CODE OF PRACTICE FOR USE OF GLASS IN BUILDINGS

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FOREWORD:

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by _____had been approved by the _____.

Glass has become a principal material expressing the exterior as well as interior of modern buildings. It is a rare construction material which is traditional as well as multi functional & constantly evolving. The Indian glass industry has updated it self and is producing world-class float glass. This normal (annealed) glass is further processed to produce tempered, laminated, reflective & insulating glass types that are widely used in buildings. A need is therefore felt to formulate a standard for safe use of glass the exterior as well as interior of buildings.

While formulating this standard, due weight-age has been given to the standards and practices prevailing in different countries including India. In preparation of this standard assistance has been derived from

- Australian Standard, AS 1288 – 1994. Glass in buildings – Selection and installation.
- British Standard, BS 6262. Code of practice for glazing for buildings.

The composition of the technical committee responsible for the formulation of this standard is given in Annexure III.

1. SCOPE

1.1 This standard covers properties and applications of types: normal (annealed), tempered, heat strengthened, laminated, reflective and insulating, which are commonly used in buildings.

1.2 This standard prescribes the safety requirements to check / minimize / control the injuries of any person accidentally coming in contact with glass.

1.3 This standard prescribes determination of safe thickness of above mentioned glass types with respect to

- Area of the glass panel
- Aspect ratio (length / breadth) of the glass panel
- Support conditions (supported on two sided / four sides)
- Effective wind pressure at the height of the glass panel

1.4 This standard in annexed with precautions for use of glass in buildings and reference material on related aspects of use of glass in buildings.

2. REFERENCES

The Indian Standards listed below contain information which through reference in this text, constitute provisions of this Indian Standard.

IS No.	Title
1382: 1981	Glossary of terms related to glass & glassware (first revision)
5437: 1994	Figured, rolled and wired glass – specification
3548: 1988	Indian Standard, Code of practice for glazing in buildings
10439: 1983	Indian Standard, Code of practice for patent glazing
875: 1987	Indian Standard, Code of practice for design loads (other than earthquake) for buildings & structures, part 3: wind loads
2553: 1990	Safety glass – specification (Part 1)
2835: 1987	Specification for flat transparent sheet glass

3. TERMINOLOGY

For the purpose of this standard, the definitions given in IS 1382 in addition to the following shall apply.

Annealed glass - A glass processed to prevent to remove objectionable stresses in it by controlled heating at and / or cooling from a suitable temperature. During its formation.

Annealing- The outer surfaces of the glass shrink faster than the glass between the surfaces, causing strain which can lead to shattering. Reheating the glass and allowing it to cool slowly avoids this.

Aspect ratio- The ratio of the longer side of a panel to its shorter side.

Balustrade- A low wall forming a parapet to a stair, ramp, balcony, raised level, or a change in levels.

Chair rail- A fixed glazing bar or rigid push bar in a glazed window / door or clear of the glazing, which provides protection from human impact.

Clear glass- As its name states, transparent or clear.

Coefficient of linear expansion- Linear expansion is expressed by a coefficient measuring the strength per unit length for a variation of $1^{o}C$. This coefficient is generally given for a temperature range of 20 to 300^{o} C. The coefficient of linear expansion for glass is 9×10^{-6} m / mk.

Compressive strength- The compressive strength of glass is extremely high: 1000 N/mm^2 = 1000 Mpa. This means that to shatter a 1cm cube of glass, it requires a load of some tones.

Density- The ratio of the mass of a body to its volume or the mass per unit volume of the substance. The density of glass is about 2.5, which gives float glass a mass of 2.5 kg/m^2 per mm of thickness or 2500 kg/m^3.

Desiccants- Porous crystalline substances used to absorb moisture and solvent vapors from the air space of insulating glass units. More properly called absorbents.

Fin- A piece of glass positioned to provide lateral support.

Float glass- Transparent glass with flat, parallel surfaces formed on the surface of a pool of molten tin.

Glass- A hard brittle amorphous substance produced by fusion and usually consisting of mutually dissolved silica or silicates that also contain soda and lime. It may be transparent, translucent, or opaque.

Glazing- The securing of glass in prepared opening in windows, door panels, screens, partitions, etc.

Guarding- Glass used to protect a change in level whether as part of balustrade, screen or window.

Heat-strengthened glass- Glass, which has been subjected to special heat treatment so that the residual surface Compression stress and the edge compression stress lies between those of ordinary annealed glass and toughened glass.

Interlayer- The transparent damping material used in laminated glass.

K-Value- The European equivalent of the American (ASHRAE) U-Value. The Units are W/m2K and are based on a wind speed of 4.4 m/sec at O°C with an indoor temperature of 20°C.

Laminated glass – Two or more pieces of glass held together by an interleaving layer or layers of plastic materials.

Light transmittance - Clear glass, depending on its thickness, allows 75 to 92 percent of visible light to pass through.

Modulus of elasticity (Young's modulus)- This modulus expresses the tensile force that would theoretically have to be applied to a glass sample to stretch it by an amount equal to its original length. It is expressed as a force per unit area. For glass, in accordance with European standards: $E = 7 \times 10^{10}$ Pa = 70 GPa.

Patterned glass- Rolled glass having a distinct pattern on one or both surfaces.

Reflective coated glass- Glass with metallic or metallic oxide coatings applied onto or into the glass surface to provide reduction of solar radiant energy, conductive heat energy, and visible light transmission.

Shading Coefficient- The ratio of the rate of solar heat gain through a specific unit assembly of glass to the solar heat gain through a single lite of 3 mm clear glass in the same situation.

Skylight- A glass and frame assembly installed into the roof of a building.

Sloped glazing- Any installation of glass that is at a slope of 15° or more from the vertical.

Solar energy absorption- The percentage of the solar spectrum energy (ultraviolet, visible, and near-infrared) from 300 to 300 nm that is absorbed by a glass product.

Solar Energy Transmittance (Direct)- The percentage of energy in the solar spectrum, ultra-violet, visible, and near infrared energy, 300 to 4,000 nanometers, that is directly transmitted through the glass.

Solar Factor (g-Value)- The European expression of the percentage of total solar heat gain through the glazing. The g-Value uses a solar air mass of lq.0 while the similar term, ASHRAE Solar Heat Gain Coefficient, uses an air mass of 1.5.

Solar Heat Gain coefficient (SHGC)- A newly introduced term showing the amount of solar energy gained through a window. Multiplying the SHGC by 100 gives the percentage of solar energy allowed into the building. Air Mass = 1.5.

Sound absorption- The property possessed by material and objects, including air, of converting sound energy to heat energy.

Span- The dimension between supports. For panels supported on all four edges, it corresponds to the smaller of the sight size dimensions.

Spandrel- That portion of the exterior wall of a multistory commercial building that covers the area below the sill of the vision glass installation.

Specific gravity- It is the ratio of the weight of any volume of substance to the weight of an equal volume of a standard substance at stated temperatures. For solids or liquids, the standard substance is usually water.

Strength- The maximum stress required overcoming the cohesion of a material. Quantitative: a complex property made up of tensile strength and shearing strength. The force required to break a bar of unit cross section under tension is the tensile strength. It depends not only upon the rate of application of the load. Strength involves the idea of resistance to rupture.

Tempered glass- A single piece of specially heat-treated or chemically treated glass, with a stress pattern such that the piece when fractured reduces to numerous granular fragments, with no large jagged edges.

Tensile strength- The capacity of a material to resist a force tending to stretch it. Ordinarily the term is used to denote the force required to stretch a material to rupture and is known variously as “breaking load” “breaking stress,” or “ultimate tensile strength”. When glass is deflected, it has one face under compression and the other in tension. While the resistance of glass to compressive stress is extremely high, its resistance to tensile stress is significantly lower. The resistance to breakage on deflection is in the order of 40 MPa for annealed glass 120 to 200 MPa for toughened glass (depending on thickness, edgework, holes, notches etc)

Thickness- The dimension between the two surfaces of a panel of glass, other than its length or width.

Tinted glass- Body-colored glass with specific ingredients formulated to produce light reducing and/or heat absorbing glass products.

UV Transmittance- The percentage of energy in the ultraviolet (UV) spectrum, from 300 to 380 nanometers, that is directly transmitted through the glass.

Visible Light Transmittance- The percentage of light in the visible spectrum, from 380 to 780 nanometers, that is transmitted through the glass.

Wind load- Load on glass because of the speed and direction of the wind.

Wired glass- Normal glass with embedded wire mesh, squire or hexagonal, wired glass with embedded square mesh is called wired glass.

4.0 GLASS TYPES, PROPERTIES & APPLICATIONS

Glass is an inorganic product of fusion that has cooled to a rigid solid without undergoing crystallization. It may be transparent, translucent or shiny depending upon the quantities of its basic constituents such as sand, soda & lime. By varying their quantities & using certain special additives, the properties and characteristics of glass are modulated to obtain a large variety. The important ones used in buildings are discussed in following paragraphs:

4.1 Normal (Annealed) Glass

Normal glass is synonymous with flat glass irrespective of the process of manufacture. Float glass has a perfectly flat, brilliant surface, whereas sheet glass has slight distortions. Both are referred as normal (annealed) glass and can be processed to obtain many different varieties of glass for use in buildings.

4.1.1 Properties

The properties of normal glass are:

- High light transmission
- Optical clarity
- Can be processed to produce other glass types such as tempered, laminated and insulating.
- Density (approximate) : 2.42 – 2.52 g/cm^3
- Tensile strength : 40 N/ sq. mm
- Compressive strength : 1000 N/ sq. mm
- Modulus of elasticity : 70 GPa
- Coefficient of linear expansion : 9 x10 $^{-6}$ m / mK
- Available thickness : 2 mm - 19 mm
- Normally available sizes up to : 2440 mm x 3660 mm (Bigger sizes can also be made)
- Colour : Clear, Grey, Bronze, Green, Blue and Pink.
- U value : 5.7 W/sq m K for 12mm thick to 6.4 W/sq. m. K for 19mm thick.

- UV transmittance : 06% for gray 12 mm thick to 80% for clear 2 mm thick
- Shading co-efficient : 0.5 for 12mm thick gray to 1.0 2mm thick clear
- Visible light transmittance : 20% for gray 12 mm thick to 90% for 2 mm thick clear .

(product specific information to be referred)

4.1.2 Applications

Normal glass is used in residences, shopping malls, hotels, restaurants, etc. for windows, shelves, doors and partitions, Solar Applications, Display cases, Shop fronts, Solariums, Greenhouse, Atriums & Railings etc.

4.1.3 Types of Normal (Annealed) Glass

4.1.3.1 Clear Glass

It is normal annealed glass, though clear & transparent, it does posses some colour tint usually greenish. It is due to presence of some impurities such as iron. Clear glass has very high-energy transmission when exposed to sunlight. It provides a clear view of the objects across it.

Applications: Used in doors, windows, solar applications, shelves etc. It is also used for further processing to other glass types.

4.1.3.2 Tinted glass

It is normal glass that is coloured by the addition of metal oxides into molten glass. Tinted glass possesses filtering properties that help reduce eyestrain due to dazzle. Its absorption properties help diminish energy transmissions when exposed to sunlight. Tints like green allows more visible light and cut out infra-red radiation.

Variations in the thickness of the glass would yield different performance in terms of light and solar radiation transmission. Although darker shades reduce the amount of heat being transmitted to the interiors, they also reduce the amount of transmitted daylight.

Applications: Used in doors, windows and partitions etc.

4.1.3.3 Patterned, figured or rolled glass

It is a decorative and translucent glass with figures or patterns on one face. In addition to diffusing light and obstructing visibility from the outside, the figures soften the interior lighting. This type of glass is usually more fragile and less convenient to clean.

Applications: Interiors of the buildings, opaque glazing like bathrooms etc

4.1.3.4 Wired glass

It has wire mesh incorporated during its production. Wired glass is recommended for its fire protection property. In case of fire, the glass cracks but broken pieces tend to remain in position restricting the spread of flame and smoke for some time.

Applications: Used where nominal fire protection is required in windows, doors & partitions etc.

4.1.3.5 Extra clear glass

Extra clear glass is a high value glass, free from impurities such as iron. It has high light transmission of more than 92 percent and is free from interference with the true colour & sparkling of objects across it.

Applications: It is used for a sparkling display of expensive materials like jewellery, watches, crystal ware, fine fabrics, art wares, solar applications etc

4.1.3.6 Ceramic printed glass

Also known as silk-screened glass for its appearance like a silk screen. Certain areas of application make it important to mask a part or whole of glass for privacy or hiding the background or enhancing the look of a product or for purely aesthetical reasons. The size, density and colour would determine the opacity and shading whereas the variety of dots, squares, checks and patterns will give

many design combinations to achieve the desired effect. It is not affected by moisture, oil, soaps, chemicals or detergents and retains its original appearance though out the life of the glass.

Applications: curtain walls, shower installations, glass doors, spandrels and partitions etc.

4.2 Laminated Glass

Laminated glass is composed of two or more layers of glass with one or more layers of a transparent/ pigmented and specially treated plastic Polyvinyl Butyral [PVB] sandwiched between the glass layers. The glass panes (layers) can be either normal glass or tempered glass. When the glass is broken, fragments tend to adhere to the plastic [PVB] interlayer thereby reducing the risk of injury and helping to resist further damage by weather.

4.2.1 Properties

The properties of laminated glass are:

- Laminated glass does not shatter like ordinary glass. It absorbs impact, resists penetration, and remains intact even if broken, holding glass fragments in place and lowering the risk of injury. Global building standards increasingly specify stricter safety requirements where any breakage could mean a major hazard from falling glass and glass floors.
- Laminated glass resists intrusion because the interlayer continues to safeguard the building even after the glass itself is broken. It cannot be cut from only one sides, so ordinary glasscutters are useless as break-in tools. Laminated glass tends to resist impact. In multi-ply configurations, it can even resist bullets, heavy objects, or small explosions. In most cases, it takes many blows, all in the same spot, to penetrate the glass. The rise in urban crime and terrorism also points to laminated glass as increasingly desirable material.
- Laminated glass is capable to stop flying debris and limit or avoid splintering on opposite side of the impact.

- Laminated glass is an excellent barrier to noise. The sheer damping performance of the plastic interlayer makes laminated glass an effective sound control product. This makes it ideal for airports, hotels, data-processing centers, recording studios, and any building near airports, highways, or train lines.
- Ultraviolet light is the leading cause of deterioration and fading of furnishings, pictures, and fabrics. Laminated glass screens out 99% of the sun's UV radiation, protecting interior furnishing, displays or merchandise from fading.
- Earthquakes often produce fallout of extremely dangerous shards of broken glass. Also, the heavy winds of tornados and hurricanes easily shatter conventional glass, causing injuries from flying debris and damage to interiors exposed to the devastating weather outside. Laminated glass remains in the frame, maintaining a protective envelope around the home or building to keep weather out and deter glass shards from flying.
- Laminated glass retains its colour and strength for the life of the building and is as easily cleaned as any conventional glass.
- When exposed to heat, laminated glass breaks but stays in place longer. The risk of thermal breakage is avoided only when heat strengthened / tempered laminated glass is used.

• Density (approximate)	:	2.42 – 2.52 g/cm^3
• Tensile strength	:	32 N/sq. m
• Compressive strength	:	1000 N /mm^2
• Modulus of elasticity	:	70 GPa
• Coefficient of linear expansion	:	9 x 10^{-6} m / mK
• Available thickness	:	4.38 mm – 20.76 mm (other thickness can also be made to order)
• Normally available sizes up to	:	2000 x 3210mm (Bigger sizes can also be made)
• U value	:	2.84 W/sq. m. K for 3 mm thick clear to 5.96 W/sq. m. K for 6 mm thick clear

- UV transmittance : 30% for bronze 6 mm thick to 80% for 6 mm thick clear
- Shading co-efficient : 0.5% for 6 mm thick gray to 0.9% for 6mm thick clear
- Visible light transmittance : 25% for 6mm thick bronze to 90% for 6mm thick clear

(product specific information to be referred)

4.2.2 Applications

Laminated glass is used in office buildings, hotels, restaurants, shopping malls, public walkways, hospitals, libraries, museums, churches, airport terminals, residences & apartment buildings, noise control applications, embassies, computer centers.

High security places, for example, banks, teller, and drive-through windows, ticket windows, gas stations, currency exchanges, armoured vehicles, jewellery shops and burglar resistant showcases. Other areas where laminated glass is used are:

- Curtain wall glazing
- Sloped glazing
- Skylights
- Glass roofs & floors
- Aquariums
- Animal observatory windows
- Safety glazing for partitions
- Security glazing for banks against bullets/ hand propelled objects.
- Earthquakes, high velocity winds & fire resistance applications.
- Museums
- Acoustic glazing

4.3 Tempered or Toughened Glass

Tempered glass is an extremely strong glass which is heat treated to a uniform temperature of approximately 650^{o}C and rapidly cooled to induce compressive stresses of 770 kg/m^2 to 1462 kg/m^2 on the surfaces and edge compression of the order of 680 kg/m^2. Tempered glass is not manufactured on float line. It is a separate process.

