

SAGGA

South African Glass and Glazing Association

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Company Logo:**About SAGGA****SAGGA Accredited Glaziers / Contractors**

SAGGA accredited glaziers/contractors are your best protection for ensuring that you, or your client's, buildings are glazed according to the Application of the National Building Regulations and an excellent way to protect you or your clients, from large damages claims associated with inadequate glazing.

The South African Glass and Glazing Association (SAGGA) have accredited installers. These installers are skilled tradespeople who have agreed to a set code and who have qualified to apply a SAGGA certificate to any glazing undertaken.

- Specifying glass for energy efficiency
- Windows & heat loss/gain
- Energy performance characteristics of windows
- Testing
- Types of glass
- Uses of glass

Introduction

Glazing in structures in excess of 10m height, overhead or sloped glazing, glass flooring, three and one edge supported glass, toughened glass assemblies and entrances, glass for balustrade supported by clamps, frame-less shower doors, cubicles and enclosures etc. must be signed off and approved in writing by a Competent Person Glazing duly registered with the South African Glazing Institute.

The South African Glass Institute consists of professionals having appropriate indemnity insurance to provide this service.

Types of Glass

Annealed or Float Glass

Annealed glass is the basic flat glass product that is the first result of the float process. It is the common glass that tends to break into large, jagged shards. It is used in some end products - often in the double-glazed windows, for example. It is also the starting material that is turned into more advanced products through further processing such as laminating, toughening, coating, etc.

Insulating Glass or Soluble Glazing

Two or more panels of glass are bonded to a perimeter spacer, either a metal or thermoplastic spacer, (TPS). Either air or argon gas fills the space between the glass panes. Their primary benefit is insulation and solar control. Most types of glass can be incorporated into an insulating glass unit.

Toughened glass

Toughened glass is treated to be far more resistant to breakage than simple annealed glass, and to break in a more predictable way when it does break, thus providing a major safety advantage in almost all of its applications.

Toughened glass is made from annealed glass treated with a thermal tempering process. A sheet of annealed glass is heated to above its 'annealing point' of 600 degrees; its surfaces are then rapidly cooled while the inner portion of the glass remains hotter. The different cooling rates between the surface and the inside of the glass produces different physical properties, resulting in compression stresses in the surface balanced by tensile stresses in the body of the glass.

These countering stresses give toughened glass its increased mechanical resistance to breakage, and are also, when it does break, what cause it to produce regular, small, typically square fragments rather than long, dangerous shards that are far more likely to lead to injuries. Toughened glass also has an increased resistance to breakage as a result of stresses caused by different temperatures within a pane.

Toughened glass has extremely broad application in products both for buildings and for automobiles and transport, as well as other areas. Car windshields and windows, glass portions of building façades, glass sliding doors and partitions in houses and offices, glass furniture such as table tops, and many other products typically use toughened glass. Products made from toughened glass often also incorporate other technologies, especially in the building and automotive and transport sectors.

Laminated Glass

Laminated glass is made of two or more layers of glass with one or more "inter-layers" of polymeric material bonded between the glass layers.

Laminated glass is produced using one of two methods

Poly Vinyl Butyral (PVB) laminated glass is produced using heat and pressure to sandwich a thin layer of PVB between layers of glass. On occasion, other polymers such as Ethyl Vinyl Acetate (EVA) or Polyurethane (PU) are used. This is the most common method.

For special applications, cast in Place (CIP) laminated glass is made by pouring a resin into the space between two sheets of glass that are held parallel and very close to each other.

Laminated glass offers many advantages. Safety and security are the best-known of these -- rather than shattering on impact, laminated glass is held together by the inter-layer, reducing the safety hazard associated with shattered glass fragments, as well as, to some degree, the security risks associated with easy penetration. But the inter-layer also provides a way to apply several other technologies and benefits, such as coloring, sound dampening, and resistance to fire, ultraviolet filtering, and other technologies that can be embedded in or with the inter-layer.

Laminated glass is used extensively in building and housing products and in the automotive and transport industries. Most building facades and most car windscreens, for example, are made with laminated glass, usually with other technologies also incorporated.

Coated Glass

Surface coatings can be applied to glass to modify its appearance and give it many of the advanced characteristics and functions available in today's flat glass products, such as low maintenance, special reflection/transmission /absorption properties, scratch resistance, corrosion resistance, etc.

Coatings are usually applied by controlled exposure of the glass surface to vapors, which bind to the glass forming a permanent coating. The coating process can be applied while the glass is still in the float line with the glass still warm, producing what is known as "hard-coated" glass.

Alternatively, in the "off-line" or "vacuum" coating process, the vapor is applied to the cold glass surface in a vacuum vessel. Coated glasses can be toughened, laminated or incorporated into an insulating glass unit.

Security Glass

Glass that is designed to resist physical attack, ballistic and bomb blasts. These products are specialist laminates that use multiple layers of glass and rigid inter-layers depending on the resistance required.

Screen printed glass: Uses ceramic paint that is screen printed and permanently fused to the toughened glass surface.

Mirrored glass

To produce mirrored glass, a metal coating is applied to one side of the glass. The coating is generally made of silver, aluminum, gold or chrome. For simple mirrored glass, a fully reflective metal coating is applied and then sealed with a protective layer. It can also include a vinyl backing for safety.

