Availability of Opacified Glass

White Aluminium Enterprises LLC - Glass Processing Division offers the opacified glass on the following thickness and sizes:

Process	Thickness Range (mm)	Minimum Glass Size (mm)	Glass Size Lamination (mm)
Opacification	6 ~ 10	300 x 300	1800 x 3000

- Maximum size that can be processed depends on thickness, shape, type of work, glass type and limitations on the other processes involved.
- Equipment limitation noted on the table above is not the maximum glass size that can be processed.

2.10 Sand Blasted Glass

Sand blasted glasses are available in either annealed, heat strengthened, tempered, heat soaked, laminated, insulated, etc.

2.10.1 Availability of Sand Blasted Glass

White Aluminium Enterprises LLC – Glass Processing Division offers the sand blasted glass on the following thickness and sizes:

Process	Thickness Range (mm)	Minimum Glass Size (mm)	Glass Size Lamination (mm)
Sand Blasting	3 ~ 9	300 x 300	2600 x 3800

- Maximum size that can be processed depends on thickness, shape, type of work, glass type and limitations on the other processes involved.
- Equipment limitation noted on the table above is not the maximum glass size that can be processed.

2.10.2 Manufacturing Guidelines

- To avoid confusion, manufacturing delays and costly replacements for glasses which requires sand blasting, opacification and other related works, accurate and detailed diagram are essential. The diagram must comply with the following:
  1. Each item must be drawn separately on A4 sized paper
  2. Dimensions must be clearly indicated from a distinct reference point.
  3. Clearly mention the surface where the sand blasted or opacification film must be placed.
  4. Glass thickness and type must be indicated

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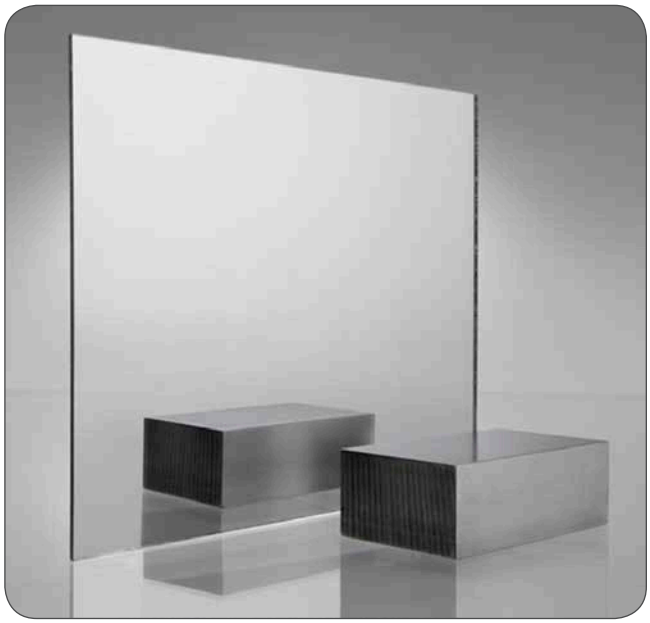
glass processing

OTHER GLASS PRODUCTS:

2.11 Mirrors

White Aluminium Enterprises - Glass Processing Division is offering silver mirrors which can be ordered with different edge finishes such as flat grinded or with bevelled edge depending on the customer's needs.



Silver Mirror Manufacturing

A mirror is produced by thoroughly cleaning the annealed glass (or toughened) by washing it with de-ionized water and cerium oxide then passing it through an oscillating scrub brush units. To promote the adhesion of the silver to the glass, a thin layer of diluted solution of tin chloride is sprayed in to the surface of the glass. Silver nitrate is then sprayed onto the sensitized surface of the glass along with other chemical configurations.

Once the silver layer is formed in the surface of the glass, a layer of copper is then deposited directly into the silver. The metal layers are then covered by a protective mirror backing paint which protects the metal layers from corrosion and mechanical scratching.

Remarks

White Aluminium Enterprises - Glass Processing Division offers fire rated glass do not manufacture silver mirrors but is a processor that is equipped with highly competitive equipments to conduct necessary edge working and hole drilling on mirrors.

2.12 Fire Rated Glass

White Aluminium Enterprises - Glass Processing Division offers fire rated glass depending upon Customer's needs and application type.

The fire rated glass units which WAE has are Schott Pyran® S, Schott Pyran Platinum and Pyrawhite Coated Fire Rated Glass.

2.12.1 Pyran® S

Pyran®S is a monolithic, thermally toughened borosilicate safety glass in accordance to EN Standard 13024 - 1. Pyran®S is a regulated building material and can be used for single or double glazing without conducting heat soak test. As a component in a wide variety of end products, it has a long record of proven performance in the fire resistant glazing that meets the requirements of fire resistance classes E30, E60, E90 to E120, due to its excellent optical and mechanical characteristics.

Pyran® S Characteristics include:

- High transmission in the visible and ultraviolet spectral ranges
- Brilliant optics, ensuring natural, pure color reproduction
- Demonstrates extreme durability against aggressive environmental atmospheric attack, exposure to UV radiation and abrasive chemical solutions.

The Certifire approval (No. CF 291) allows the use of Pyran®S fire resistant glass in sizes specified on the certification when used in conjunction with previously tested timber and steel screens and doorsets or framing systems.

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glass processing

2.12.2 Pyrawhite

Pyrawhite E60/EW45 is the fire rated glass brand name for White Aluminium Enterprises - Glass Processing Division. Pyrawhite passed 60 minutes integrity (E), and 45 minutes radiation (EW) test. For this type of fire rated glass, the unit should be glazed with the coated surface facing the direction of fire exposure.

The Intertek Warnock Hersey Mark for Fire Resistant Glazing (Certificate No. WHI18 - 28085513) allows the use of Pyrawhite fire resistant glass in maximum glass size of 818mm (width) and 2093mm (height) as specified in WAE's certificate, when used in conjunction with previously tested steel doorsets or single fixed screen.

Following extended glass sizes are allowed on field of direct application of EN 1364-1 standard:

Glass Width	: 981mm (20% at 2110 height)
Glass Height	: 2511mm (20% at 824mm width)
Glass Area	: 2.07 m2 (21%)

2.12.3 Pyran® Platinum

Pyran® Platinum fire-protection rated glazing material is made from a transparent glass-ceramic with a thickness of 3/16" (5mm). It is intended for use in non-impact, safetyrelated locations such as transoms and windows with firerating requirements up to 90 minutes.

PYRAN® Platinum fire-rated glass-ceramics are certified by Underwriters Laboratories for fire-protection ratings up to 90 minutes (UL–9 and UL-10B and UL-10C).

Features:

- Fire-rated up to 90 minutes with required hose stream test
- Specially floated glass-ceramic
- Transparent and wireless
- Withstands thermal shock
- Suited for use with standard fire-rated frames with the same rating
- Conforms to positive pressure test standards
- Environment-friendly glass-ceramic produced without the use of toxins
- Can be used to construct insulated glazing units

2.13 Bullet Resistant Glass

White Aluminium Enterprises - Glass Processing Division offers Bullet Resistant Glass with Spall to threat levels BR2, BR3 and BR4.

A testing certification issued by Wiltshire Ballistic Services of UK confirms compliance of bullet-resistant glasses of WAE with European Standards BS EN 1063 and DIN EN 1063.

The BRG glass types being offered by WAE are:

With Spall:

- BR2 30.04 mm thick Bullet-Resistant Glass
- BR3 40.08 mm thick Bullet-Resistant Glass
- BR4 52.8 mm thick Bullet-Resistant Glass

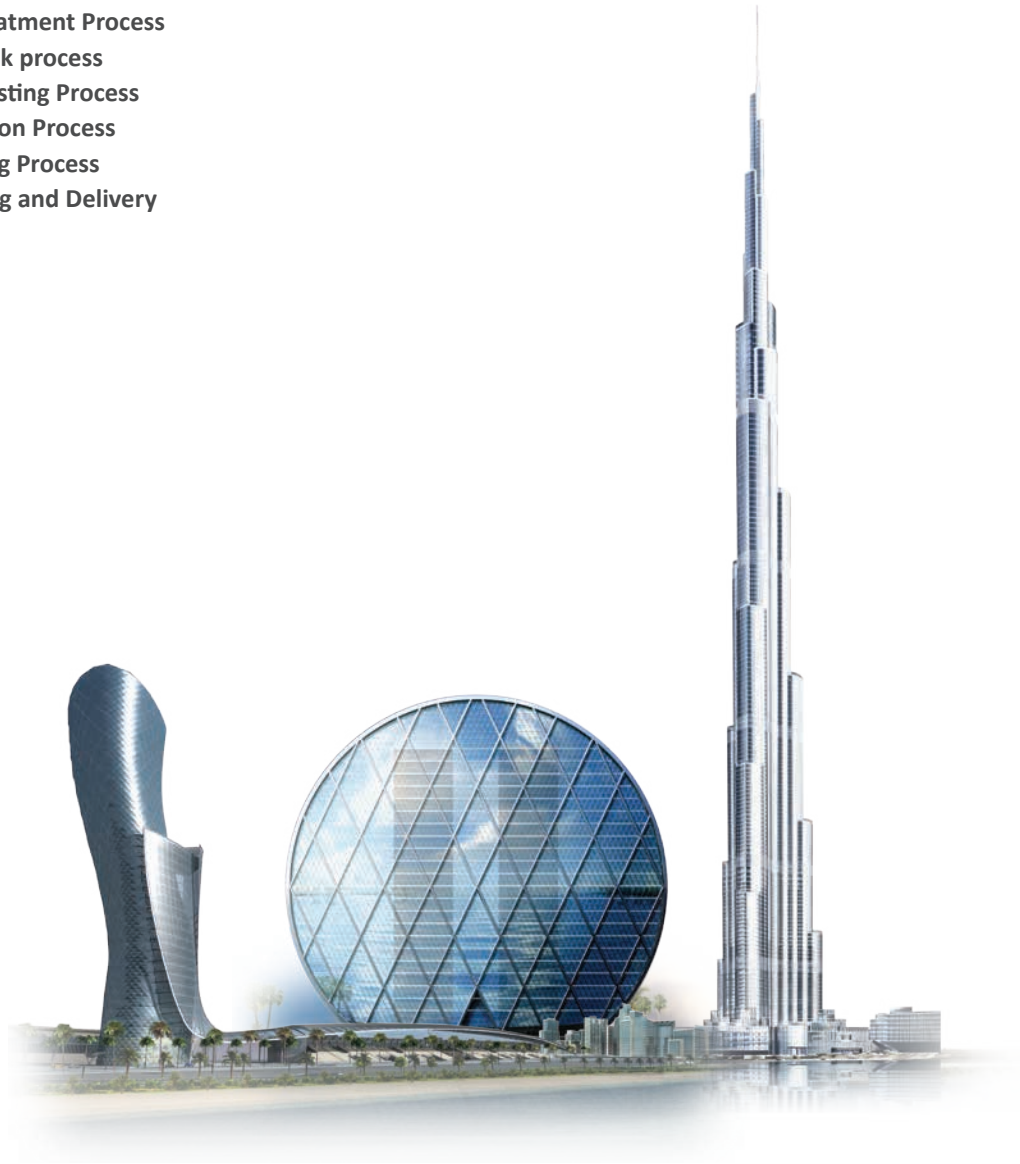
No Perforation and No Splinters

- BR2 - NS 22 mm thick Bullet-Resistant Glass
- BR3 - NS 19 mm thick Bullet-Resistant Glass
- BR4 - NS 33 mm thick Bullet-Resistant Glass
- BR4 - NS 21 mm thick Bullet-Resistant Glass
- BR5 - NS 35 mm thick a Glass
- BR5 - NS 37 mm thick Bullet-Resistant Glass
- BR6 - NS 42 mm thick Bullet-Resistant Glass
- BR6 - NS 46 mm thick Bullet-Resistant Glass
- BR7 - NS 82 mm thick Bullet-Resistant Glass
- SG1 - NS 24 mm thick Bullet-Resistant Glass

WHITE ALUMINIUM
glass processing

CHAPTER 3

Quality Inspection and Testing Guidelines



CHAPTER 3

Quality Inspection and Testing Guidelines

WHITE ALUMINIUM
glass processing

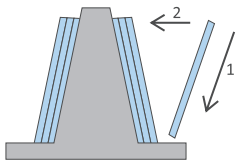
3.01 Transportation and Handling of Glasses

- All employees involved in the handling of glasses (both coated and non-coated) wear a clean, soft and grit free gloves. Glasses are carried from the edge without touching the glass surface.

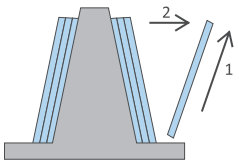
Handling of small glasses

Handling of Big Glasses

- Glasses are stacked at an incline of minimum 4 degrees from the vertical. Proper stacking and removal from the stands as shown on the figures below:



Correct Stacking



Correct Removal

- A soft wood or rubber is placed at the bottom of the stand before stacking the glasses to avoid chips due to transportation and mishandling. The condition of the stand / A-frame before stacking the glasses is always inspected.
- Cork spacers are fixed in between glasses especially if the dimensions of the two glasses are different to avoid scratches.
- The suction cups from clips / cranes used in handling and transporting glasses are cleaned, dried and grit free. The suction is fixed on the non-coated surface of the glass. For some cases wherein the use of suction in the coating side is unavoidable, a special suction cup cloth covering is used to avoid damaging the coated surface. The suction surface is also checked frequently ensuring no presence of dirt and grit.
- Safety belt is wrapped around the A-frame and glasses ensuring zero movement between glasses during transportation. The ends of the belt are tied tight before taking the stand.
- It is ensured that each glass are labelled properly detailing important specifications such as glass type, size and thickness.
- The coated surface of the glass is ensured not to have contact with the transport rollers to prevent coating damage. The coated surface therefore is always opposite the transport rollers.
- If the coated glass shows spots or any other impurity on the surface after washing, a smooth and fast drying cleaner together with a clean cotton cloth or soft tissue is used. More importantly, the spot is not wiped, but dabbed or blotted.

Cleaning glass with soft tissue

3.02 Receiving of Materials and Storage

3.02.1 Glass

Glass sheets from suppliers arrive either as a wooden crate or as a jumbo sheet packed with an edge tape (for high performance Low-E glasses). The responsible personnel receiving the glasses ensure that the glasses received are matching with the information described on the delivery notes, purchase order, packing list and invoice. The external condition of the box / crate / glass is inspected to ensure that the received glasses are in good condition. A proper identification label (TAGs) is fixed on each box. Any sign of damage such as breakage, cracks, scratch or damage box is reported immediately to the Quality Control Department. The glass sheets are stored in a well-ventilated warehouse ensuring that the glass quality is protected.

3.02.2 Other Materials (Sealants, desiccants, spacer, etc.)

The responsible personnel receiving the materials ensure that the goods received are matching with the information described on the delivery notes, purchase order, packing list and invoice. The external condition of the box / crate is inspected to ensure that the received materials are in good condition. A proper identification label (TAGs) is fixed on each box. Any sign of damage such as damaged box or unsealed packages is reported immediately to the Quality Control Department. The materials are stored in accordance to the supplier's guidelines to ensure that the quality of the material is protected.

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glass processing

3.03 Cutting Process

3.03.1 Charging to the Cutting Line

The crates / bundles are opened carefully at the storage area close to the cutting-line. Special attention is given for coated glasses. Usually the first sheet on the crate is a non-coated float-sheet for protection of the other sheets. This sheet can be put aside, but needs to be re-used again if the crate has to be stocked half-empty. The edge-protection tape of the packing is removed carefully. This edge-protection tape is reused for opened or half-empty crates.

The suction cups are cleaned frequently (daily) or early in case of heavy fouling. When transporting the sheet to the cutting table, WAE uses a machine that is constructed for lifting coated glass on the non-coated side. The sucker and the table are working together and it is ensured that the coated side is on top and the non-coated side is down, when the glass is laid down on the cutting-table.

3.03.2 Cutting the Glass Sheet

The cutting is done by the automatic cutting line of “Lisec Austria”. The cutting-wheel pressure is automatically fixed by the entry of 6mm, 8mm or other glass thickness. A wrong wheel pressure will cause unacceptable cut edge quality. The responsible head of the cutting-line will immediately stop the work and adjust the cutting pressure.

With the start of a new shift the cutting-table is cleaned. This is especially the case if a breakage has happened or a visual inspection of the glass-quality is necessary.

3.03.3 Dimension Checking and Visual Inspection

A visual inspection of the cut glass is done by the discharging workers in general. Any defects are stated, reported and documented.

The head of the cutting line inspects the first cutting after the start of a new shift. During the shift every hour three cut glasses from different sheets are measured by the responsible person. The measurement includes the length, width, thickness, squareness of the cut glass, visual inspection of the cut edge and the coating.

Glass inspection after cutting

3.04 Washing and Drying of Glasses

3.04.1 Machine Working Condition

The head of a particular section conducting the washing and drying process always ensure that the machine is in good condition prior to production. The brushes and transport rollers are checked frequently ensuring that there is no foreign material present on the rollers that may induce scratch on glass surface. After washing, the glass is dried immediately.

3.04.2 Water Condition

It is ensured that there is no solid contaminant present on the water tank / container. The glass is washed with deionized clean water, having a conductivity less than 30µS and a pH value between 6 and 8. Water temperature must be maintained between 40~60ºC. The conformance of the water is checked once during a shift by the QC Department. The results are documented on the data sheet for a particular section.

Water Condition Inspection

3.05 Edge Works and Hole Drilling

3.05.1 Machine Working Condition

The head of the edge works line always ensure that the machine is in good condition prior to production. The machine pads and transport rollers are checked frequently ensuring that there is no foreign material present that may cause scratch on the glass surface.

3.05.2 Visual Inspection

A visual inspection of the cut to size glass is done by the receiving / discharging workers in general. Any defects are stated, reported and documented.

3.05.3 Work Type and Dimension

It is always referred to the Job Order for the edge work type and detail. The instruction is analyzed carefully before proceeding into production. The dimension of the cut to size glass such as width, height and thickness is always checked. More importantly, the accuracy of hole diameter and location is monitored as per Job Order.

3.06 Ceramic Fritting and Digital Printing

3.06.1 Machine Working and Room Condition

The head of the Screen printing / ceramic fritting line always ensure that the machine is in good condition prior to production. The machine pads, squeegee and transport rollers are checked frequently ensuring that there is no foreign material present that may cause scratch on the glass surface.

Room condition is equally important. The controlled parameters are monitored to ensure that materials used are contained within supplier requirements, clean and in order.

3.06.2 Visual Inspection

A visual inspection of the cut to size glass is done by the receiving / discharging workers in general. Any defects are stated, reported and documented.

The silk screen used is also checked of its tension and clarity of design for its printing worthiness.

3.06.3 Work Type and Dimension

It is always referred to the Job Order for the ceramic frit type, design and detail. The instruction is analyzed carefully before proceeding into production. The dimension of the cut to size glass such as width, height and thickness is always checked.

3.06.4 Ceramic Paint and Printing Quality

Ceramic paint is ensured not have any impurities, foreign objects, bubbles and properly mixed. The mixing ratio on all batches is compared to the approved sample. The comparison for the uniformity in color with the approved sample is done in every batch. The ceramic paint is applied in one direction without pin holes and scratch. The supplier's guidelines are always referred to in using the ceramic paint

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glass processing

Glass inspection after Ceramic Fritting

3.07 Heat Treatment Process

3.07.1 Machine Working Condition

The head of the Heat Treatment Line always ensures that the machine is in good condition prior to production. The machine pads, brushes and transport rollers are checked frequently ensuring that there is no foreign material present that may cause scratch on the glass surface.

3.07.2 Visual Inspection

A visual inspection of the cut to size glass is done by the responsible person after washing, receiving and discharging workers in general. Any defects are stated, reported and documented.

3.07.3 Arrising of the Edges

It is ensured that arrising of edges is done properly on all sides prior to heat treatment. There are no skips to avoid chances for breakage during the heat treatment process. The corners are checked if properly done. The edges along the holes are grinded properly without causing scratches on the surface of the glass. The coated surface of the glass is always opposite the rollers to avoid any contact with the roller.

3.07.4 Heat Treatment Process

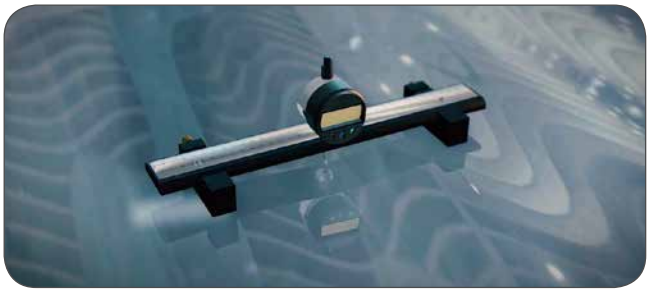
The foreman of the heat treatment process ensures that all the details mentioned on the JPO are done properly and accurately. The width of the glass is placed parallel to the rollers and the logo is placed at the bottom right corner of the glass when viewed outside of the building. Each glass coming out from the chiller is inspected in the zebra board (as defined in ASTM 1048, EN 12150 or EN 1863) to evaluate the level of distortion subjectively.

Logo Stamping Before Heat Treatment

3.07.5 Quality Inspection and Records

The following are checked, measured, tested and recorded to ensure that the glasses produced are in accordance to the international standards:

- Local Bow
- Over-all Bow
- Rollerwave
- Surface compressive stress
- Bending Strength / Stress
- Fragmentation test
- Impact Test
- Color Test



Rollerwave Measurement

Overall Bow

Surface Compressive Stress (by GASP)

Fragmentation Test

3.08 Heat Soak Process

3.08.1 Machine Working Condition

The head of the Heat Soak Line always ensure that the machine is in good condition prior to production. The machine pads and separators are checked to ensure that there is no foreign material present that may cause scratch on the glass surface.

3.08.2 Visual Inspection

A visual inspection of the cut to size glass is done by the receiving and discharging workers in general. Any defects are stated, reported and documented.

3.08.3 Heat Soak Process

The head of the heat soak line records the percentage of failure for each batch of the production. The temperature profile is kept and recorded by the Quality Control Department for reference.

3.09 Sand Blasting Process

3.09.1 Machine Working Condition

The head of the Heat Soak Line always ensure that the machine is in good condition prior to production. The machine pads and transport rollers are checked to ensure that there is no foreign material present that may cause scratch on the glass surface.

3.09.2 Visual Inspection

A visual inspection of the cut to size glass is done by the receiving and discharging workers in general. Any defects are stated, reported and documented.

3.09.3 Sand Blasting Process

The foreman of the sand blasting process ensures that all the details mentioned on the JPO are done properly and accurately. These are the side of the glass where the sand blast is to be placed, the design and dimension and polymer coating application as per the order requirement.

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glass processing

Glass Inspection after Sand Blasting

PVB or SGP Interlayer Lay-up at Lamination

3.10 Lamination Process

3.10.1 Machine Working Condition

The head of the Lamination Line always ensure that the machine is in good condition prior to production. The machine pads, brushes, and transport rollers are checked frequently ensuring that there is no foreign material present that may cause scratch on the glass surface.