Tempered or toughened glass gains its added strength from the compressed surfaces. However, if a deep scratch or an impact penetrates the surface, the glass will break into a number of small particles. The heat treatment process for tempered glass requires that all fabrication be completed prior to toughening. Any attempt to cut, drill, grind or sand blast the glass after toughening may result in glass breakage. The heat treatment process does not change the light transmission and solar radiant heat properties of the glass.

4.3.1 Properties

- Tempered Glass is four to five times stronger than normal glass of equivalent thickness. It is mainly used for safety & strength.
- Tempered Glass provides greater thermal strength. It offers increased resistance to both sudden temperature changes and temperature differentials up to 250°C compared with normal glass, which can withstand temperature differentials up to 40°C only.
- Tempered Glass is difficult to break and when on breakage it will break into small, relatively harmless fragments. This substantially reduces the likelihood of injury to people, as there are no jagged edges or sharp corners like normal glass.

Due to the inherent superior features of tempered glass like more strength, ability to withstand sudden impacts and breaking safely into small pieces, it is used as a safety glazing.

- Density (approximate) : 2.42 – 2.52 g/cm^3
- Tensile strength : 120 to 200 N/sq. mm

- Compressive strength : 1000 N /sq. mm
- Modulus of elasticity : 70 GPa
- Coefficient of linear expansion : 9 x 10^{-6} m / mK
- Available thickness : 3 mm - 19 mm
- Normally available sizes up to : 2440 mm x 3660mm(Bigger sizes can also be made)
- U value : 5.7 W/sq. m. K for 12 mm thick clear to 6.4 W/sq. m. K for 2 mm thick clear
- UV transmittance : 06% for 12 mm thick gray to 80% for 2 mm thick clear
- Shading co-efficient : 0.5% for 6 mm thick gray to 0.9% 6mm thick clear
- Visible light transmittance : 20% for 6mm thick bronze to 90%6mm thick clear

(product specific information to be referred)

4.3.2 Applications

It is used in commercial applications where wind, snow or thermal loads exceed the strength capabilities of normal (annealed) glass such as safety glazing for entranceway, railings, partitions or fire knock-out windows. Tempered glass can be used in balustrades, escalator side panels, handrails, shower screens, bathtub enclosures, sliding/swing doors, squash, racquetball wall, showcases, partitions etc. Other areas where tempered glass should be used are:

- Mainly used for safety and strength
- Curtain walls of high-rise buildings
- Exterior and interior of buildings where strength is important
- Spandrels for walls and decorative panelling
- Door openings, showroom and lobby facades, escalator side plates, and staircase handrails
- Viewing partitions of sports complexes, resorts and airports.

4.4. Heat Strengthened Glass

Heat strengthened glass is a type of tempered glass which has been strengthened thermally by inducing a surface compression of 422 to 658 kg/cm^2 as compared to a range of 770 to 1462 kg/cm^2 in case of fully tempered glass. Heat strengthened glass is not manufactured on float line. It is a separate process. It is valued for its mechanical strength, which is twice that of normal annealed glass though half of fully tempered glass. With the exception of strength and breakage characteristics, heat - strengthened glass retains the normal properties of annealed glass. Heat-strengthened glass provides necessary resistance to thermal stress associated with high performance glazing materials such as tinted glass and reflective glass. It also provides necessary resistance to heat building up when used as spandrel glass. Heat-strengthened glass with its flatter surface also results in the facade having less optical distortions.

4.4.1 Properties

- Density (approximate) : 2.42 – 2.52 g/cm^3
- Tensile strength : 120 to 200 N/sq. mm
- Compressive strength : 1000 N / sq. mm
- Modulus of elasticity : 70 GPa
- Coefficient of linear expansion : 9 x 10^{-6} m / mK
- Available thickness : 3 mm - 19 mm
- Normally available sizes up to : 2440 mm x 3660mm (Bigger sizes can also be made)
- U value : 5.7 W/sq. m. K for 12 mm thick to 6.4 W/sq. m. K for 2 mm thick
- UV transmittance : 06% for gray 12 mm thick to 80% for clear 2 mm thick
- Shading co-efficient : 0.5 for 12 mm thick gray to 1.0 for 2 mm thick clear
- Visible light transmittance : 20% for 6mm thick bronze to 90% for 6mm thick clear

(product specific information to be referred)

4.4.2 Applications

Heat Strengthened glass is suitable for spandrel and vision panels of curtain walls and structural glazing as they safeguards against thermal breakages. It is used for making laminated glass panels for safety combined with strength. It is used in complex glass combinations like double-glazing as one lite of laminated glass for glass floors and roofs.

4.5 Reflective Glass

A metallic coating is applied to one side of the glass in order to significantly increase the amount of reflection by the glass of both the visible and infra-red (light and heat) range of the electromagnetic spectrum. This metallic coating can be applied to clear or body tinted glass. The reflective glass imparts a mirror like appearance to the exterior of buildings under most daytime conditions. Due to the coating of metal oxides on the glass, they are widely applied as an aesthetic product in buildings for its highly reflective surface and its wide palette of colours. It reduces heat gain and glare from the exterior and allows optimum visible light transmission to the interior. It significantly reduces the air-conditioning load of the buildings. An exceptional property of solar reflective glass is that the coating of metal oxides on the glass can be achieved without affecting the transparency of the glass.

4.5.1 Properties

The properties of reflective glass are:

- Increased aesthetic appeal.
- Gives enormous flexibility in designing the exterior due to availability of number of colours / shades
- Facilitates energy savings through reduction in interior solar heat gain and cost reduction in the cost of heating and cooling systems.
- Improves occupants comfort as interior temperature variations are less and easier to control.
- Varying degrees of light transmittance and varying reflectance.
- Reduces the air- conditioning load of the buildings

- Density : 2.4 – 2.5 g/cm^3
- Available thickness : 3 mm - 12 mm
- Normally available sizes up to : 2250 x3210 mm (Bigger size can also be made)
- U value : 5.1 to 5.7 W/sq. m.K for 6mm thick
- Shading co-efficient : 0.25 - 0.552 for 6mm thick
- Visible light transmittance : 5 – 40% for 6 mm thick

  (product specific information to be referred)

4.5.2 Applications

Reflective glass is used in office buildings, high-rise buildings,

- Entrance
- Privacy windows
- Decorative walls
- Spandrel glazing
- Vertical and sloped glazing
- Solar control applications
- Building facades

4.6 Insulating Glass

The insulating glass is a prefabricated unit made of two or more glass panes, separated by a cavity and edges-hermetically sealed together. This edge seal not only binds the individual sheets of glass together to maintain the mechanical strength of the joint but also protects the cavity between the glasses from outside influences. The moisture in the cavity between the two glasses is controlled by desiccants filled in the perforated spacer. The spacer can be aluminum, composite plastics etc. The spacer ensures the precise distance between the glass panes. The cavity normally filled with dry air but can be also filled with gases such as Argon, Krpton for better thermal performance or hydrogen fluro oxide for better acoustic performance.

The low heat conductivity of the enclosed dry gas between the glass panes drastically reduces the thermal heat transmission through the glass 2.8 W/sqm-

K as compared to 5.73 W/sqm K for normal glass. It also helps is reducing the direct solar energy specifically when the outer pane is a solar control glass.

4.6.1 Properties

- Heat transferred by conduction and convection due to temperature difference between the outside and inside is reduced to nearly half in case of normal glass thus reduces the heat flow / transfer & gain / loss). It is specifically very effective in winters as it saves loss of inner heat.
- The use of heat absorbing or heat reflective glass as outer glass further reduces the load on the cooling system.
- In case of monolithic glass, the temperature difference between the outside and inside of a room may lead to condensation in humid climate. The insulating effect of the air layer makes it difficult for the glass to become cold and is consequently avoids dew condensation.
- Insulating glass can significantly help in reducing the exterior noise pollution if the unit is made up of glass panes of asymmetrical thickness. The amount of sound reduction depends on the combination of the insulating glass. Using one or both panes of laminated or acoustic laminated glasses will drastically reduce sound transmission.
- It offers increased personal comfort and aids energy conservation. Because of its high insulation properties, the lack of cold or warm droughts leads to a pleasant internal environment. Strength to withstand wind load is also increased.
- Normally secondary seal is of silicone if the edges are exposed and of polyshulphide if the edges are framed.
- Available thickness : Custom made
- Normally available sizes up to : Custom made
- U value : 0.64 W/sq. m. K for 6mm thick [6mm air space] to 0.56W/sq.m.K for 6mm thick [12.9mm air space]
- UV transmittance : -
- Shading co-efficient : 0.52 for 6 mm thick gray to 0.95 for 6 mm thick clear monolithic

- Visible light transmittance : 37% for 6mm thick gray to 87% for 6mm thick clear monolithic

(product specific information to be referred)

4.6.2 Applications

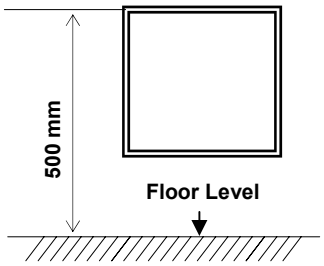
- Office buildings, hospitals, hotels, houses and buildings with exceptionally high heating or cooling requirements.
- Buildings that need the temperature and humidity strictly controlled such as telephone exchanges, laboratories, etc.
- Airport control towers, windows of coaches of trains, and other environments that need regulated atmosphere and prevention of condensation.
- Buildings near highways, railways and airports that need sound insulation property of insulating glass.

5.0 GENERAL REQUIREMENTS

Any person accidentally coming in contact with glass should not be injured. This does not presuppose that the glass will not be broken under impact conditions, but rather that it will not be broken under the most likely forms of impact or, when broken, the likelihood of cutting and piercing injuries will be minimized.

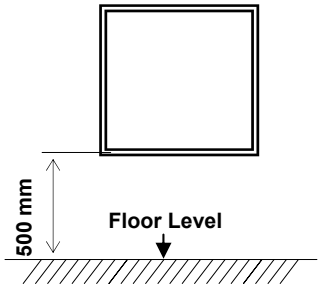
Therefore, area of glass panels should be within the maximum permissible limits defined below for different thickness, glass types & support conditions.

a. For framed glass panels supported on four sides such as windows, facades, partitions, doors, inner walls, show windows, side panels starting anywhere between the floor level and 500 mm above it, area of normal (annealed) glass with respect to its thickness shall be with in the permissible maximum area as defined below.



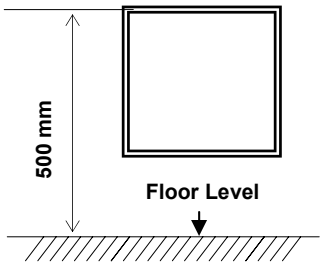
Thickness (mm)	4	5	6	8	10	12
Maximum area of glass panel (m^2)	0.3	0.5	0.9	1.8	2.7	4.5

b. For framed glass panels supported on four sides such as windows, facades, partitions, doors, inner walls, side panels starting above 500 mm from the floor level, area of normal (annealed) glass with respect to its thickness shall be with in the permissible maximum area as defined below.

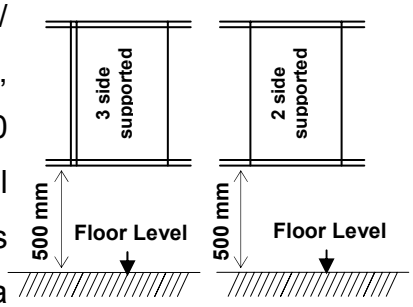


Thickness (mm)	4	5	6	8	10	12
Maximum area of glass panel (m^2)	1.4	2.2	3.3	4.5	6.0	8.0

c. For framed glass panel supported on two/ three sides such as partitions, doors, inner walls, show windows, side panels starting anywhere between the floor level and 500 mm above it, tempered / laminated glass instead of normal (annealed) glass shall be used.



d. For framed glass panels supported on two / three sides such as partitions, doors, inner walls, show windows, side panels starting above 500 mm from the floor level, area of normal (annealed) glass with respect to its thickness shall be with in the permissible maximum area as defined below.



Thickness (mm)	6	8	10	12
Maximum area of glass panel (m^2)	0.9	1.8	2.7	4.5

e. For glass areas exceeding the above stated limits of maximum permissible areas, tempered / laminated glass shall be used.

f. Any glass panel supported at one edge such as balustrade, partitions, barriers, minimum 10 mm thick tempered / laminated glass shall be used.

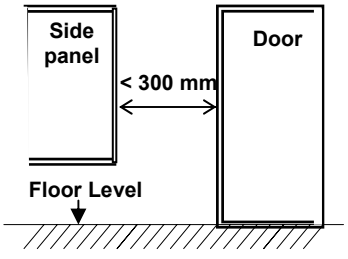
g. Any glass pane in bolted glazing fixed by fixtures like patch fittings wherein holes are required to be drilled to fix the glass pane, only tempered glass shall be used.

h. In shower enclosures, tempered or laminated glass of minimum 5mm thick shall be used.

i Glass in doors shall be tempered / laminated glass in accordance with table 5.1 except that:

- In fully framed doors, normal glass up to a maximum area of 0.5 m^2 may be used.
- Unframed doors shall be glazed with tempered glass with a standard nominal thickness of not less than 10 mm.

j. All framed glass side panels with their nearest vertical sight line less than 300 mm from the nearest edge of the doorway opening shall be of tempered / laminated in accordance with table 5.1 except that:



- In non-residential buildings, normal glass in accordance with table 5.2 may be used in any of the following cases:

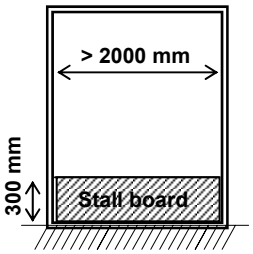
i) where the clear opening width of the glass is not wider than 500 mm at any part.

ii) where the lowest part of the glass is 500 mm or more above the highest abutting finished floor level.

iii) where the clear opening height of each of the glass panels is no greater than 1000 mm at any part.

iv) where the side panel is provided with a chair rail to protect each face of the glass and located with its upper edge not less than 700 mm or its bottom edge not more than 1000 mm above the highest abutting finished floor level.

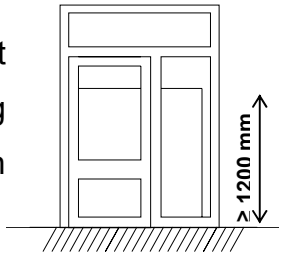
k. In non-residential buildings, normal glass in accordance with table 5.3 may be used provided that the clear opening width of the glass is greater than 2 m and either-



i) A stall board not less than 300 mm above the highest abutting finished floor level is provided or

ii) Ordinary normal glass not less than 10 mm standard nominal thickness is used.

l. In residential buildings, where the lowest visible sight line is 1200 mm or greater above the highest abutting finished floor level, normal glass in accordance with table 5.3 may be used.



m. A glazed panel so located in a building that it is capable of being mistaken for an unobstructed opening shall comply, as appropriate, with the following requirements:

- Framed panels shall be glazed with tempered / laminated glass in accordance with table 5.1 except that normal glass complying with table 5.2 and having an area not greater than 0.5 m^2 may be used.
- Unframed panels shall be glazed with tempered / laminated glass complying with Table 5.4.

n. Unframed glass panels, which are not covered above shall be toughened glass in accordance with table 5.1.

Table 5.1: Maximum Areas of tempered / laminated glass for Framed Glass Doors, Framed Glass side Panels, and other Glazed Panels

Type of glass	Standard nominal thickness (mm)	Maximum area (m^2)
Tempered safety glass	3	1.0
	4	2.0
	5	3.0
	6	4.0
	8	6.0
	10	8.0
	12	10.0
Laminated safety glass	5.38	2.0
	6.38	3.0
	8.38	5.0
	10.38	7.0
	12.38	9.0
Where sealed insulating glass units are used the maximum areas specified in may be multiplied by 1.5 provided that each of the component glasses of the unit otherwise comply with the relevant requirements.		

Table 5.2: Maximum areas of Normal Glass for Framed Glass Doors, Framed Glass Side Panels and other framed glazed panels

Standard nominal thickness (mm)	Maximum area (m^2)
3	0.1
4	0.3
5	0.5
6	0.9
8	1.8
10	2.7
12	4.5
15	6.3
19	8.5
25	12.0

p. For domestic applications guarding is to be provided to protect changes in level greater than 600 mm. In commercial applications, guarding is provided were a change in level of 380 mm or two stair risers takes place. In all buildings, where glazing is protecting a change of level and the glass is within 800 mm of finish floor level, it must have sufficient strength to "provide containment". Where barriers are to be used in buildings in which children will be present, consideration of the design should be made to ensure that any gaps are less than 100mm and that the barrier cannot be easily climbed. Line load (KN/m run), infill load (KN/sq m) and point load

(KN) as follows shall be used in the design of barriers incorporating glass depending on their location within a building and the building usage.

Table 5.3 : Maximum areas of Normal (Annealed) Glass for Shop fronts, Internal Partitions, and other Glazed Panels

Standard nominal thickness (mm)	Maximum area (m^2)		
	Framed		Top edge unframed
	Side panels and internal partitions	Shopfront side panels and shopfronts	
3	0.8	0.8	0.1
4	1.4	1.4	0.3
5	2.2	2.2	0.5
6	3.3	3.3	0.9
8	4.5	6.0	1.8
10	6.0	9.0	2.7
12	8.0	12.0	4.5
15	10.0	15.0	6.3
19	12.0	15.0	8.5
25	15.0	15.0	12.0

Table 5.4: Shop fronts, Internal partitions, and other Glazed Panels with Unframed Side Edges.