To produce "one-way" mirrors, a much thinner metal coating is used, with no additional sealing or otherwise opaque layer.

Mirrored glass is gaining a more prominent place in architecture, for important functional reasons as well as for the aesthetic effect.

Patterned glass

Patterned glass is flat glass whose surfaces display a regular pattern. The most common method for producing patterned glass is to pass heated glass (usually just after it exits the furnace where it is made) between rollers whose surfaces contain the negative relief of the desired pattern(s).

Patterned glass is mostly used in internal decoration and internal architecture. Today, it is typically used for functional reasons, where light but not transparency is desired, and the patterns are accordingly subtle.

However, it has also at times been fashionable as a design feature in itself, in such cases often displaying more prominent patterns.

Self-cleaning glass

Used for exteriors. The glass incorporates a pyrolytic coating that dissolves dirt (photo active) and sheds water (hydrophilic) using natural UV light and rain.

Specialized Architectural Glazing

Aluminum sections can be powder coated or polished.

Glass room separations specifically designed and manufactured for:

- Entrance doors
- Bathroom entrances
- Toilet separations
- Any specialized acoustic glazing requirements
- Manufactured according to the standards of SAGGA (South African Glass and Glazing Association)
- Framed and Frameless options
- Technical backup and international design standards
- Turkish bath enclosures
- any other glass enclosure requirements



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SA Shower Enclosure
Manufacturers Association

SANS 10400-N:2012 Edition 3.1 requires glazing (framing and glazing materials) to comply with all the requirements of SANS 613 in respect of wind and impact loads, water penetration and air leakage. Upon completion of project provide appropriate Performance Test Certificates confirming compliance with all the requirements of SANS 613. Installations of glass panes will be inspected in accordance with SANS 10400-Part N:2012 Edition 3.1.

1. EXTERNAL VERTICAL GLAZING – Structures not exceeding 10m in height (3 storeys) Single Glazing

Vertical Glazing supported all round							
	Maximum Pane sizes in sq. m						
Nominal Glass Thickness (mm)	3	4	5	6	8	10	12
Monolithic Annealed Glass	0.75	1.5	2.1	3.2	4.6	6.0	6.0
Patterned Annealed & Wired Glass	-	0.75	1.2	1.9	2.6	3.4	-
Laminated Annealed Safety Glass	-	-	-	2.9	4.3	5.7	5.7
Toughened Safety Glass	-	1.9	3.0	4.5	8.0	8.0	8.0

Vertical Glazing – two opposite sides supported							
	Maximum Span between support in m						
Nominal Glass Thickness (mm)	3	4	5	6	8	10	12
Monolithic Annealed Glass	-	0.4	0.5	0.6	0.85	1.0	1.3
Patterned Annealed & Wired Glass	-	0.25	0.3	0.35	0.5	0.6	-
Laminated Annealed Safety Glass	-	-	-	0.55	0.8	0.95	1.2
Toughened Safety Glass	-	0.55	0.7	0.85	1.15	1.3	1.8

2. INTERNAL VERTICAL GLAZING – Single Glazing

Vertical Glazing all round supported							
	Maximum Pane sizes in sq. m						
Nominal Glass Thickness (mm)	3	4	5	6	8	10	12
Monolithic Annealed Glass	0.75	1.5	2.1	3.2	4.6	6.0	6.0
Patterned Annealed & Wired Glass	-	0.75	1.2	1.9	2.6	3.4	-
Laminated Annealed Safety Glass	-	-	-	4.1	6.0	7.2	7.2
Toughened Safety Glass	-	3.0	4.2	6.4	9.2	9.2	9.2

Vertical Glazing – Two opposite sides supported							
	Maximum Span between support in m						
Nominal Glass Thickness (mm)	3	4	5	6	8	10	12
Monolithic Annealed Glass	-	0.65	0.8	0.95	1.3	1.55	2.0
Patterned Annealed & Wired Glass	-	0.4	0.48	0.57	0.78	0.9	-
Laminated Annealed Safety Glass	-	-	-	0.9	1.25	1.5	1.95
Toughened Safety Glass	-	0.9	1.1	1.3	1.75	2.0	2.7

3. VERTICAL DOUBLE GLAZING (SIGU) – External (up to 3 storey) and Internal applications

Double Glazing (SIGU) all round supported only							
Type of glass	Maximum pane area in sq. m						
	Nominal glass thickness weakest light						
	3	4	5	6	8	10	12
Monolithic annealed glass	1.00	2.00	2.80	4.27	6.13	8.00	8.00
Patterned annealed & wired glass	-	1.00	1.60	2.53	3.47	4.53	-
Laminated annealed safety glass	-	-	-	3.87	5.73	7.60	7.60
Toughened safety glass	-	2.53	4.00	6.00	10.67	10.67	10.67

Deviations from the above must be approved by Competent Person (Glazing) including applications in excess of three storeys.

Two-edge supported SIGU (double glazing) must be done in consultation with the manufacturer of the SIGU and approved by Competent Person (Glazing).