3.10.2 Visual Inspection

A visual inspection of the cut to size glass is done by the responsible person after washing, receiving and discharging workers in general. Any defects are stated, reported and documented.

3.10.3 Working Condition

The room is maintained clean at all times free from dust and any foreign material. The responsible people in the lay-up room are required to use a clean anti-static suit and gloves together with hair net / cap to avoid inclusions in the laminates. The room temperature and humidity is regulated in a suitable condition for the films.

3.10.4 Lamination Process

The JPO is always checked for the structure of laminated glass. After lamination, the excess cured film is removed carefully ensuring that it will not create a problem on the succeeding processes. Scratches are avoided when handling the glass and it is required to use clean and soft gloves while cutting the excess film. Proper label is attached to each glass after autoclave process. The Quality engineer in-charge in the lamination section together with the head of the lamination line records all the information concerning the quality of the product. Boil test and/or Bake Test is conducted to ensure the integrity of the laminated glass.

3.11 Insulating Process

3.11.1 Machine Working Condition

The head of the Insulating Line always ensure that all of the machines are in good condition prior to production. The machine pads, brushes, and transport rollers are checked frequently ensuring that there is no foreign material present that may cause scratch on the glass surface.

3.11.2 Visual Inspection

A visual inspection of the cut to size glass is done by the responsible person after washing, receiving and discharging workers in general. Any defects are stated, reported and documented.

3.11.3 Spacer Preparation and Assembly

Spacers are cut to the proper length to insure adequate sealant fill. There are no burrs that can create high spots and the spacer is free of contaminants that could adversely affect adhesion. Gloves are worn when handling spacers. The spacer is checked for proper profile. Spacers are filled with fresh, active desiccant.

3.11.4 The Primary Sealant

The originally packaged Butyl (polyisobutylene) is stored according to the supplier's guidelines. The drum is tightly sealed, protected from direct sun and heat, well ventilated and under dry conditions.

The following are measured during the application of the primary sealant:

- Weight of the butyl / linear meter
- Temperature of the butyl
- Width and thickness

3.11.5 The Desiccant

The originally packaged desiccant is stored according to the desiccant guidelines. The drum is tightly sealed, well ventilated and under dry conditions. Heat rise test is conducted whenever a new batch of desiccant drum is used in production.

Desiccant Heat Rise Test

3.11.6 The secondary Sealant

The sealants are kept according to the guidelines of the supplier. Undamaged originally sealed containers under dry conditions are stored at a temperature between +5° C and + 25° C. The maximum shelf-life is indicated on the label of the drum.

The following tests are done to ensure the integrity of the secondary sealant:

- Butterfly Test
- Glass / Marble Test
- Snap Time Test
- Adhesion Test
- Mixing Ratio Test

Butterfly Test

Glass / Marble Test

Snap Time Test

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glass processing

3.12 Packaging and Delivery

3.12.1 Visual Inspection

Visual inspection of the finished product in accordance with international standards is done by the receiving and discharging workers in general. Any defects are stated, reported and documented.

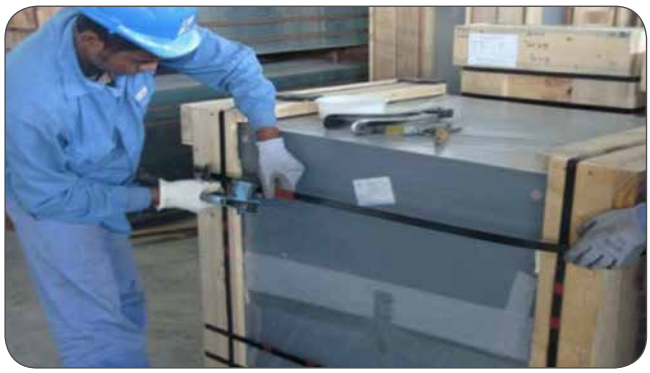
3.12.2 Standard Procedure in Packaging

Scratches are avoided during handling of the IGU, laminated or single glass. Proper protective pads are placed on glass edges to support the glass during transportation.

It is required for the head of the Packaging Section to ensure that all of the packed glasses are properly labelled indicating the correct quantity, type and sizes.

It is ensured that the glasses are in good condition as it leaves the factory. Glasses with scratches or damages after verification from the Quality Control Department are separated right away and are not delivered.

An adequate interleaf such as cork pads is used to prevent glass to glass contact inside the box. A plastic cover is also wrapped around the glasses in the box to insulate it from intense heat of the sun and moisture during transport. The box is reinforced with steel strap to improve the box's strength.

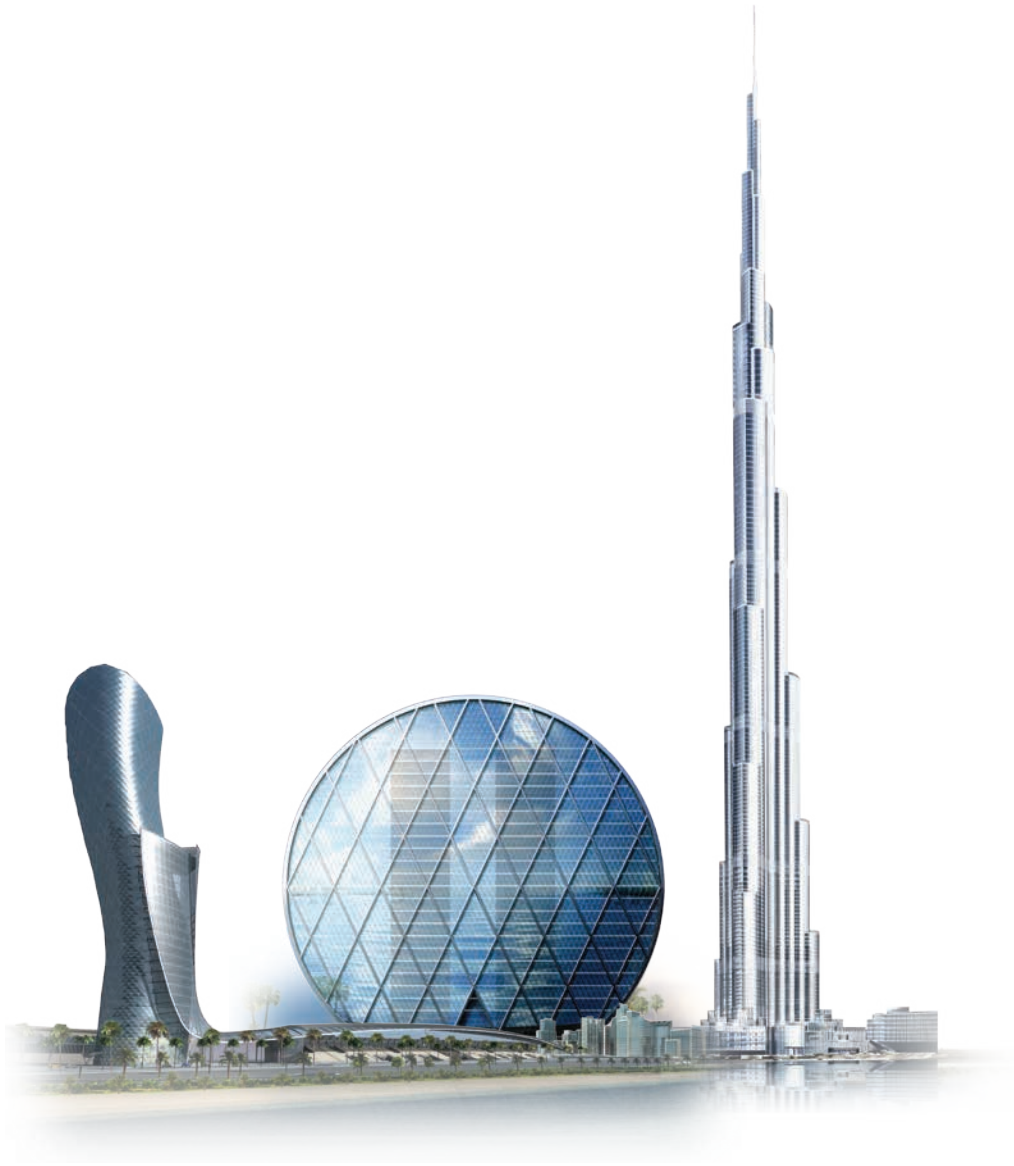


Fixing of steel strap to reinforce packaging and plastic for protection against extreme weather conditions

WHITE ALUMINIUM
glass processing

CHAPTER 4

Accomplished Projects



CHAPTER 4

References for Finished Projects

WHITE ALUMINIUM
glass processing

Burj Khalifa

Dubai, United Arab Emirates

The World's Tallest Structure, Burj Khalifa Tower formerly known as Burj Dubai is the world's tallest building on earth. The height of the Khalifa Burj Tower is a little less than a Killo Meter 828 meter (2717 feet) and it is world's tallest building. The construction of this great building burj tower stated on 21 September 2004. The exterior of the structure completed on 1st October 2009. The building was inaugurated and officially opened on 4th January 2010.

This Global Icon is cladded with more than 120,000 sqm of glass supplied by White Aluminium - Glass Division.
WA|Glass Processing managed to fulfill and exceed ALL Quality and Production requirements and milestones, and completed all deliveries by May 2008.

Developer: Emaar
Architect: S.O.M.
Consultant: Hyder Consulting
Façade Contractor: Arabian Aluminium Co

White Aluminium Enterprises L.L.C P.O. Box: 30665, Abu Dhabi - UAE Tel.: (+971 2) 5500 830 Fax: (+971 2) 5500 828
www.whitealuminium.ae

WHITE ALUMINIUM
glass processing

Abu Dhabi National Exhibition Center (ADNEC) The Capital Gate

Abu Dhabi, United Arab Emirates

The New Icon of Abu Dhabi, The Capital Gate is an iconic and avantgarde building which blends the beauty of nature with the power of technological advancements

Developer: ADNEC
Architect / Consultant: RMJM Dubai
Façade Contractor: Waagner-Biro Stahlbau AG

WHITE ALUMINIUM
glass processing

Aldar Headquarters

Abu Dhabi, United Arab Emirates

The First Spherical Building in the Middle East, This iconic 121m-tall building is a mixed-use waterfront project in the Al Raha Beach community with 51,000 square meters of commercial office space.

Develope: ALDAR
Architect: MZ & Partners
Consultant: ARUP
Façade Contractor: Josef Gartner GmbH

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www.whitealuminium.ae

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Cleveland Clinic, Abu Dhabi (by Mubadala Healthcare)

Al Maryah, Abu Dhabi, United Arab Emirates

Cleveland Clinic Abu Dhabi (known as CCAD) is a multi -specialty hospital located in Abu Dhabi, UAE. The 364 bed luxury hospital, part of Cleveland Clinic Foundation, USA, has been open to the public since May 2015.

Developer: ALDAR Properties
Architect: AEDAS / AECOM
Consultant: AEDAS
Façade Contractor: SIX CO

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glass processing

Singapore Sports Hub

Kallang, Singapore

Singapore Sports Hub is a fully integrated sports, entertainment and lifestyle hub that was built in 2014 and hosts sporting and entertainment events. The Rugby World Club 10s on 21–22 June 2014 was the first sporting event at the new national stadium.

Developer: Singapore Sports Hub Consurtium
Architect: DP Architects
Consultant: ARUP
Façade Contractor: Positive Engineering PTE LTD.

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Baku International Airport - Presidential Terminal

Baku, Azerbeijan

The new Baku International Airport is a 60,000m² terminal which has 13 passenger boarding bridges and is designed for an annual flow of six million passengers.

Developer:
Architect: BURO HAPPOLD
Consultant: ARUP
Façade Contractor: WAAGNER BIRO - STAUHL BARU

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glass processing

Baku Convention Center

Baku, Azerbeijan

Baku's New Convention Centre is conceived to complement the Heydar Aliyev Center in many ways, acting as the 'dancing partner' alongside the existing cultural center.

Developer: State Committee On Property Issues
Architect: Coop Himmelb(L)AU
Consultant: Obermeyer Consultants
Façade Contractor: Ilk Construction

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Four Seasons Hotel - Bahrain Bay

Manama, Bahrain

Four Seasons Hotel is a 201- metre waterfront community area off the north shore of Manama, comprising 43-stories, 260 guest rooms and boast a penthouse level “Sky Pod” restaurant which will extensive views of the Arabian Gulf.

Developer: Bahrain Bay
Architect: Swkidmore, Owings & Merril
Consultant: Turner Construction International
Façade Contractor: BESIX

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The Louvre Museum - Abu Dhabi

Abu Dhabi, United Arab Emirates

Louvre Museum - Abu Dhabi is an art and civilization museum located in Abu Dhabi. It is approximately 24,000 m2 in size, with 8,000 m2 of galleries, making it the largest art museum in the Arabian peninsula.

Developer: TDIC - AUH
Architect: Jean Nouvel
Consultant: Ateliers Jean Nouvel
Façade Contractor: Folcra Beach IND.

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Barwa Commercial Avenue

Mesaimeer, Doha, Qatar

Barwa Commercial Avenue is a mega-sized mixed-use development of residential, commercial and offices set to be Qatar's new lifestyle destination and where all business activities are Available. Barwa Commercial Avenue offers 460 apartments, 475 showrooms, 630 offices and a shopping mall with net leasable area of 56,600 m2.

Developer: Barwa Real Estate Co.
Architect:
Consultant: Cansult Maunsell
Façade Contractor: Alumco

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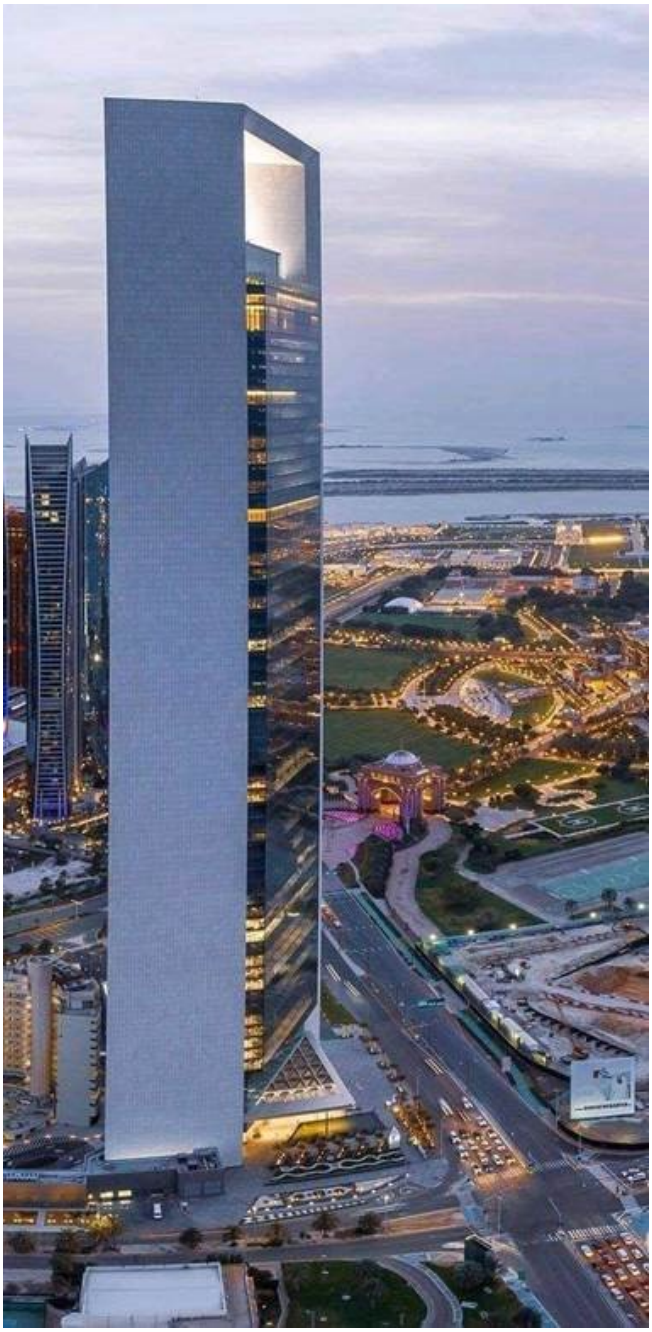
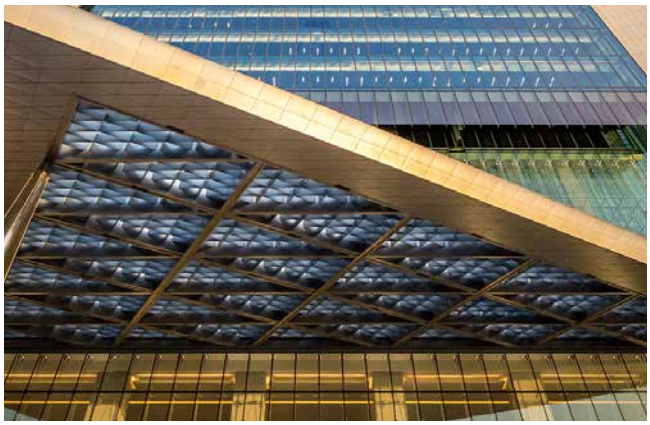
Abu Dhabi National Oil Company Headquarter (ADNOC HQ)

Abu Dhabi, United Arab Emirates

ADNOC Headquarters is a skyscraper office complex located in Abu Dhabi, UAE and is the corporate headquarters of the Abu Dhabi National Oil Company (ADNOC)





Developer: ADNOC
Architect: Ch2m Hill/ Hok, Inc.
Consultant: Werner Sobek Group
Façade Contractor: Jangho Group Co. Ltd.

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Presidential Palace

Abu Dhabi, United Arab Emirates

Presidential Palace was built to utilize to serve an important role as the primary governmental facility for receiving visiting dignitaries.

Developer: Abu Dhabi Ministry Of Presidential Affairs
Architect: CCC
Consultant: DAR SSH
Façade Contractor: ALUMCO UAE

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Eaton Centre Montreal Canada

Montreal, Quebec, Canada

The **Montreal Eaton Centre** is a shopping mall in Downtown Montreal, Quebec, Canada. The mall is accessible through the Underground City, and is connected to the Montreal Metro via McGill station.

Aluminum Contractor: Vitreco Co.

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Reseau Express Metropolitan (REM), Montreal Canada

Montreal, Quebec, Canada

The Réseau Express Métropolitain (REM): Metropolitan Express Network is a light metro rapid transit system under construction in the Greater Montreal area around Montreal,Quebec,Canada. The system will link several suburbs with Downtown Montreal via Central Station. It involves the conversion of the existing Deux-Montagnes communter rail line to light metro standards.

Consultant: NouvLR
Aluminum Contractor: Vitreco Co.

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Project Name	Location	Work Period	Area (m2)
REM central station	Canada	2021	435
Mount Dennis Childcare	Canada	2021	295
Lester B Pearson Building	Canada	2020-2023	10,000
Reseau Express Metropolitan (REM)	Canada	2019-2023	45,000
Mashreq Bank Headquarters	Dubai	2020	28,000
Pier Village Phase III Long Branch	USA	2020	10,000
B+G+13+R-Arenco Hotel	Dubai	2017 - 2020	13,000
Telal Hotel & Apartments	Dubai	2020	9,000
Riyadh Bus Transit	Saudi Arabia	2020	14,500
Sharjah Bank	Sharjah	2020	8,000
Dubai Hills Villas	Dubai	2019 - 2020	8,500
The Address Residence (TAR) Sky Views	Dubai	2019	63,500
Jeddah Hospital	Saudi Arabia	2017 - 2019	38,500
Mamsha Al Saadiyat	Abu Dhabi	2019	32,000
Element Tower	UAE	2019	12,000
Sterling Project	UAE	2019	12,000
5-Star Hotel	UAE	2018 - 2019	10,000
Riyadh Metro	Saudi Arabia	2019	7,000
Residential and Commercial Building	Sharjah	2019	17,500
Park View Tower	Abu Dhabi	2019	12,000
Fountain Views	Dubai	2017 - 2019	9,500
Dubai International Financial Center (DIFC) Gate Avenue	Dubai	2019	8,500
Nudra Villa	Sharjah	2019	7,000
Nisma Residence	Sharjah	2019	6,500
Eclipse Tower	Abu Dhabi	2018 - 2019	6,000
Swaziland International Convention Center	Africa	2019	6,000
Jabel Ali Park Hotel	Dubai	2019	5,500
KITC - Kuwait	Kuwait	2019	5,000
Residential Development at Nad Al Sheba	Dubai	2019	4,000
Commercial Building for Alu Majed Al Mansouri	Abu Dhabi	2019	4,000
Topaz 1 – Residential Building	Dubai	2019	2,500
Emirates Hills	Dubai	2018	15,000
Saadiyat Island Resort Development	Abu Dhabi	2018	14,500
Moon Flower City	Abu Dhabi	2018	11,000
Emerald Palace Hotel	UAE	2018	6,500
C10 Najmat Development	Abu Dhabi	2018	6,000

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Project Name	Location	Work Period	Area (m2)
DAMAC	Dubai	2018	4,500
MBRH – Sobha	Dubai	2018	4,000
Munajem Tower	Saudi Arabia	2018	4,000
Bin Hashed Tower	Abu Dhabi	2018	3,500
Mulberry Park	Dubai	2018	3,500
Suhail Al Murar Residential & Commercial Building	Abu Dhabi	2018	3,000
Eaton Centre Montreal Canada	Canada	2018	1,000
Commercial Building for H.H. Sheikh Seif Mohammed Al Nahyan	Abu Dhabi	2016 - 2017	14,000
Lodha New Cuffe Parade (NCP – Wadala)	India	2017	13,500
Jabal Omar Development	Saudi Arabia	2016 -2017	10,500
Saraya Tower	Abu Dhabi	2017	9,500
First Avenue Mall & Hotel	UAE	2017	8,000
Msheireb Downtown Doha	Qatar	2017	7,000
Leaf Tower	Abu Dhabi	2017	6,000
Bloom Marina	Abu Dhabi	2015 - 2016	14,500
Al Hilal Bank Tower	UAE	2016	10,000
King Fahad Medical City	Saudi Arabia	2016	9,500
Kigali Heights	Rwanda, Afirca	2016	6,000
National Housing at Al Raheeb	UAE	2016	6,000
Dawadmi Faculty of Engineering – Shar (P 14/15)	Saudi Arabia	2016	5,000
Hail Medical Science College	Abu Dhabi	2015 - 2016	4,500
Renovation of Khalifa Stadium and Museum	Qatar	2016	4,000
American University Beirut – Medical Center (AUBMC)	Lebanon	2016	4,000
Jabal Al Akhdar Anantara Hotel Resort	Oman	2015 - 2016	3,500
Tawar Mall	Qatar	2016	3,000
16th Street Church	USA	2016	1,500
DIFAF - Sudan	Sudan	2015	7,200
Dubai Design District	Dubai	2015	1,500
Baha Mar Development	USA	2014	127
Tavern on Green	USA	2013	185