Height of glass (m)	Type of glass	Minimum standard nominal thickness (mm)
≤ 2	Normal	6.0
	Tempered	6.0
	Tempered	6.0
	Tempered	8.0
	Laminated	6.38
	Laminated	8.38
$>2 \leq 2.5$	Normal	10.0
	Tempered	10.0
	Tempered	8.0
	Tempered	10.0
	Laminated	8.38
	Laminated	10.38
$> 2.5 \leq 2.8$	Tempered	10.0
	Tempered	12.0
	Laminated	13.38
	Laminated	12.38
$>2.8 \leq 3.2$	Tempered	12.0
	Laminated	12.38

Type of Buildings	Line load UDL KN/m run	UDL (infill) KN/ sq m	Point Load KN
Residential	0.36	0.5	0.25
Office Building, Hotels, Hostels, Library, Museum, Hospital & Schools	0.74	1	0.5
Cinema & points of assembly	3.0	1.5	1.5

The loads are to be considered separately and are not cumulative. The design should take into account the most unfavorable likely imposed loads without excessive deflections or distortion.

q. Chair rails shall have a width in the vertical direction of not less than 40 mm and shall be designed for the horizontal railing loads. Where the chair rail is installed clear of the glazing, it shall also be designed for the vertical railing loads and the deflection of the chair rail under the horizontal loads shall be such that the chair rail remains clear of the glass panel under 1.5 times the specified rail loads.

r. Where louver windows are installed, the blade length for normal (annealed) glass louver shall not exceed the following values provided that the design wind pressure does not exceed 0.9 kPa.

Standard nominal thickness	3	4	5	6
Maximum blade length Blade width $\leq$ 100	400	500	600	750
Maximum blade length Blade width > 100 $\leq$ 150	500	600	750	900

For higher wind pressure and other types of glass, the blade length shall be determined in accordance with the requirements for wind loading for rectangles of glass supported on two opposite sides only.

s. Slope glazing or overhead glazing used to cover roofs / skylights shall be tempered or laminated glass. It shall be designed for necessary loads as per IS 875 (Part - 3) 1987.

6.0 DETERMINATION OF SAFE THICKNESS OF GLASS

6.1 General

Once the type of glass to be used is selected, section deals with the determination of appropriate thickness of glass. The thickness of the glass to be used in window panels is governed by the following factors:

i. Area to be covered by the window panel.
ii. Support conditions (supported on two sides or four sides).
iii. Aspect ratio of window panel (length / breadth).
iv. Effective wind pressure at the window height
v. Strength/load bearing capacity of glass to be used.

A simplified procedure is described in the following sections for the determination of appropriate thickness of glass in a window panel. In general, the provisions of Australian Code AS 1288-1994, British Code BS 6262 (Part-3) - 1996 and IS 3548-1988 have been considered. The wind pressure computation is based on the procedure given in IS: 875 (Part –3) 1987, (Reaffirmed 1997).

The salient features of the procedure are as follows:

- The maximum area of glass panel is restricted to 15 m^2.
- The maximum span of window is restricted to 4 m.
- Aspect ratio of the glass panel should be greater than 1.5. If it is less than 1.5, next higher available thickness should be selected.
- The factor of safety used is 2.5 considering the variability in strength of glass.
- Applicable to normal, reflective, laminated, tempered and insulating glass.
- Applicable to rectangular panels properly fixed.
- Design minimum thickness of the glass will be the maximum value of the thickness arrived at under article 6.3, 6.4 and 6.5.

The numerical examples for computation of glass thickness for various locations and glass specifications are given in the article 6.6.

6.2 Standard Nominal Thickness (SNT)

The glass sheets may have different thickness at different locations. Table 6.1 shows acceptable thickness limits for different types of the glass.

Table 6.1: Thickness Limits for Standard Nominal Thickness of Glass (mm)

Type of glass	Standard nominal thickness	Thickness limits	
		Minimum	Maximum
Normal Reflective& Tempered glass	3	2.8	3.2
	4	3.8	4.2
	5	4.8	5.2
	6	5.8	6.2
	8	7.7	8.3
	10	9.7	10.3
	12	11.7	12.3
	15	14.5	15.5
	19	18.0	20.0
	25	23.5	26.5
Laminated glass	5.38	4.95	5.81
	6.38	5.95	6.81
	8.38	7.95	8.81
	10.38	9.95	10.81
	12.38	11.95	12.81
	16.38	15.75	17.01

6.3 Design Considerations

This article deals with the design strength of the glass and the empirical relation to evaluate the minimum thickness or the maximum allowable area of the glass panel for a particular glass type for given set of design wind pressure, support condition and aspect ratio.

6.3.1 Design Flexural Tensile Strength of Glass

The required thickness of the glass depends upon the design strength obtained after applying a factor of safety of 2.5. The minimum design strength of normal glass for thickness $\leq$ 6mm is 16.7 N/mm^2 and for thickness > 6mm is 15.2 N/mm^2.

6.3.2 Empirical Relationship

Assuming that the normal glass has design strength in accordance with article 6.3.1, following empirical relation between the wind pressure, area of the glass panel and the required glass thickness can be used:

$P_{net} * A = 200.0 * T^k$ ($T \leq$ 6 mm) … (6.1)

$P_{net} * A = 200.0 * T^k + 1900$ ($T >$ 6 mm) … (6.2)

where,

P_{net} = Net design wind pressure (N/m^2) as per article 6.5

A = area of glass panel (m^2)

T = SNT of the normal glass (mm),

k = a constant as shown in table 6.2.

Table 6.2: SNT and Corresponding 'k' values

'T'	'k'	'T'	'k'
3 mm	1.683	10 mm	1.578
4 mm	1.732	12 mm	1.583
5 mm	1.753	15 mm	1.579
6 mm	1.765	19 mm	1.569
8 mm	1.570	25 mm	1.569

6.3.3 Limiting Aspect Ratio (AR_{max})

The design of the thickness using empirical relation in accordance with article 6.3.2 will be valid upto a limiting aspect ratio AR_{max}. The value of AR_{max} for different SNT of glass is shown in the following table 6.3.

Table 6.3: SNT and Corresponding AR_{max} values

SNT	AR_{max}	SNT	AR_{max}
3 mm	7.3	10 mm	4.9
4 mm	6.8	12 mm	4.3
5 mm	6.5	15 mm	3.8
6 mm	6.3	19mm	3.3
8 mm	5.9	25 mm	2.9

6.4 Determination of Minimum Glass Thickness

The determination of minimum glass thickness of panels of different types of glass supported on four sides as well as two opposite sides is discussed in the following sections.

6.4.1 Glass Panels Supported on all four sides

The thickness of panels of normal glass can be obtained using the empirical relation explained in article 6.3.2. This relation is valid for the glass having the minimum design strength of the material as mentioned in article 6.3.1 and the maximum aspect ratio limited to a value in accordance with article 6.3.3. However, if the aspect ratio exceeds the prescribed values under article 6.3.3, the design will be carried out in accordance with the article 6.4.2 applicable to glass supported on two opposite sides.

6.4.1.1 Normal (Annealed) /Reflective Glass

The minimum thickness of normal/reflective glass for a particular value of net design wind pressure P_{net} can be evaluated as per the procedure given in article 6.3. User can refer table 6.5 or the figure 6.1 to directly obtain the minimum thickness or the allowable maximum area of the glass panel.

6.4.1.2 Laminated/Tempered/Insulating Glass

To determine the thickness of laminated / tempered / insulating glass, the design wind pressure P_{net} is modified as below:

$P_{net} = P_{net}/P_f$

where, P_f is the pressure factor dependent on the type of glass.

The values of the pressure factor P_f can be taken from table 6.4 as below:

Table 6.4: The values of the pressure factor P_f

S. No	Glass type	P_f
1.	Normal (Annealed)	1.00
2.	Laminated	0.80
3.	Tempered	2.5
4.	Insulating	1.50
5.	Heat Strengthen	1.60

Using the modified value of P_{net} as explained in this article, the thickness of other types of glass can be obtained in accordance with article 6.3. However, tables 6.6, 6.7, 6.8, 6.9 or figures 6.2, 6.3, 6.4, 6.5 may be referred to directly get the minimum thickness or the allowable maximum area of glass panel for laminated, tempered, insulated and heat strengthen glass respectively.

6.4.2 Glass Supported on two opposite sides

Normal and laminated glass panels supported on two opposite sides can be designed using following empirical relations:

For $T \leq 6$ mm

$$b = \frac{4.39 \times T}{\sqrt{P_{net} / P_f}} \quad \ldots \quad (6.3)$$

For $T > 6$ mm

$$b = \frac{4.22 \times T}{\sqrt{P_{net} / P_f}} \quad \ldots \quad (6.4)$$

Tempered glass panels supported on two opposite sides can be designed using following empirical relations:

For $T \leq 6$ mm

$$b = \frac{3.2688 \times T}{\sqrt{P_{net} / P_f}} \quad \ldots \quad (6.5)$$

For $T > 6$ mm

$$b = \frac{2.9069 \times T}{\sqrt{P_{net} / P_f}} \quad \ldots \quad (6.6)$$

Where,

b = Span in meters
P_{net} = Net design wind pressure in N/m^2 as per article 6.5
P_f = Pressure factor as given in Table 6.4.
T = SNT of glass (mm)

- For laminated glass, thickness of PVB, 0.38 mm should be reduced i.e. T = SNT – 0.38
- For insulating glass, thickness of only one glass pane shall be considered. If the glass panes are of different thickness, the minimum of the two thicknesses shall be considered.

Above empirical relation may be used to calculate thickness of different types of glass for given pressure and span.

Table 6.10 / figure 6.6 for normal glass, table 6.11 / figure 6.7 for laminated glass and table 6.12 / figure 6.8 for tempered glass 6.13 / figure 6.9 for heat strengthen glass may also be used directly.

6.5 Design Wind Pressure (P_{net})

Net design wind pressure (P_{net}) is an important parameter governing the thickness of glass to be used in the window panels. It depends on several factors i.e location of building (wind zone), construction patterns around buildings (terrain category), topography of site, building plan and height etc.

Net design wind pressure (P_{net}), may be defined using the following equation:

$$P_{net} = P_z \times C_p \qquad \ldots\ldots\ldots (6.7)$$

where, C_p = Net pressure coefficient as per IS: 875 (part. 3) 1987
P_z = Design wind pressure at height 'z' (N/m^2) as per IS: 875 (part. 3) 1987.

6.6 Examples to determine the appropriate thickness of glass panel for an Office Building in Delhi Region.

The procedure to calculate the appropriate thickness of the glass panel has been explained under previous articles. The wind pressure has been calculated using IS 875 (Part 3) 1987. In order to illustrate the steps, some examples are solved as follows:

Example - 1:

The design of tempered glass panel of size 3.0 x 1.5 m supported on four sides for a 60 m high office building located in Delhi in terrain category II. The plan of building is rectangular with the size as 50 x 60 m. The permeability of building is between 5% to 20%.

Design:

The step-by-step procedure to obtain the minimum thickness of the glass panel for a building with above mentioned parameters is explained below:

Step 1 : Selection of Design Wind Pressure P_z

Select value of wind pressure for Delhi, Wind Zone-IV, terrain category - II and height of window 60 m above ground. This can be taken from I.S: 875 (Part3) and the value is 2127.25 N/m^2

Step 2: Selection of Net pressure coefficient C_p

The value of C_p for permeability in the range of 5% - 20 % and h/w = 60/50 = 1.2 being between ½ & 6, is 1.7 as per IS 875 (Part 3) 1987.

Step 3: Computation of net wind Pressure P_{net}.

Delhi is in wind zone IV where the basic wind speed is 47 m/s. For this wind speed, I.S: 875 (Part3) gives the value of wind pressure at various heights & terrain categories. For 60m height, terrain category II, the value of wind pressure is 2127.25 N/m^2.

Net Pressure $P_{net} = P_z \times C_p$

$= 2127.25 \times 1.7$

$= 3616.33\ N/m^2$

Step 4: Calculation of minimum thickness in accordance with article 6.4 (supported on all sides)

Aspect ratio = 3.0 / 1.5 = 2.00

Area of panel = 3.0 x 1.5 = 4.5 m^2

Now referring table 6.7 for the Tempered glass, it is clear that 8 mm thickness is required for the wind pressure 3616 N/m^2 & 7.5 m^2 glass area. Hence, the glass thickness of 8 mm shall be used. The same thickness is arrived at using the fig. 6.3 also.

Following the above procedure and keeping all other parameters same as in example-1, the thickness for reduced window panel size of 1.0 x 1.8 m comes out to be 5 mm of tempered glass.

Example: 2

Design of a glass panel supported on two opposite sides, 1.5 m apart with all other parameters same as on example 1.

Design:

Under such support conditions, the thickness of a tempered glass will be calculated using equation 6.6 as given below:

$$b = \frac{4.22 \times T}{\sqrt{P_{net} / P_f}}$$

$T = 13.5$ mm

where, b = span of glass

= 1.5 m

P_{net} = Net design wind pressure

P_f = 2.5 for tempered glass thickness greater than 6mm (Table – 6.4)

P_{net} = 3616.33 / 2.5

= 1446.53 N/m^2

Substituting values of P_{net} & b, the thickness of glass panel comes out to be, T = 13.5 mm. As 13.5 mm glass thickness is not commercially available, 15 mm glass thickness shall be used.

For 1.0 x 1.8m size window supported on two edges, 1.0m apart and for same wind pressure, thickness of tempered glass panel comes out to be 9.01 mm. However, 10 mm size will have to be provided due to non-availability of 9.01 mm thickness. This is due to the fact that thickness of glass may decrease with decrease in span.

Example 3:

Same as Example 1 with a change in the location of the glass panel at a height of 45 m.

Design:

All the steps explained under example 1 will be followed and some of the important calculations are being shown below:

Design wind pressure P_z for terrain category II is 2033 N/m^2

Coefficient C_p = 1.7

Net Pressure $P_{net} = P_z \times C_p$

$= 2033 \times 1.7 = 3456 \text{ N/m}^2$

From table 6.7, it is clear that the thickness of 8 mm tempered glass is sufficient to cater a pressure of 3456 N/m^2 for 4.5 m^2 panel area.

Example 4 :

Same as in Example 1 with a change in the location of the glass panel at a height of 20 m.

Design:

All the steps explained in example 1 will be followed and some of the important calculations are being shown below:

Design Wind Pressure P_z for Terrain Category II is 1737 N/ m^2.

Coefficient $C_p = 1.7$

Net Pressure $P_{net} = P_z \times C_p = 1737 \times 1.7$

$= 2952.9 \text{ N/m}^2$

From table 6.7, the maximum allowable area for 8 mm thick tempered glass panel is 5.90m^2, which is greater than the area of 4.5m^2 glass panel. Hence, 8 mm thick tempered glass panel can also be used at this height.

Example 5 :

Same as Example 1 with a change in the location of the glass panel at a height 10 m.

Design:

All the steps explained under example 1 will be followed and some of the important calculations are being shown below:

Design Wind Pressure P_z for Terrain Category II is 1517 N/ m^2

Coefficient $C_p = 1.7$

Net Pressure $P_{net} = P_z \times C_p = 1517 \times 1.7 = 2578.9 \text{ N/m}^2$

From table 6.7, it is clear that the required thickness of the tempered glass for 4.5 m^2 panel will be 6 mm.

Considering above examples, a summary of the required thickness of tempered glass for glass panel sizes of 3.0 x 1.5m fixed on all sides is shown in the following table:

Height of window above the ground level	**Glass types**	**SNT**
Height 10 m	Tempered	6 mm
Height 20 m	Tempered	8 mm
Height 45 m	Tempered	8 mm
Height 60 m	Tempered	8 mm

In order to use normal glass instead of tempered glass, the thickness of glass panel comes out as given in the following table.

Height of window above the ground level	**Glass types**	**SNT**
Height 10 m	Normal	12 mm
Height 20 m	Normal	15 mm
Height 45 m	Normal	15 mm
Height 60 m	Normal	19 mm

From the above exercise it is inferred that the required thickness of the glass panel may reduce with the reduction in the height as well as reduction in size of the window panel.

Table 6.5 : Maximum Areas (m^2) for Normal (Annealed) Glass Fixed on all four sides.