4. GLASS FIN DIMENSIONS

Minimum Glass Fin Dimensions			
Fin Height in m	Internal	External	
1.5	150 x 12	150 x 15	Note: A butt joint is assumed to have no structural strength. Accordingly panels, which incorporate a butt joint, are not considered to be supported on four sides. A glass fin is necessary to provide the support at the joint so that the pane can be considered to be supported along four sides. Should no fin be in place selection of glass must be in accordance with Tables 1 or 2 above. Butt joints are not recommended for SIGU.
2	150 x 12	150 x 19	
2.5	150 x 12	175 x 19	
3	175 x 15	200 x 25	
3.5	225 x 15	275 x 25	
4	275 x 15	300 x 25	

4.4 SAFETY GLAZING (Obtain SAGGA Certificate of Conformance confirming compliance).

4.4.1 The performance of safety glazing material shall be in accordance with the requirements of SANS 1263-1 and the individual panes of safety glazing material shall be permanently marked by the installer in such a manner that the markings are visible after installation.

4.4.2 Safety glazing materials that comply with SANS 1263-1 shall be used where:

- doors and sidelights form part of any entrance up to 2100mm from finished floor level;
- a window has a sill height of less than 500mm from the floor or external ground level;
- a window has a sill height of less than 800mm from the floor or external ground level without any permanent barrier that prevents persons from coming into contact with the glass panel, and is so placed that persons are likely, on normal traffic routes, to move directly towards such window.

NOTE: A barrier could be any feature, i.e. a heavy bar across a window or a flower box placed in front of the window, that will provide a physical or visual barrier between the glass and a person.

- a bath enclosure or shower cubicle is glazed, or where glazing occurs immediately above and within a distance of 1800mm horizontally or vertically from a bath or shower;
- glazing is used in any shop front or display window within 2100mm from the finished floor level;
- glazing is used in any wall or balustrade to (or immediately adjacent to) a stairway, ramp, landing, pathway, patio, veranda or balcony;
- glazing is used within 1800mm of the pitch line of a stairway or the surface of a ramp, landing, pathway, patio, veranda or balcony;
- glazing applications are sloped or horizontal;
- a mirror is installed as a facing to a cupboard door less than 800mm above floor level and there is no solid backing;
- glazing is used around areas such as swimming pools and ice rinks; and
- glazing is used in internal partitions, within 2100mm of floor level.

4.4.3 All glazing for occupancy or building classification is A3 (places of instruction), E1 (place of detention), E2 (hospital), E3 (other institutional (residential buildings) and H2 (dormitory), where such is associated with a building of occupancy classification A3, E1, E2 or E3 (see SANS 10400-A) shall be safety glazing material that complies with the requirements of SANS 1263-1.

4.4.4 Glass in balustrades shall be toughened safety glass unless rigidly supported on all sides. Glazing material in balustrades is subject to impact and line loads determined in accordance within the requirements of SANS 10160-2.

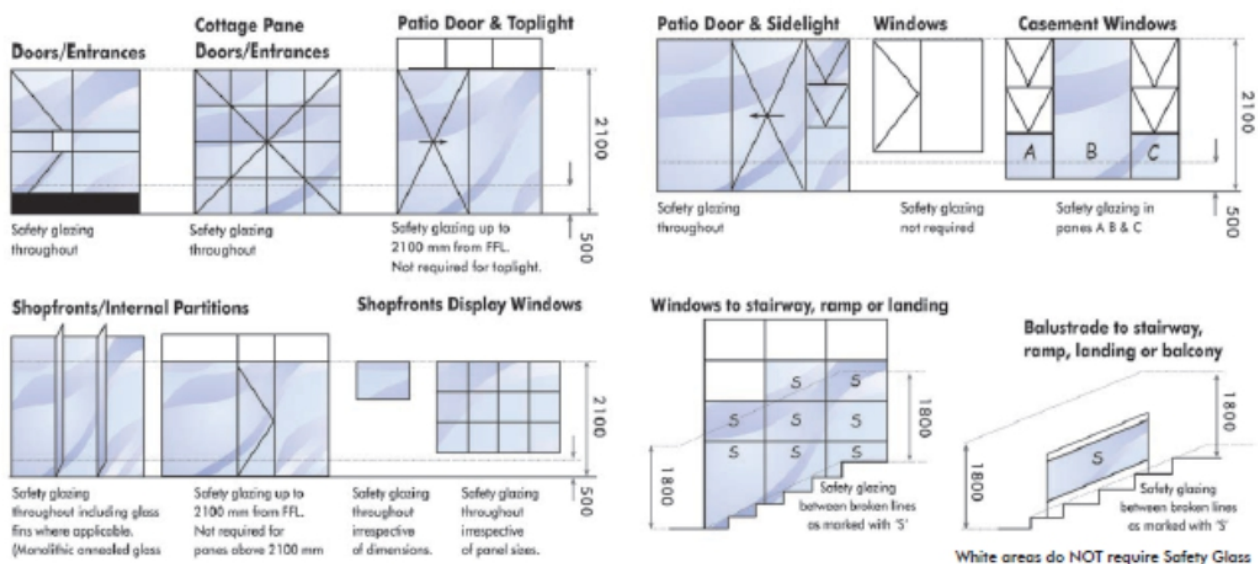
4.4.5 Glass in horizontal or sloping applications shall be laminated safety glass or toughened safety glass. Toughened safety glass shall only be used where individual panes are framed on all sides.