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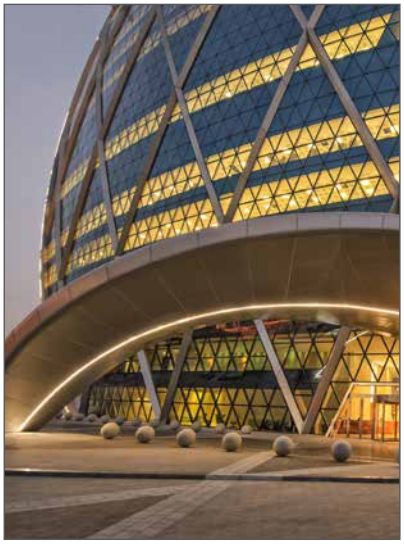
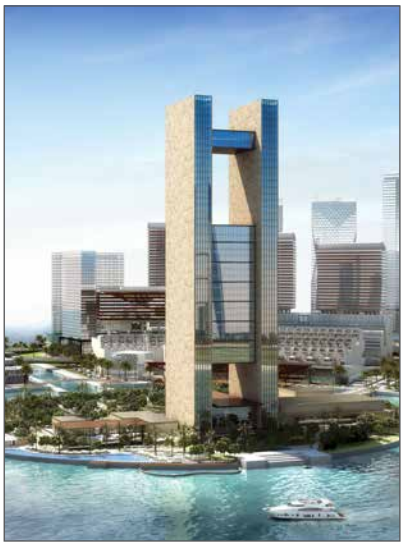
Project Name	Location	Work Period	Area (m2)
Burj Vista	Dubai	2016	30,000
Al Kout Mall	Kuwait	2016	15,000
Abu Dhabi Courthouse	Abu Dhabi	2016	15,000
King Abdulah Financial District (KAFD)	Riyadh, Saudi Arabia	2016	10,000
Multan Bus Stations	Multan, Pakistan	2016	5,000
Ruwais Housing Complex Expansion Expansion Phase III	Abu Dhabi	2015	50,000
Bvlgari Residence and Hotels	Dubai	2015	25,000
Shaza Kempinsky	Qatar	2015	15,000
The Louvre Museum	Abu Dhabi	2015	10,000
Caspian Waterfront	Baku, Azerbeijan	2015	10,000
Singapore Sports Hub	Singapore	2013	8,000
Cleveland Clinic	Abu Dhabi	2012	60,000
Baku Airport - Presidential Terminal	Baku, Azerbeijan	2012	25,000
Heart of Doha	Doha, Qatar	2011	25,000
Taj Mall	Jordan	2011	5,000
Barwa Commercial Avenue	Doha, Qatar	2010	30,000
Arzanah Medical Complex	Abu Dhabi	2010	10,000
Marasy Apartments	Abu Dhabi	2010	10,000
Marina Hotel - Yas Island	Abu Dhabi	2008	10,000
Yas Viceroy Hotel	Abu Dhabi	2008	8,000
Marina Hotel	Abu Dhabi	2008	5,000
Park Place	Abu Dhabi	2009	4,500
Dona Tower	Dubai	2009	17,000
Jumaira Park Villa	Dubai	2009	15,000
Nojoom Tower	Dubai	2009	10,000
Reem Island A2	Abu Dhabi	2008	16,000
Jumaira Lake Tower	Dubai	2009	60,000
Burj Dubai Tower	Dubai	2007-2008	120,000
Al Dar Headquarters	Dubai	2008	19,000
Dubai World Central Int. Airport	Dubai	2008	1,000
Al Salam Industrial Park	Doha, Qatar	2008	1,200
Commercial Bldg. In Dubai	Dubai	2008	5,000
Creative Scientific School at Khalifa City	Abu Dhabi	2008	2,000
G+4P+17 Floors+Swimming Pool, Commercial & Residential Building	Sharjah	2008	1,500
Al Qasba Tower	Sharjah	2008	5,000
J-995 Injazat Data Center	Abu Dhabi	2008	6,500





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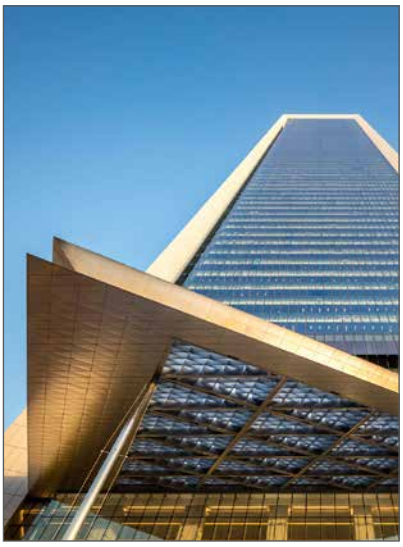
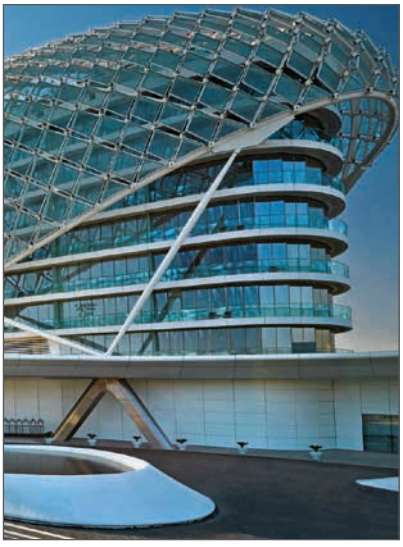
Project Name	Location	Work Period	Area (m2)
Churchill Tower	Dubai	2008	34,300
Liberty House	Dubai	2008	17,000
Fairmont Hotel	Dubai	2008	8,700
Male & Female High School	Abu Dhabi	2008	5,500
Al Habtoor- 7 Nos. Commercial and Residential Building	Sharjah	2007	37,422
Villa for Salem Al Moosa	Dubai	2007	1,289
Falcon City	Dubai	2007	12,000
Business Bay Hotel	Dubai	2007	18,000
Limitless	Dubai	2007	5,000
Concorde Tower	Dubai	2007	22,195
Sharjah Islamic Bank	Sharjah	2007	2,680
3B+G+34 Commercial & Residential Tower on Plot C3	Dubai	2006-2007	9,557
DIDC	Dubai	2006-2007	15,480
Green Coast	Dubai	2006-2007	1,775
Salahuddin	Dubai	2006-2007	3,927
Old Town	Dubai	2006-2007	12,323
Discovery Gardens 1&2	Dubai	2006-2007	22,000
Used Car Showroom	Dubai	2006-2007	8,676
Grandstand	Abu Dhabi	2006-2007	5,329
Twin Commercial Bldg. On C 64 & C65 at Sector E/25	Abu Dhabi	2006-2007	4,162
Etihad Complex	Abu Dhabi	2006-2007	5,776
J-991 Residential Complex	Abu Dhabi	2006-2007	5,500
J-992 Bayside Residential	Dubai	2006-2007	1,500
Discovery Gardens- Contemporary	Dubai	2006-2007	20,000
Zen Gardens	Dubai	2006-2007	16,000
Burj Dubai Development-Old Town	Dubai	2006-2007	5,000
Al Fardous Hotel & Residential Complex	Doha, Qatar	2006-2007	18,203
Bin Sumaikh Tower	Doha, Qatar	2006-2007	3,900
Doha Racing Club	Doha, Qatar	2006-2007	3,000
Commercial Complex in Khalidiya Sectow W-10 Plot C8	Abu Dhabi	2006-2007	14,000
Bel Ghalim Residential Tower	Abu Dhabi	2006-2007	4,000
Villa at Jumeirah Third	Dubai	2006-2007	1,000
Al Ansari	Sharjah	2006-2007	2,678
International City Package 14	Sharjah	2006-2007	6,500





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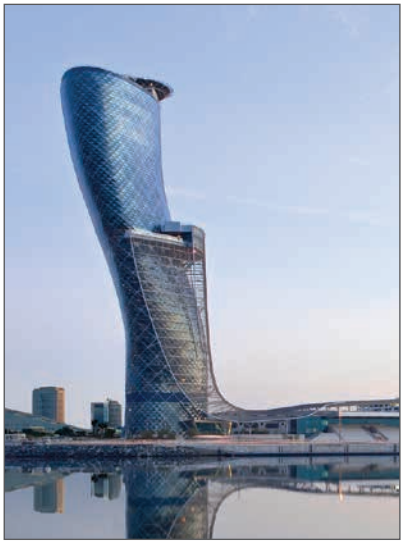
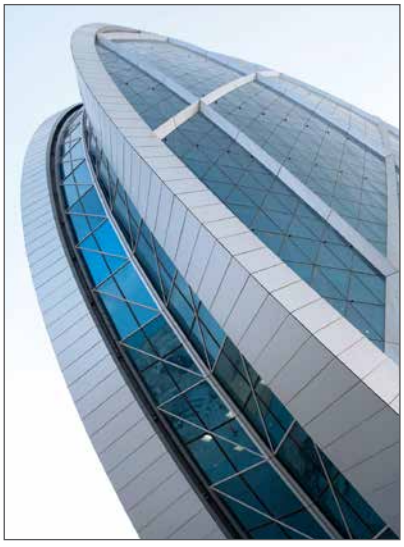
Project Name	Location	Work Period	Area (m2)
G+44 Storey Bldg.	Doha, Qatar	2005-2006	20,000
Quipco Tower 1 & 2	Doha, Qatar	2005-2006	13,000
Abu Dhabi Airport Ext.	Abu Dhabi	2005-2006	3,000
Ajman Complex Building (8 Nos.)	Ajman	2005-2006	7,600
Construction of Sahil Acc. Replacement for ADMA-OFCO on Das Island	Abu Dhabi	2005-2006	4,000
6 Commercial Bldg.	Abu Dhabi	2004-2005	18,000
Mina Port	Abu Dhabi	2004-2005	18,000
Sheikh Sultan Bin Zayed Tower	Abu Dhabi	2004-2005	6,000
Al Manal Residential Furnished Suits for Sheikh Mohd. Bin Butti Al Hamid on Plot C-18 E-14	Abu Dhabi	2004-2005	5,000
Blood Bank- AUH & Al Ain	Abu Dhabi	2004-2005	2,000
Dubai Creek Golf & Yatch Club Villas	Dubai	2004-2005	3,000
Multi Storey Bldg. At Abu Dhabi	Abu Dhabi	2002-2003	5,000
Commercial Bldg. For Heirs of Late Saeed Mohd. Al Badi	Abu Dhabi	2002-2003	6,000
Abu Dhabi Industrial City	Abu Dhabi	2002-2003	9,000
Tower for Sheikh Zayed Bin Sultan Al Nahyan, Loc. Plot C-70 Sector E-4/2, AUH	Abu Dhabi	2002-2003	6,000
Beach Villa	Doha, Qatar	2007	3,000
Bavaria Executive Suites	Dubai	2007	2,078
Dubai Festival City	Dubai	2007	3,000
Nasser Bin Khalid	Doha, Qatar	2007	1,590
Al Raha Gardens Residential Compounds	Abu Dhabi	2007	7,000
19 Nos. Villas Between 2 Bridges for Al Fahim & Hashoo Group	Abu Dhabi	2007	1,000
B+G+Office Bldg. On plot # 373-263 at Al Barsha, Dubai	Dubai	2006	1,500
Commercial Residential Complex on Plot 124, 125, 126, & 127 in Sector E 48, AUH	Abu Dhabi	2006	1,200
Schlumberger (Phase I) MLC-MEA Learning Center-ADNOC, AUH	Abu Dhabi	2006	1,500
Al Marsa-2B+G+7 Residential Bldg. On Plot 392-420	Dubai	2006	2,000
Dubai Low Voltage Cable Factory	Abu Dhabi	2005	1,500
Habshan Residential Complex Expansion	Abu Dhabi	2005	3,000
UAE Central Bank Head Office Extension	Abu Dhabi	2004	2,000





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Project Name	Location	Work Period	Area (m2)
State Audit Bureau, Kuwait	Kuwait	2004	3,000
Al Jazeera Grandstand, Gymnasium & Assorted Facilities	Abu Dhabi	2003	2,000
Commercial Bldg. On Plot # W-8, C-31 Abu Dhabi for Sheikh Hamd	Abu Dhabi	2003	11,000
Commercial Bldg. For Mr. Hadef Jawaan Al Dhahiri	Abu Dhabi	2003	4,000
Commercial Bldg. For Sheikh Fatima Bint Mubarak, Loc. P-C20, E-12, AUH	Abu Dhabi	2003	4,000
Construction Works for Hasa Infrastructure Upgrade	Abu Dhabi	2003	5,000
Sheikha Sheikha Afra	Abu Dhabi	2003	4,000
Sheraton Hotel	Abu Dhabi	2002	1,000
Bldg. For Mr. Mahmood Doshan	Sharjah	2002	4,000
Liwa Center	Abu Dhabi	2002	4,000
Bldg. For Sheikh Bin Butty Towers C28 & C26, AUH	Abu Dhabi	2001	3,500
Umm Al Nar Destination	Abu Dhabi	2001	1,000
Bldg. For Mr. Salem Khalifa Al Qubeisi	Abu Dhabi	2001	1,500
Cargo Bldg. Expansion at Amiri Flight Facilities (Loc. Abu Dhabi Airport)	Abu Dhabi	2001	4,700
Commercial Bldg. For Mr. Ibrahim Mahmood	Abu Dhabi	2001	1,000
Al Kharazi Building	Abu Dhabi	2000	8,000
Al Sayal	Abu Dhabi	2000	4,000
Design & Construction of Petroleum Institute Temporary Facilities	Abu Dhabi	2000	2,000
Commercial Bldg. For Sheikh Surror Bin Sultan Al Dahiri	Abu Dhabi	2000	2,000
Commercial Development for Diwan of H.H. The Crown Prince	Abu Dhabi	2000	3,000
Hamel Al Gaith Building	Abu Dhabi	2000	4,000
G+M+17 Storey Commercial Bldg. For Mr. Sihail Nasser & Awida Sons of Mr. Hamed Sohail Al Khaily	Abu Dhabi	2000	6,000
Bldg. For Mr. Rehma Al Masaood	Abu Dhabi	2000	1,500

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CHAPTER 5

Certifications and Accreditations

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Certifications and Accreditations

Certificate Of Registration

Awarded to

WHITE ALUMINIUM ENTERPRISES LLC

at

P.O.BOX: 30665, SECTOR NO. M41, PLOT NO. D14(51)–D11(48,49), D11 ICAD 1, M14 SECTOR 63, M21 SECTOR 28, MUSAFFAH, ABU DHABI, UAE

Quality Registrar Systems certify that the management system of the above organization has been audited and found to be in compliance with the QRS requirements for registration of the management system standard detailed below:

ISO 9001:2015

Quality Management Systems

Scope of work

- PROCESSING AND DISTRIBUTION OF FIRE RATED GLASSES, BULLET RESISTANT GLASSES
- ALUMINIUM AND GLASS PRODUCTS

EA 13, 15
Certificate No: AAU-1791
Originally Registered: 26 SEP 2020
Latest Issue: 26 SEP 2020
Valid up-to: 25 SEP 2023

Quality Registrar Systems

MANAGING OFFICE ADDRESS:
Quality Registrar Systems
P.O. Box :26826
United Arab Emirates

Tel: +971-2-6714302
Fax: +971-2-6741449
www.qrsyst.com

WORLD WIDE CERTIFICATION

Certificate Of Registration

Awarded to

WHITE ALUMINIUM ENTERPRISES LLC

at

P.O.BOX: 30665, SECTOR NO. M41, PLOT NO. D14(51)–D11(48,49), D11 ICAD 1, M14 SECTOR 63, M21 SECTOR 28, MUSAFFAH, ABU DHABI, UAE

Quality Registrar Systems certify that the management system of the above organization has been audited and found to be in compliance with the QRS requirements for registration of the management system standard detailed below:

ISO 14001:2015

Environmental Management Systems

Scope of work

- PROCESSING AND DISTRIBUTION OF FIRE RATED GLASSES, BULLET RESISTANT GLASSES
- ALUMINIUM AND GLASS PRODUCTS

EA 13, 15
Certificate No: AAU-5480
Originally Registered: 26 SEP 2020
Latest Issue: 26 SEP 2020
Valid up-to: 25 SEP 2023

Quality Registrar Systems

QRS ISO 14001 : 2015 CERTIFIED

ASCB(E) Accrediting Certifying Bodies.

MANAGING OFFICE ADDRESS:
Quality Registrar Systems
P.O. Box :26826
United Arab Emirates

QRS
WORLD WIDE CERTIFICATION

Tel: +971-2-6714302
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Certificate Of Registration

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Quality Registrar Systems certify that the management system of the above organization has been audited and found to be in compliance with the QRS requirements for registration of the management system standard detailed below:

ISO 45001:2018

Occupational Health and Safety Management Systems

Scope of work

- PROCESSING AND DISTRIBUTION OF FIRE RATED GLASSES, BULLET RESISTANT GLASSES
- ALUMINIUM AND GLASS PRODUCTS

EA 13, 15
Certificate No: AAU-3567
Originally Registered: 26 SEP 2020
Latest Issue: 26 SEP 2020
Valid up-to: 25 SEP 2023

Quality Registrar Systems

MANAGING OFFICE ADDRESS:
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United Arab Emirates

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Fax: +971-2-6741449
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WORLD WIDE CERTIFICATION

GLASS AND GLAZING FEDERATION

ARE PROUD TO CONFIRM THAT

White Aluminium LLc

HAS SUCCESSFULLY IMPLEMENTED A FACTORY PRODUCTION CONTROL SYSTEM IN ACCORDANCE WITH THE APPLICABLE HARMONISED EUROPEAN STANDARD, HAS COMPLETED THE REQUIRED INITIAL TYPE TESTING AND HAS PREPARED ALL THE APPROPRIATE PAPERWORK TO ALLOW THEM TO
CE *MARK THEIR*

THERMALLY TOUGHENED SODA LIME SILICATE SAFETY GLASS

IN ACCORDANCE WITH EN 12150-2

Issued: 23rd May 2014

Certificate No: TC600

GGF
Glass and Glazing Federation

Chief Executive:

N. Rees

Director of Glazing:

S. H. Rice

Glass and Glazing Federation
Ayres Street
London
SE1 1EU
Tel: 020 7939 9101
Fax: 020 7357 7458

Test Facility:
WINTECH Engineering Ltd
Halesfield 2
Telford TF7 4QH
Tel: 01952 586580
Fax: 01952 586585

GLASS AND GLAZING FEDERATION

ARE PROUD TO CONFIRM THAT

White Aluminium LLc

HAS SUCCESSFULLY IMPLEMENTED A FACTORY PRODUCTION CONTROL SYSTEM IN ACCORDANCE WITH THE APPLICABLE HARMONISED EUROPEAN STANDARD, HAS COMPLETED THE REQUIRED INITIAL TYPE TESTING AND HAS PREPARED ALL THE APPROPRIATE PAPERWORK TO ALLOW THEM TO
CE *MARK THEIR*

LAMINATED GLASS AND LAMINATED SAFETY GLASS

IN ACCORDANCE WITH EN 14449

Issued: *23rd May 2014*

Certificate No: *TC601*

GGF

Glass and Glazing Federation

Glass and Glazing Federation
54 Ayres Street
London
SE1 1EU
Tel: 020 7939 9101
Fax: 020 7357 7458

Chief Executive:

N. Rees

Director of Glazing:

S. H. Rice

GLASS AND GLAZING FEDERATION

ARE PROUD TO CONFIRM THAT

White Aluminium LLc

HAS SUCCESSFULLY IMPLEMENTED A FACTORY PRODUCTION CONTROL SYSTEM IN ACCORDANCE WITH THE APPLICABLE HARMONISED EUROPEAN STANDARD, HAS COMPLETED THE REQUIRED INITIAL TYPE TESTING AND HAS PREPARED ALL THE APPROPRIATE PAPERWORK TO ALLOW THEM TO
CE *MARK THEIR*

INSULATING GLASS UNITS

IN ACCORDANCE WITH EN 1279-2

Issued: 23rd May 2014

Certificate No: TC602

GGF

Glass and Glazing Federation

Glass and Glazing Federation
54 Ayres Street
London
SE1 1EU
Tel: 020 79390101
Fax: 020 7357 7458

Chief Executive:

N. Rees

Director of Glazing:

S. H. Rice

GGF

Certifies that

White Aluminium

is a member of the

Glass and Glazing Federation

www.ggf.org.uk

Membership No.

P2704

For the Year

2012

Member since: 01 February 2008

Nigel Rees
GGF Chief Executive

Glass and Glazing Federation, 54 Ayres Street, London SE1 1EU

SAINT-GOBAIN

exprover.saint-gobain-glass.com

EXPRO CLUB GOLD

This is to certify that

WHITE ALUMINIUM
glass processing

White Aluminium Enterprises

(Abu Dhabi, United Arab Emirates)

is appointed as Saint-Gobain Exproclub Gold member

This certification is valid from 01st Jul 2020 to 01st Jul 2022

Nicolas Mondy, General Manager
Saint-Gobain Glass International

PRODUCTS
RvA C 078

Certificate of constancy of performance

0336 – CPR - 89206432 D

In compliance with the Regulation 305/2011/EU of the European Parliament and of the Council of 9 March 2011 (the Construction Products Regulation or CPR), this certificate applies to the construction product

Insulating Glass Units with the intended use fire resistance

Specified by the commercial name(s):
• **Climalit®** • **Climaplus®** • **Climatop®**

placed on the market by:
White Aluminum Enterprises L.L.C.
P.O. Box 30665
Abu Dhabi ; U.A.E.

and produced in the manufacturing plant(s):
White Aluminum Enterprises L.L.C.
P.O. Box 30665
Abu Dhabi ; U.A.E.

This certificate attests that all provisions concerning the assessment and verification of constancy of performance at system 1 being certified and that the performances described in Annex ZA of standard(s)

EN 1279-5:2005+A2:2010
were applied and that

the product fulfils all the prescribed requirements.

This certificate was first issued on 1 December 2014 and remains valid as long as the harmonised technical standard remains valid or the manufacturing conditions in the plant or the factory production control itself are not modified significantly.

TÜV Rheinland Nederland BV
Boogschutterstraat 11A
NL – 7224 AE Apeldoorn
The Netherlands

Apeldoorn, 1 December 2014

H. van Ginkel, Business field manager

safety glazing
certification council

Administrative Office, AMS, Inc.
205 West Main Street, PO Box 730
Sackets Harbor, NY 13685
Phone: (315) 646-2234
E-mail: SGCC@amscert.com

ANSI ACCREDITED
#0961
ISO/IEC 17065
Product Certification Body

ACKNOWLEDGEMENT OF CERTIFICATION

THIS IS TO ACKNOWLEDGE THAT AS OF THIS DATE

White Aluminum Enterprises LLC
Abu Dhabi, United Arab Emirates

IS A CURRENT LICENSEE AND HAS MET ALL GUIDELINES AND REQUIREMENTS FOR THE SGCC® CERTIFICATION PROGRAM AND AS SUCH IS ELIGIBLE TO LABEL THE BELOW INDICATED PRODUCT(S) AS SGCC® CERTIFIED. REPRESENTATIVE SAMPLES OF THE BELOW PRODUCTS HAVE BEEN FOUND TO BE IN COMPLIANCE WITH ANSI Z97.1-2015 AS INDICATED AND CPSC 16 CFR 1201 STANDARDS, KNOWN AS COMPOSITE CERTIFICATION (COMP), OR BOTH STANDARDS WITH CAN/CGSB 12.1-2017 KNOWN AS COMP+CAN.