Design Wind Pr. (N/m^2)	Standard Nominal Thickness of glass in mm									
	3.00	**4.00**	**5.00**	**6.00**	**8.00**	**10.00**	**12.00**	**15.00**	**19.00**	**25.00**
500	2.540	4.410	6.720	9.450	14.270	15.000	15.000	15.000	15.000	15.000
550	2.310	4.010	6.110	8.590	12.970	15.000	15.000	15.000	15.000	15.000
600	2.120	3.680	5.600	7.880	11.890	15.000	15.000	15.000	15.000	15.000
650	1.950	3.400	5.170	7.270	10.980	14.570	15.000	15.000	15.000	15.000
700	1.820	3.150	4.800	6.750	10.190	13.530	15.000	15.000	15.000	15.000
750	1.690	2.940	4.480	6.300	9.510	12.630	15.000	15.000	15.000	15.000
800	1.590	2.760	4.200	5.910	8.920	11.840	15.000	15.000	15.000	15.000
850	1.490	2.600	3.950	5.560	8.390	11.140	14.260	15.000	15.000	15.000
900	1.410	2.450	3.730	5.250	7.930	10.520	13.460	15.000	15.000	15.000
950	1.340	2.320	3.540	4.970	7.510	9.970	12.760	15.000	15.000	15.000
1000	1.270	2.210	3.360	4.730	7.130	9.470	12.120	15.000	15.000	15.000
1050	1.210	2.100	3.200	4.500	6.790	9.020	11.540	15.000	15.000	15.000
1100	1.160	2.010	3.050	4.300	6.490	8.610	11.020	14.810	15.000	15.000
1150	1.100	1.920	2.920	4.110	6.200	8.230	10.540	14.170	15.000	15.000
1200	1.060	1.840	2.800	3.940	5.950	7.890	10.100	13.580	15.000	15.000
1250	1.020	1.770	2.690	3.780	5.710	7.580	9.690	13.030	15.000	15.000
1300	0.980	1.700	2.580	3.640	5.490	7.280	9.320	12.530	15.000	15.000
1350	0.940	1.630	2.490	3.500	5.280	7.010	8.980	12.070	15.000	15.000
1400	0.910	1.580	2.400	3.380	5.100	6.760	8.660	11.640	15.000	15.000
1450	0.880	1.520	2.320	3.260	4.920	6.530	8.360	11.230	15.000	15.000
1500	0.850	1.470	2.240	3.150	4.760	6.310	8.080	10.860	14.800	15.000
1550	0.820	1.420	2.170	3.050	4.600	6.110	7.820	10.510	14.320	15.000
1600	0.790	1.380	2.100	2.950	4.460	5.920	7.570	10.180	13.870	15.000
1650	0.770	1.340	2.040	2.860	4.320	5.740	7.340	9.870	13.450	15.000
1700	0.750	1.300	1.980	2.780	4.200	5.570	7.130	9.580	13.060	15.000
1750	0.730	1.260	1.920	2.700	4.080	5.410	6.920	9.310	12.680	15.000
1800	0.710	1.230	1.870	2.630	3.960	5.260	6.730	9.050	12.330	15.000
1850	0.690	1.190	1.820	2.550	3.860	5.120	6.550	8.810	12.000	15.000
1900	0.670	1.160	1.770	2.490	3.760	4.980	6.380	8.570	11.680	15.000
1950	0.650	1.130	1.720	2.420	3.660	4.860	6.210	8.350	11.380	15.000
2000	0.640	1.100	1.680	2.360	3.570	4.730	6.060	8.150	11.100	15.000
2050	0.620	1.080	1.640	2.310	3.480	4.620	5.910	7.950	10.830	15.000
2100	0.610	1.050	1.600	2.250	3.400	4.510	5.770	7.760	10.570	15.000
2150	0.590	1.030	1.560	2.200	3.320	4.400	5.640	7.580	10.320	15.000
2200	0.580	1.000	1.530	2.150	3.240	4.300	5.510	7.400	10.090	15.000
2250	0.560	0.980	1.490	2.100	3.170	4.210	5.390	7.240	9.860	14.720
2300	0.550	0.960	1.460	2.050	3.100	4.120	5.270	7.080	9.650	14.400
2350	0.540	0.940	1.430	2.010	3.040	4.030	5.160	6.930	9.440	14.090
2400	0.530	0.920	1.400	1.970	2.970	3.950	5.050	6.790	9.250	13.800
2450	0.520	0.900	1.370	1.930	2.910	3.860	4.950	6.650	9.060	13.520
2500	0.510	0.880	1.340	1.890	2.850	3.790	4.850	6.520	8.880	13.250
2550	0.500	0.870	1.320	1.850	2.800	3.710	4.750	6.390	8.700	12.990
2600	0.490	0.850	1.290	1.820	2.740	3.640	4.660	6.270	8.540	12.740
Maximum Aspect Ratio	**7.3**	**6.8**	**6.5**	**6.3**	**5.9**	**4.9**	**4.3**	**3.8**	**3.3**	**2.9**

Contd.

	3.00	4.00	5.00	6.00	8.00	10.00	12.00	15.00	19.00	25.00
2650	0.480	0.830	1.270	1.780	2.690	3.570	4.570	6.150	8.380	12.500
2700	0.470	0.820	1.240	1.750	2.640	3.510	4.490	6.030	8.220	12.270
2750	0.460	0.800	1.220	1.720	2.590	3.440	4.410	5.920	8.070	12.040
2800	0.450	0.790	1.200	1.690	2.550	3.380	4.330	5.820	7.930	11.830
2850	0.450	0.770	1.180	1.660	2.500	3.320	4.250	5.720	7.790	11.620
2900	0.440	0.760	1.160	1.630	2.460	3.270	4.180	5.620	7.650	11.420
2950	0.430	0.750	1.140	1.600	2.420	3.210	4.110	5.520	7.520	11.230
3000	0.420	0.740	1.120	1.580	2.380	3.160	4.040	5.430	7.400	11.040
3050	0.420	0.720	1.100	1.550	2.340	3.100	3.970	5.340	7.280	10.860
3100	0.410	0.710	1.080	1.520	2.300	3.050	3.910	5.260	7.160	10.680
3150	0.400	0.700	1.070	1.500	2.260	3.010	3.850	5.170	7.050	10.510
3200	0.400	0.690	1.050	1.480	2.230	2.960	3.790	5.090	6.940	10.350
3250	0.390	0.680	1.030	1.450	2.200	2.910	3.730	5.010	6.830	10.190
3300	0.390	0.670	1.020	1.430	2.160	2.870	3.670	4.940	6.730	10.040
3350	0.380	0.660	1.000	1.410	2.130	2.830	3.620	4.860	6.630	9.890
3400	0.370	0.650	0.990	1.390	2.100	2.780	3.560	4.790	6.530	9.740
3450	0.370	0.640	0.970	1.370	2.070	2.740	3.510	4.720	6.430	9.600
3500	0.360	0.630	0.960	1.350	2.040	2.710	3.460	4.650	6.340	9.460
3550	0.360	0.620	0.950	1.330	2.010	2.670	3.410	4.590	6.250	9.330
3600	0.350	0.610	0.930	1.310	1.980	2.630	3.370	4.530	6.170	9.200
3650	0.350	0.600	0.920	1.290	1.950	2.590	3.320	4.460	6.080	9.070
3700	0.340	0.600	0.910	1.280	1.930	2.560	3.280	4.400	6.000	8.950
3750	0.340	0.590	0.900	1.260	1.900	2.530	3.230	4.340	5.920	8.830
3800	0.330	0.580	0.880	1.240	1.880	2.490	3.190	4.290	5.840	8.720
3850	0.330	0.570	0.870	1.230	1.850	2.460	3.150	4.230	5.760	8.600
3900	0.330	0.570	0.860	1.210	1.830	2.430	3.110	4.180	5.690	8.490
3950	0.320	0.560	0.850	1.200	1.810	2.400	3.070	4.120	5.620	8.380
4000	0.320	0.550	0.840	1.180	1.780	2.370	3.030	4.070	5.550	8.280
4050	0.310	0.540	0.830	1.170	1.760	2.340	2.990	4.020	5.480	8.180
4100	0.310	0.540	0.820	1.150	1.740	2.310	2.960	3.970	5.410	8.080
4150	0.310	0.530	0.810	1.140	1.720	2.280	2.920	3.930	5.350	7.980
4200	0.300	0.530	0.800	1.130	1.700	2.250	2.890	3.880	5.280	7.890
4250	0.300	0.520	0.790	1.110	1.680	2.230	2.850	3.830	5.220	7.790
4300	0.300	0.510	0.780	1.100	1.660	2.200	2.820	3.790	5.160	7.700
4350	0.290	0.510	0.770	1.090	1.640	2.180	2.790	3.740	5.100	7.610
4400	0.290	0.500	0.760	1.070	1.620	2.150	2.750	3.700	5.040	7.530
4450	0.290	0.500	0.760	1.060	1.600	2.130	2.720	3.660	4.990	7.440
4500	0.280	0.490	0.750	1.050	1.590	2.100	2.690	3.620	4.930	7.360
4550	0.280	0.490	0.740	1.040	1.570	2.080	2.660	3.580	4.880	7.280
4600	0.280	0.480	0.730	1.030	1.550	2.060	2.630	3.540	4.830	7.200
4650	0.270	0.470	0.720	1.020	1.530	2.040	2.610	3.500	4.770	7.120
4700	0.270	0.470	0.710	1.010	1.520	2.010	2.580	3.470	4.720	7.050
4750	0.270	0.460	0.710	0.990	1.500	1.990	2.550	3.430	4.670	6.970
4800	0.260	0.460	0.700	0.980	1.490	1.970	2.520	3.390	4.620	6.900
4850	0.260	0.460	0.690	0.970	1.470	1.950	2.500	3.360	4.580	6.830
4900	0.260	0.450	0.690	0.960	1.460	1.930	2.470	3.320	4.530	6.760
4950	0.260	0.450	0.680	0.950	1.440	1.910	2.450	3.290	4.480	6.690
5000	0.250	0.440	0.670	0.950	1.430	1.890	2.420	3.260	4.440	6.620
Maximum Aspect Ratio	**7.3**	**6.8**	**6.5**	**6.3**	**5.9**	**4.9**	**4.3**	**3.8**	**3.3**	**2.9**

Fig. 6.1 : Normal (Annealed) Glass Fixed on All Four Sides

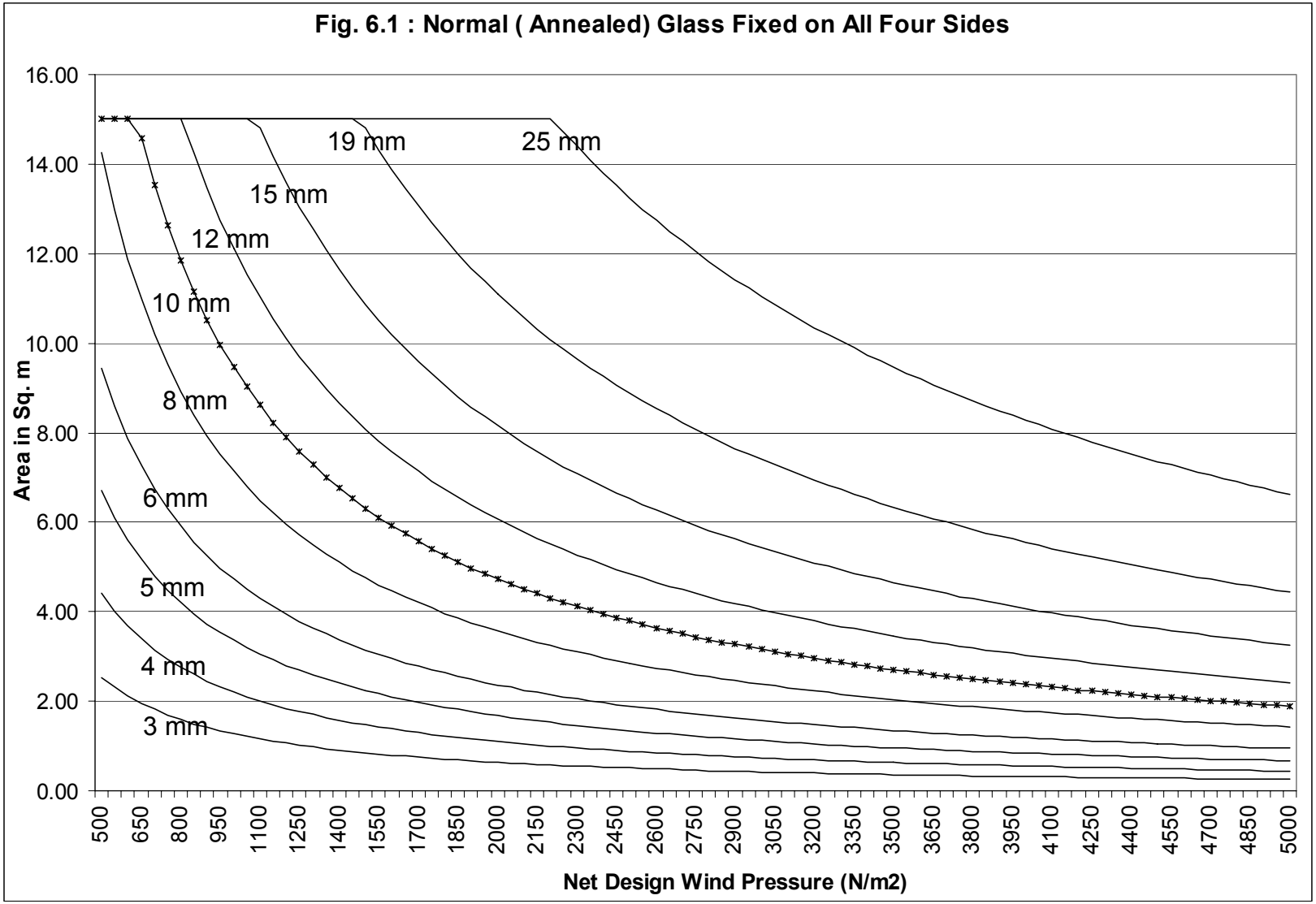


Table 6.6 : Maximum Areas (m^2) for Laminated Glass Fixed on all four sides.

Design Wind Pr. (N/m^2)	Standard Nominal Thickness of glass in mm					
	5.38	**6.38**	**8.38**	**10.38**	**12.38**	**16.38**
500	5.380	7.560	11.420	15.000	15.000	15.000
550	4.890	6.870	10.380	13.770	15.000	15.000
600	4.480	6.300	9.510	12.630	15.000	15.000
650	4.140	5.820	8.780	11.650	14.910	15.000
700	3.840	5.400	8.150	10.820	13.850	15.000
750	3.580	5.040	7.610	10.100	12.930	15.000
800	3.360	4.730	7.130	9.470	12.120	15.000
850	3.160	4.450	6.710	8.910	11.410	15.000
900	2.990	4.200	6.340	8.420	10.770	14.480
950	2.830	3.980	6.010	7.970	10.200	13.720
1000	2.690	3.780	5.710	7.580	9.690	13.030
1050	2.560	3.600	5.440	7.210	9.230	12.410
1100	2.440	3.440	5.190	6.890	8.810	11.850
1150	2.340	3.290	4.960	6.590	8.430	11.330
1200	2.240	3.150	4.760	6.310	8.080	10.860
1250	2.150	3.020	4.570	6.060	7.760	10.430
1300	2.070	2.910	4.390	5.830	7.460	10.020
1350	1.990	2.800	4.230	5.610	7.180	9.650
1400	1.920	2.700	4.080	5.410	6.920	9.310
1450	1.850	2.610	3.940	5.220	6.690	8.990
1500	1.790	2.520	3.810	5.050	6.460	8.690
1550	1.730	2.440	3.680	4.890	6.250	8.410
1600	1.680	2.360	3.570	4.730	6.060	8.150
1650	1.630	2.290	3.460	4.590	5.880	7.900
1700	1.580	2.220	3.360	4.460	5.700	7.670
1750	1.540	2.160	3.260	4.330	5.540	7.450
1800	1.490	2.100	3.170	4.210	5.390	7.240
1850	1.450	2.040	3.090	4.090	5.240	7.040
1900	1.410	1.990	3.000	3.990	5.100	6.860
1950	1.380	1.940	2.930	3.880	4.970	6.680
2000	1.340	1.890	2.850	3.790	4.850	6.520
2050	1.310	1.840	2.780	3.700	4.730	6.360
2100	1.280	1.800	2.720	3.610	4.620	6.210
2150	1.250	1.760	2.650	3.520	4.510	6.060
2200	1.220	1.720	2.590	3.440	4.410	5.920
2250	1.190	1.680	2.540	3.370	4.310	5.790
2300	1.170	1.640	2.480	3.290	4.220	5.670
2350	1.140	1.610	2.430	3.220	4.130	5.550
2400	1.120	1.580	2.380	3.160	4.040	5.430
2450	1.100	1.540	2.330	3.090	3.960	5.320
2500	1.080	1.510	2.280	3.030	3.880	5.210
2550	1.050	1.480	2.240	2.970	3.800	5.110
2600	1.030	1.450	2.200	2.910	3.730	5.010
Maximum Aspect Ratio	**6.5**	**6.2**	**5.7**	**4.8**	**4.3**	**3.6**

Contd.