4.4.6 Wired glass having two-edge support may be used in vertical glazing in sawtooth roofs.

4.4.7 The thicknesses and maximum panel dimensions of frameless bath and shower enclosures shall be as given in table below.

Dimensions for flat frameless glass shower enclosures		
Toughened safety glass thickness mm	Maximum panel size in sq. m	
	Doors and panels supporting doors	Fixed panels
6	1.6	2.1
8	2.0	3.3
10	2.2	4.0

Note: This table does not apply to curved glass



GENERAL

Glazing installations not covered by or deviating from the items above such as, but not limited to, external glazing in structures in excess of 10m in height, overhead or sloped glazing, glass flooring, three and one edge supported glass, toughened glass assemblies and entrances, glass for balustrading etc. must be signed off and approved in writing by Competent Person (Glazing) or Structures. The SAGGA Certificate of Conformance does NOT cover water penetration, air leakage and wind load capacity of framing.

HANS A SCHEFFERLIE FSAGI (EXECUTIVE DIRECTOR)

OCTOBER 2015

Coated:

- Glass may be coated 'on-line' (independent of the manufacturing process). On-line coatings are called 'pyrolytic' and, because of their high durability, can be further (cut, toughened, curved etc.)
- Off-line coated products are often referred to as 'sputtered' coatings and some of these coatings need to be protected within a double-glazed unit or a laminate, once manufactured, off-line coated products are generally not suitable for further processing other than cutting

Double-Glazed Unit or Insulated Glass Unit (IGU):

- A double-glazed unit or IGU is comprised of two panes of glass separated by a cavity containing air (or another gas) and hermetically sealed. An IGU provides thermal insulation and improved acoustic performance. An IGU is described in terms of the thickness of outer pane in millimeters, followed by the gap width between the panes and finally the thickness of the internal pane, the greater the gap width (towards about 20mm), the better the insulation performance
- The inclusion of an inert gas such as argon instead of air and specification of Low E glass further improves the insulation provided by the IGU

Laminated:

- Laminated glass panes are assembled from two sheets of glass sandwiching an inter-layer, which bonds the glass (usually PVB). A heavy impact can break laminated glass, but won't splinter it. This leads to greater safety and security. Laminated glass eliminates nearly 99% of harmful UV rays, greatly slowing the fading of floors and furniture. A specialized inter-layer in laminated glass can further reduce the Solar Heat Gain Coefficient
- Light Transmittance, Visible Transmittance (VT): VT refers to the proportion of visible spectrum that is transmitted through the glass

Low E:

- Low E is a coating that is deposited on a glass surface to enable it to reflect short wave *direct solar) heat or long wave (direct solar) heat or long wave (re-radiated/reflected) heat

Reflective Coating:

- To create a reflective coating, a metallic coating is applied to one side of the glass in order to significantly increase the amount of reflected visible and infrared heat
- Solar Control Glass: Solar glass is glass that reduces heat gain derived from direct solar radiation. This may be achieved via inter-layers, body tints, reflective coatings or Low E coatings

Solar Heat Gain Coefficient (SHGC):

- The SHGC is the ratio of solar heat admitted by the glazing into a building, compared with the energy striking the outside surface of the glazing. It includes directly-transmitted radiation plus indirect heat gain from re-radiation and convection of absorbed heat from the glass into the buildings
- The lower the number, the higher the performance

Toned/Tinted:

- Toned/Tinted glass is usually green, grey, bronze or blue. It can shade internal areas and reduce the amount of heat entering through the window. This will keep the building cooler and reduce glare and UV rays

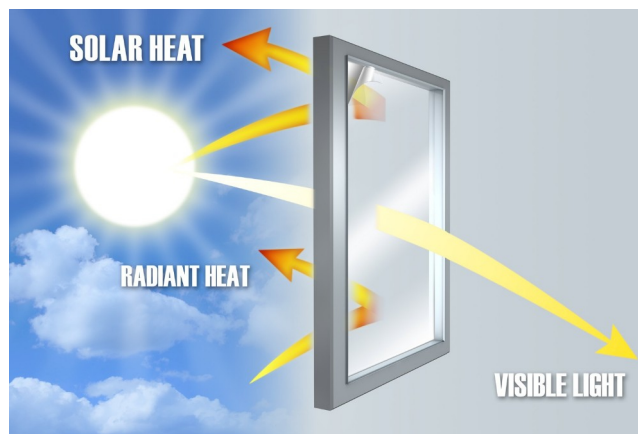
U-Value:

- The U-value indicated the rate of heat flow through a window due to a temperature difference, from inside to outside (in winter) or from outside to inside (in summer)
- Heat is lost and gained through a window by the combined effects of conduction, convection and radiation.
- The lower the number, the higher the thermal performance

Benefits of Membership

- Membership Certificate
- SAGGA Glazing Conformance Certificate (only available to members in good standing)
- Articles of Association
- SAGGA truck stickers
- SAGGA logo bromides for inclusion in advertising
- Complimentary full set of AAAMSA General Specifications and Selection Guides
- Free issue of the bi-monthly AAMSA magazine 'Architect & Specification'
- Company details published through Matrix's some 73000 times / annually to Architects / Quantity Surveyors / Engineers

Specifying glass for energy efficiency



The following requirements with regards to fenestration are applicable in accordance with SANS 10400-XA Energy usage in buildings:

- Buildings with up to 15% fenestration area to nett floor area per store comply with the minimum energy performance requirements.
- Buildings with a fenestration area to nett floor area per storey that exceeds 15% shall comply with the requirements for fenestration in accordance with SANS 204.
- All fenestration air infiltration shall be in accordance with SANS 613.