SGCC#	IN	MM	Attributes	INT	Type Code	Max Size	ANSI Class	Test Std
4597	5/16	8			TTG	U	A	COMP
4598	1/4	6			TTG	U	A	COMP
7085	5/32	4			TTG	U	A	COMP
7237	(H)	8-16+	(ip)(T)	(.035)	LTG	U	A	COMP
7260	(H)	8-16+	(b)(T)	(.030)	LTG	U	A	COMP
7477	3/8	10			TTG	U	A	COMP

THIS SGCC® PROGRAM CERTIFICATION IS CURRENT AND IN FULL EFFECT AS OF THIS ISSUE DATE. CERTIFICATION IN THE SGCC® PROGRAM IS SUBJECT TO SEMI-ANNUAL RENEWAL. PLEASE CHECK THE SGCC WEBSITE AT WWW.SGCC.ORG OR THIS OFFICE FOR MOST CURRENT INFORMATION.

Wednesday, March 16, 2022	F22	
DATE OF ISSUE	CERTIFICATION PERIOD	ADMINISTRATIVE MANAGER

INSULATING GLASS IGCC CERTIFICATION COUNCIL

IGMA INSULATING GLASS MANUFACTURERS ALLIANCE

Administrative Management Systems, Inc.
205 West Main Street, PO Box 730
Sackets Harbor, NY 13685
Phone: (315) 646-2234
Fax: (315) 646-2297
E-mail: staff@amscert.com

ANSI ACCREDITED
#0961
ISO/IEC 17065
Product Certification Body

ACKNOWLEDGEMENT OF CERTIFICATION

THIS IS TO ACKNOWLEDGE THAT AS OF THIS DATE

White Aluminum Enterprises LLC
Abu Dhabi, United Arab Emirates

IS A CURRENT LICENSEE AND HAS MET ALL GUIDELINES AND REQUIREMENTS FOR THE IGCC®/IGMA® CERTIFICATION PROGRAM AND AS SUCH IS ELIGIBLE TO LABEL THE BELOW INDICATED PRODUCT(S) AS IGCC®/IGMA® CERTIFIED. THE FOLLOWING ARE IN COMPLIANCE WITH ASTM E2190 FOR SEAL DURABILITY OF INSULATING GLASS UNITS AND PASSING GAS CONTENT INITIAL AND AFTER WEATHERING (GCIA) CERTIFICATION REQUIREMENTS AS INDICATED.

CERT #	GLASS	SPACER	FRAME CONST.	DESICCANT	SEALANT	GCIA	IC
2335	U/U	AA	BC4/ALLC	LF	PIB/S2	No	

THIS IGCC®/IGMA® PROGRAM CERTIFICATION IS CURRENT AND IN FULL EFFECT AS OF THIS ISSUE DATE. CERTIFICATION IN THE IGCC®/IGMA® PROGRAM IS SUBJECT TO SEMI-ANNUAL RENEWAL. PLEASE CHECK THE CURRENT CERTIFIED PRODUCTS DIRECTORY OR THIS OFFICE FOR MOST CURRENT INFORMATION.

Wednesday, March 16, 2022	February 1, 2022 - January 31, 2023	
DATE OF ISSUE	CERTIFICATION PERIOD	ADMINISTRATIVE MANAGER

ID-14 Last Reviewed By: AD 9/18/20 Last Approved By: KS 9/18/20

IGMA INSULATING GLASS MANUFACTURERS ALLIANCE

Administrative Management Systems, Inc.
205 West Main Street, PO Box 730
Sackets Harbor, NY 13685
Phone: (315) 646-2234

ANSI ACCREDITED
#0961
ISO/IEC 17065
Product Certification Body

igmac CERTIFICATION

Insulating Glass Manufacturers Alliance

Certification Program for the CGSB 12.8 Insulating Glass Standard

White Aluminum Enterprises LLC

Abu Dhabi, United Arab Emirates

Has certified the following product line in accordance with the requirements of the IGMAC Certification Program:

# IGMAC	CONNECTOR	SPACER	DESICCANT	SEALANT	GAS	# OF LITES
021719G	MC-4	SS	LF	PIB+S2	GCIA	2

AMS, Certification Body

19-Feb-21
Issue Date

27-Aug-22
Expiry Date

IGMA Executive Director

CA-54 5-8-19 KW

IGMA INSULATING GLASS MANUFACTURERS ALLIANCE

Administrative Management Systems, Inc.
205 West Main Street, PO Box 730
Sackets Harbor, NY 13685
Phone: (315) 646-2234

ANSI ACCREDITED
#0961
ISO/IEC 17065
Product Certification Body

igmac CERTIFICATION

Insulating Glass Manufacturers Alliance

Certification Program for the CGSB 12.8 Insulating Glass Standard

White Aluminum Enterprises LLC

Abu Dhabi, United Arab Emirates

Has certified the following product line in accordance with the requirements of the IGMAC Certification Program:

# IGMAC	CONNECTOR	SPACER	DESICCANT	SEALANT	GAS	# OF LITES
012005G	MC4	PHSS	LF	PIB+S2	GCIA	3

AMS, Certification Body	05-Mar-21 Issue Date	05-Mar-23 Expiry Date	IGMA Executive Director

CA-54 5-8-19 KW

CERTIFICATE OF APPROVAL
No CF 291

This is to certify that, in accordance with
TS00 General Requirements for Certification of Fire Protection Products
The undermentioned products of

SCHOTT UK LIMITED

Drummond Road, Stafford. ST16 3EL
Tel: 01785 223166 Fax: 01785 223522

Have been assessed against the requirements of the Technical Schedule(s) denoted below and are approved for use subject to the conditions appended hereto:

CERTIFIED PRODUCT	TECHNICAL SCHEDULE
PYRAN S Fire Resisting Glass	TS 25 Fire Resistant Glass, Glazing Systems and Materials

Signed and sealed for and on behalf of Exova (UK) Limited trading as Warrington Certification

Paul Duggan
Certification Manager

Issued: 9th September 2002
Reissued: 30th May 2018
Valid to: 29th May 2023

intertek
Total Quality. Assured.

Certificate of Compliance

Intertek

This is a certificate of compliance to certify that the bearer has successfully completed the requirements of the above scheme which include the testing of products, the initial assessment, and are subject to continuing annual assessments of their compliance and testing of samples of products taken from production (as applicable to the scheme) and has been registered within the scheme for the products detailed.

You have been awarded:

WH Service Mark 2014 for Glazing/glass

Standards: BS 476 Part 22 (1987), EN 1364-1 (2015), BS 476 Part 20 (1987), EN 1634-1 (2014)

Certificate number: WHI18-28085513

Organization: White Aluminium Enterprises LLC
P.O. Box 30665
ICAD 1
Abu Dhabi, .
United Arab Emirates

Product: White Aluminium - PYRAWHITE - Fire Resisting, One Side Coated, Unidirectional Glass
Spec ID: 43155
Fire Rating: 90 Minute Fire Rated, 60 Minute Fire Rated
Listing Information: See following page(s)

Certification body: Intertek Testing Services NA, Inc.
Initial registration: February 19, 2018
Date of expiry: December 31, 2022
Issue status: 5

Authorized By: _____
Jean-Philippe Kayl, Director of Certification

Intertek Testing Services NA, Inc.
545 E. Algonquin Road, Ste H., Arlington Heights, IL 60005 USA
Phone: 847-439-5667 Fax: 847-439-7320

www.intertek.com

KADDB

مركز الملك عبدالله الثاني للتصميم والتطوير

Test Certificate

UKAS TESTING

4515

Test Sample: 22 mm Ballistic Glass / Type 1 - SN.1

Manufacturer: White Aluminum Enterprises L.L.C/UAE

Test Date: 20 December 2016

Test Report No.: KADDB/TEST/KBTF/TR/351/01

The Submitted Sample Met Test Requirements According To:

EN 1063:2000

"Glass in Building -Security Glazing -Testing and Classification of Resistance Against Bullet Attack"

BR2 – NS

"No Perforation & No Splinters"

23th January 2017

Head of Weapons, Ammunition & Armor Testing

Dr. Eng. Riyad Ali Ratrout

23th January 2017

Head of Test & Evaluation

Eng. Samir Al Majali

KADDB

مركز الملك عبدالله الثاني للتصميم والتطوير

Test Certificate

UKAS TESTING

4515

Test Sample: 19 mm Ballistic Glass / Type 8 - SN.4

Manufacturer: White Aluminum Enterprises L.L.C/UAE

Test Date: 20 December 2016

Test Report No.: KADDB/TEST/KBTF/TR/351/02

The Submitted Sample Met Test Requirements According To:

EN 1063:2000

"Glass in Building -Security Glazing -Testing and Classification of Resistance Against Bullet Attack"

BR3 – NS

"No Perforation & No Splinters"

23th January 2017

Head of Weapons, Ammunition & Armor Testing

Dr. Eng. Riyad Ali Ratrout

KADDB

23th January 2017

Head of Test & Evaluation

Eng. Samir Al Majali

Test Certificate

4515

Test Sample: 33 mm Ballistic Glass / Type 2 - SN.2

Manufacturer: White Aluminum Enterprises L.L.C/UAE

Test Date: 20 December 2016

Test Report No.: KADDB/TEST/KBTF/TR/351/03

The Submitted Sample Met Test Requirements According To:

EN 1063:2000

"Glass in Building -Security Glazing -Testing and Classification of Resistance Against Bullet Attack"

BR4 – NS

"No Perforation & No Splinters"

23th January 2017

Head of Weapons, Ammunition & Armor Testing

Dr. Eng. Riyad Ali Ratrout

23th January 2017

Head of Test & Evaluation

Eng. Samir Al Majali

KADDB

مركز الملك عبدالله الثاني للتصميم والتطوير

Test Certificate

UKAS TESTING

4515

Test Sample: 21 mm Ballistic Glass / Type 5 - SN.8

Manufacturer: White Aluminum Enterprises L.L.C/UAE

Test Date: 19 December 2016

Test Report No.: KADDB/TEST/KBTF/TR/351/03

The Submitted Sample Met Test Requirements According To:

EN 1063:2000

"Glass in Building -Security Glazing -Testing and Classification of Resistance Against Bullet Attack"

BR4 – NS

"No Perforation & No Splinters"

23th January 2017

Head of Weapons, Ammunition & Armor Testing

Dr. Eng. Riyad Ali Ratrout

23th January 2017

Head of Test & Evaluation

Eng. Samir Al Majali

KADDB

مركز الملك عبدالله الثاني للتصميم والتطوير

Test Certificate

UKAS TESTING

4515

Test Sample: 35 mm Ballistic Glass / Type 3 - SN.13

Manufacturer: White Aluminum Enterprises L.L.C/UAE

Test Date: 19 December 2016

Test Report No.: KADDB/TEST/KBTF/TR/351/04

The Submitted Sample Met Test Requirements According To:

EN 1063:2000

"Glass in Building -Security Glazing -Testing and Classification of Resistance Against Bullet Attack"

BR5 – NS

"No Perforation & No Splinters"

23th January 2017

Head of Weapons, Ammunition & Armor Testing

Dr. Eng. Riyad Ali Ratrout

23th January 2017

Head of Test & Evaluation

Eng. Samir Al Majali

KADDB

مركز الملك عبدالله الثاني للتصميم والتطوير

Test Certificate

UKAS TESTING

4515

Test Sample: 37 mm Ballistic Glass / Type 10 - SN.5

Manufacturer: White Aluminum Enterprises L.L.C/UAE

Test Date: 19 December 2016

Test Report No.: KADDB/TEST/KBTF/TR/351/04

The Submitted Sample Met Test Requirements According To:

EN 1063:2000

"Glass in Building -Security Glazing -Testing and Classification of Resistance Against Bullet Attack"

BR5 – NS

"No Perforation & No Splinters"

23th January 2017

Head of Weapons, Ammunition & Armor Testing

Dr. Eng. Riyad Ali Ratrout

23th January 2017

Head of Test & Evaluation

Eng. Samir Al Majali

KADDB

مركز الملك عبدالله الثاني للتصميم والتطوير

Test Certificate

UKAS TESTING

4515

Test Sample: 42 mm Ballistic Glass / Type 11 - SN.6

Manufacturer: White Aluminum Enterprises L.L.C/UAE

Test Date: 19 December 2016

Test Report No.: KADDB/TEST/KBTF/TR/351/05

The Submitted Sample Met Test Requirements According To:

EN 1063:2000

"Glass in Building -Security Glazing -Testing and Classification of Resistance Against Bullet Attack"

BR6 – NS

"No Perforation & No Splinters"

23th January 2017

Head of Weapons, Ammunition & Armor Testing

Dr. Eng. Riyad Ali Ratrout

23th January 2017

Head of Test & Evaluation

Eng. Samir Al Majali

KADDB

مركز الملك عبدالله الثاني للتصميم والتطوير

Test Certificate

UKAS TESTING

4515

Test Sample: 46 mm Ballistic Glass / Type 4 - SN.3

Manufacturer: White Aluminum Enterprises L.L.C/UAE

Test Date: 20 December 2016

Test Report No.: KADDB/TEST/KBTF/TR/351/05

The Submitted Sample Met Test Requirements According To:

EN 1063:2000

"Glass in Building -Security Glazing -Testing and Classification of Resistance Against Bullet Attack"

BR6 – NS

"No Perforation & No Splinters"

23th January 2017

Head of Weapons, Ammunition & Armor Testing

Dr. Eng. Riyad Ali Ratrout

23th January 2017

Head of Test & Evaluation

Eng. Samir Al Majali

KADDB

مركز الملك عبدالله الثاني للتصميم والتطوير

Test Certificate

UKAS TESTING

4515

Test Sample: 82 mm Ballistic Glass / Type 12 - SN.7

Manufacturer: White Aluminum Enterprises L.L.C/UAE

Test Date: 19 December 2016

Test Report No.: KADDB/TEST/KBTF/TR/351/06

The Submitted Sample Met Test Requirements According To:

EN 1063:2000

"Glass in Building -Security Glazing -Testing and Classification of Resistance Against Bullet Attack"

BR7 – NS

"No Perforation & No Splinters"

23th January 2017

Head of Weapons, Ammunition & Armor Testing

Dr. Eng. Riyad Ali Ratrout

23th January 2017

Head of Test & Evaluation

Eng. Samir Al Majali

KADDB

مركز الملك عبدالله الثاني للتصميم والتطوير

Test Certificate

UKAS TESTING

4515

Test Sample: 24 mm Ballistic Glass / Type 13 - SN.11

Manufacturer: White Aluminum Enterprises L.L.C/UAE

Test Date: 20 December 2016

Test Report No.: KADDB/TEST/KBTF/TR/351/07

The Submitted Sample Met Test Requirements According To:

EN 1063:2000

"Glass in Building -Security Glazing -Testing and Classification of Resistance Against Bullet Attack"

SG1 – NS

"No Perforation & No Splinters"

23th January 2017

Head of Weapons, Ammunition & Armor Testing

Dr. Eng. Riyad Ali Ratrout

23th January 2017

Head of Test & Evaluation

Eng. Samir Al Majali

Baden-Württemberg
Regierungspräsidium Tübingen

Beschussamt Ulm
Eich- und Beschusswesen Baden-Württemberg
Staatliche Prüf- und Zertifizierungsstelle für Waffen- und Sicherheitstechnik
Legal verification and certification office for weapons and security engineering

Zertifikat - Certificate

S 19 0044 03 / Z

Durchschusshemmende Verbundsicherheitsverglasung

Bullet resistant laminated glazing

Antragsteller Applicant	White Aluminium Enterprises LLC Glass Processing Division United Arab Emirates, Abu Dhabi
Hersteller Manufacturer	White Aluminium Enterprises LLC Glass Processing Division United Arab Emirates, Abu Dhabi
Ort und Datum der Prüfung Location and test date (d.m.y.)	89081 Ulm, 04.06.2019
Prüfanforderung und Verfahren Test requirement and method	**DIN EN 1063** : 2000-01
Gegenstand der Zertifizierung Item under certification	VSG-Verglasung (+21°C) Laminated glazing (+21°C) 500 x 500 x 80,80 mm
Typenbezeichnung Product reference	**81mm BR7**
Zugeordnete Widerstandsklasse Resistance class achieved	**DIN EN 1063 BR7 NS**
Details siehe Prüfbericht-Nr. Details see test report number	S 19 0044 03 / B

Hiermit bestätigen wir, dass sämtliche zur Zertifizierung eingesetzten Prüfmittel, Messmittel und Hilfsmittel entsprechend dem akkreditiertem System qualifiziert bzw. messtechnisch rückgeführt sind.
We hereby confirm that all test devices, measuring tools and aids used for the certification are qualified or metrological traceable to the accredited system.

Zertifikate ohne Unterschrift und Dienstsiegel haben keine Gültigkeit. Dieses Zertifikat darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung des Beschussamtes Ulm.
Der Prüfbericht ist Grundlage und Bestandteil des Zertifikats.
Only the original certificate stamped and signed by the Proof House is valid. This certificate may only be passed on in its entirety and without modification. The use of parts of this certificate is allowed only with the express consent of the Beschussamt Ulm.
The test report is basis and part of the certificate.

Mitglied der VPAM

Beschussamt Ulm
Albstraße 74
89081 Ulm
Tel.: 0731-9 68 51-0
Fax: 0731-9 68 51-99
beschussamt@rpt.bwl.de
www.beschussamt.eu

Akkreditierte Prüf- und Zertifizierungsstelle
DAkkS Deutsche Akkreditierungsstelle D-ZE-17047-01-00

REGIERUNGSPRÄSIDIUM TÜBINGEN

Ulm, den 12.06.2019

B. Kurz

KURZ
Leiter der Zertifizierung
Head of certification

Baden-Württemberg
Regierungspräsidium Tübingen

Beschussamt Ulm

Eich- und Beschusswesen Baden-Württemberg

Staatliche Prüf- und Zertifizierungsstelle für Waffen- und Sicherheitstechnik
Legal verification and certification office for weapons and security engineering

Zertifikat - Certificate

S 19 0044 02 / Z

Durchschusshemmende Verbundsicherheitsverglasung
Bullet resistant laminated glazing

Antragsteller Applicant	White Aluminium Enterprises LLC Glass Processing Division United Arab Emirates, Abu Dhabi
Hersteller Manufacturer	White Aluminium Enterprises LLC Glass Processing Division United Arab Emirates, Abu Dhabi
Ort und Datum der Prüfung Location and test date (d.m.y.)	89081 Ulm, 04.06.2019
Prüfanforderung und Verfahren Test requirement and method	**DIN EN 1063** : **2000-01**
Gegenstand der Zertifizierung Item under certification	VSG-Verglasung (+21°C) Laminated glazing (+21°C) 500 x 500 x 84,20 mm
Typenbezeichnung Product reference	**84mm BR7**
Zugeordnete Widerstandsklasse Resistance class achieved	**DIN EN 1063 BR7 NS**
Details siehe Prüfbericht-Nr. Details see test report number	S 19 0044 02 / B

Hiermit bestätigen wir, dass sämtliche zur Zertifizierung eingesetzten Prüfmittel, Messmittel und Hilfsmittel entsprechend dem akkreditiertem System qualifiziert bzw. messtechnisch rückgeführt sind.
We hereby confirm that all test devices, measuring tools and aids used for the certification are qualified or metrological traceable to the accredited system.

Zertifikate ohne Unterschrift und Dienstsiegel haben keine Gültigkeit. Dieses Zertifikat darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung des Beschussamtes Ulm.
Der Prüfbericht ist Grundlage und Bestandteil des Zertifikats.
Only the original certificate stamped and signed by the Proof House is valid. This certificate may only be passed on in its entirety and without modification. The use of parts of this certificate is allowed only with the express consent of the Beschussamt Ulm.
The test report is basis and part of the certificate.

Mitglied der VPAM

Beschussamt Ulm
Albstraße 74
89081 Ulm
Tel.: 0731-9 68 51-0
Fax: 0731-9 68 51-99
beschussamt@rpt.bwl.de
www.beschussamt.eu

Akkreditierte Prüf- und Zertifizierungsstelle
DAkkS Deutsche Akkreditierungsstelle D-ZE-17047-01-00

REGIERUNGSPRÄSIDIUM TÜBINGEN

Ulm, den 12.06.2019

B. Kurz

KURZ
Leiter der Zertifizierung
Head of certification

Baden-Württemberg
Regierungspräsidium Tübingen

Beschussamt Ulm
Eich- und Beschusswesen Baden-Württemberg
Staatliche Prüf- und Zertifizierungsstelle für Waffen- und Sicherheitstechnik
Legal verification and certification office for weapons and security engineering

Zertifikat - Certificate

S 19 0044 01 / Z

Durchschusshemmende Verbundsicherheitsverglasung

Bullet resistant laminated glazing

Antragsteller Applicant	White Aluminium Enterprises LLC Glass Processing Division United Arab Emirates, Abu Dhabi
Hersteller Manufacturer	White Aluminium Enterprises LLC Glass Processing Division United Arab Emirates, Abu Dhabi
Ort und Datum der Prüfung Location and test date (d.m.y.)	89081 Ulm, 04.06.2019
Prüfanforderung und Verfahren Test requirement and method	**DIN EN 1063** : 2000-01
Gegenstand der Zertifizierung Item under certification	VSG-Verglasung (+21°C) Laminated glazing (+21°C) 500 x 500 x 86,00 mm
Typenbezeichnung Product reference	**86mm BR7**
Zugeordnete Widerstandsklasse Resistance class achieved	**DIN EN 1063 BR7 NS**
Details siehe Prüfbericht-Nr. Details see test report number	S 19 0044 01 / B

Hiermit bestätigen wir, dass sämtliche zur Zertifizierung eingesetzten Prüfmittel, Messmittel und Hilfsmittel entsprechend dem akkreditiertem System qualifiziert bzw. messtechnisch rückgeführt sind.
We hereby confirm that all test devices, measuring tools and aids used for the certification are qualified or metrological traceable to the accredited system.

Zertifikate ohne Unterschrift und Dienstsiegel haben keine Gültigkeit. Dieses Zertifikat darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung des Beschussamtes Ulm.
Der Prüfbericht ist Grundlage und Bestandteil des Zertifikats.
Only the original certificate stamped and signed by the Proof House is valid. This certificate may only be passed on in its entirety and without modification. The use of parts of this certificate is allowed only with the express consent of the Beschussamt Ulm.
The test report is basis and part of the certificate.