	5.38	6.38	8.38	10.38	12.38	16.38
2650	1.010	1.430	2.150	2.860	3.660	4.920
2700	1.000	1.400	2.110	2.810	3.590	4.830
2750	0.980	1.370	2.080	2.750	3.530	4.740
2800	0.960	1.350	2.040	2.710	3.460	4.650
2850	0.940	1.330	2.000	2.660	3.400	4.570
2900	0.930	1.300	1.970	2.610	3.340	4.490
2950	0.910	1.280	1.930	2.570	3.290	4.420
3000	0.900	1.260	1.900	2.530	3.230	4.340
3050	0.880	1.240	1.870	2.480	3.180	4.270
3100	0.870	1.220	1.840	2.440	3.130	4.200
3150	0.850	1.200	1.810	2.400	3.080	4.140
3200	0.840	1.180	1.780	2.370	3.030	4.070
3250	0.830	1.160	1.760	2.330	2.980	4.010
3300	0.810	1.150	1.730	2.300	2.940	3.950
3350	0.800	1.130	1.700	2.260	2.890	3.890
3400	0.790	1.110	1.680	2.230	2.850	3.830
3450	0.780	1.100	1.650	2.200	2.810	3.780
3500	0.770	1.080	1.630	2.160	2.770	3.720
3550	0.760	1.060	1.610	2.130	2.730	3.670
3600	0.750	1.050	1.590	2.100	2.690	3.620
3650	0.740	1.040	1.560	2.080	2.660	3.570
3700	0.730	1.020	1.540	2.050	2.620	3.520
3750	0.720	1.010	1.520	2.020	2.590	3.480
3800	0.710	0.990	1.500	1.990	2.550	3.430
3850	0.700	0.980	1.480	1.970	2.520	3.390
3900	0.690	0.970	1.460	1.940	2.490	3.340
3950	0.680	0.960	1.440	1.920	2.450	3.300
4000	0.670	0.950	1.430	1.890	2.420	3.260
4050	0.660	0.930	1.410	1.870	2.390	3.220
4100	0.660	0.920	1.390	1.850	2.360	3.180
4150	0.650	0.910	1.380	1.830	2.340	3.140
4200	0.640	0.900	1.360	1.800	2.310	3.100
4250	0.630	0.890	1.340	1.780	2.280	3.070
4300	0.630	0.880	1.330	1.760	2.250	3.030
4350	0.620	0.870	1.310	1.740	2.230	3.000
4400	0.610	0.860	1.300	1.720	2.200	2.960
4450	0.600	0.850	1.280	1.700	2.180	2.930
4500	0.600	0.840	1.270	1.680	2.150	2.900
4550	0.590	0.830	1.250	1.660	2.130	2.860
4600	0.580	0.820	1.240	1.650	2.110	2.830
4650	0.580	0.810	1.230	1.630	2.080	2.800
4700	0.570	0.800	1.210	1.610	2.060	2.770
4750	0.570	0.800	1.200	1.590	2.040	2.740
4800	0.560	0.790	1.190	1.580	2.020	2.720
4850	0.550	0.780	1.180	1.560	2.000	2.690
4900	0.550	0.770	1.160	1.550	1.980	2.660
4950	0.540	0.760	1.150	1.530	1.960	2.630
5000	0.540	0.760	1.140	1.520	1.940	2.610
Maximum Aspect Ratio	**6.5**	**6.2**	**5.7**	**4.8**	**4.3**	**3.6**

Fig. 6.2 : Laminated Glass Panel Fixed on All Four Sides

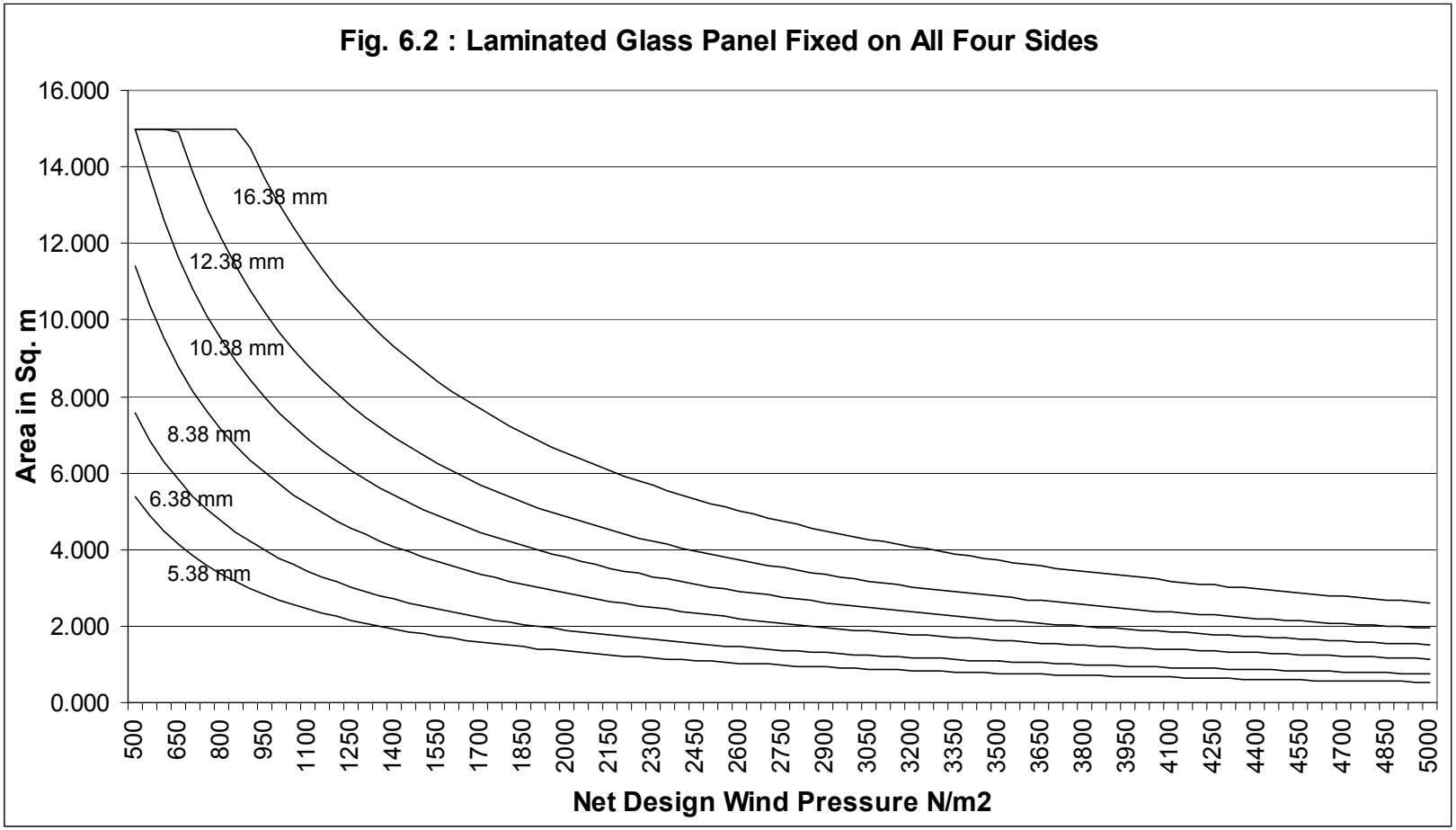


Table 6.7 : Maximum Areas (m^2) for Tempered Glass Fixed on all four sides.

Design Wind Pr. (N/m^2)	Standard Nominal Thickness of glass in mm									
	3.00	**4.00**	**5.00**	**6.00**	**8.00**	**10.00**	**12.00**	**15.00**	**19.00**	**25.00**
500	6.350	11.030	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000
550	5.780	10.030	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000
600	5.290	9.200	14.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000
650	4.890	8.490	12.920	15.000	15.000	15.000	15.000	15.000	15.000	15.000
700	4.540	7.880	12.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000
750	4.240	7.360	11.200	15.000	15.000	15.000	15.000	15.000	15.000	15.000
800	3.970	6.900	10.500	14.770	15.000	15.000	15.000	15.000	15.000	15.000
850	3.740	6.490	9.880	13.900	15.000	15.000	15.000	15.000	15.000	15.000
900	3.530	6.130	9.330	13.130	15.000	15.000	15.000	15.000	15.000	15.000
950	3.340	5.810	8.840	12.440	15.000	15.000	15.000	15.000	15.000	15.000
1000	3.180	5.520	8.400	11.810	15.000	15.000	15.000	15.000	15.000	15.000
1050	3.030	5.250	8.000	11.250	15.000	15.000	15.000	15.000	15.000	15.000
1100	2.890	5.020	7.640	10.740	15.000	15.000	15.000	15.000	15.000	15.000
1150	2.760	4.800	7.300	10.270	15.000	15.000	15.000	15.000	15.000	15.000
1200	2.650	4.600	7.000	9.850	14.860	15.000	15.000	15.000	15.000	15.000
1250	2.540	4.410	6.720	9.450	14.270	15.000	15.000	15.000	15.000	15.000
1300	2.440	4.240	6.460	9.090	13.720	15.000	15.000	15.000	15.000	15.000
1350	2.350	4.090	6.220	8.750	13.210	15.000	15.000	15.000	15.000	15.000
1400	2.270	3.940	6.000	8.440	12.740	15.000	15.000	15.000	15.000	15.000
1450	2.190	3.810	5.790	8.150	12.300	15.000	15.000	15.000	15.000	15.000
1500	2.120	3.680	5.600	7.880	11.890	15.000	15.000	15.000	15.000	15.000
1550	2.050	3.560	5.420	7.620	11.510	15.000	15.000	15.000	15.000	15.000
1600	1.990	3.450	5.250	7.380	11.150	14.800	15.000	15.000	15.000	15.000
1650	1.930	3.340	5.090	7.160	10.810	14.350	15.000	15.000	15.000	15.000
1700	1.870	3.250	4.940	6.950	10.490	13.920	15.000	15.000	15.000	15.000
1750	1.820	3.150	4.800	6.750	10.190	13.530	15.000	15.000	15.000	15.000
1800	1.760	3.070	4.670	6.560	9.910	13.150	15.000	15.000	15.000	15.000
1850	1.720	2.980	4.540	6.390	9.640	12.800	15.000	15.000	15.000	15.000
1900	1.670	2.900	4.420	6.220	9.390	12.460	15.000	15.000	15.000	15.000
1950	1.630	2.830	4.310	6.060	9.150	12.140	15.000	15.000	15.000	15.000
2000	1.590	2.760	4.200	5.910	8.920	11.840	15.000	15.000	15.000	15.000
2050	1.550	2.690	4.100	5.760	8.700	11.550	14.780	15.000	15.000	15.000
2100	1.510	2.630	4.000	5.630	8.490	11.270	14.430	15.000	15.000	15.000
2150	1.480	2.570	3.910	5.500	8.300	11.010	14.090	15.000	15.000	15.000
2200	1.440	2.510	3.820	5.370	8.110	10.760	13.770	15.000	15.000	15.000
2250	1.410	2.450	3.730	5.250	7.930	10.520	13.460	15.000	15.000	15.000
2300	1.380	2.400	3.650	5.140	7.750	10.290	13.170	15.000	15.000	15.000
2350	1.350	2.350	3.570	5.030	7.590	10.070	12.890	15.000	15.000	15.000
2400	1.320	2.300	3.500	4.920	7.430	9.860	12.620	15.000	15.000	15.000
2450	1.300	2.250	3.430	4.820	7.280	9.660	12.370	15.000	15.000	15.000
2500	1.270	2.210	3.360	4.730	7.130	9.470	12.120	15.000	15.000	15.000
2550	1.250	2.160	3.290	4.630	6.990	9.280	11.880	15.000	15.000	15.000
2600	1.220	2.120	3.230	4.540	6.860	9.100	11.650	15.000	15.000	15.000
Maximum Aspect Ratio	**7.30**	**6.8**	**6.5**	**6.3**	**5.9**	**4.9**	**4.3**	**3.8**	**3.3**	**2.9**

Contd.

	3.00	4.00	5.00	6.00	8.00	10.00	12.00	15.00	19.00	25.00
2650	1.200	2.080	3.170	4.460	6.730	8.930	11.430	15.000	15.000	15.000
2700	1.180	2.040	3.110	4.380	6.610	8.770	11.220	15.000	15.000	15.000
2750	1.160	2.010	3.050	4.300	6.490	8.610	11.020	14.810	15.000	15.000
2800	1.130	1.970	3.000	4.220	6.370	8.450	10.820	14.550	15.000	15.000
2850	1.110	1.940	2.950	4.150	6.260	8.310	10.630	14.290	15.000	15.000
2900	1.100	1.900	2.900	4.070	6.150	8.160	10.450	14.040	15.000	15.000
2950	1.080	1.870	2.850	4.000	6.050	8.020	10.270	13.810	15.000	15.000
3000	1.060	1.840	2.800	3.940	5.950	7.890	10.100	13.580	15.000	15.000
3050	1.040	1.810	2.750	3.870	5.850	7.760	9.930	13.350	15.000	15.000
3100	1.020	1.780	2.710	3.810	5.750	7.640	9.770	13.140	15.000	15.000
3150	1.010	1.750	2.670	3.750	5.660	7.510	9.620	12.930	15.000	15.000
3200	0.990	1.720	2.620	3.690	5.570	7.400	9.470	12.730	15.000	15.000
3250	0.980	1.700	2.580	3.640	5.490	7.280	9.320	12.530	15.000	15.000
3300	0.960	1.670	2.550	3.580	5.400	7.170	9.180	12.340	15.000	15.000
3350	0.950	1.650	2.510	3.530	5.320	7.070	9.040	12.160	15.000	15.000
3400	0.930	1.620	2.470	3.470	5.250	6.960	8.910	11.980	15.000	15.000
3450	0.920	1.600	2.430	3.420	5.170	6.860	8.780	11.800	15.000	15.000
3500	0.910	1.580	2.400	3.380	5.100	6.760	8.660	11.640	15.000	15.000
3550	0.890	1.550	2.370	3.330	5.020	6.670	8.530	11.470	15.000	15.000
3600	0.880	1.530	2.330	3.280	4.950	6.580	8.420	11.310	15.000	15.000
3650	0.870	1.510	2.300	3.240	4.890	6.490	8.300	11.160	15.000	15.000
3700	0.860	1.490	2.270	3.190	4.820	6.400	8.190	11.010	15.000	15.000
3750	0.850	1.470	2.240	3.150	4.760	6.310	8.080	10.860	14.800	15.000
3800	0.840	1.450	2.210	3.110	4.690	6.230	7.970	10.720	14.600	15.000
3850	0.830	1.430	2.180	3.070	4.630	6.150	7.870	10.580	14.410	15.000
3900	0.810	1.410	2.150	3.030	4.570	6.070	7.770	10.440	14.230	15.000
3950	0.800	1.400	2.130	2.990	4.520	5.990	7.670	10.310	14.050	15.000
4000	0.790	1.380	2.100	2.950	4.460	5.920	7.570	10.180	13.870	15.000
4050	0.780	1.360	2.070	2.920	4.400	5.840	7.480	10.060	13.700	15.000
4100	0.770	1.350	2.050	2.880	4.350	5.770	7.390	9.930	13.530	15.000
4150	0.770	1.330	2.020	2.850	4.300	5.700	7.300	9.810	13.370	15.000
4200	0.760	1.310	2.000	2.810	4.250	5.640	7.210	9.700	13.210	15.000
4250	0.750	1.300	1.980	2.780	4.200	5.570	7.130	9.580	13.060	15.000
4300	0.740	1.280	1.950	2.750	4.150	5.510	7.050	9.470	12.900	15.000
4350	0.730	1.270	1.930	2.720	4.100	5.440	6.960	9.360	12.760	15.000
4400	0.720	1.250	1.910	2.690	4.050	5.380	6.890	9.260	12.610	15.000
4450	0.710	1.240	1.890	2.650	4.010	5.320	6.810	9.150	12.470	15.000
4500	0.710	1.230	1.870	2.630	3.960	5.260	6.730	9.050	12.330	15.000
4550	0.700	1.210	1.850	2.600	3.920	5.200	6.660	8.950	12.200	15.000
4600	0.690	1.200	1.830	2.570	3.880	5.150	6.590	8.850	12.060	15.000
4650	0.680	1.190	1.810	2.540	3.840	5.090	6.520	8.760	11.930	15.000
4700	0.680	1.170	1.790	2.510	3.790	5.040	6.450	8.670	11.810	15.000
4750	0.670	1.160	1.770	2.490	3.760	4.980	6.380	8.570	11.680	15.000
4800	0.660	1.150	1.750	2.460	3.720	4.930	6.310	8.480	11.560	15.000
4850	0.650	1.140	1.730	2.440	3.680	4.880	6.250	8.400	11.440	15.000
4900	0.650	1.130	1.710	2.410	3.640	4.830	6.180	8.310	11.320	15.000
4950	0.640	1.110	1.700	2.390	3.600	4.780	6.120	8.230	11.210	15.000
5000	0.640	1.100	1.680	2.360	3.570	4.730	6.060	8.150	11.100	15.000
Maximum Aspect Ratio	**7.3**	**6.8**	**6.5**	**6.3**	**5.5**	**4.9**	**4.3**	**3.8**	**3.3**	**2.9**