Quality Assurance

Membership of SAGGA will provide recognition the products and services meet the requirements of quality, performance and safety set by the Association.

F1

Uses of glass

Glass has many applications both internal and external that play a vital role in the function and design of a building. Below is a list of some of the many uses of how glass is applied in the building fabric.

Balustrades

Glass balustrades are ideal for balconies, staircases, pool fences and other applications where fencing is required. Available with minimum framing or even as a freestanding system, glass balustrades provide a barrier while allowing you to achieve uninterrupted views. Used externally, an additional benefit of glass balustrades is that the panels provide a windbreak.

Bathroom vanities

Glass bathroom vanities provide a clean and contemporary look while offering complete functionality.

Benches and table tops

Glass benches and table tops offer a sleek modern look for any room of the house.

Decorative glass

The versatility of glass means it has many uses beyond simply providing a view. The use of glass as a design feature is growing in popularity and there are plenty of decorative glass options available. Glass can be patterned, textured, frosted or screen printed in a range of colors and designs.

Double Glazed Units/Insulating Glass

Double glazed units (also known as Insulated Glass Units or IGU's), comprises of two or more panes of glass separated by an air (or gas) filled cavity, providing improved thermal insulation. When combined with a Low E coating and suitable frame, this option can stop up to 70% of heat loss and 77% of heat gain when compared to standard 3mm glazing. The individual design, orientation and most importantly the climate zone all determine the right glazing solution.

Energy efficient glazing

Energy efficient glazing can significantly reduce the amount of heat that travels through windows, improving your building's thermal comfort and saving you money at the same time. There are many energy efficient glazing solutions available.

Low E (low emissivity) glass can reduce the amount of heat that is conducted through the glass by around 30% compared to ordinary glass and reduce the need for air-conditioning and heating, however the most comprehensive solution is found by combining a Low E coating with double glazing.

A

Specifying glass for energy efficiency

The following requirements with regards to fenestration are applicable in accordance with SANS 10400-XA Energy usage in buildings:

- Buildings with up to 15 % fenestration area to nett floor area per storey comply with the minimum energy performance requirements
- Buildings with a fenestration area to nett floor area per storey that exceeds 15 % shall comply with the requirements for fenestration in accordance with SANS 204
- All fenestration air infiltration shall be in accordance with SANS 613
- Importance of SHGC and U Value SHGC (Solar Heat Gain Coefficient) and U-Value are critical considerations when specifying windows and glass

B

Energy performance characteristics windows

An average home may lose 30 % of its heat or air-conditioning energy through its windows. Windows, doors, and skylights, otherwise known as products of the fenestration industry, can gain and lose heat in the following ways:

- Direct conduction through the glass or glazing, frame, and/or door
- The radiation of heat into a house (typically from the sun) and out of a house from room-temperature objects, such as people, furniture, and interior walls
- Air leakage through and around them

The thermal performance rating is based on the following:

- U-Factor or U-value measures how well a product prevents heat from escaping (heat loss) a home or building. The lower the U-Factor, the better a product is at keeping heat in i.e. the greater a window's resistance to heat flow and the better its insulating value. U-Factor is particularly important during the winter heating season.
- Solar Heat Gain Coefficient (SHGC) measures how well a product blocks heat from the sun. SHGC is expressed as a number between 0 and 1; values typically range from 0.25 to 0.80. The lower the SHGC, the better a product is at blocking unwanted heat gain. Blocking solar heat gain is particularly important during the summer cooling season. The lower a window's solar heat gain coefficient; the less solar heat it transmits.
- Air Leakage (AL) measures how much outside air comes into a home or building through a product. The lower the AL, the better a product is at keeping air out.
- Visible Transmittance (VT) measures how much light comes through a product, i.e. it is an optical property that indicates the amount of visible light transmitted through a product. While VT theoretically varies between 0 and 1, most values are between 0.3 and 0.8. The higher the VT additional light is transmitted. A high VT is desirable to maximize daylight. Select windows with a higher VT to maximize daylight and view.
- Condensation Resistance (CR) measures how well a product resists the formation of condensation. CR is expressed as a number between 1 and 100. The higher the number, the better a product is able to resist condensation.

C

Window & Heat loss Gain

We spend millions of Rand's every year to heat our homes and businesses. That is why it is so important to understand the role that windows play in how buildings use energy. One of the best ways to measure the effect of windows on building energy use is known as a U-factor rating.

Windows Are Not Like Walls and Insulation

The high prices for natural gas, electricity, and home heating fuel makes energy a high profile issue. Many consumers became aware of R-values – a measurement of a product's resistance to heat loss – and learned that materials (floors, walls, and roofs) with higher R-values are more energy efficient. R-values are still used by many building materials, especially insulation.