Mitglied der VPAM

Beschussamt Ulm
Albstraße 74
89081 Ulm
Tel.: 0731-9 68 51-0
Fax: 0731-9 68 51-99
beschussamt@rpt.bwl.de
www.beschussamt.eu

Akkreditierte Prüf- und Zertifizierungsstelle
DAkkS Deutsche Akkreditierungsstelle D-ZE-17047-01-00

REGIERUNGSPRÄSIDIUM TÜBINGEN

Ulm, den 12.06.2019

KURZ
Leiter der Zertifizierung
Head of certification

WILTSHIRE BALLISTIC SERVICES

TESTING CERTIFICATE

Certificate Number: 11/06/2013 10101146

This is to certify that

30.04mm Thick Laminated Glass Unit

manufactured by

White Aliminium Enterprices L.L.C.

Of

Industrial City of Abu Dhabi (ICAD) #1
PO Box 30665
Abu Dhabi

UAE

has been tested in accordance with the standard

DIN EN 1063

and has passed all requirements to threat level BR2 with Spall

Devizes, Wiltshire, UK
11 June 2013
Place and Date of Testing

Management Representative

WILTSHIRE BALLISTIC SERVICES

TESTING CERTIFICATE

Certificate Number: 11/06/2013 10101143

This is to certify that

BRG 40.08mm Thick Laminated Glass Unit

manufactured by

White Aliminium Enterprices L.L.C.

Of

Industrial City of Abu Dhabi (ICAD) #1
PO Box 30665
Abu Dhabi

UAE

has been tested in accordance with the standard

DIN EN 1063

and has passed all requirements to threat level BR2 with Spall

Devizes, Wiltshire, UK
11 June 2013
Place and Date of Testing

Management Representative

WILTSHIRE BALLISTIC SERVICES

TESTING CERTIFICATE

Certificate Number: 11/06/2013 10101140

This is to certify that

BRG 52.8mm Thick Laminated Glass Unit

manufactured by

White Aliminium Enterprices L.L.C.

Of

Industrial City of Abu Dhabi (ICAD) #1
PO Box 30665
Abu Dhabi

UAE

has been tested in accordance with the standard

DIN EN 1063

and has passed all requirements to threat level BR2 with Spall

Devizes, Wiltshire, UK
11 June 2013
Place and Date of Testing

Management Representative

WILTSHIRE BALLISTIC SERVICES

TESTING CERTIFICATE

Certificate Number: 11/06/2013 10101145

This is to certify that

30.04mm Thick Laminated Glass Unit

manufactured by

White Aliminium Enterprices L.L.C.

Of

Industrial City of Abu Dhabi (ICAD) #1
PO Box 30665
Abu Dhabi

UAE

has been tested in accordance with the standard

BS EN 1063

and has passed all requirements to threat level BR2 with Spall

Devizes, Wiltshire, UK
11 June 2013
Place and Date of Testing

bsi.

Management Representative

WILTSHIRE BALLISTIC SERVICES

TESTING CERTIFICATE

Certificate Number: 11/06/2013 10101142

This is to certify that

BRG 40.08mm Thick Laminated Glass Unit

manufactured by

White Aliminium Enterprices L.L.C.

Of

Industrial City of Abu Dhabi (ICAD) #1
PO Box 30665
Abu Dhabi

UAE

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Devizes, Wiltshire, UK
11 June 2013
Place and Date of Testing

bsi.

Management Representative

INDUSTRIAL LICENSE

رخصة صناعية

License No	IN-1000836	**رقم الرخصة**	
License Status : **Production**		**إنتاج** :	حالة الرخصة
Legal Form : Limited Liability Company		شركة ذات مسؤولية محدودة :	الشكل القانوني
ADCCI No :		:	عضوية الغرفة
First Issue Date : 25/07/2001	تاريخ أول إصدار :	Enviroment No. : 1122	: الرقم البيئي
Issue Date : 19/08/2021	تاريخ الإصدار :	FCR No. : -	: السجل المركزي الموحد
Expiry Date : 18/08/2024	تاريخ الإنتهاء :	Trade Name No. : IN-1000836	: رقم الإسم التجاري
Trade Name : White Aluminium Enterprises Llc		وايت المنيوم للمشاريع ذ.م.م :	الإسم التجاري
Location : Abu Dhabi - Mussaffah - ICAD I - (48D11)			: موقع المنشأة

Owner(s) Partner(s)

اسم صاحب المنشأة / الشركـــاء

#	Owners / Partners المـــلاك / الشركـــاء	Nationality الجنسية	Role الصلة	Share (%) نسبة الشراكة
1	ماجد على مبارك عبدالله العتيقي Majed Ali Mubarak Abdulla Al Ateeqi	الإمارات العربية المتحدة United Arab Emirates	شريك Partner	51.00 %
2	ورثة محمود جبر محمود دوشن Heirs Of Mahmoud Jabr Mahmoud Doshan	فلسطين Palestine	شريك Partner	49.00 %

Activities

الأنشـــطـــة

#	Activity النشاط
1	Onshore and Offshore Oil and Gas Fields and Facilities Services خدمات حقول ومنشأت النفط والغاز البرية والبحرية
2	Glass Mirrors Manufacturing صناعة المرايا الزجاجية
3	Stained Glass Forming تشكيل الزجاج الملون
4	Glass Multiple-Walled Insulating Units Manufacturing صناعة وحدات زجاجية عازلة ذات جدران متعدد
5	Toughened or Laminated Flat Glass Manufacturing صناعة الزجاج المسطح المقسى أو المنضد
6	Construction Metal Framework and Skeletons and Parts thereof Manufacturing صناعة الأطر والهياكل المعدنية اللازمة للتشييد وأجزاء منها
7	Fireproof Metal Doors Manufacturing صناعة الأبواب المعدنية المقاومة للحريق
8	Metal Doors, Windows and Their Frames, Shutters and Gates Manufacturing صناعة الأبواب والنوافذ وأطرها والمصاريع والبوابات المعدنية
9	House Furniture Manufacturing صناعة الأثاث المنزلي
10	Kitchen Furniture Manufacturing صناعة أثاث المطابخ

Products

المنتجات

#	Product المنتج
1	Personal Used Unframed Glass Mirrors مرايا زجاجية بلا أطر للإستخدام الشخصي
2	Personal Used Framed Glass Mirrors مرايا زجاجيه ذات أطر للإستخدام الشخصي
3	Decorative Painted Glass زجاج مطلي مزخرف
4	Decorative Glass ديكورات زجاجية

INDUSTRIAL LICENSE

رخصة صناعية

License No IN-1000836 **رقم الرخصة**

License Status : **Production** حالة الرخصة : **إنتاج**

Legal Form : Limited Liability Company الشكل القانوني : شركة ذات مسؤولية محدودة

ADCCI No : عضوية الغرفة :

First Issue Date : 25/07/2001 تاريخ أول إصدار : Enviroment No. : 1122 الرقم البيئي :

Issue Date : 19/08/2021 تاريخ الإصدار : FCR No. : - السجل المركزي الموحد :

Expiry Date : 18/08/2024 تاريخ الإنتهاء : Trade Name No. : IN-1000836 رقم الإسم التجاري :

Trade Name : White Aluminium Enterprises Llc الإسم التجاري : وايت المنيوم للمشاريع ذ.م.م

Location : Abu Dhabi - Mussaffah - ICAD I - (48D11) موقع المنشأة :

5	Double Glass	زجاج مزدوج 5
6	Toughened Glass	زجاج مقسى 6
7	Bulletproof Glass	زجاج مقاوم للرصاص 7
8	Laminated Safety Glass	زجاج أمان منضد 8
9	Fireproof Steel and Glass Domes	قبب من الحديد و الزجاج مقاومة للحريق 9
10	Fireproof Steel and Glass Frontages	واجهات من الحديد و الزجاج مقاومة للحريق 10
11	Aluminium and Glass Frontages	واجهات من الألمنيوم و الزجاج 11
12	Fireproof Steel and Glass Doors	أبواب من الحديد و الزجاج مقاومة للحريق 12
13	Fireproof Aluminium and Glass Doors	أبواب من الألمنيوم والزجاج مقاومة للحريق 13
14	Fireproof Steel and Glass Windows	نوافذ من الحديد و الزجاج مقاومة للحريق 14
15	Motorized Fire Rated Rolling Shutter Doors	ابواب كراجات معدنية تعمل بالكهرباء مقاومة للحريق 15
16	Aluminium and Glass Doors	أبواب من الألمنيوم و الزجاج 16
17	Aluminium and Glass Windows	نوافذ من الالمنيوم و الزجاج 17
18	Aluminium Wardrobes	خزائن ملابس من الألمنيوم 18
19	Aluminium Kitchens Cupboards	خزائن مطابخ من الألمنيوم 19

United Arab Emirates

Ministry of Interior

General Directorate of Civil Defense

General Department of Civil Defense - Abu Dhabi

دولة الامارات العربية المتحدة

وزارة الداخلية

القيادة العامة للدفاع المدني

الإدارة العامة للدفاع المدني - أبوظبي

الرقم: 201211114768

شهادة استيفاء شروط السلامة الوقائية

صدرت هذه الشهادة استنادا إلى قرار مجلس الوزراء رقم (24) لسنة 2012 م في شأن تنظيم خدمات الدفاع المدني بالدولة

الاسم التجاري للمنشأة :	وايت المنيوم للمشاريع ذ م م	رقم الرخصة :	IN-1000836 (صناعي)	رقم الأرض :	
المالك:	ماجد علي مبارك عبدالله العتيقي	الجنسية:	الإمارات العربية المتحدة		
العنوان:	مدينة أبوظبي الصناعية (أ) - مدينة أبوظبي الصناعية (1) - أبوظبي	صلاحية الشهادة:	من 19/08/2019 إلى 18/08/2020	حررت بتاريخ:	16/01/2020

وقد وجد مستوفي لشروط السلامة الوقائية بتاريخ 12/12/2019

ملاحظات:

- تم تسديد الرسوم بإيصال رقم (0000190070566696).
- يجب الإلتزام بإعتماد عقود الصيانة الدورية لأجهزة ومعدات السلامة والوقاية من الحريق من إحدى الشركات المعتمدة.
- أي تعديلات في أنظمة وأجهزة السلامة والوقاية من الحريق أو النشاط يتطلب موافقة مسبقة من الدفاع المدني.
- يجب ربط المبنى بنظام حصنتك لحماية المباني - رقم التواصل (800333363).
- في حال الإخلال بأي من اشتراطات السلامة الوقائية سيتم مخالفة المنشأة (نموذج المخالفات خلف الشهادة).
- توضع الشهادة في مكان بارز وواضح للعيان.
- مراجعة الدفاع المدني سنوياً للكشف على المبنى.
- يرجى الانتهاء من إجراءات التدريب خلال 60 يوم كحد أقصى و إلا سوف تتعرض المنشأة للمساءلة القانونية وفقا لقرار مجلس الوزارة رقم 24 لسنة 2012 م.

يعتمد

للطوارئ
997
999
Emergency

هاتف: 02 - 6964453 فاكس: - الموقع الالكتروني: www.adcd.gov.ae

نظام الشكاوى والمقترحات: www.fms.ae

رؤيتنا أن تكون دولة الإمارات العربية المتحدة من أفضل دول العالم في تحقيق الأمن و السلامة

دولة الإمارات العربية المتحدة
وزارة الداخلية
الإدارة العامة للدفاع المدني - دبي
United Arab Emirates
Ministry of Interior
DCD General Directorate

Tel.: 009714 2611111
Fax : 009714 2612449
P.O. Box 11377 Dubai
United Arab Emirates

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www.dcd.gov.ae

ترخيص وكيل - بإمارة دبي

رقم الترخيص: K162
سنة الترخيص: 2019
عدد التراخيص: 1 - 4

تم اصدار الترخيص استنادا إلى القرار الوزاري رقم(213) لسنة 2017 ، في شان تنظيم خدمات الدفاع المدني

اسم الشركة	وايت المنيوم لتجارة الابواب المقاومة للحريق لمالكها جاسم صالح شركة ذات الشخص الواحد ش.ذ.م.م	رقم الرخصة	788479	رقم السجل	1313454
اسم صاحب الترخيص	جاسم صالح جاسم بوصبيع	الجنسية	الامارات		
أطراف الرخصة	-	الجنسية	-		
رقم الهاتف	06-5443366	رقم الفاكس	06-5443388	ص.ب:	80443
عنوان الشركة	محل رقم 17 – ملك الشيخ بطي بن مكتوم بن جمعه ال مكتوم				
الموقع /البريد الالكتروني	Moen.harouda@gmail.com				
تأسست بتاريخ	2017/08/14م	تاريخ الإصدار	2019/06/20 م	تاريخ الانتهاء	2020/01/28م
عدد المعدات والأجهزة المعتمدة	9				
عدد المهندسين المعتمدين	0	عدد الفنيين المعتمدين	0		

يعتمد/ عن مدير الإدارة العامة للدفاع المدني/دبي

دولة الإمارات العربية المتحدة
وزارة الـداخـلـيـة
الإدارة العامة للدفاع المدني-دبي
United Arab Emirates
Ministry of Interior
DCD General Directorate

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Emergency
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رقم الترخيص: K162
سنة الترخيص: 2019
عدد التراخيص: (1 – 4)

اسم الشركة: وايت المنيوم لتجارة الابواب المقاومة للحريق لمالكها جاسم صالح
شركة ذات الشخص الواحد ش.ذ.م.م

م	اسم المعدة	الاسم التجاري	رقم شهادة السلامة	اسم المختبر الصادر للشهادة	بلد الصنع	قيد الوكالة	منطقة النشاط	تاريخ انتهاء قيد الوكالة
1	**FIRE WINDOW FRAMES** • FIRE WINDOW FRAMES: Models: Pyran S glass. Overall Partition size: 3000 × 3000mm (w × h). Glass size:1413 × 2313 × 6mm (w × h × t) Clear view of glass: 1385 × 2285mm (w × h). Rated: 60 Min.	FORSTER	WHI17-28085504	INTEREK TESTING SERVICE S NA. INC.	ABU DHABI	17873	دبي	2019/12/04 م
2	**FIRE DOOR FRAMES** • FIRE DOOR FRAMES: Models: Contraflam 60-3/4. Door frame size: 2100 × 2500 × 65mm (w × h × t). Door leaf size: 1023 × 2460 × 65mm (w × h × t). Glass size:873 × 2328 × 30mm (w × h × t). Maximum Clear view of glass: 843 × 2298 mm (w × h). Rated: 60 Min.	FORSTER	WHI16-28085503	INTEREK TESTING SERVICE S NA. INC.	ABU DHABI	17873	دبي	2019/12/04 م

ملاحظة :
1. يعتبر الوكيل مرخص من قبل الإدارة العامة للدفاع المدني - دبي ويحق له مزاولة نشاطه في امارة دبي فقط باستنادا الى قرار مجلس الوزاري رقم (24) لسنة 2012 في شأن تنظيم خدمات الدفاع المدني للائحة التنفيذية رقم(505) لسنة 2013 ، ولا يحق له بمزاولة انشطته في باقي الامارات الا بعد استخراج ترخيص موزع من قبل الادارات العامة ذات الاختصاص بكل امارة .
2. يحق للوكيل تركيب وصيانة المعدات المراد تداولها والمسجلة بترخيصه فقط
3. ابلاغ الادارة العامة للدفاع المدني - دبي في حالة تغيير أو تعديل في البيانات المتعلقة في الترخيص الصادر من قبل الإدارة .
4. يجب على الشركة المعتمدة لدى ادارة الدفاع المدني - دبي ابراز الترخيص ساري المفعول الخاص بالمعدات المعتمدة والصادر من قبل الادارة للعميل ، وعلى الشركة تحمل المسؤولية [illegible]

يعتمد/ عن مدير الإدارة العامة للدفاع المدني/دبي

دولة الإمارات العربية المتحدة
وزارة الداخلية
الإدارة العامة للدفاع المدني-دبي
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ترخيص وكيل - بإمارة دبي

رقم الترخيص: K162
سنة الترخيص: 2019
عدد التراخيص: 4 - 3

تم اصدار الترخيص استناداً إلى القرار الوزاري رقم(213) لسنة 2017 ، في شان تنظيم خدمات الدفاع المدني

اسم الشركة	وايت المنيوم لتجارة الابواب المقاومة للحريق لمالكها جاسم صالح شركة ذات الشخص الواحد ش.ذ.م.م	رقم الرخصة	788479	رقم السجل	1313454
اسم صاحب الترخيص	جاسم صالح جاسم بوصبيع	الجنسية	الامارات		
أطراف الرخصة	-	الجنسية	-		
رقم الهاتف	06-5443366	رقم الفاكس	06-5443388	ص.ب:	80443
عنوان الشركة	محل رقم 17 – ملك الشيخ بطي بن مكتوم بن جمعه ال مكتوم				
الموقع /البريد الالكتروني	Moen.harouda@gmail.com				
تأسست بتاريخ	2017/08/14م	تاريخ الإصدار	2019/06/20 م	تاريخ الانتهاء	2020/01/28م
عدد المعدات والأجهزة المعتمدة	9				
عدد المهندسين المعتمدين	0	عدد الفنيين المعتمدين	0		

يعتمد/ عن مدير الإدارة العامة للدفاع المدني/دبي

دولة الامارات العربية المتحدة
وزارة الـــداخـــلـــيـــة
الإدارة العامة للدفاع المدني - دبي
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رقم الترخيص: K162
سنة الترخيص: 2019
عدد التراخيص: (3 – 4)

اسم الشركة: وايت المنيوم لتجارة الابواب المقاومة للحريق لمالكها جاسم صالح
شركة ذات الشخص الواحد ش.ذ.م.م

م	اسم المعدة	الاسم التجاري	رقم شهادة السلامة	اسم المختبر الصادر للشهادة	بلد الصنع	قيد الوكالة	منطقة النشاط	تاريخ انتهاء قيد الوكالة
5	**FIRE WINDOW FRAMES** • FIRE WINDOW FRAMES: Models: Contraflam 60-3/4 glass. Overall Partition size: 2985 × 2840 mm (w × h). Glass size: 2075 × 2750 × 61.52 mm (w × h × t) Clear view of glass: 2045 × 2720 mm (w × h). Rated: 60 Min.	FORSTER	WHI17-28085509	INTEREK TESTING SERVICE S NA. INC.	ABU DHABI	17873	دبي	2019/12/04 م
6	**FIRE DOOR FRAMES** • FIRE DOOR FRAMES: Models: Pyran S glass. Double leaf door size: 2290 × 2450 mm (w × h). Double leaf size: 1100 × 2390 mm (w × h). Glass size in door leaf: 948 × 2258 × 6 mm (w × h × t) Clear view of glass in door leaf: 920 × 2230 mm (w × h). Rated: 60 Min.	FORSTER	WHI17-28085505	INTEREK TESTING SERVICE S NA. INC.	ABU DHABI	17873	دبي	2019/12/04 م

ملاحظة :

9. يعتبر الوكيل مرخص من قبل الادارة العامة للدفاع المدني - دبي ويحق له مزاولة نشاطه في إمارة دبي فقط ،استنادا إلى قرار مجلس الوزراء رقم (24) لسنة 2012 في شأن تنظيم خدمات الدفاع المدني للائحة التنفيذية رقم(505) لسنة 2013 ، ولا يحق له بمزاولة أنشطته في باقي الامارات الا بعد استخراج ترخيص موزع من قبل الادارات العامة ذات الاختصاص بكل امارة .
10. يحق للوكيل تركيب وصيانة المعدات المراد تداولها والمسجلة بترخيصه فقط
11. ابلاغ الادارة العامة للدفاع المدني - دبي في حالة تغيير أو تعديل في البيانات المتعلقة في الترخيص الصادر من قبل الادارة .
12. يجب على الشركة المعتمدة لدى ادارة الدفاع المدني - دبي ابراز الترخيص ساري المفعول الخاص بالمعدات المعتمدة والصادر من قبل الادارة للعميل ، وعلى الشركة تحمل المسؤولية عند [illegible] اخلاق الشركة

يعتمد/ عن مدير الإدارة العامة للدفاع المدني/دبي

شهادة العضوية
Membership Certificate

الرقم الموحد : 254437

رقم الرخصة : IN-1001816

غرفة أبوظبي
ABU DHABI CHAMBER

بناءاً على قانون غرفة تجارة وصناعة أبوظبي رقم 27 لسنة 2005 م وتعديلاته

فقد تم تسجيل : وايت المنيوم للصناعات ذ م م

من الجنسية: الامارات

لممارسة النشاط : صناعة الأطر والهياكل المعدنية اللازمة للتشييد وأجزاء منها - صناعة الأبواب المعدنية المقاومة للحريق - طلاء المعادن

العنوان :

جنسية الشركاء: الامارات - فلسطين

الشكل القانوني: شركة ذات مسئولية محدودة

صدرت بتاريخ : 28/2/2021

ويسرى مفعولها حتى تاريخ : 28/2/2022

غرفة أبوظبي
ABU DHABI CHAMBER
قطاع خدمات الأعضاء
Members Services Sector
غرفة تجارة وصناعة أبوظبي
Abu Dhabi Chamber of Commerce & Industry

محمد هلال المهيري

المدير العام

مستند صادر من غرفة أبوظبي-دولة الإمارات العربية المتحدة، ولمزيد من التحقق الرجاء زيارة الرابط:
https://digital.abudhabichamber.ae/Portal/#/certificate-validation

غرفة أبوظبي **الرقمية**
Abu Dhabi **Digital Chamber**

Louvain-la-Neuve, the 21th of January,2021

AGC Glass Europe

is pleased to declare that that the company

WHITE ALUMINIUM
glass processing

is able to process the following products in terms of pre-processing and heat-treatment

The whole Stopsol and Sunergy range
The whole iplus range
The whole VisionT range
The EnergyNT

Valid until FEBRUARY 2023

It is the sole responsibility of the processor to adequately inspect the heat treatable coated glass before each step of fabrication and prior to installation. Failure to apply all professional standards, customary instructions and processing instructions (availbale on www.yourglass.com) will automatically void any warranty regarding heat treatable glass of AGC. The processor has the full responsibility for the quality of the final product.

Jean-Marie Sellier

AGC
GLASS UNLIMITED

AGC Obeikan

We are pleased to declare that company

White Aluminium Enterprises LLC

وايت المنيوم للمشاريع ذ.م.م.

is able to process following products in terms of pre-processing and heat treatment

Sunlux, iplusSolid, iplus AS
Stopray Smart, Stopray Vision

Hamza Al Naimat
Technical Support Manager

Yanbu, Saudi Arabia, July 2021

Valid until July 2022

It is sole responsibility of the processor to adequately inspect heat treatable coated glass before each step of fabrication and prior installation. Failure to apply professional standards, customary and processing instructions available on www.agc-yourglass.com and www.agc-obeikanglass.com.sa will automatically void any warranty related to heat treatable coated glass of AGC Obeikan. The processor has full responsibility for the final product.