Fig. 6.3 : Tempered Glass Fixed on All Four Sides

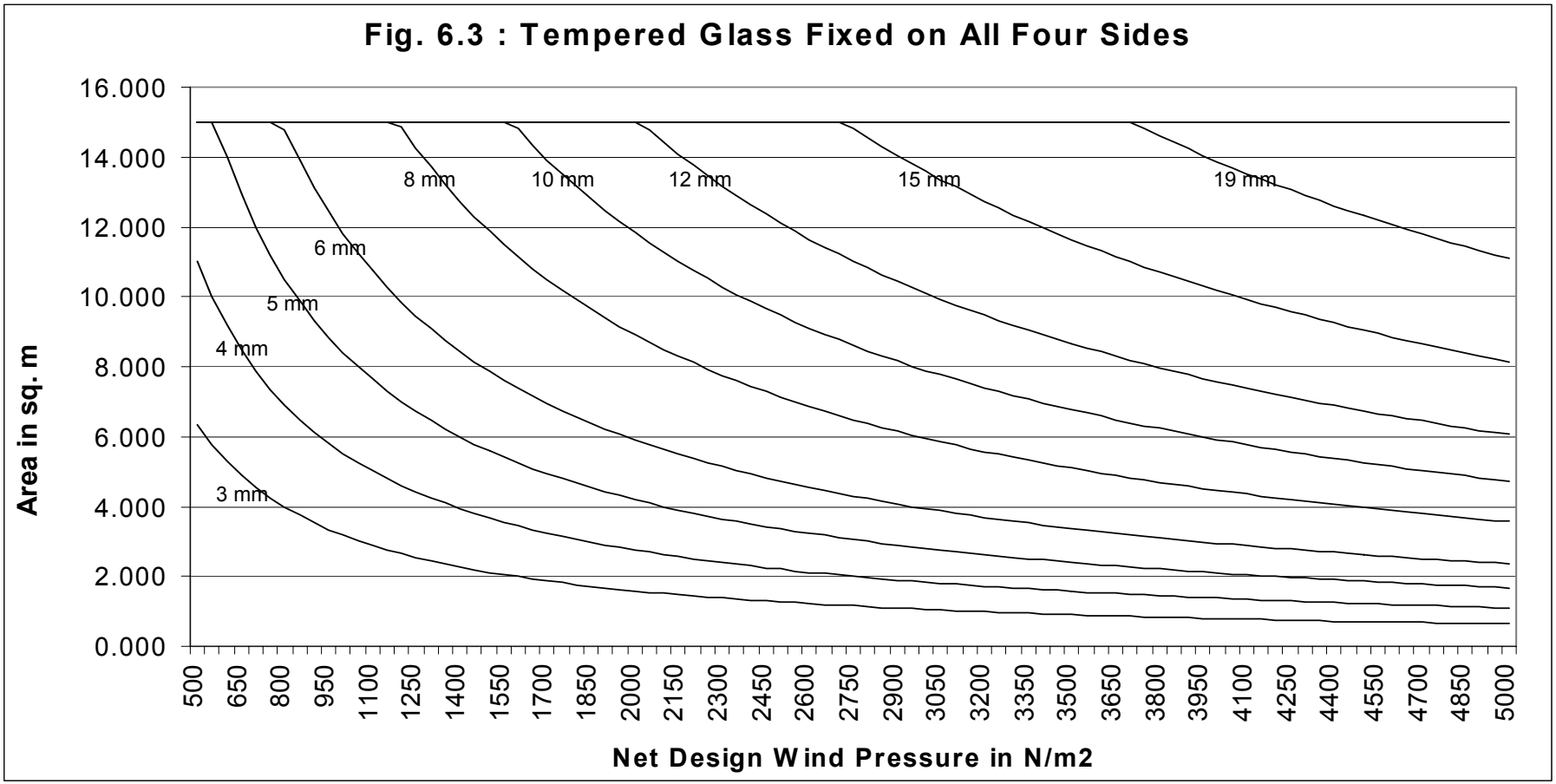


Table 6.8 : Maximum Areas (m^2) for Insulating Glass fixed on all four sides.

Design Wind Pressure (N/m^2)	Standard Nominal Thickness of glass in mm						
	3+3	**4+4**	**5+5**	**6+6**	**8+8**	**10+10**	**12+12**
500	3.810	6.620	10.080	14.180	15.000	15.000	15.000
550	3.470	6.020	9.160	12.890	15.000	15.000	15.000
600	3.180	5.520	8.400	11.810	15.000	15.000	15.000
650	2.930	5.090	7.750	10.910	15.000	15.000	15.000
700	2.720	4.730	7.200	10.130	15.000	15.000	15.000
750	2.540	4.410	6.720	9.450	14.270	15.000	15.000
800	2.380	4.140	6.300	8.860	13.380	15.000	15.000
850	2.240	3.890	5.930	8.340	12.590	15.000	15.000
900	2.120	3.680	5.600	7.880	11.890	15.000	15.000
950	2.010	3.480	5.310	7.460	11.270	14.950	15.000
1000	1.910	3.310	5.040	7.090	10.700	14.200	15.000
1050	1.820	3.150	4.800	6.750	10.190	13.530	15.000
1100	1.730	3.010	4.580	6.440	9.730	12.910	15.000
1150	1.660	2.880	4.380	6.160	9.310	12.350	15.000
1200	1.590	2.760	4.200	5.910	8.920	11.840	15.000
1250	1.520	2.650	4.030	5.670	8.560	11.360	14.540
1300	1.470	2.550	3.880	5.450	8.230	10.930	13.980
1350	1.410	2.450	3.730	5.250	7.930	10.520	13.460
1400	1.360	2.360	3.600	5.060	7.640	10.150	12.980
1450	1.310	2.280	3.480	4.890	7.380	9.800	12.540
1500	1.270	2.210	3.360	4.730	7.130	9.470	12.120
1550	1.230	2.140	3.250	4.570	6.900	9.160	11.730
1600	1.190	2.070	3.150	4.430	6.690	8.880	11.360
1650	1.160	2.010	3.050	4.300	6.490	8.610	11.020
1700	1.120	1.950	2.960	4.170	6.300	8.350	10.690
1750	1.090	1.890	2.880	4.050	6.120	8.120	10.390
1800	1.060	1.840	2.800	3.940	5.950	7.890	10.100
1850	1.030	1.790	2.720	3.830	5.780	7.680	9.830
1900	1.000	1.740	2.650	3.730	5.630	7.480	9.570
1950	0.980	1.700	2.580	3.640	5.490	7.280	9.320
2000	0.950	1.660	2.520	3.540	5.350	7.100	9.090
2050	0.930	1.610	2.460	3.460	5.220	6.930	8.870
2100	0.910	1.580	2.400	3.380	5.100	6.760	8.660
2150	0.890	1.540	2.340	3.300	4.980	6.610	8.450
2200	0.870	1.500	2.290	3.220	4.860	6.460	8.260
2250	0.850	1.470	2.240	3.150	4.760	6.310	8.080
2300	0.830	1.440	2.190	3.080	4.650	6.180	7.900
2350	0.810	1.410	2.140	3.020	4.550	6.040	7.740
2400	0.790	1.380	2.100	2.950	4.460	5.920	7.570
2450	0.780	1.350	2.060	2.890	4.370	5.800	7.420
2500	0.760	1.320	2.020	2.840	4.280	5.680	7.270
2550	0.750	1.300	1.980	2.780	4.200	5.570	7.130
2600	0.730	1.270	1.940	2.730	4.120	5.460	6.990
Maximum Aspect Ratio	**7.3**	**6.8**	**6.5**	**6.3**	**5.9**	**4.9**	**4.3**

Contd.

	3+3	4+4	5+5	6+6	8+8	10+10	12+12
2650	0.720	1.250	1.900	2.670	4.040	5.360	6.860
2700	0.710	1.230	1.870	2.630	3.960	5.260	6.730
2750	0.690	1.200	1.830	2.580	3.890	5.160	6.610
2800	0.680	1.180	1.800	2.530	3.820	5.070	6.490
2850	0.670	1.160	1.770	2.490	3.760	4.980	6.380
2900	0.660	1.140	1.740	2.440	3.690	4.900	6.270
2950	0.650	1.120	1.710	2.400	3.630	4.810	6.160
3000	0.640	1.100	1.680	2.360	3.570	4.730	6.060
3050	0.620	1.090	1.650	2.320	3.510	4.660	5.960
3100	0.610	1.070	1.630	2.290	3.450	4.580	5.860
3150	0.610	1.050	1.600	2.250	3.400	4.510	5.770
3200	0.600	1.030	1.570	2.220	3.340	4.440	5.680
3250	0.590	1.020	1.550	2.180	3.290	4.370	5.590
3300	0.580	1.000	1.530	2.150	3.240	4.300	5.510
3350	0.570	0.990	1.500	2.120	3.190	4.240	5.430
3400	0.560	0.970	1.480	2.080	3.150	4.180	5.350
3450	0.550	0.960	1.460	2.050	3.100	4.120	5.270
3500	0.540	0.950	1.440	2.030	3.060	4.060	5.190
3550	0.540	0.930	1.420	2.000	3.010	4.000	5.120
3600	0.530	0.920	1.400	1.970	2.970	3.950	5.050
3650	0.520	0.910	1.380	1.940	2.930	3.890	4.980
3700	0.520	0.890	1.360	1.920	2.890	3.840	4.910
3750	0.510	0.880	1.340	1.890	2.850	3.790	4.850
3800	0.500	0.870	1.330	1.870	2.820	3.740	4.780
3850	0.500	0.860	1.310	1.840	2.780	3.690	4.720
3900	0.490	0.850	1.290	1.820	2.740	3.640	4.660
3950	0.480	0.840	1.280	1.790	2.710	3.600	4.600
4000	0.480	0.830	1.260	1.770	2.680	3.550	4.540
4050	0.470	0.820	1.240	1.750	2.640	3.510	4.490
4100	0.460	0.810	1.230	1.730	2.610	3.460	4.430
4150	0.460	0.800	1.210	1.710	2.580	3.420	4.380
4200	0.450	0.790	1.200	1.690	2.550	3.380	4.330
4250	0.450	0.780	1.190	1.670	2.520	3.340	4.280
4300	0.440	0.770	1.170	1.650	2.490	3.300	4.230
4350	0.440	0.760	1.160	1.630	2.460	3.270	4.180
4400	0.430	0.750	1.150	1.610	2.430	3.230	4.130
4450	0.430	0.740	1.130	1.590	2.400	3.190	4.080
4500	0.420	0.740	1.120	1.580	2.380	3.160	4.040
4550	0.420	0.730	1.110	1.560	2.350	3.120	4.000
4600	0.410	0.720	1.100	1.540	2.330	3.090	3.950
4650	0.410	0.710	1.080	1.520	2.300	3.050	3.910
4700	0.410	0.700	1.070	1.510	2.280	3.020	3.870
4750	0.400	0.700	1.060	1.490	2.250	2.990	3.830
4800	0.400	0.690	1.050	1.480	2.230	2.960	3.790
4850	0.390	0.680	1.040	1.460	2.210	2.930	3.750
4900	0.390	0.680	1.030	1.450	2.180	2.900	3.710
4950	0.390	0.670	1.020	1.430	2.160	2.870	3.670
5000	0.380	0.660	1.010	1.420	2.140	2.840	3.640
Maximum Aspect Ratio	**7.3**	**6.8**	**6.5**	**6.3**	**5.9**	**4.9**	**4.3**

Fig. 6.4 : Insulating Glass Fixed on All Four Sides

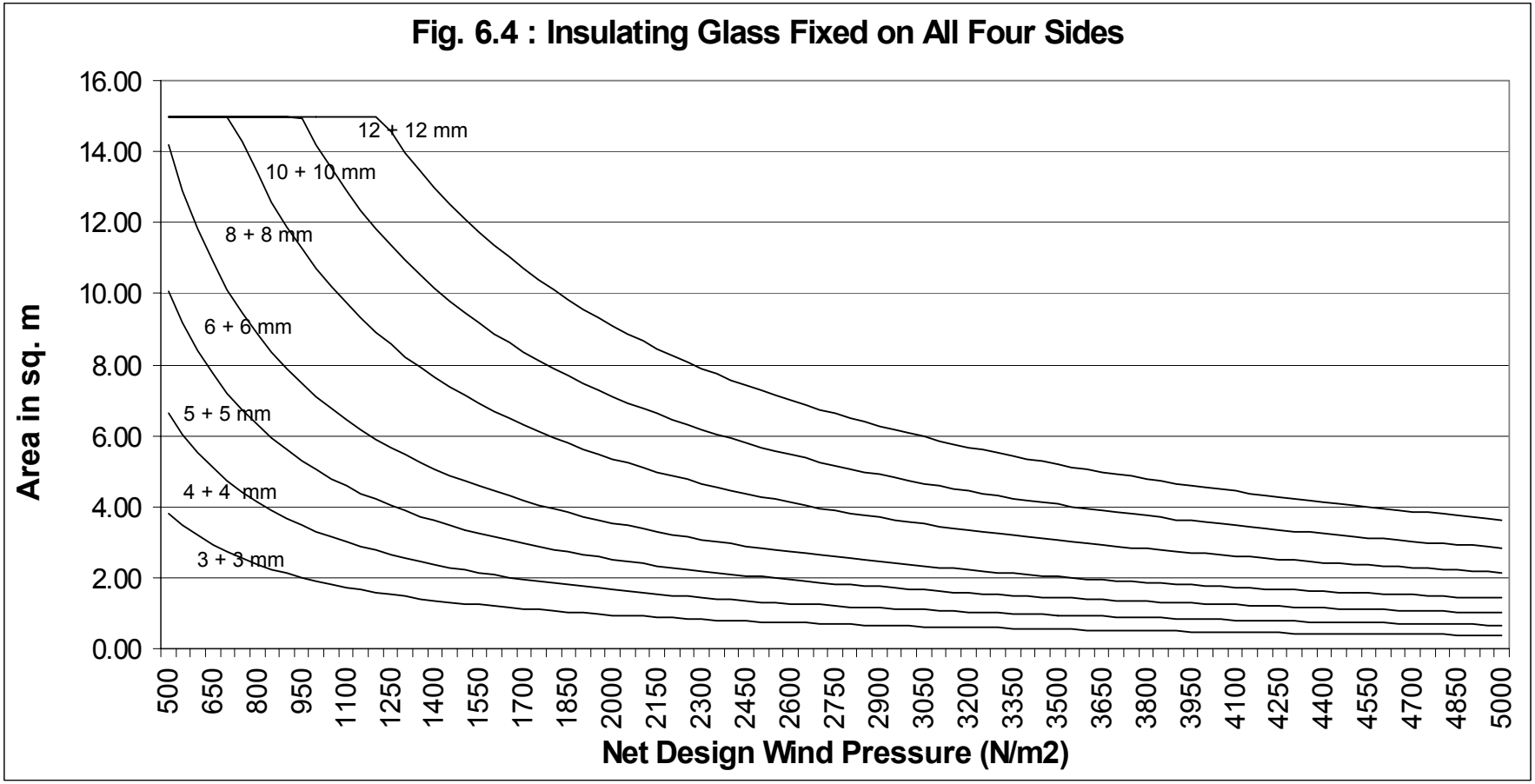


Table 6.9: Maximum Area (m^2) for Heat Strengthened Glass Fixed on four sides.

Thickness	3	4	5	6	8	10	12	15	19	25
500	4.07	7.06	10.75	15	15	15	15	15	15	15
550	3.7	6.42	9.77	13.75	15	15	15	15	15	15
600	3.39	5.89	8.96	12.6	15	15	15	15	15	15
650	3.13	5.43	8.27	11.63	15	15	15	15	15	15
700	2.9	5.04	7.68	10.8	15	15	15	15	15	15
750	2.71	4.71	7.17	10.08	15	15	15	15	15	15
800	2.54	4.41	6.72	9.45	14.27	15	15	15	15	15
850	2.39	4.15	6.32	8.9	13.43	15	15	15	15	15
900	2.26	3.92	5.97	8.4	12.68	15	15	15	15	15
950	2.14	3.72	5.66	7.96	12.02	15	15	15	15	15
1000	2.03	3.53	5.38	7.56	11.42	15	15	15	15	15
1050	1.94	3.36	5.12	7.2	10.87	14.43	15	15	15	15
1100	1.85	3.21	4.89	6.87	10.38	13.77	15	15	15	15
1150	1.77	3.07	4.67	6.57	9.93	13.17	15	15	15	15
1200	1.69	2.94	4.48	6.3	9.51	12.63	15	15	15	15
1250	1.63	2.82	4.3	6.05	9.13	12.12	15	15	15	15
1300	1.56	2.72	4.14	5.82	8.78	11.65	14.91	15	15	15
1350	1.51	2.62	3.98	5.6	8.46	11.22	14.36	15	15	15
1400	1.45	2.52	3.84	5.4	8.15	10.82	13.85	15	15	15
1450	1.4	2.44	3.71	5.21	7.87	10.45	13.37	15	15	15
1500	1.36	2.35	3.58	5.04	7.61	10.1	12.93	15	15	15
1550	1.31	2.28	3.47	4.88	7.36	9.77	12.51	15	15	15
1600	1.27	2.21	3.36	4.73	7.13	9.47	12.12	15	15	15
1650	1.23	2.14	3.26	4.58	6.92	9.18	11.75	15	15	15
1700	1.2	2.08	3.16	4.45	6.71	8.91	11.41	15	15	15
1750	1.16	2.02	3.07	4.32	6.52	8.66	11.08	14.89	15	15
1800	1.13	1.96	2.99	4.2	6.34	8.42	10.77	14.48	15	15
1850	1.1	1.91	2.91	4.09	6.17	8.19	10.48	14.09	15	15
1900	1.07	1.86	2.83	3.98	6.01	7.97	10.2	13.72	15	15
1950	1.04	1.81	2.76	3.88	5.85	7.77	9.94	13.37	15	15
2000	1.02	1.77	2.69	3.78	5.71	7.58	9.69	13.03	15	15
2050	0.99	1.72	2.62	3.69	5.57	7.39	9.46	12.71	15	15
2100	0.97	1.68	2.56	3.6	5.44	7.21	9.23	12.41	15	15
2150	0.95	1.64	2.5	3.52	5.31	7.05	9.02	12.12	15	15
2200	0.92	1.61	2.44	3.44	5.19	6.89	8.81	11.85	15	15
2250	0.9	1.57	2.39	3.36	5.07	6.73	8.62	11.58	15	15
2300	0.88	1.54	2.34	3.29	4.96	6.59	8.43	11.33	15	15
2350	0.87	1.5	2.29	3.22	4.86	6.45	8.25	11.09	15	15
2400	0.85	1.47	2.24	3.15	4.76	6.31	8.08	10.86	14.8	15
2450	0.83	1.44	2.19	3.09	4.66	6.18	7.91	10.64	14.49	15
2500	0.81	1.41	2.15	3.02	4.57	6.06	7.76	10.43	14.2	15
2550	0.8	1.38	2.11	2.97	4.48	5.94	7.6	10.22	13.93	15
2600	0.78	1.36	2.07	2.91	4.39	5.83	7.46	10.02	13.66	15
2650	0.77	1.33	2.03	2.85	4.31	5.72	7.32	9.84	13.4	15
2700	0.75	1.31	1.99	2.8	4.23	5.61	7.18	9.65	13.15	15

Contd.