Windows are very different from insulation in walls and ceilings. Windows let the light in and allow people to see out, and they interact with their environment in ways that insulation does not. They react to outside air temperatures, sunlight, and wind, as well as indoor air temperatures and occupant use.

Windows are strongly affected by solar radiation and the airflow around them. R-value does not accurately reflect this interaction.

Therefore, the window industry measures the energy efficiency of their products in terms of thermal transmission, or U-factor/U-value. U-factor measures the rate of heat transfer through a product. Therefore, the lower the U-factor, the lower the amount of heat loss, and the better a product is at insulating a building. How is heat loss measured?

The U-value is expressed using the metric units (W/m². K) where

- W refers to the amount of heat transmitted across the face or through the material in watts;
- m² refers to one meter squared of the material of a specified thickness; and
- K or 'degree Kelvin' refers to each °C temperature difference across the face of the materials or through the material.

What's the Difference between U-factor and R-value?

The biggest difference between U-factor and R-value is that U-factor measures the rate of heat transfer (or loss) while R-value measures the resistance to heat loss. R-value is a measure of conductivity.

A product with high conductivity will transfer heat quickly, like a hot pan on the stove or a single pane of glass on a cold day. U-factor, on the other hand, takes into account more than conductivity. It also is affected by the airflow around the window and the emissivity of the glass.

Emissivity is the ability of a product to absorb certain types of energy (specifically infrared) and radiate that energy through itself and out of a room. A product with high emissivity, such as one pane of clear glass, will transfer over 84 percent of the infrared energy from a warm room outside to the cold air. The lower the conductivity and emissivity of the glass, the lower the rate of heat loss and the lower the U-factor.

There have been significant technological developments over the last 10 years involving low emissivity (low-e) coatings on the glass. There are now many glass products available with these low-e coatings, which are typically used in dual pane windows and insulating glass units.

The Standard for U-factor Ratings - NFRC 100

Prior to the formation of the National Fenestration Rating Council of America (NFRC), window manufacturers used different tools to measure and report the energy efficiency of their products. In 1993, the NFRC developed the first consensus method for evaluating the thermal transmission of windows. NFRC 100 "Procedures for Determining Fenestration Product U-factors" is now the accepted standard for rating windows, doors, and skylights for U-factor.

NFRC 100 established standardized environmental conditions, product sizes, and testing requirements, so that architects, specifiers, builders, and consumers can make an informed choice by comparing the performance of different products fairly and accurately. One of the most important improvements NFRC 100 offered the industry was that the standard determined the heat loss of the entire window unit, including both the frame and the glass. As a result, consumers were provided with a more accurate, credible, and uniform energy rating for fenestration products.

The South African Fenestration and Insulation Energy Rating Association (SAFIERA) is the country representative of the NFRC and part of the AAAMSA Group.

Certified Window Performance

A window rated in accordance with NFRC 100 gets credit for all of the energy efficient features, including low-e glass, thermally improved frames, etc. When comparing window performance, always look for products that have U-factors determined in accordance with NFRC 100. For more assurance that the window has been rated accordingly, ask for SAFIERA Certified Performance – which is indicated by the use of a SAFIERA Certificate. Manufacturers who participate in the SAFIERA Certification Program have their products listed in the SAFIERA Certified Products Directory.

D

Testing

1. Mechanical Performance Testing in accordance with SANS 613

Firstly, the mechanical performance is determined by testing for air leakage, wind deflection, water penetration and structural strength of fenestration systems are conducted.

This includes

- Air leakage through specimen not exceeding 2 L/s/m² under a pressure difference of 75 Pa.
- Water resistance under a pressure - No leakage when subjected to a flow of 0.05 l/s.m²
- Deflection (positive and negative) under uniform loading 1000Pa- 3000Pa Maximum deflection allowed 1/175 of span or 20mm, whichever is less;
- Structural proof loading 1.5 x Uniform loading - No structural failure or permanent deformation allowed

2. Rotatable Guarded Hot Box (RGHB) Testing

AAAMSA's thermal performance measurement facility – known as the Rotatable Guarded Hot Box (RGHB) administered by the South African Fenestration and Insulation Rating Association (SAFIERA), is helping the construction industry to meet government mandates to reduce energy usage and thus reducing carbon emission. The recently published draft South African Standard SANS 10400-XA, sets a target of reducing energy usage in buildings. It paves the way for legislation and regulations aimed at minimizing energy usage from new buildings.

The Rotatable Guarded Hot Box (RGHB) is a testing facility for determining the heat transmission values of virtually any building envelope system. The RGHB is situated at the Thermal Test Laboratory (TTL) on the CSIR campus in Pretoria. The laboratory is NFRC and SANAS accredited.

The RGHB can determine the thermal transmittance or U-factor (in W/m². K) of building envelope systems for any angle of application from vertical to horizontal in accordance with ASTM C 1199 and ASTM C 1363. In addition to fenestration systems, thermal insulation products, wall cladding's and roof assemblies can also be tested.

The thermal efficiency of a building is determined by the design and application of the building envelope which influence the productivity and comfort of its occupants. Additions to the building such as fenestration systems contribute significantly to the energy efficiency of a building.

Testing of a building envelope system by means of a Hot Box is still is the most reliable method to determine its thermal performance.