الامـــارات للزجـــاج
Emirates Glass

This is to certify that

WHITE ALUMINIUM ENTERPRISES L.L.C

have successfully demonstrated competence at every stage of handling & processing

of the following Emicool Post-Temperable glass product(s):

Emicool ® E-lite Series
Emicool ® Sun NN Series
Emicool ® Plus NE Series
Emicool ® Classic ST Series
Emicool ® Classic T Series

Reference : CP-01-WAE-2022
Date : 29 Mar 2022
Validity : 1 Year

Issued by:

QA/QC Manager

Senior Sales & Marketing Manager

Executive President

زجاج
GLASS
مملوكة بالكامل من دبي للاستثمار
Wholly Owned by DUBAI INVESTMENTS

Emirates Glass
Certified Processor

glaströsch

Certificate

Glas Trösch AG SILVERSTAR, CH – Bützberg is pleased to confirm that the company

White Aluminium Enterprises L.L.C.,
Abu Dhabi
U.A.E.

is able to successfully process the following product:

SILVERSTAR SUNSTOP T
SILVERSTAR EN2plus T
SILVERSTAR Superselekt 60/27 T
SILVERSTAR Superselekt 35/14 T
SILVERSTAR COMBI Neutral 70/40
SILVERSTAR Combi Neutral 40/21 T
SILVERSTAR Combi Grey 40/22 T
SILVERSTAR Combi Neutral 30/21 T
SILVERSTAR Combi Silver 32/21 T
SILVERSTAR Selekt 74/42 T
Luxar
SILVERSTAR Combi Grey 50/28 T
SILVERSTAR Combi Blue 31/19 T

Glas Trösch AG SILVERSTAR

i. A. Glas Trösch AG Silverstar Industriestrasse 29 CH-4922 Bützberg

Volker Herrmann

Issued: September 2021

Glas Trösch AG Silverstar
Glasbeschichtungswerk

Industriestrasse 29
Postfach
CH-4922 Bützberg

Telefon +41 (0)62 958 52 10
Telefax +41 (0)62 963 22 43

E-Mail: silverstar@glastroesch.ch
www.glastroesch.ch
CHE-116.268.158 MWST
UID: CHE-101.387.498
EORI-Nr.: DE 7065728

GUARDIAN

Glass - Automotive - Building Products

CERTIFIED CUSTOMER PROGRAM
FOR HEAT TREATABLE COATINGS

CERTIFICATE

GUARDIAN LuxGuard I S.A. is pleased to confirm that the company

WHITE ALUMINIUM

Industrial City of Abu Dhabi (ICAD) #1

P.O.Box: 30665 Abu Dhabi, UAE

Has demonstrated the capability to successfully process the following products in terms of mechanical treatment, heat treatment, PVB-laminating and insulating glass production:

SUNGUARD® SOLAR
SUNGUARD® HIGH PERFORMANCE / HP
SUNGUARD® SUPERNEUTRAL / SN
SUNGUARD® EXTRA SELECTIVE / SNX

It is the sole responsibility of the processor to adequately inspect the heat treatable coated glass before each step of fabrication and prior to installation. Failure to apply all professional standards, customary instructions and processing instructions will automatically void any warranty regarding heat treatable glass of GUARDIAN. The processor has the full responsibility for the quality of the final product.
By this certificate GUARDIAN is not granting any warranty regarding the processor's continuing capability to adequately process GUARDIAN's products.

Issued: Wednesday, 24 December 2014

BUILD WITH LIGHT™

Liouris Dimosthenis
Technical Advisory Center
Guardian LuxGuard I S.A.

GUARDIAN SUNGUARD®
ADVANCED ARCHITECTURAL GLASS

CERTIFICATE

Nº 10374

Cardinal Coated Glass

Is pleased to confirm that the company

WHITE ALUMINIUM

WHITE ALUMINIUM

Date: Jan. 17th 2022

CERTIFICATE

Nº 10373

Cardinal Coated Glass

Is pleased to confirm that the company

WHITE ALUMINIUM

WHITE ALUMINIUM

LoE3 366 GLASS

Date: Jan. 17th 2022

CERTIFICATE

Nº 10372

Cardinal Coated Glass

Is pleased to confirm that the company

WHITE ALUMINIUM

WHITE ALUMINIUM

LoE2 240 GLASS

Date: Jan. 17th 2022

CERTIFICATE

Nº 10373

Cardinal Coated Glass

Is pleased to confirm that the company

WHITE ALUMINIUM

WHITE ALUMINIUM

LoE² 270 GLASS

Date: Jan. 17th 2022

GUARDIAN® GLASS

See what's possible™

SELECT ADVANTAGE CERTIFIED PROCESSOR

CERTIFICATE

Guardian Zoujaj International Float Glass Co. L.L.C, Po Box 6297, Al Jazirah Al Hamra, Ras Al Khaimah, UAE is pleased to confirm that the processor

White Aluminium Enterprises L.L.C

PO Box 30665,
Industrial City of Abudhabi, ICAD#1, Abudhabi
United Arab Emirates

WHITE ALUMINIUM
glass processing

has demonstrated on 12/16/21 the capability to successfully process and is certified to process the following Guardian glass product

High Performance HP, Double Silver DS, ClimaGuard P2S, Sun T & Super Neutral SN

for thicknesses 6,8,10 and 12

In Terms of Mechanical Treatment, Heat Treatment, PVB Lamination and Insulated Glass

It is the sole responsibility of the processor to adequately inspect the glass before each step of fabrication and prior to installation. Failure to apply all professional standards, customary instructions and guidelines will automatically void any warranty. The processor has the full responsibility for the quality of the final product. By this certificate Guardian is not granting any warranty regarding the processor's continuing capability to adequately process Guardian's products.

Issued: 12/20/21

Expiration date: 12/20/23

Guardian's representative:

Vimal Anand M

Annex 1: General Processing Guideines - GPG_0919_AME
SunGuard PAI Sealant_LR_1219_AME_Dec 2019

The product(s) indicated above is (are) sold subject to Guardian's standard terms and conditions of sale and any applicable written warranties. It is the responsibility of the purchaser to confirm that the products are suitable for their intended application. Please contact your local Guardian representative should you require any additional information as to handling and fabrication of the products and for the most current product information.

Cert No GRAK-ADV-21-20

PILKINGTON NORTH AMERICA, INC.
811 Madison Avenue
Toledo, OH 43604-5684

Office: +1 419 247 3731
Fax: +1 419 247 3821

January 12, 2022

To Whom It May Concern:

This letter is to confirm that **White Aluminum Enterprises LLC** is an approved processor of Pilkington North America Inc. (PNA) products.

Should you have any questions, please do not hesitate to contact me at Jason.Weiss@NSG.com

Sincerely,

Jason A. Weiss
Director, Domestic and Export Sales
Architectural Glass SBU

Pilkington North America, Inc. CORPORATE SEAL 1986 Delaware

In Recognition of Excellence

PROGRAM MEMBER SINCE 2010

WHITE ALUMINIUM

Successfully Completed the

Vitro Certified™ International Fabricator

Requirements

The glass fabrication facility named above has successfully completed all Vitro certification inspection and annual audit requirements and is certified to fabricate Vitro products through 2022.

Mark J. Seeton
Vice President, Sales
Vitro Architectural Glass

Vitro Certified™ INTERNATIONAL FABRICATOR

Glenn R. Davis
Vice President, Business Development
International Sales

SAINT-GOBAIN

CERTIFICATE

THIS IS TO CERTIFY THAT

White Aluminium

has successfully concluded an assessment on coated glass processing technics and manufacturing of insulating glass units, managed by the technical support department of Saint Gobain Glass

The processing facilities located on: Industrial City of Abu Dhabi (ICAD), United Arab Emirates, were visited and assessed on: 14 March 2020

This certificate is valid until: 30 July 2022

In performing this certification, Saint-Gobain Glass does not assume to discharge any responsibility of the inspected company, which is the sole party responsible for the processing of its products in conformity with applicable laws, regulations, norms and the Guidelines for Use of Coated Glass of Saint-Gobain Glass.

Nicolas Mondy

General Manager Saint-Gobain Glass International

CERTIFIED SAINT-GOBAIN PROCESSORS NETWORK

Validated products:

- **COOL-LITE K series**
- **COOL-LITE SKN series**
- **COOL-LITE XTREME series**
- **PLANITHERM series**

CERTIFICATE

SCHOTT Technical Glass Solutions GmbH
is pleased to confirm that

White Aluminium Enterprises L.L.C.

was evaluated regarding its processing of
SCHOTT Technical Glass Solutions fire resistant products.

On behalf of SCHOTT Technical Glass Solutions GmbH
SCHOTT AG, as the trademark owner,
has granted a trademark licence to

White Aluminium Enterprises L.L.C.

to use the trademarks PYRAN® S, PYRAN® Platinum and PYRAN® Star
for fire resistant glazing made from specialty glass from
SCHOTT Technical Glass Solutions GmbH.

SCHOTT Technical Glass Solutions GmbH -
Jena/Germany, 04.11.2016

Kai Olbricht
Managing Director

Helmut Kugelmann
Director Sales
Fire Resistant and Security Glazing

SCHOTT
glass made of ideas

上海耀皮工程玻璃有限公司
SHANGHAI SYP ENGINEERING GLASS CO. LTD
SHANGHAI YAOHUA PILKINGTON GLASS GROUP CORP., LTD.

Jan 13, 2022

CERTIFICATE

To whom it may concerns,
Dear Sirs,
SHANGHAI YAOHUA PILKINGTON GLASS GROUP CO., LTD. (SYP in brief) is pleased to confirm that the company M/s White Aluminum is a qualified glass processor for SYP post temperable products. Factory information listed below:

M/S White Aluminium Enterprises L.L.C.
Industrial City of Abu Dhabi(ICAD)#1
P.O.Box:30665,Abu Dhabi,UAE
TEL:(+9712)5500830
Fax:(+9712)5500828
www.whitealuminium.ae

If there is any question, please feel free to refer to us.

Thank you and best regards,

上海耀皮工程玻璃有限公司
SHANGHAI SYP ENGINEERING GLASS CO., LTD.

SHANGHAI YAOHUA PILKINGTON GLASS GROUP CO., LTD.

ŞİŞECAM
FLAT GLASS

ACCREDITATION CERTIFICATE

White Aluminium Enterprice L.L.C.

Industrial City Of Abu Dhabi (ICAD 1) P.O BOX 30665 Abu Dhabi, UAE

In edging, heat treatment and double glazing processes
Double and Single Silver
Şişecam Temperable Solar Control Low-E Glass and
Şişecam Temperable Low-E Glass
are favourable to be processed by the glass processor.

S. Ebru Şapoğlu
Marketing and Sales Vice President

Hakan Özdamar
Quality and Environment Director

This certificate demonstrates that the processor has capability to process Şişecam's products in terms of edging, heat treatment and insulating glass process with the machine infrastructure declared by the processor. It is the sole responsibility of the processor to conduct its production in accordance with applicable laws, regulations, norms and Offline Temperable Coated Glass Processing Guideline of Şişecam and to control at each step of fabrication and prior to installation. The processor has the full responsibility for the quality of the final product. Şişecam is not responsible for any warranties that the processor provides to its customers or other end users of the products. Şişecam reserves the right to make alterations or cancellation in hereby document if necessary without prior notice. This document is valid until **31.12.2021**

JM

Johnson Matthey

Advanced Glass Technologies

White Aluminium Enterprises LLC
Glass Division
Fao. M. Eleazar SALUT
R&D, QA/QC Manager

Paris, December 19th, 2014

Dear M. Eleazar SALUT,

Further to your enquiry I'm pleased to hereby confirm that your company, WHITE ALUMINIUN ENTERPRISES LLC – Glass Division, having its Head Quarter in Abu Dhabi (UAE) is successfully using our several ranges of architectural glass enamels since about 10 years, and that Johnson Matthey is supporting this business and this company through the regular shipment of new colour's samples.

Remaining at your disposal for any further information,

Best regards.

Olivier DESANTE
Commercial and Technical Manager

Disclaimer: Johnson Matthey cannot be liable for any mis-use of our products or any issue occurring when using our glass enamels. This letter does not consider how our glass enamels are processed.

FENZI

Since 1941 paints, sealants and speciality chemicals for glass processing industry.

UNI EN ISO 9001:2015

CERTIQUALITY

SISTEMA DI GESTIONE QUALITÀ CERTIFICATO

White Aluminium Enterprises L.C.C. – Glass Division
Abu Dhabi

Tribiano, 03.09.2021
PU

Object: Approved Applicator for FENZI S.p.A. TEMPVER glass enamels

With the present we declare that Company White Aluminium Enterpises L.C.C. have received in writing and acknowledged all technical instructions for correct handling, application and firing of TEMPVER glass enamels (Manual of Instructions, Product Technical Specifications etc.).

Therefore, we are pleased to grant White Aluminium Enterprises L.C.C. the status of Approved Applicator for above mentioned products.

FENZI S.p.A.
Dr. Pietro Ungarelli

FENZI S.p.A.
Assicurazione Qualità
Dott. Pietro Ungarelli

White Aluminium Enterprises L.C.C.

Note and Disclaimer: Present declaration is valid one year from date of issue. In case of disputes between any involved party, due to quality of decorated glasses produced by White Aluminium Enterprises L.C.C.; this declaration does not constitute any assumption of responsibility by FENZI S.p.A.

FENZI S.p.A.
Cap. Soc. € 13.000.000
Partita Iva 11328880155 – Cod. Fisc. 03892140371
Trib. di Milano n. 348413 soc. – 8545 vol. -13 fasc
C.C.I.A.A. Milano n. 1455499
Sede Legale: Via Sant'Andrea 21 – 20121 Milano

Stabilimento e amministrazione
Via Trieste 13/15 – Zona Industriale – 20067 Tribiano (Milano) Italy
Tel. +39 02 906221 r.a. Fax +39 02 90631216
e-mail: info@fenzigroup.com
web site: www.fenzigroup.com

kuraray

trosifol™
world of interlayers

Certificate Nº: 2020/0196
Certificate date: 16/12/2020

SentryGlas®

Trosifol® is pleased to confirm that

WHITE ALUMINIUM LLC

has successfully passed the qualification process of lamination SentryGlas® - part of the Trosifol® product portfolio - and successfully passed performance monitoring testing on December 17th, 2020.

This certificate is valid until December 1st, 2022 as long as your manufacturing process for laminated safety glass remains unchanged. Renewal is subject to validation of newly supplied laminates.

Jan Scheers, Sales and Marketing Manager
Kuraray GmbH

Kuraray Europe GmbH, Business Area PVB
Mülheimer Straße 26, D-53840 Troisdorf

Jan Scheers
Sales Manager
jan.scheers@kuraray.com
www.trosifol.com

16.12.2020

White Aluminium Enterprises L.L.C.
Glass Division
Industrial City of Abu Dhabi (ICAD)#1
P.O. Box: 30665
ABU DHABI

UNITED ARAB EMIRATES

Certificate of compliance

To Whom it May Concern,

We, KURARAY GmbH, producer of Trosifol PVB (polyvinyl butyral) and SentryGlas®, certify that

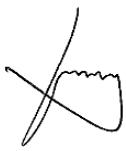
White Aluminium Enterprises L.L.C.

based in the industrial city of Abu Dhabi, United Arab Emirates, is an approved glass processing company to use our products.

From the start of the production we worked closely together in order to produce world class PVB and SentryGlas® laminates.

Procedures for lamination are well known and regular trainings for the staff take place.

Yours sincerely,



Jan Scheers
Sales and Marketing Manager Middle East

INLAID Partner

SEFAR

Certificate No IPSAV09

Sefar AG

is pleased to confirm that the company:

White Aluminium Enterprises L.L.C., Abu Dhabi UAE

*has successfully passed the qualification process of **SEFAR®** Architecture **VISION** with SentryGlas®*

This certificate is valid until the date shown in the below table as long as the manufacturing process for laminated glass remains unchanged. Renewal is subject to validation of newly supplied laminates.

Date: 04.10.2021

By Sefar:

Matthias Meissner
Business Dev. & Sales Architecture

Validity:

SEFAR Qualified INLAID Valid: 12.1.2016	SEFAR Qualified INLAID Valid: 16.8.2017	SEFAR Qualified INLAID Valid: 05.08.2021	SEFAR Qualified INLAID Valid: 04.10.2022				

Dow *Quality Bond*™

CERTIFICATE

Dow is proud to name

WHITE ALUMINIUM ENTERPRISES LLC

Abu Dhabi, UAE

as a member of Quality Bond™

for Insulating Glazing Applications
with DOWSIL™ Sealants

Signed

Customer

who are following the commitments and standards of quality and best practice as defined in Quality Bond™

Jean-Paul Hautekeer
Global Marketing Director

Markus Plettau
EMEA Marketing Manager

Sébastien Dath
EMEAI TS&D Leader

On behalf of Dow Europe GmbH

Valid from June 2021

Valid to August 2022

QB Quality Bond™ from Dow

DOWSIL™ silicones by DOW

62-1357Q-01

Quality Bond™ MEMBERSHIP POLICY

This *Quality Bond*™ Certificate and the following provisions (hereinafter referred to as the "Certificate") shall govern the relationship between Dow Europe GmbH and the *Quality Bond*™ Membership applicant as identified hereunder with regard to non-staining sealant applications, insulating glazing sealant applications, structural glazing sealant applications and panel bonding sealant applications (hereinafter referred to as the "Building Sealant Applications").

Any party who consistently and successfully meets the *Quality Bond*™ Membership Qualification Criteria (Version November 2017), details of which are available upon request from the nearest Dow representative, can apply for this membership at any time.

Provided said *Quality Bond*™ Membership Qualification Criteria are met by the applicant to the satisfaction of Dow Europe GmbH, including the applicant's production site audit, this Certificate is granted to the applicant who shall then officially become a *Quality Bond*™ Member for a twelve-month period, at the end of which this Certificate will automatically be cancelled.

Upon such cancellation date or at the earliest date thereafter, the *Quality Bond*™ ex-Member shall successfully pass another production site audit with respect to its Building Sealant Application knowledge and related processes as well to other non-process qualification criteria to obtain the renewal of its *Quality Bond*™ Certificate for another twelve-month period.

Upon the grant or the renewal of the Certificate as per the above procedure, the new or renewed *Quality Bond*™ Member hereby warrants that it will continuously meet the *Quality Bond*™ Membership - Qualification Criteria (Version November 2017) for the entire duration of said new or renewed Certificate.

By being qualified under this Certificate, the *Quality Bond*™ Member further acknowledges and agrees that the remedy for defective Dow products shall be governed by the relevant limited warranty provisions applicable to the concerned Building Sealant Applications as well as by the current applicable Dow terms and conditions of sales. However, to the extent there may be a conflict between this Dow Europe GmbH limited warranty and such Dow Europe GmbH current terms and conditions of sales, the provisions of said limited warranty shall prevail.

Usage by *Quality Bond*™ Member of non-Dow Europe GmbH products for any Building Sealant Application under this *Quality Bond*™ Certificate would permanently and immediately cancel the membership of such *Quality Bond*™ Member, including any right to make reference to Dow Europe GmbH trade name, logos or promotional material in any shape or form, as well as any relating Dow Europe GmbH limited warranty.

This Certificate shall be interpreted, construed and governed by the laws of Switzerland and shall be effective as of the effective date of the Dow Europe GmbH signature hereon.

CERTIFICATE

TRAINED CONTRACTOR

This is to certify that

WHITE ALUMINIUM ENTERPRISES LLC

is a Trained Contractor for applications of:

SIKA ENGINEERING SILICONES IN FAÇADE APPLICATIONS

The Trained Contractor has received a practical and theoretical training in the proper storing, preparation and application of Sika products.

The Trained Contractor has been made aware of the relevant Sika Product Data Sheets and all other technical documentation. This confirmation is valid for two years from its date of issue and may be renewed subject to the Trained Contractor successfully completing any training courses required by Sika.

This training was conducted by Sika UAE LLC on January 17, 2021
in Abu Dhabi, UAE

Dubai, January 27, 2021

DRAGOSLAV DJORDJEVIC
Technical Service Manager
GCC

RUBEN ALLAN CRUZ
Product & Technical Engineer
GCC

Validity: 01/2023

Sika is not responsible for the Trained Contractor's compliance with Sika's guidelines or training instructions or any other requirements of third parties. Sika is not liable for any acts or omissions of the Trained Contractor arising in any way, including, but not limited to, any breach of contract; or any tort (including negligence); or any breach of statutory duty.

BUILDING TRUST

CERTIFIED APPLICATOR

Glass Processor Certificate

PCT Global is pleased to confirm

White Aluminum Enterprises L.L.C, ABU DHABI, UAE

as a certified professional applicator of EnduroShield and is authorised to issue warranties exclusive to that certification.

1st December 2021

Date

Signed on behalf of PCT Global

WHITE ALUMINIUM
glass processing

CHAPTER 6

Appendices

APPENDIX 1 **QUALITY PLAN**
APPENDIX 2 **WAE PROCESS DIAGRAMS**

CHAPTER 6

APPENDIX 1

QUALITY PLAN

WHITE ALUMINIUM
glass processing

Introduction

White Aluminium Enterprises LLC. - Glass Processing Division, a private company based in Abu Dhabi, United Arab Emirates, is a processor of high quality, high reliability architectural glasses. WAE - Glass Processing Division has a developed Quality Management System compliant to ISO 9001 and implements it to document the company's best business practices to better satisfy the requirements and expectations of its Customers and improve the overall Management of the Company.

White Aluminium Enterprises LLC. - Glass Processing Division has a firm commitment to quality and excellence as well as strict adherence to the stringent requirements of the European (BS EN) and the American Standards (ASTM). WAE - Glass Processing Division supports its products and services with a comprehensive Service / Quality program that is second to none. We achieve this through:

- Management's philosophy of continual improvement in all aspects of company performance
- Well engineered and validated new product design processes
- Vendor selection process based on long term relationships
- Responsive assistance to Customers, with on-site support when necessary

The purpose of this is to provide a tabulated Quality Control Plan for the individual tasks in the production of architectural glasses. The goal is to standardize the quality procedures such that all Operators or Inspectors perform the same task in the same manner to ensure consistent and quality manufacturing.

It is the policy of White Aluminium Enterprises LLC – Glass Processing Division to manufacture and deliver products to the highest quality levels and which conform to the specified standards of quality reliability and performance with the best manufacturing techniques to ensure competitive advantage.

A key way to achieve this is by operating a Quality Management System (QMS) in accordance with the requirements of ISO 9001: 2015.

Our quality policy is committed to continual process improvement involving all employees with the objective of satisfying the needs of our customers while meeting our financial goals. The strength of this policy is based on:

- Full management commitment to communication of the policy to all employees
- Education and training of employees to assure active participation in the continual improvement of the quality system with emphasis on defect prevention
- Internal quality system audits and timely corrective actions for system elements that are found to be "non-conforming"
- Periodic evaluation of the quality system to ensure efficiency and performance as well as productivity

Our Quality Objectives are:

- To meet or exceed customer delivery expectations
- Usage of best raw materials
- Quality checking at every stage
- Immediate action upon customer complaints
- Adoption of up to date know-how for the enhancement of performance

This quality policy and objectives is reviewed annually by top management and where deemed necessary will be amended and re-issued. Previous versions of this policy are archived. This policy is available to relevant interested parties, upon reasonable request.