2750	0.74	1.28	1.95	2.75	4.15	5.51	7.05	9.48	12.91	15
2800	0.73	1.26	1.92	2.7	4.08	5.41	6.92	9.31	12.68	15
2850	0.71	1.24	1.89	2.65	4.01	5.32	6.8	9.15	12.46	15
2900	0.7	1.22	1.85	2.61	3.94	5.22	6.69	8.99	12.25	15
2950	0.69	1.2	1.82	2.56	3.87	5.14	6.57	8.84	12.04	15
3000	0.68	1.18	1.79	2.52	3.81	5.05	6.46	8.69	11.84	15
3050	0.67	1.16	1.76	2.48	3.74	4.97	6.36	8.55	11.64	15
3100	0.66	1.14	1.73	2.44	3.68	4.89	6.25	8.41	11.46	15
3150	0.65	1.12	1.71	2.4	3.62	4.81	6.16	8.27	11.27	15
3200	0.64	1.1	1.68	2.36	3.57	4.73	6.06	8.15	11.1	15
3250	0.63	1.09	1.65	2.33	3.51	4.66	5.97	8.02	10.93	15
3300	0.62	1.07	1.63	2.29	3.46	4.59	5.88	7.9	10.76	15
3350	0.61	1.05	1.6	2.26	3.41	4.52	5.79	7.78	10.6	15
3400	0.6	1.04	1.58	2.22	3.36	4.46	5.7	7.67	10.44	15
3450	0.59	1.02	1.56	2.19	3.31	4.39	5.62	7.56	10.29	15
3500	0.58	1.01	1.54	2.16	3.26	4.33	5.54	7.45	10.15	15
3550	0.57	0.99	1.51	2.13	3.22	4.27	5.46	7.34	10	14.93
3600	0.56	0.98	1.49	2.1	3.17	4.21	5.39	7.24	9.86	14.72
3650	0.56	0.97	1.47	2.07	3.13	4.15	5.31	7.14	9.73	14.52
3700	0.55	0.95	1.45	2.04	3.09	4.09	5.24	7.04	9.6	14.32
3750	0.54	0.94	1.43	2.02	3.04	4.04	5.17	6.95	9.47	14.13
3800	0.54	0.93	1.41	1.99	3	3.99	5.1	6.86	9.35	13.94
3850	0.53	0.92	1.4	1.96	2.97	3.94	5.04	6.77	9.22	13.76
3900	0.52	0.91	1.38	1.94	2.93	3.88	4.97	6.68	9.11	13.59
3950	0.51	0.89	1.36	1.91	2.89	3.84	4.91	6.6	8.99	13.41
4000	0.51	0.88	1.34	1.89	2.85	3.79	4.85	6.52	8.88	13.25
4050	0.5	0.87	1.33	1.87	2.82	3.74	4.79	6.44	8.77	13.08
4100	0.5	0.86	1.31	1.84	2.78	3.7	4.73	6.36	8.66	12.92
4150	0.49	0.85	1.3	1.82	2.75	3.65	4.67	6.28	8.56	12.77
4200	0.48	0.84	1.28	1.8	2.72	3.61	4.62	6.21	8.46	12.62
4250	0.48	0.83	1.26	1.78	2.69	3.56	4.56	6.13	8.36	12.47
4300	0.47	0.82	1.25	1.76	2.65	3.52	4.51	6.06	8.26	12.32
4350	0.47	0.81	1.24	1.74	2.62	3.48	4.46	5.99	8.16	12.18
4400	0.46	0.8	1.22	1.72	2.59	3.44	4.41	5.92	8.07	12.04
4450	0.46	0.79	1.21	1.7	2.57	3.4	4.36	5.86	7.98	11.91
4500	0.45	0.78	1.19	1.68	2.54	3.37	4.31	5.79	7.89	11.78
4550	0.45	0.78	1.18	1.66	2.51	3.33	4.26	5.73	7.8	11.65
4600	0.44	0.77	1.17	1.64	2.48	3.29	4.22	5.67	7.72	11.52
4650	0.44	0.76	1.16	1.63	2.45	3.26	4.17	5.61	7.64	11.4
4700	0.43	0.75	1.14	1.61	2.43	3.22	4.13	5.55	7.56	11.27
4750	0.43	0.74	1.13	1.59	2.4	3.19	4.08	5.49	7.48	11.16
4800	0.42	0.74	1.12	1.58	2.38	3.16	4.04	5.43	7.4	11.04
4850	0.42	0.73	1.11	1.56	2.35	3.12	4	5.37	7.32	10.93
4900	0.41	0.72	1.1	1.54	2.33	3.09	3.96	5.32	7.25	10.81
4950	0.41	0.71	1.09	1.53	2.31	3.06	3.92	5.27	7.17	10.7
5000	0.41	0.71	1.08	1.51	2.28	3.03	3.88	5.21	7.1	10.6

Fig 6.5 : Heat Strengthened Glass Fixed on Four Sides.

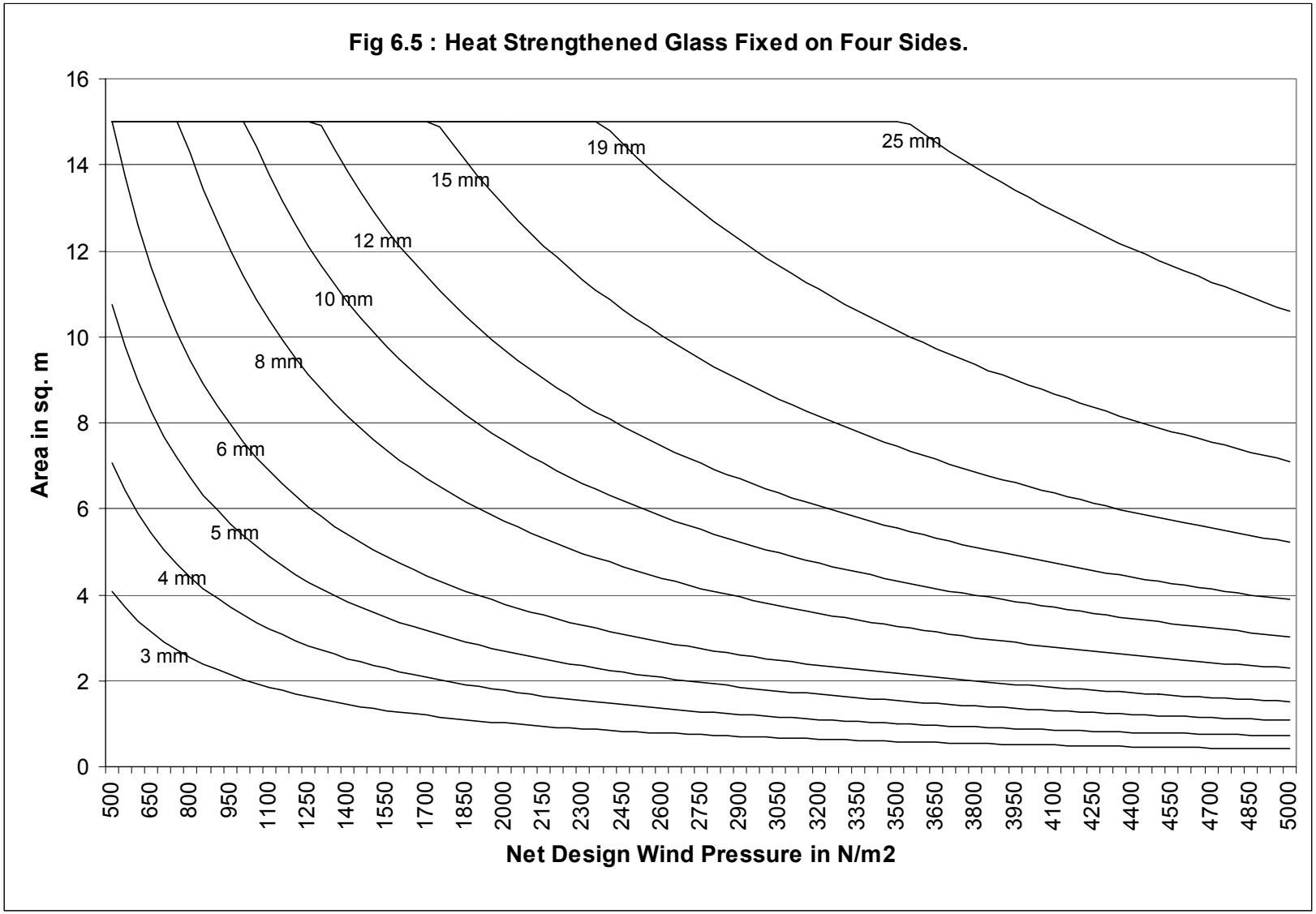


Table 6.10 : Maximum Span (m) for Normal Glass Fixed on two opposite sides.

Design Wind Pr. (N/m^2)	Standard Nominal Thickness of glass in mm									
	3.0	**4.0**	**5.0**	**6.0**	**8.0**	**10.0**	**12.0**	**15.0**	**19.0**	**25.0**
500	0.59	0.78	0.98	1.18	1.51	1.89	2.26	2.83	3.59	4.00
550	0.56	0.75	0.93	1.12	1.44	1.8	2.16	2.7	3.42	4.00
600	0.54	0.72	0.89	1.07	1.38	1.72	2.07	2.58	3.27	4.00
650	0.52	0.69	0.86	1.03	1.32	1.66	1.99	2.48	3.14	4.00
700	0.50	0.66	0.83	0.99	1.28	1.6	1.91	2.39	3.03	3.99
750	0.48	0.64	0.80	0.96	1.23	1.54	1.85	2.31	2.93	3.85
800	0.46	0.62	0.77	0.93	1.19	1.49	1.79	2.24	2.83	3.73
850	0.45	0.60	0.75	0.90	1.16	1.45	1.74	2.17	2.75	3.62
900	0.44	0.58	0.73	0.88	1.13	1.41	1.69	2.11	2.67	3.52
950	0.43	0.57	0.71	0.85	1.10	1.37	1.64	2.05	2.6	3.42
1000	0.42	0.55	0.69	0.83	1.07	1.33	1.6	2	2.54	3.34
1050	0.41	0.54	0.68	0.81	1.04	1.3	1.56	1.95	2.47	3.26
1100	0.40	0.53	0.66	0.79	1.02	1.27	1.53	1.91	2.42	3.18
1150	0.39	0.52	0.65	0.77	1.00	1.24	1.49	1.87	2.36	3.11
1200	0.38	0.51	0.63	0.76	0.97	1.22	1.46	1.83	2.31	3.05
1250	0.37	0.5	0.62	0.74	0.95	1.19	1.43	1.79	2.27	2.98
1300	0.36	0.49	0.61	0.73	0.94	1.17	1.4	1.76	2.22	2.93
1350	0.36	0.48	0.6	0.72	0.92	1.15	1.38	1.72	2.18	2.87
1400	0.35	0.47	0.59	0.7	0.9	1.13	1.35	1.69	2.14	2.82
1450	0.35	0.46	0.58	0.69	0.89	1.11	1.33	1.66	2.11	2.77
1500	0.34	0.45	0.57	0.68	0.87	1.09	1.31	1.63	2.07	2.72
1550	0.33	0.45	0.56	0.67	0.86	1.07	1.29	1.61	2.04	2.68
1600	0.33	0.44	0.55	0.66	0.84	1.05	1.27	1.58	2	2.64
1650	0.32	0.43	0.54	0.65	0.83	1.04	1.25	1.56	1.97	2.6
1700	0.32	0.42	0.53	0.64	0.82	1.02	1.23	1.54	1.94	2.56
1750	0.31	0.42	0.52	0.63	0.81	1.01	1.21	1.51	1.92	2.52
1800	0.31	0.41	0.52	0.62	0.8	0.99	1.19	1.49	1.89	2.49
1850	0.31	0.41	0.51	0.61	0.78	0.98	1.18	1.47	1.86	2.45
1900	0.3	0.4	0.5	0.6	0.77	0.97	1.16	1.45	1.84	2.42
1950	0.3	0.4	0.5	0.6	0.76	0.96	1.15	1.43	1.82	2.39
2000	0.29	0.39	0.49	0.59	0.75	0.94	1.13	1.42	1.79	2.36
2050	0.29	0.39	0.48	0.58	0.75	0.93	1.12	1.4	1.77	2.33
2100	0.29	0.38	0.48	0.57	0.74	0.92	1.11	1.38	1.75	2.3
2150	0.28	0.38	0.47	0.57	0.73	0.91	1.09	1.37	1.73	2.28
2200	0.28	0.37	0.47	0.56	0.72	0.9	1.08	1.35	1.71	2.25
2250	0.28	0.37	0.46	0.55	0.71	0.89	1.07	1.33	1.69	2.22
2300	0.27	0.37	0.46	0.55	0.7	0.88	1.06	1.32	1.67	2.2
2350	0.27	0.36	0.45	0.54	0.7	0.87	1.04	1.31	1.65	2.18
2400	0.27	0.36	0.45	0.54	0.69	0.86	1.03	1.29	1.64	2.15
2450	0.27	0.35	0.44	0.53	0.68	0.85	1.02	1.28	1.62	2.13
2500	0.26	0.35	0.44	0.53	0.68	0.84	1.01	1.27	1.6	2.11
2550	0.26	0.35	0.43	0.52	0.67	0.84	1	1.25	1.59	2.09
2600	0.26	0.34	0.43	0.52	0.66	0.83	0.99	1.24	1.57	2.07
2650	0.26	0.34	0.43	0.51	0.66	0.82	0.98	1.23	1.56	2.05
2700	0.25	0.34	0.42	0.51	0.65	0.81	0.97	1.22	1.54	2.03
2750	0.25	0.33	0.42	0.5	0.64	0.8	0.97	1.21	1.53	2.01

Contd.