The RGHB will not only be of immense benefit to professionals in the building industry but equally to the members of the related Associations in the construction industry. Architects and engineers can now make accurate assessments of a building's energy efficiency before it is built, while members can confidently recommend their products for specific building envelopes.

Available plug sizes

- 3.0m high x 3.0m wide - Sample size 2995mm x 2995mm
- 2.1m high x 2.4m wide - Sample size 2095mm x 2395mm
- 1.2m high x 1.2m wide - Sample size 1195mm x 1195mm
- 1.2m high x 1.5m wide - Sample size 1195mm x 1495mm

Testing for air infiltration & thermal transmittance
Sample size: 149mm5 x 1195mm

Glass staircases

Due to advances in glazing technology and engineering, glass is being used more and more innovatively to provide unlimited design possibilities. From floors to glass staircases and footbridges, glass can be used to create a spectacular focal point.

Noise resistant glass

Noise reduction glass aims to reduce unwanted external noises. Creating an effective noise reduction solution involves measuring the nature and intensity of the offending sound and selecting a glass product which reduces the intensity sufficiently at all frequencies. Common solutions include thicker glass, laminated glass comprising two panes of glass with an inter-layer, and secondary glazing with an air gap of 100mm to 200mm. Any noise reduction glass solution must be installed and sealed properly to be effective.

Partition walls

Made from either toughened or laminated safety glass, glass partition walls are a modern and stylish alternative to traditional partitions. Clear glass partitions provide an innovative way of creating separate living areas in contemporary homes and maintaining an overall feel of space.

While colored, opaque or frosted glass can be used to ensure privacy, the easy to clean surface ensures glass partition walls are a low maintenance option for any room. Glass partition walls also maximize light infiltration into the living area and overall sense of internal space.

Safety glass

Safety glass is commonly available in two forms; toughened or laminated, with both available as either clear or toned glass. Toughened glass is four to five times stronger than ordinary glass. If broken, the glass will shatter into small fragments minimizing the risk of injury caused by glass splintering.

Laminated glass comprises two pieces of glass with an inter-layer. The inter-layer prevents the glass from shattering as the glass remains affixed to the inter-layer creating a 'spider web' effect.

Shower screens

Glass shower screens help achieve a sense of space with a modern clean look. Framed or frame-less, there are plenty of styles to choose from with a range of fittings available.

Often constructed from laminated or toughened glass, glass type and thickness depend on the selected frame. Mould, grime and bacteria are kept to a minimum, providing a hygienic and easy to clean solution for any bathroom.

Storm resistant glass

Storm resistant glass provides protection from the weather even in the most extreme conditions. Designed to withstand extreme pressures, the extra thick laminated safety glass resists penetration from flying debris and is suitable for all buildings in strong wind coastal areas.

Switchable glass

Switchable glass is a Nanotechnology laminated product that maximizes privacy by transforming clear glass into an opaque, non-transparent screen with the flick of a switch. The user has complete control over vision and can regulate daylight as desired.

Switchable glass is ideal for use in boardrooms, internal partitions, shop-fronts or as a high clarity large projection screen and provides instant privacy with no need for blinds or curtains.

Available as laminated or laminated toughened glass, the product uses liquid crystals encapsulated within the inter-layer to control opacity. When inactive, the crystals are scattered rendering the glass opaque. When switched on, the liquid crystals realign allowing light to transmit through the glass.

Wardrobes

With a range of finishes to select from, such as mirrored or high gloss painted finish, glass wardrobe doors provide a stylish and practical addition to any bedroom. Both frame-less and framed doors are available in a range of colors and aluminum frames can be powder coated in a color to match any decor.

Typically used as sliding wardrobe doors, this style maximizes access and avoids the need for clear space as required for outward opening doors. Long-lasting and durable, glass sliding doors also contribute to an increased sense of space in the bedroom and ensure a wardrobe that operates smoothly and quietly.

South African Glass Standards

Does your glazier/contractor or glass supplier engage in best practice?

- South African Standards and their absolute adherence are essential to ensure the protection and safety of people living and working in residential and commercial buildings
- SANS 10400-N: - The application of the National Building Regulations Part N: Glazing
- SANS 10137 - The installation of glazing in buildings
- SANS 1263-1 - Safety and security glazing materials for buildings – Part 1: Safety performance of glazing materials under human impact
- Always ask if your glazier/contractor or glass supplier is an SAGGA accredited member

What can go wrong?

Mechanical performance criteria of fenestration products are determined in accordance with SANS 613

This standard specifies the criteria for the performance in respect of wind action (deflection and structural strength), water penetration, air penetration and operation of fenestration products (such as windows, doors,

curtain walls and roof lights), within the confines of the perimeter of the main frame, irrespective of the framing material.

Deflection

When testing for deflection (wind load) the fenestration product shall not show any visible signs of cracking or functional impairment, and the deflection shall not exceed 1/175th of the span (positive or negative).

Failure to comply with wind load requirement – fenestration blown out of building

Structural strength

When testing for structural strength, the product shall not crack or undergo any permanent deformations.

Water & air tightness

When testing water tightness, the products shall show no signs of water penetration to the inside of the frame.