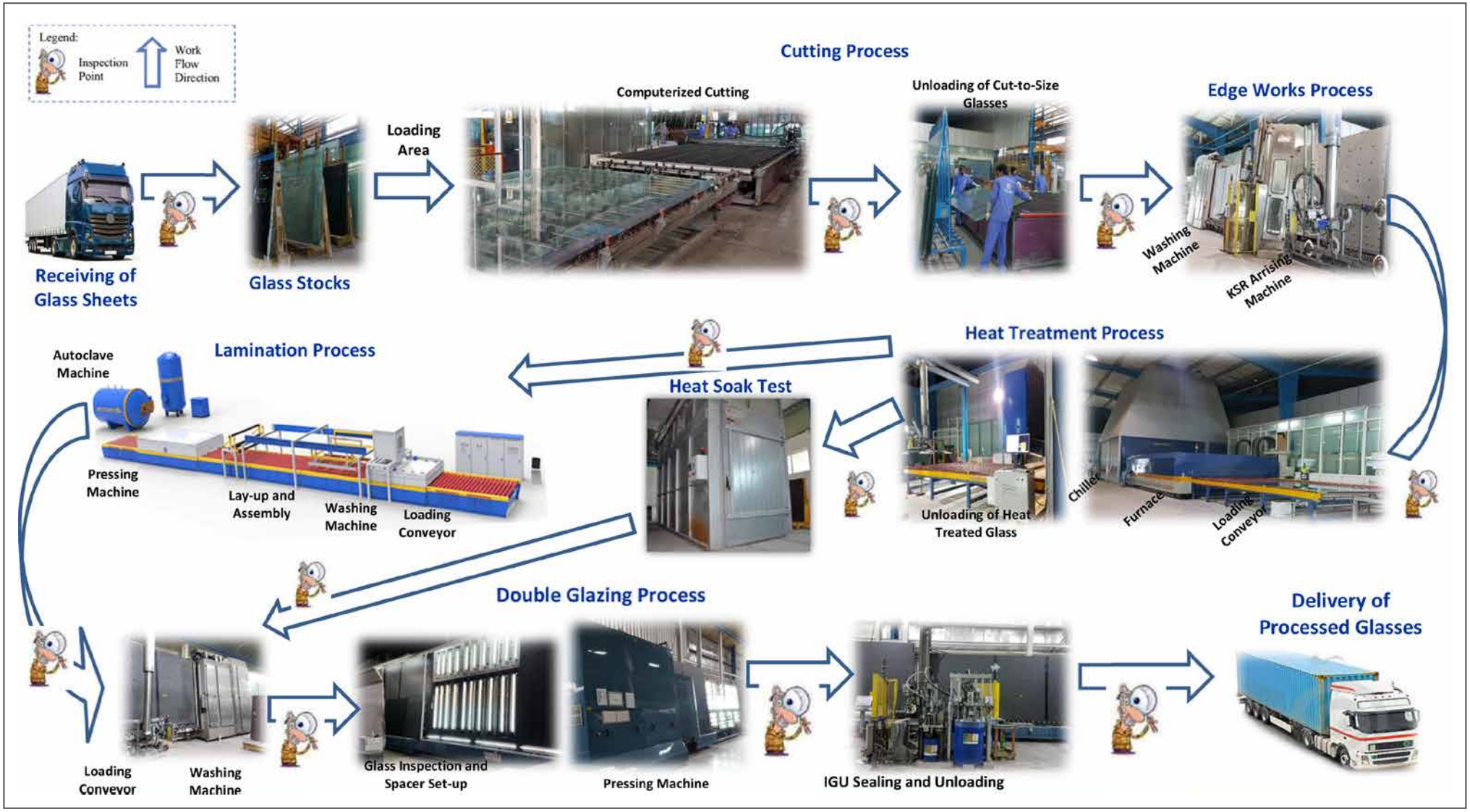
Engr. Jabr M. Doshan
Group Chairman and CEO

White Aluminium Enterprises L.L.C. P.O.Box: 39865 - Abu Dhabi - U.A.E.

WHITE ALUMINIUM glass processing

WHITE ALUMINIUM
glass processing

Quality Plan Map
Glass Store to Delivery



White Aluminium Enterprises LLC – Glass Division's

Glass Quality
Inspection and Testing Plan

Reference Number	WAE.ITP.01
Revision Number	03
Prepared Date	03 – January – 2020
Page Number	Page 1 of 10

Ref	Section / Stage	Inspection / Test	Evaluation Method	Operation Instruction	Instrument	Form / File	Acceptance Criteria	Frequency	Recorded
1	**Incoming Materials**	Incoming material condition, Quality and Quantity Inspection	Visual Inspection	Check the external condition of the containers / box. Check the quantity, type, size, weight, TAG numbers and expiry date if mentioned.	Visual Inspection	WAE.QC.FRM.001 rev 02	No external damage on crates / box. Actual quantity and other specifications must match the order and delivery details.	Check each crates / box of incoming materials	Yes
		Incoming material identification, Quality and Quantity Inspection	Visual Inspection	Note all the information written on the tags attached to the wooden boxes. Make sure that there all information needed are available and boxes are received with tags.	Visual Inspection	WAE.QC.FRM.001 rev 02	Tag numbers are properly attached on the wooden boxes clearly mentioning the batch/tag number, glass type and thickness, sheet size, quantity, etc.	Check each crates / box of incoming materials	Yes
2	**Cutting Process**	Glass quality	Visual Inspection / Measurement	Ensure that the coated surface or air side of the glass is opposite the conveyor belts of cutting table. Check the glass size, thickness, type and visual quality. Check for scratches and other blemishes. Always refer to the standard operating procedures. Inspect the cutting quality on edges for each piece	Visual, measuring tape and hand loupe	WAE.QC.FRM.003 rev 04	ASTM C1036 / BS EN 572 / JIS R3202 / BS EN 1096 / ASTM C376 *(Project Specifications Compliance)*	Every change of glass type/thickness per order; One piece per hour	Yes
3	**All sections that uses washing machines**	Water Condition for Processing of Coated Glass	Measurement	Ensure that the water being used in washing machines where high performance glasses are being processed are within the allowable range	pH meter and Conductivity meter	WAE.QC.FRM.019 rev 03	pH of water should be >6 but <8. Conductivity must be ≤30 µS and temperature must be 40 °C – 60 °C.	Twice a day per machine	Yes

WHITE ALUMINIUM
glass processing

Glass Quality
Inspection and Testing Plan

Reference Number	WAE.ITP.01
Revision Number	03
Prepared Date	03 – January – 2020
Page Number	Page 2 of 10

Ref	Section / Stage	Inspection / Test	Evaluation Method	Operation Instruction	Instrument	Form / File	Acceptance Criteria	Frequency	Recorded
4	**Edge Works**	Edge work type and details	Visual Inspection	Always refer to the Job Order, drawings and other supporting details	Visual Inspection	WAE.QC.FRM.004 rev 03	ASTM C1036 / BS EN 572 / JIS R3202 / BS EN 1096 / ASTM C1376 *(Project Specifications Compliance)*	Every change of glass type/thickness per order; once per hour	Yes
		Glass quality	Visual Inspection / Measurement	Refer to EN or ASTM standards for quality. Measure defects (i.e. scratch, chip, etc.) as per agreed standard for the order/project.	Visual, measuring tape and hand loupe	WAE.QC.FRM.004 rev 03	ASTM C1036 / BS EN 572 / JIS R3202 *(Project Specifications Compliance)*	100% visual inspection, record every change of glass type/thickness per order; once per hour	Yes
		Coated Glass Processing	Visual Inspection	The coating must always be opposite the transport rollers. Always refer to the standard operating procedures.	Visual Inspection	N/A	BS EN 1096 / ASTM C376 Standard Operating Procedures and Supplier's Guidelines	100%	Yes
5	**Ceramic Frit**	Ceramic paint quality	Visual Inspection	Ceramic paint must be prepared in accordance to the supplier's guidelines. There must be no impurities present and the paint should be mixed properly	Visual Inspection	WAE.QC.FRM.006 rev 04	Refer to the paint supplier's guidelines	Every paint prepared for batch processing.	No

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Ref	Section / Stage	Inspection / Test	Evaluation Method	Operation Instruction	Instrument	Form / File	Acceptance Criteria	Frequency	Recorded
5	**Ceramic Frit**	Fritted Glass Quality	Visual Inspection	Fritted glass units shall be inspected after passing through the drying machine after screen printing. Roll coating or digital printing. Visual quality of frit shall be inspected prior unloading and transfer to staging racks. Always refer to standards and/or internal processing guidelines.	Visual Inspection	WAE.QC.FRM.006 rev 04	ASTM/EN glass standards *(WAE Internal Guidelines)*	Every change of glass type/thickness per order; Start of production for screen printing and digital printing; (3) start of production and after every 45 pcs. produced for roll coating	Yes
6	**Heat Treatment Process**	Glass quality	Visual Inspection / Measurement	Check the glass size, thickness, type and quality. Check for scratches, bubbles, stones and other blemishes. Always refer to the standard operating procedures and international glass standards	Visual, measuring tape and hand loupe	N/A	ASTM C1036 / BS EN 572 / JIS R3202 ASTM C1376 / BS EN 1096 *(Project Specifications Compliance)*	100% of glasses processed	No
		Fixing of company logo	Visual Inspection	The logo must be applied after the washing and drying process. Careful analysis and application should be done to get the proper position and legibility of the logo. Logo position will be as per WAE's standard procedures.	Visual Inspection	N/A	ASTM C1048 / BS EN 12150 / BS EN 1863 *(Project Specifications Compliance)*	100% of glasses processed	No

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Ref	Section / Stage	Inspection / Test	Evaluation Method	Operation Instruction	Instrument	Form / File	Acceptance Criteria	Frequency	Recorded
6	**Heat Treatment Process**	Glass position during loading in the furnace	Visual Inspection	The glass must be placed in the loading table in such a way that the width is parallel to the transport rollers.	Visual Inspection	N/A	Roller waves must be uniform in direction *(Unless otherwise specified or more than the machine capacity)*	100% of glasses processed	No
		Inspection of distortion due over-all bow	Visual Inspection / Measurement	The distortion on the heat treated glass must be measured in accordance to European standards. Always refer to the standard operating procedure.	String and feeler gauge	WAE.QC.FRM.007 rev 03	ASTM C1048 / BS EN 12150 / BS EN 1863 *(Project Specifications Compliance)*	Each start of a shift. When changing glass type and thickness. After machine shutdown.	Yes
		Inspection of roller-wave	Visual Inspection / Measurement	Roller-wave measurement should be from peak-to-valley using roller-wave meter gauge	RWG-DF Roller-wave meter	WAE.QC.FRM.007 rev 03	ASTM / EN Standards *(Project Specifications Compliance)*	Each start of a shift. When changing glass type and thickness. After machine shutdown.	Yes
		Inspection of the break pattern	Visual Inspection / Measurement	Conduct the break test in accordance to EN 12150 or EN 1863 whichever applies. Always refer to the standard operating procedures	Hammer	WAE.QC.FRM.007 rev 03	BS EN 12150 / BS EN 1863	Each start of a shift. When changing glass type and thickness. After machine shutdown.	Yes

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Ref	Section / Stage	Inspection / Test	Evaluation Method	Operation Instruction	Instrument	Form / File	Acceptance Criteria	Frequency	Recorded
6	**Heat Treatment Process**	Measurement of surface compressive stress *(non – destructive test)*	Measurement	Measure the surface compressive stress of the heat treated glasses. Always refer to the standard operating procedure	GASP	WAE.QC.FRM.007 rev 03	ASTM 1048	Each start of a shift. When changing glass type and thickness. After machine shutdown.	Yes
		Measurement of bending strength	Measurement	Measure the bending strength of the heat treated glasses. Always refer to the standard operating procedure	4-point bender for proxy test	WAE.QC.FRM.007 rev 03	BS EN 12150 / BS EN 1863	Each start of a shift. When changing glass type and thickness. After machine shutdown.	Yes
7	**Heat Soak Test**	Inspection of breakage due to critical Nickel Sulfide inclusion after Heat Soak Test	Visual Inspection / Measurement	Broken units due to critical nickel sulfide inclusion after heat soak testing is noted and recorded.	Heat Soak Test Oven	WAE.QC.FRM.008 rev 01	BS EN 14179	100 % of tempered glass requiring heat soak test	Yes
		Glass quality	Visual Inspection	Confirm the visual quality of units which passed the heat soak test.	Visual	WAE.QC.FRM.008 rev 01	ASTM C1036 / BS EN 572 / JIS R3202 ASTM C1376 / BS EN 1096 *(Project Specification Compliance)*	100% of glasses processed	Yes

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8	**Sand Blasting**	Glass quality	Visual Inspection / Measurement	Check the glass size, thickness, type and quality. Check for the scratches and other blemishes. Always refer to the standard operating procedures.	Visual, measuring tape and hand loupe	N/A	ASTM C1036 / ASTM C1376 / BS EN 572 / BS EN 1096 / JIS R3202 *(Project Specification Compliance)*	100% of processed glasses	N/A
		Sand Blasting Type and Details	Visual Inspection	Always refer to the Job Order, drawings and other supporting details.	Visual Inspection	N/A	Project Specification Compliance	100% of processed glasses	N/A
		Glass Label	Visual Inspection	Proper label must be attached in the glass after processing the glass.	Visual Inspection	N/A	No interchanging of labels	100% of processed glasses	N/A
9	**Bending**	Glass quality	Visual Inspection / Measurement	Check the glass size, thickness, type and quality. Check for the scratches and other blemishes. Always refer to the standard operating procedures.	Visual, measuring tape and hand loupe	N/A	ASTM C1036 / BS EN 572 / JIS R3202 ASTM C1376 / EN 1096	100% of processed glasses	N/A
		Bending Type and Details	Visual Inspection	Always refer to the Job Order, drawings and other supporting details.	Visual Inspection	N/A	Project Specification Compliance	100% of processed glasses	N/A
		Glass Label	Visual Inspection	Proper label must be attached in the glass after processing the glass.	Visual Inspection	N/A	No interchanging of labels	100% of processed glasses	N/A

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10	Lamination	Glass quality (Lay-up and after Autoclave)	Visual Inspection / Measurement	Check the glass size, thickness, type and visual quality. Check for scratches, other blemishes, lamination bubbles, delamination, etc. Always refer to the standard operating procedures.	Visual, measuring tape and hand loupe	N/A	ASTM C1036 / ASTM C1376 / JIS R3202 BS EN 572 / BS EN 1096 / ASTM C1048 / EN 12150 /EN 1863 ASTM C1172 / BS EN 12543 *(Project Specification Compliance)*	100% of glasses processed	No
		High Temperature Test	Visual Inspection	Heat three specimens to a temperature of 100C^{o}. Maintain the temperature for a period of 2 hours, then cool to room temperature. Always refer to standard operating procedure.	Oven	WAE.QC.FRM.013 rev 01	BS EN 12543	Sample for every autoclave loading	Yes
11	Insulation (Double Glazing)	Glass quality	Visual Inspection / Measurement	Check the glass size, thickness, type and visual quality. Check for scratches and other blemishes. Always refer to the standard operating procedures.	Visual, measuring tape and hand loupe	WAE.QC.FRM.014 rev 02	ASTM C1036 / ASTM C1376 / JIS R3202 BS EN 572 / BS EN 1096 / ASTM C1048 / EN 12150 /EN 1863 ASTM C1172 / BS EN 12543 *(Project Specification Compliance)*	100% of glasses processed	No

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Ref	Section / Stage	Inspection / Test	Evaluation Method	Operation Instruction	Instrument	Form / File	Acceptance Criteria	Frequency	Recorded
11	**Insulation (Double Glazing)**	Inspection on the primary sealant	Visual Inspection / Measurement	Always check the quality of the primary sealant being applied. Always refer to the standard operating procedures and test methods.	Weighing scale, thermometer	WAE.QC.FRM.014 rev 02	Temperature = 120 ºC -150 ºC ; Weight = 2.5 g - 4 g; Width = ≥ 3 mm ; Thick(mm) = ≥ 0.3 mm	Each start of a shift	Yes
		Heat Rise Test for Desiccant	Visual Inspection / Measurement	Conduct the heat rise test in accordance to the supplier's guidelines. Always refer to the standard operating procedure and test method	Thermometer	WAE.QC.FRM.014 rev 02	Supplier guideline. ΔT ≥ 37 °C	When new batch of desiccant is used	Yes
		Butterfly test and Glass Test	Visual Inspection	Prepare the butterfly test in accordance to the supplier's guideline. Always refer to the standard operating procedure and test method	Visual Inspection	WAE.QC.FRM.017 rev 00	Supplier's guideline. Color homogeneity	Each start of a shift and after changing the drum (Base / Catalyst)	Yes
		Snap Time Test	Visual Inspection	Conduct the snap time test in accordance to the test method. Snap time acceptance criteria will differ depending on the supplier and type of material	Cup and Stick	WAE.QC.FRM.017 rev 00	Refer to the supplier's specification	Each start of a shift and after changing the drum (Base / Catalyst)	Yes
		Test for the Mixing Ratio	Measurement	Conduct the test for mixing ratio in accordance to the test method. Mixing ratio requirement will differ depending on the supplier and type of material	N/A	WAE.QC.FRM.017 rev 00	Refer to the supplier's specification	2x / week and whenever there is a sign of improper mixing	Yes

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Ref	Section / Stage	Inspection / Test	Evaluation Method	Operation Instruction	Instrument	Form / File	Acceptance Criteria	Frequency	Recorded
11	**Insulation (Double Glazing)**	Test for Argon Concentration in IGU	Measurement	Conduct the test for argon gas concentration filled in IGU in accordance to test method. Argon concentration requirement shall be as per standard.	Gas Analyzer	WAE.QC.FRM.014 rev 02	EN 1279	3 units / day in production > 100 otherwise 1 unit/day. – Minimum 1 unit/gas filling machine / day	Yes
12	**Dispatch**	Inspection of Visual Quality of Glass Units before Packing	Visual Inspection	All glass units are visually inspected as per standards before endorsement to Packing	N/A	N/A	ASTM C1036 / ASTM C1376 / JIS R3202 BS EN 572 / BS EN 1096 / ASTM C1048 / EN 12150 /EN 1863 ASTM C1172 / BS EN 12543 *(Project Specification Compliance)*	Prior to each delivery	No
		Inspection of glass packaging	Visual Inspection	All glasses should be packed as per WAE packaging guideline.	N/A	N/A	WAE packaging	Prior to each delivery	No
		Inspection before dispatch	Visual Inspection	The vehicle containing the packed glasses should be inspected. The boxes / frames must be properly and safely loaded on the vehicle.	N/A	N/A	WAE packaging	Prior to each delivery	No

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Ref	Section / Stage	Inspection / Test	Evaluation Method	Operation Instruction	Instrument	Form / File	Acceptance Criteria	Frequency	Recorded
12	**Dispatch**	Documentation	Paper Works	All necessary documents must be prepared properly before dispatch. The information on delivery notes and packing list should be double checked to assure no error on the documents	N/A	N/A	WAE packaging	Prior to each delivery	No

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CHAPTER 6

Appendices

APPENDIX 1 **QUALITY PLAN**
APPENDIX 2 **WAE PROCESS DIAGRAMS**

CHAPTER 6

APPENDIX 2

WAE PROCESS DIAGRAMS

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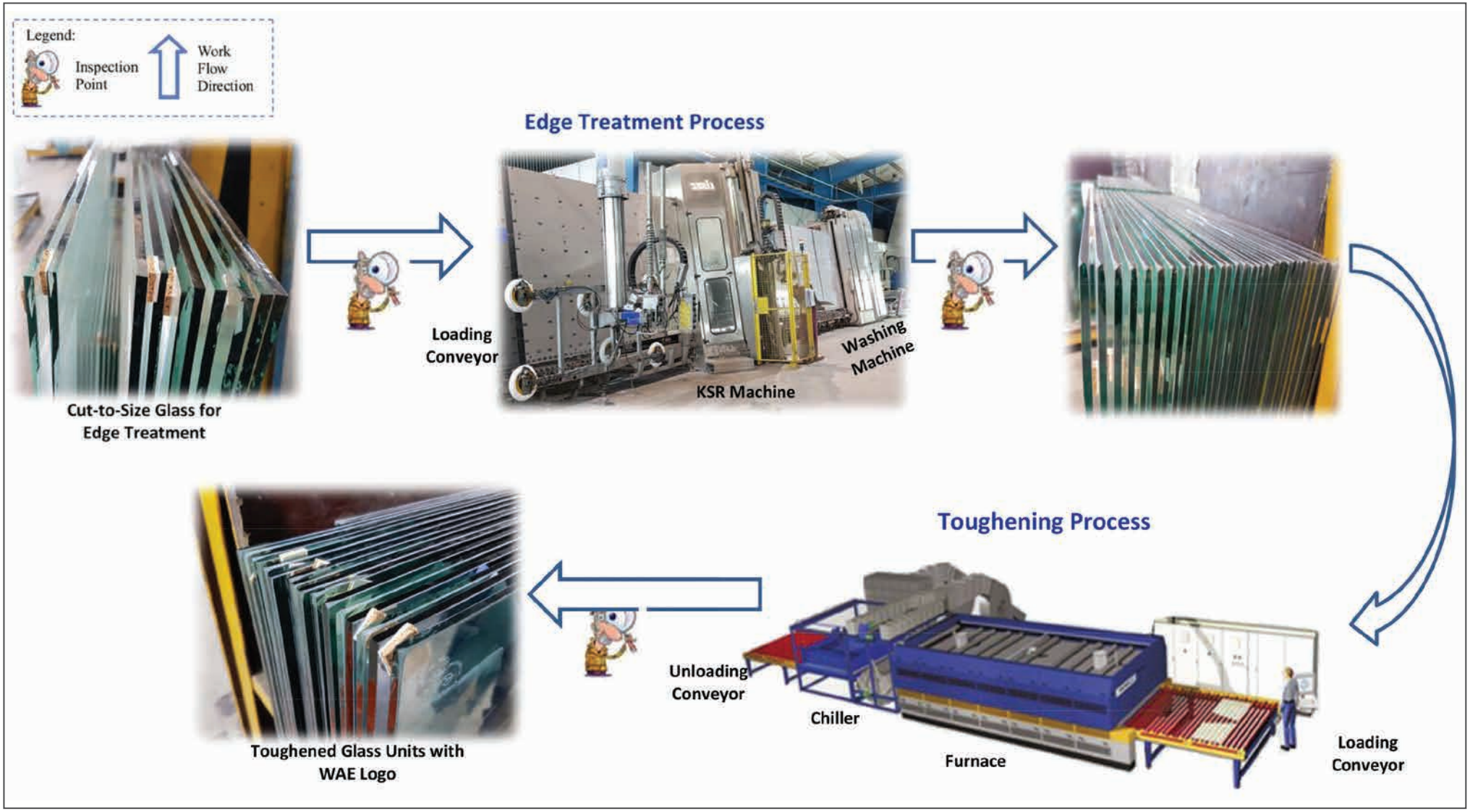
Process Flow for Thermally Toughened Glass Unite



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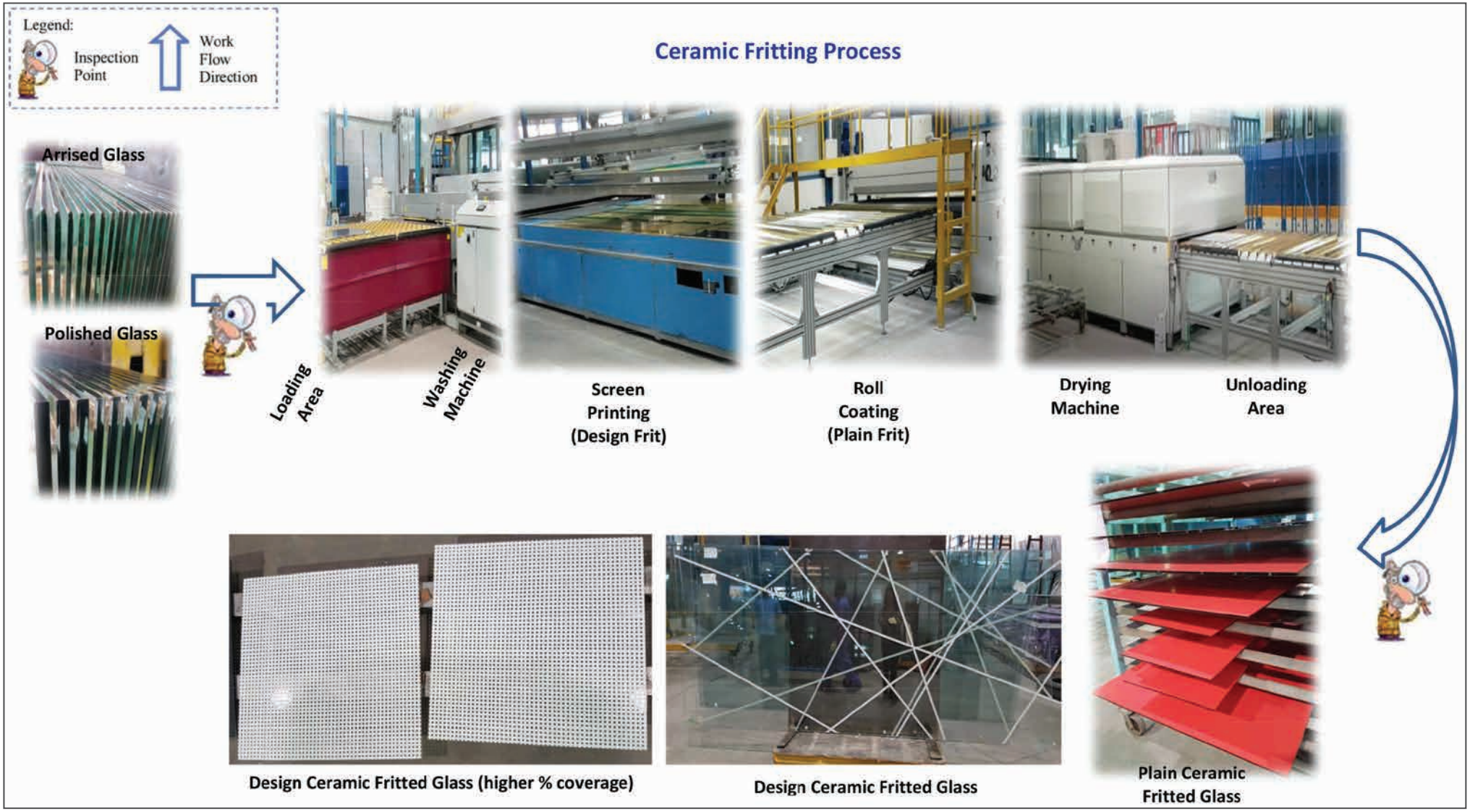
Process Flow for Decorative Painted Glass Unit



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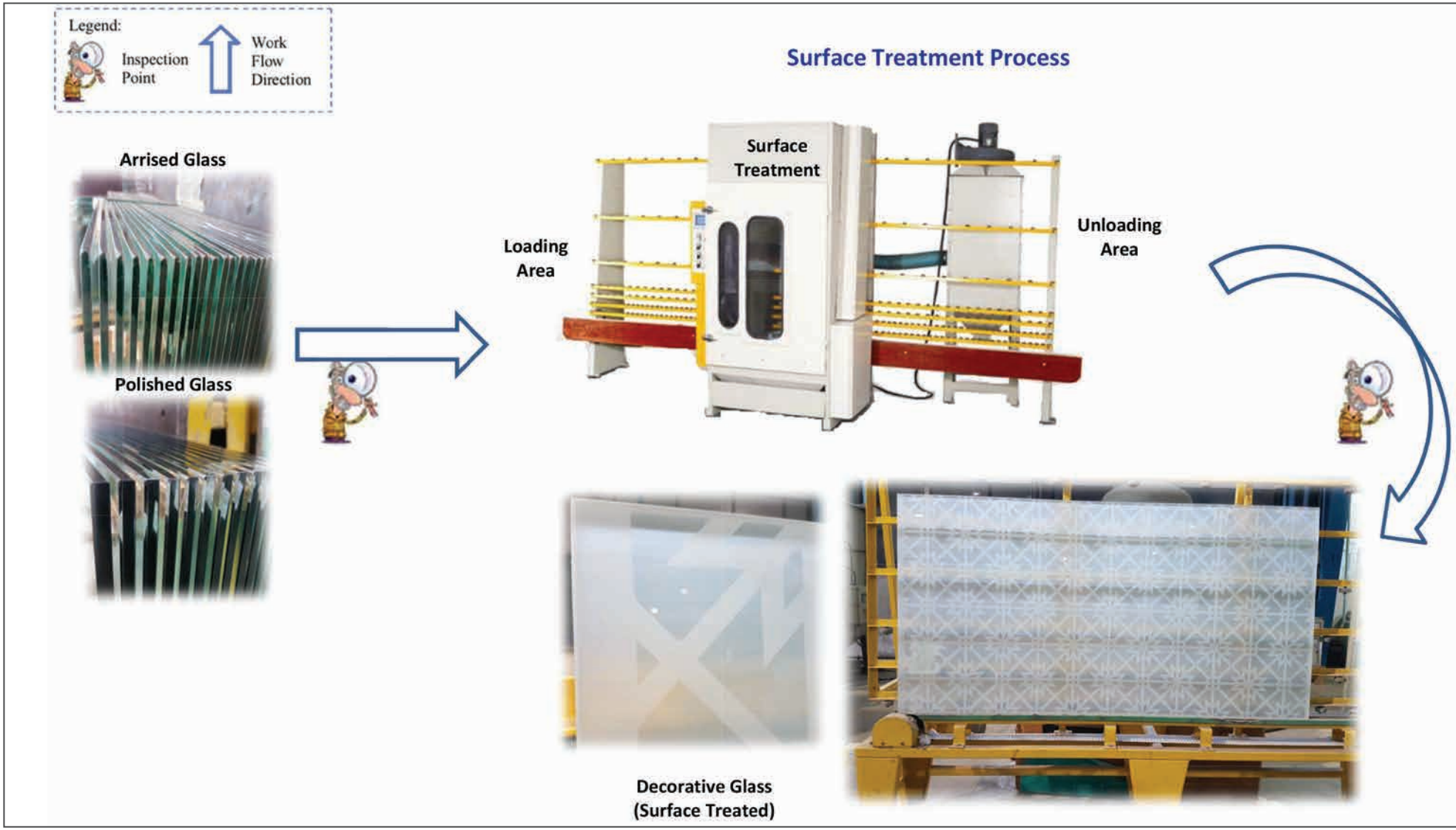
Process Flow for Decorative Glass Unit



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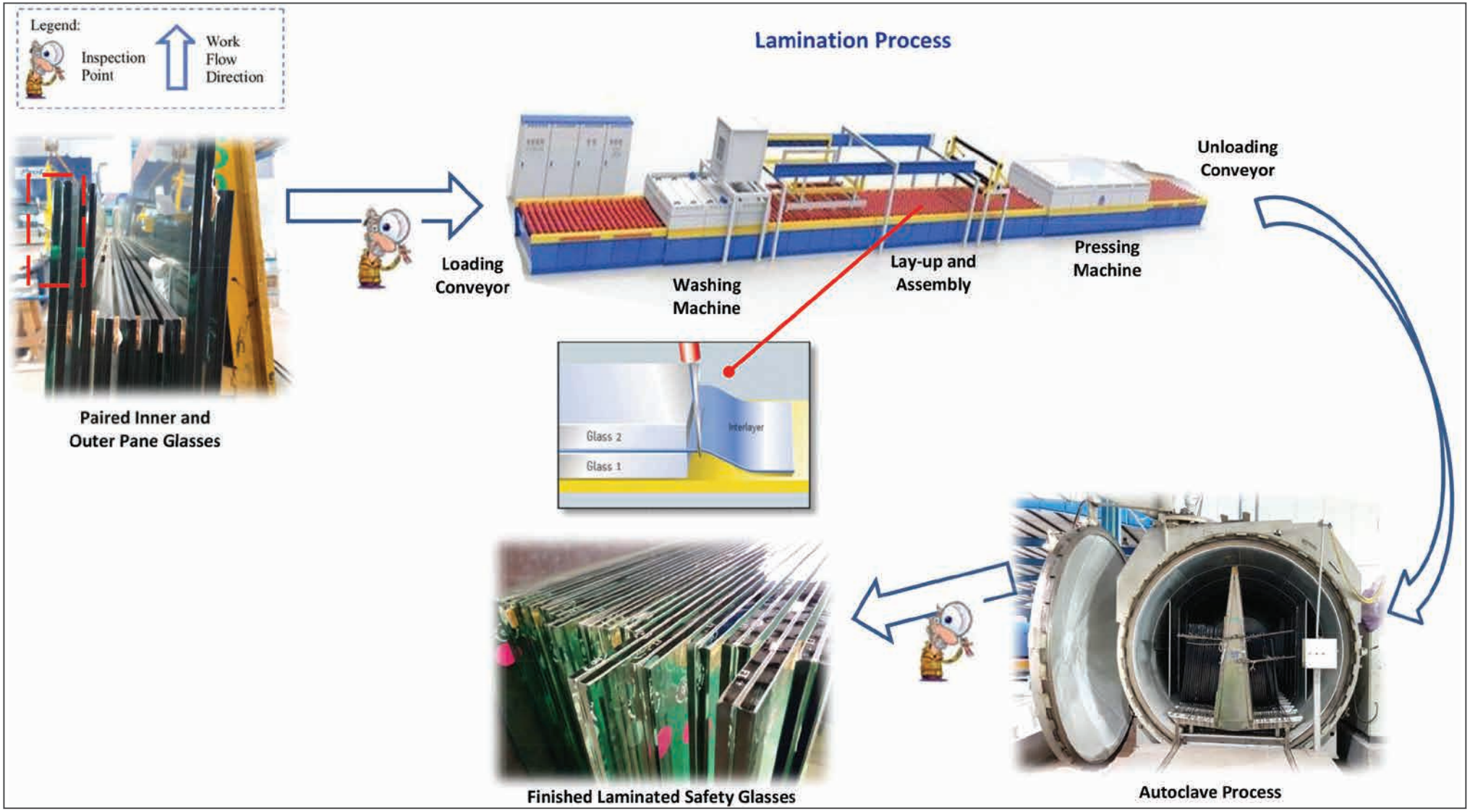
Process Flow for Laminated Safety Glass Unit



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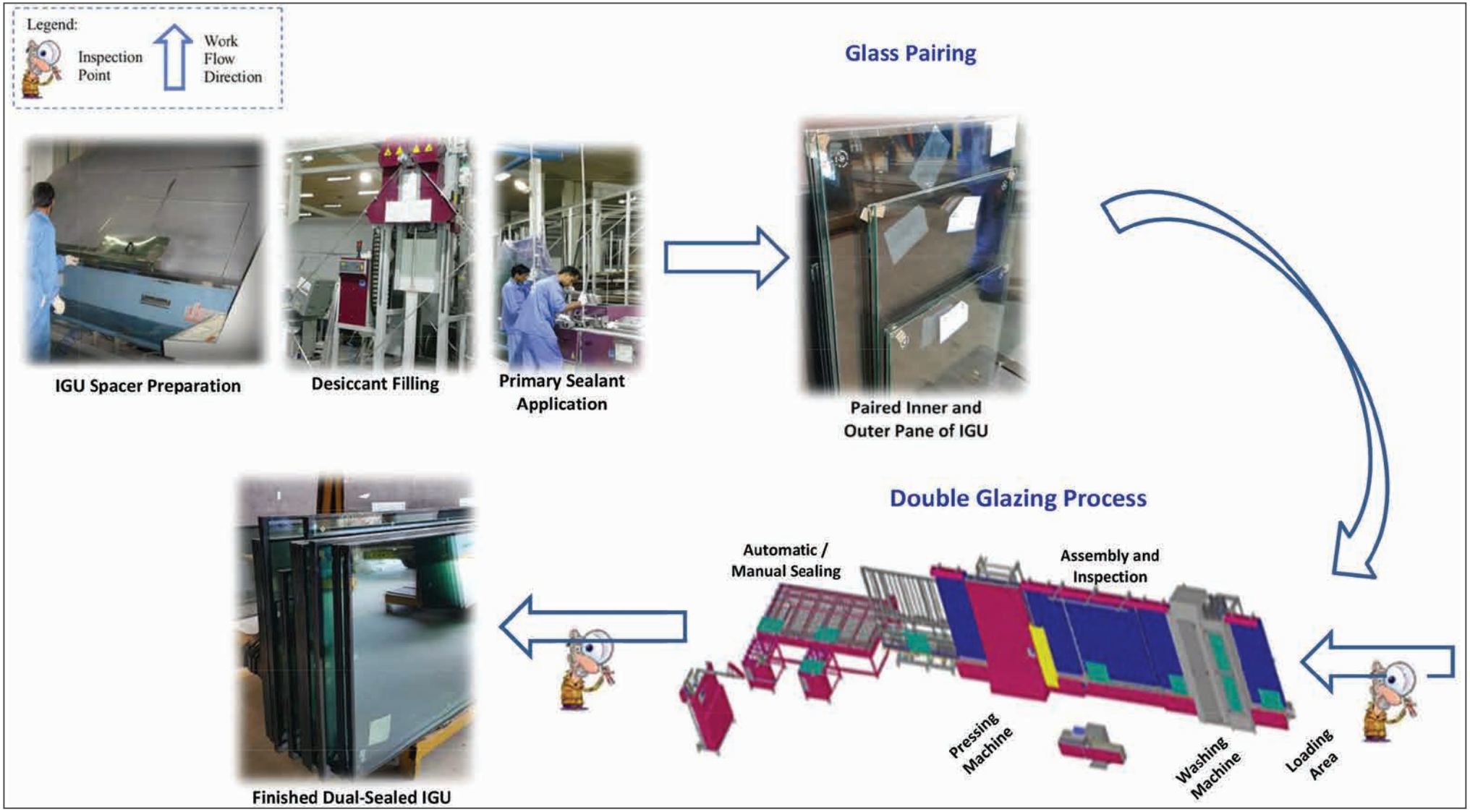
Process Flow for Insulated Glass Unit



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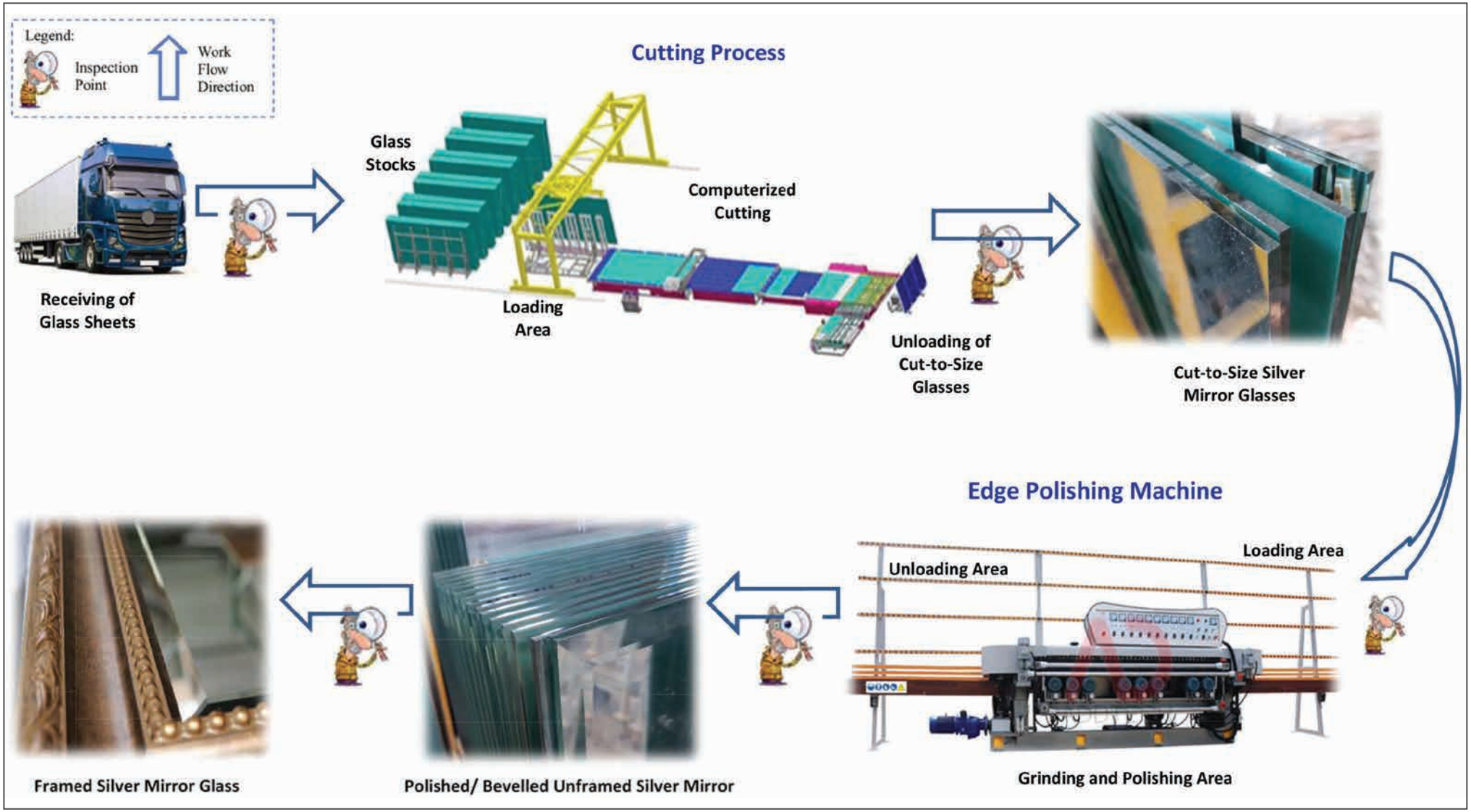
Process Flow for Personal-Used Framed Glass Mirror



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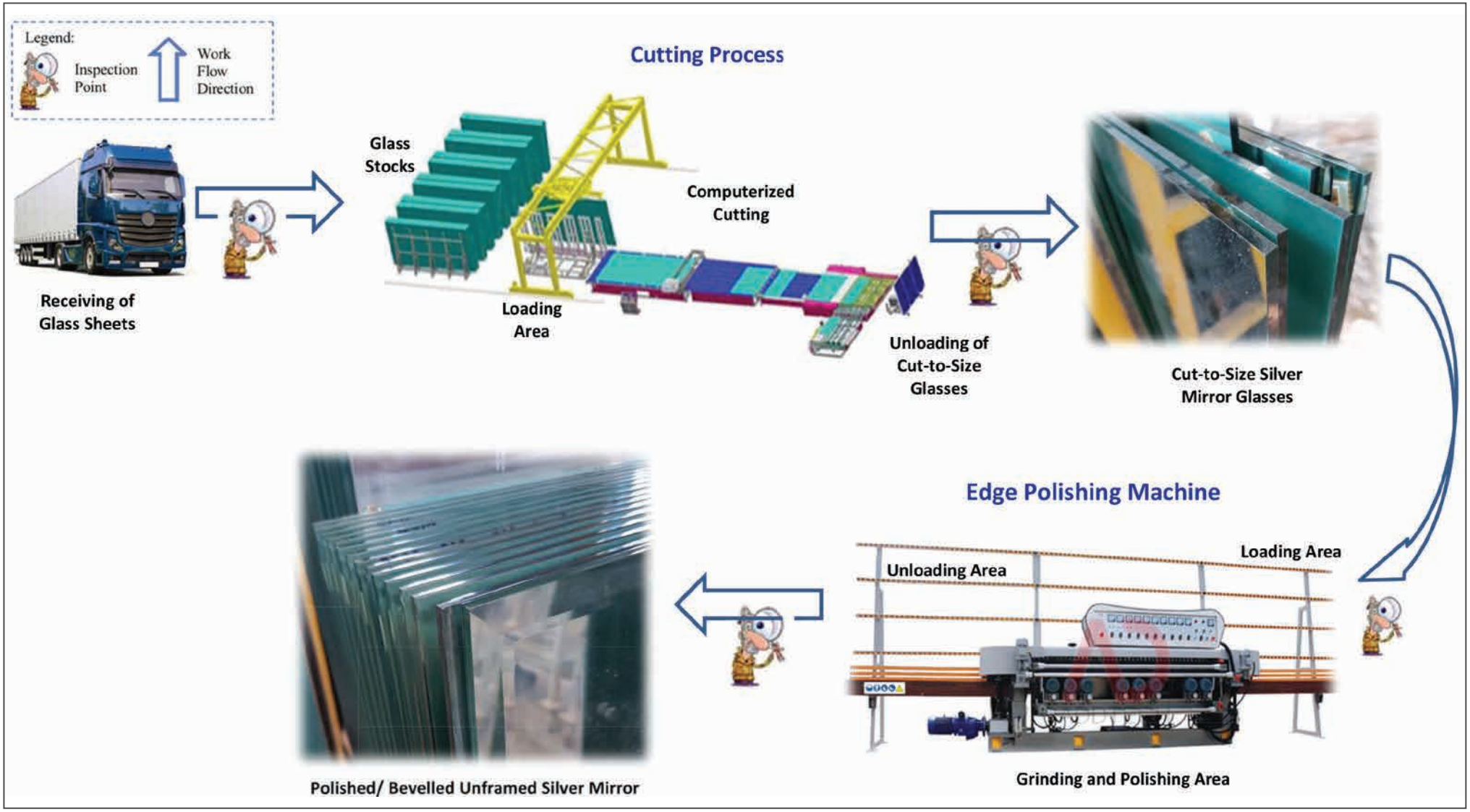
Process Flow for Personal-Used Framed Glass Mirror



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Process Flow for Bullet Resistant Glass Unit