When testing air tightness:

- the air penetration through the products shall not exceed 2 L/s/m² fenestration area,
- the average airflow rate for fixed glazing shall not exceed 0,306 L/s/m² fenestration area, and
- the air penetration through revolving doors and swing doors shall not exceed 5 L/s/m² fenestration area.

Safety glazing in accordance with SANS 10400 Part N - Glazing

The panes of all safety glazing material shall be permanently marked by the installer in such a manner that the markings are visible in individual panes after installation.

Safety glazing material shall comply with the requirements of SANS 1263-1 and shall be used in the following occupancy or building classification:

- A3 - Places of instruction;
- E1 - Places of detention;
- E2 - Hospitals; and
- E3 - other institutional or residential buildings

Where safety glazing shall be installed?

- a window has a sill height of less than 500 mm from the floor;
- a window has a sill height of less than 800 mm from the floor without any permanent barrier that prevents persons from coming into contact with the glass panel, and is so placed that persons are likely, on normal traffic routes, to move directly towards such window;

NOTE A barrier could be any feature, i.e. a heavy bar across a window, or a flower box placed in front of the window, that will provide a physical or visual barrier between the glass and a person

- a bath enclosure or shower cubicle is glazed or where glazing occurs immediately above a bath;
- glazing is used in any shop front or display window within 2 100 mm from the finished floor level;
- glazing is used in any wall or balustrade to a stairway, ramp, landing or balcony;
- glazing is used within 1 800 mm of the pitch line of a stairway or the surface of a ramp, landing or balcony;
- glazing applications are sloped or horizontal;
- a mirror is installed as a facing to a cupboard door less than 800 mm above floor level and there is no solid backing;
- glazing is used around areas such as swimming pools and ice rinks; and
- glazing is used in internal partitions, which are within 2 100 mm of floor level.

Ordinary glass

The familiar jagged edge pattern with lethal slivers of glass, depending on the strength of impact, either fly out or remain precariously intact. Often the removal of shattered pieces is difficult and dangerous.

Laminated safety glass

A web-like pattern is the result of a bonded vinyl inter-layer holding two sheets of broken laminated glass basically intact. With this tendency to “give” and not fall out under impact, the severity of physical injury is decidedly lessened. Broken laminated safety window glass will remain intact as a barrier against weather while visibility is partially retained. Grade A laminated safety glass can be used anywhere there is a risk of human impact.

Toughened safety glass

In the event of toughened glass being broken, the particles are small, and are relatively harmless compared with the sharp splinters resulting from the breakage of ordinary glass. Grade A toughened safety glass may be used

where the possibility of human impact exists or in any situation requiring strength, safety or resistance to temperature fluctuations.

Marking of glass

Permanent Marking on Safety Glazing Materials

In terms of the National Building Regulations all individual panes of safety glazing materials installed must have a permanent marking which includes the code.

1. The panes of all safety glazing material shall be permanently marked by the installer in such a manner that the markings are visible in individual panes after installation.
2. Safety glazing material that complied with the requirement of SANS 1263-1 shall be used where:
doors and sidelights form part of any entrance up to 2100mm from finished floor level;
 - a. a window has a sill height of less than 500mm from the floor;
 - b. a window has a sill height of less than 800mm from the floor without any permanent barrier that prevents people from coming into contact with the glass panel, and is so placed that persons are likely, on normal traffic routes, to move directly towards such window.

Note: A barrier could be any feature, i.e. a heavy bar across a window or a flower box placed in front

- c. a bath enclosure or shower cubicle is glazed or where glazing occurs immediately above a bath;
 - d. glazing is used in any shop front or display window within 2100mm from the finished floor level;
 - e. glazing is used in any wall or balustrade to a stairway, ramp, landing or balcony;
 - f. glazing is used within 1800mm of the pitch of a stairway or the surface of a ramp, landing or balcony;
 - g. glazing applications are sloped or are horizontal;
 - h. a mirror is installed as a facing to a cupboard door less than 800mm above floor level and there is no solid backing;
 - i. glazing is used around areas such as swimming pools and ice rinks; and
 - j. glazing is used in internal partitions, within 2100mm of floor level, forming escape routes in buildings.
3. All glazing for occupancy or building classifications; A3 (places of instruction), E1 (place of detention), E2 (hospital) and E3 (other institutional (residential buildings)) shall be safety glazing material that complies with the requirements of SANS 1263-1.
4. Glass in balustrades shall be toughened safety glass unless rigidly supported all round. Specialized plastic glazing materials i.e. poly-carbonate may be used for glazing in balustrades.

Note: Glazing material in balustrade is subject to impact and line loads as determined in accordance with the requirements of SANS 10160-2.

5. Glass in horizontal or sloping applications shall be laminated safety glass or toughened safety glass. Toughened safety glass shall only be used where individual panes are framed all round.
6. Wired glass having two-edge support may be used in vertical glazing in saw tooth roofs.

General

Glazing installations not covered by or deviating from items 1, 2 and 4 above such as, but not limited to, external glazing in structures in excess of 10m in height, overhead or sloped glazing, glass flooring, three and one edge supported glass, toughened glass assemblies and entrances, glass for balustrade supported by clamps etc. must be signed off and approved in writing by Competent Person (Glazing) or Structures.