	3.0	4.0	5.0	6.0	8.0	10.0	12.0	15.0	19.0	25.0
2800	0.25	0.33	0.41	0.5	0.64	0.8	0.96	1.2	1.52	1.99
2850	0.25	0.33	0.41	0.49	0.63	0.79	0.95	1.19	1.5	1.98
2900	0.24	0.33	0.41	0.49	0.63	0.78	0.94	1.18	1.49	1.96
2950	0.24	0.32	0.4	0.48	0.62	0.78	0.93	1.17	1.48	1.94
3000	0.24	0.32	0.4	0.48	0.62	0.77	0.92	1.16	1.46	1.93
3050	0.24	0.32	0.4	0.48	0.61	0.76	0.92	1.15	1.45	1.91
3100	0.24	0.31	0.39	0.47	0.61	0.76	0.91	1.14	1.44	1.89
3150	0.23	0.31	0.39	0.47	0.6	0.75	0.9	1.13	1.43	1.88
3200	0.23	0.31	0.39	0.46	0.6	0.75	0.9	1.12	1.42	1.86
3250	0.23	0.31	0.38	0.46	0.59	0.74	0.89	1.11	1.41	1.85
3300	0.23	0.3	0.38	0.46	0.59	0.73	0.88	1.1	1.4	1.84
3350	0.23	0.3	0.38	0.45	0.58	0.73	0.87	1.09	1.39	1.82
3400	0.23	0.3	0.38	0.45	0.58	0.72	0.87	1.09	1.38	1.81
3450	0.22	0.3	0.37	0.45	0.57	0.72	0.86	1.08	1.37	1.8
3500	0.22	0.3	0.37	0.44	0.57	0.71	0.86	1.07	1.36	1.78
3550	0.22	0.29	0.37	0.44	0.57	0.71	0.85	1.06	1.35	1.77
3600	0.22	0.29	0.37	0.44	0.56	0.7	0.84	1.05	1.34	1.76
3650	0.22	0.29	0.36	0.43	0.56	0.7	0.84	1.05	1.33	1.75
3700	0.22	0.29	0.36	0.43	0.56	0.69	0.83	1.04	1.32	1.73
3750	0.21	0.29	0.36	0.43	0.55	0.69	0.83	1.03	1.31	1.72
3800	0.21	0.28	0.36	0.43	0.55	0.68	0.82	1.03	1.3	1.71
3850	0.21	0.28	0.35	0.42	0.54	0.68	0.82	1.02	1.29	1.7
3900	0.21	0.28	0.35	0.42	0.54	0.68	0.81	1.01	1.28	1.69
3950	0.21	0.28	0.35	0.42	0.54	0.67	0.81	1.01	1.28	1.68
4000	0.21	0.28	0.35	0.42	0.53	0.67	0.8	1	1.27	1.67
4050	0.21	0.28	0.34	0.41	0.53	0.66	0.8	0.99	1.26	1.66
4100	0.21	0.27	0.34	0.41	0.53	0.66	0.79	0.99	1.25	1.65
4150	0.2	0.27	0.34	0.41	0.52	0.66	0.79	0.98	1.24	1.64
4200	0.2	0.27	0.34	0.41	0.52	0.65	0.78	0.98	1.24	1.63
4250	0.2	0.27	0.34	0.4	0.52	0.65	0.78	0.97	1.23	1.62
4300	0.2	0.27	0.33	0.4	0.51	0.64	0.77	0.97	1.22	1.61
4350	0.2	0.27	0.33	0.4	0.51	0.64	0.77	0.96	1.22	1.6
4400	0.2	0.26	0.33	0.4	0.51	0.64	0.76	0.95	1.21	1.59
4450	0.2	0.26	0.33	0.39	0.51	0.63	0.76	0.95	1.2	1.58
4500	0.2	0.26	0.33	0.39	0.5	0.63	0.75	0.94	1.2	1.57
4550	0.19	0.26	0.32	0.39	0.5	0.63	0.75	0.94	1.19	1.56
4600	0.19	0.26	0.32	0.39	0.5	0.62	0.75	0.93	1.18	1.56
4650	0.19	0.26	0.32	0.39	0.5	0.62	0.74	0.93	1.18	1.55
4700	0.19	0.26	0.32	0.38	0.49	0.62	0.74	0.92	1.17	1.54
4750	0.19	0.25	0.32	0.38	0.49	0.61	0.73	0.92	1.16	1.53
4800	0.19	0.25	0.32	0.38	0.49	0.61	0.73	0.91	1.16	1.52
4850	0.19	0.25	0.31	0.38	0.48	0.61	0.73	0.91	1.15	1.51
4900	0.19	0.25	0.31	0.38	0.48	0.6	0.72	0.9	1.15	1.51
4950	0.19	0.25	0.31	0.37	0.48	0.6	0.72	0.9	1.14	1.5
5000	0.19	0.25	0.31	0.37	0.48	0.6	0.72	0.9	1.13	1.49

Fig. 6.6: Normal Glass Fixed on Two Opposite sides.

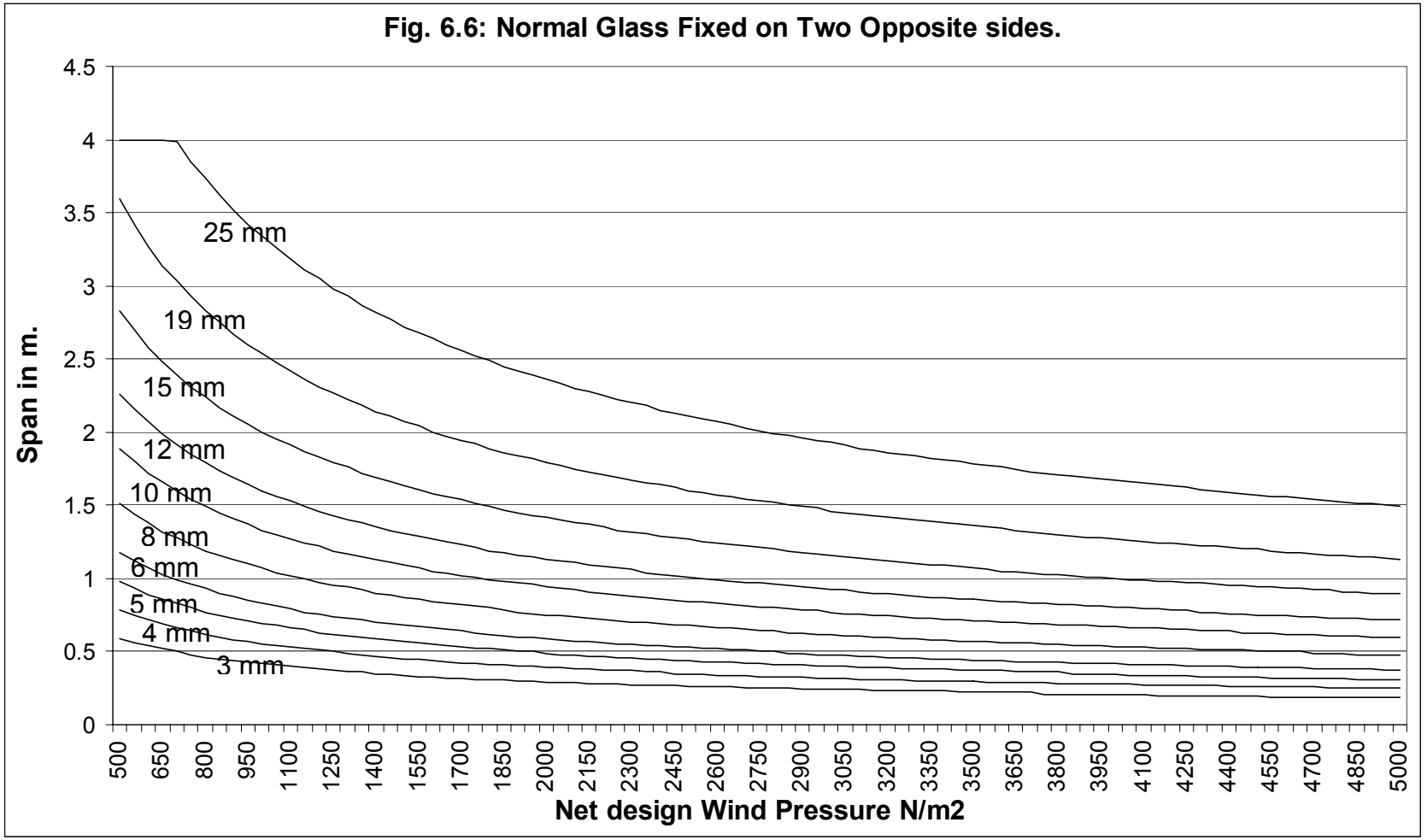


Table 6.11 : Maximum Span (m) for Laminated Glass Fixed on two opposite sides.

Design Wind Pressure (N/m^2)	Standard Nominal Thickness of glass in mm					
	5.38	**6.38**	**8.38**	**10.38**	**12.38**	**16.38**
500	0.88	1.05	1.35	1.69	2.03	2.53
550	0.84	1.00	1.29	1.61	1.93	2.41
600	0.80	0.96	1.23	1.54	1.85	2.31
650	0.77	0.92	1.18	1.48	1.78	2.22
700	0.74	0.89	1.14	1.43	1.71	2.14
750	0.72	0.86	1.10	1.38	1.65	2.07
800	0.69	0.83	1.07	1.33	1.60	2.00
850	0.67	0.81	1.04	1.29	1.55	1.94
900	0.65	0.78	1.01	1.26	1.51	1.89
950	0.64	0.76	0.98	1.22	1.47	1.84
1000	0.62	0.74	0.95	1.19	1.43	1.79
1050	0.60	0.73	0.93	1.16	1.40	1.75
1100	0.59	0.71	0.91	1.14	1.37	1.71
1150	0.58	0.69	0.89	1.11	1.34	1.67
1200	0.57	0.68	0.87	1.09	1.31	1.63
1250	0.55	0.66	0.85	1.07	1.28	1.60
1300	0.54	0.65	0.84	1.05	1.26	1.57
1350	0.53	0.64	0.82	1.03	1.23	1.54
1400	0.52	0.63	0.81	1.01	1.21	1.51
1450	0.51	0.62	0.79	0.99	1.19	1.49
1500	0.51	0.61	0.78	0.97	1.17	1.46
1550	0.50	0.60	0.77	0.96	1.15	1.44
1600	0.49	0.59	0.75	0.94	1.13	1.42
1650	0.48	0.58	0.74	0.93	1.12	1.39
1700	0.48	0.57	0.73	0.92	1.10	1.37
1750	0.47	0.56	0.72	0.9	1.08	1.35
1800	0.46	0.55	0.71	0.89	1.07	1.33
1850	0.46	0.55	0.70	0.88	1.05	1.32
1900	0.45	0.54	0.69	0.87	1.04	1.30
1950	0.44	0.53	0.68	0.85	1.03	1.28
2000	0.44	0.53	0.68	0.84	1.01	1.27
2050	0.43	0.52	0.67	0.83	1.00	1.25
2100	0.43	0.51	0.66	0.82	0.99	1.24
2150	0.42	0.51	0.65	0.81	0.98	1.22
2200	0.42	0.50	0.64	0.80	0.97	1.21
2250	0.41	0.50	0.64	0.80	0.95	1.19
2300	0.41	0.49	0.63	0.79	0.94	1.18
2350	0.40	0.48	0.62	0.78	0.93	1.17
2400	0.40	0.48	0.62	0.77	0.92	1.16
2450	0.40	0.47	0.61	0.76	0.92	1.14
2500	0.39	0.47	0.60	0.75	0.91	1.13
2550	0.39	0.47	0.60	0.75	0.90	1.12
2600	0.38	0.46	0.59	0.74	0.89	1.11
2650	0.38	0.46	0.59	0.73	0.88	1.10
2700	0.38	0.45	0.58	0.73	0.87	1.09

Contd.

	5.38	6.38	8.38	10.38	12.38	16.38
2750	0.37	0.45	0.58	0.72	0.86	1.08
2800	0.37	0.44	0.57	0.71	0.86	1.07
2850	0.37	0.44	0.57	0.71	0.85	1.06
2900	0.36	0.44	0.56	0.7	0.84	1.05
2950	0.36	0.43	0.56	0.69	0.83	1.04
3000	0.36	0.43	0.55	0.69	0.83	1.03
3050	0.35	0.43	0.55	0.68	0.82	1.03
3100	0.35	0.42	0.54	0.68	0.81	1.02
3150	0.35	0.42	0.54	0.67	0.81	1.01
3200	0.35	0.42	0.53	0.67	0.80	1.00
3250	0.34	0.41	0.53	0.66	0.79	0.99
3300	0.34	0.41	0.53	0.66	0.79	0.99
3350	0.34	0.41	0.52	0.65	0.78	0.98
3400	0.34	0.40	0.52	0.65	0.78	0.97
3450	0.33	0.40	0.51	0.64	0.77	0.96
3500	0.33	0.40	0.51	0.64	0.77	0.96
3550	0.33	0.39	0.51	0.63	0.76	0.95
3600	0.33	0.39	0.50	0.63	0.75	0.94
3650	0.32	0.39	0.50	0.62	0.75	0.94
3700	0.32	0.39	0.50	0.62	0.74	0.93
3750	0.32	0.38	0.49	0.62	0.74	0.92
3800	0.32	0.38	0.49	0.61	0.73	0.92
3850	0.32	0.38	0.49	0.61	0.73	0.91
3900	0.31	0.38	0.48	0.6	0.73	0.91
3950	0.31	0.37	0.48	0.6	0.72	0.90
4000	0.31	0.37	0.48	0.6	0.72	0.90
4050	0.31	0.37	0.47	0.59	0.71	0.89
4100	0.31	0.37	0.47	0.59	0.71	0.88
4150	0.30	0.36	0.47	0.59	0.70	0.88
4200	0.30	0.36	0.47	0.58	0.70	0.87
4250	0.30	0.36	0.46	0.58	0.69	0.87
4300	0.30	0.36	0.46	0.58	0.69	0.86
4350	0.30	0.36	0.46	0.57	0.69	0.86
4400	0.30	0.35	0.46	0.57	0.68	0.85
4450	0.29	0.35	0.45	0.57	0.68	0.85
4500	0.29	0.35	0.45	0.56	0.68	0.84
4550	0.29	0.35	0.45	0.56	0.67	0.84
4600	0.29	0.35	0.45	0.56	0.67	0.83
4650	0.29	0.34	0.44	0.55	0.66	0.83
4700	0.29	0.34	0.44	0.55	0.66	0.83
4750	0.28	0.34	0.44	0.55	0.66	0.82
4800	0.28	0.34	0.44	0.54	0.65	0.82
4850	0.28	0.34	0.43	0.54	0.65	0.81
4900	0.28	0.34	0.43	0.54	0.65	0.81
4950	0.28	0.33	0.43	0.54	0.64	0.80
5000	0.28	0.33	0.43	0.53	0.64	0.80

Fig 6.7 : Laminated Glass Fixed on Two Opposite Sides.

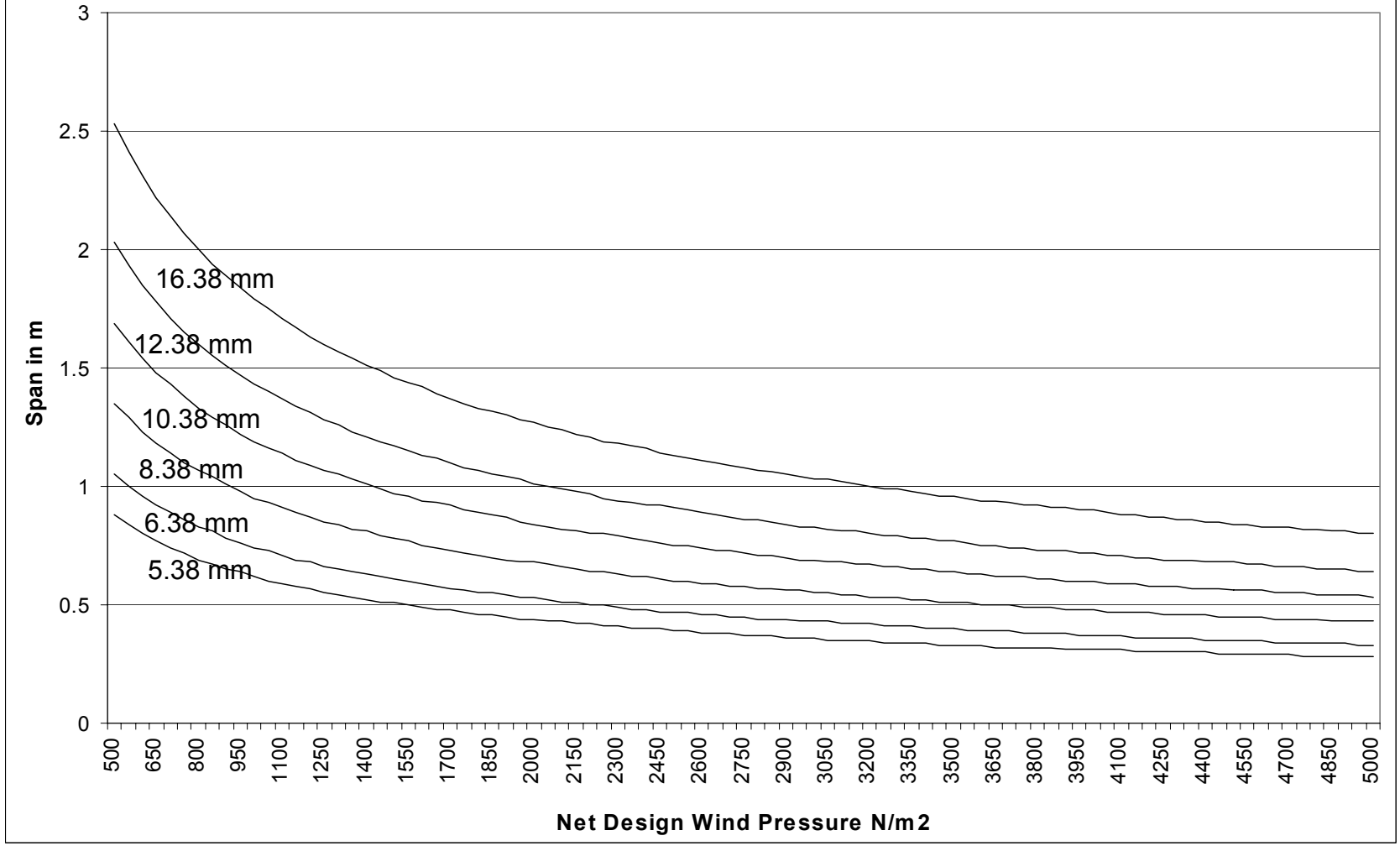


Table 6.12: Maximum Span (m) for Tempered Glass Fixed on two opposite sides.

Design Wind Pressure (N/m^2)	Standard Nominal Thickness of glass in mm									
	3.0	**4.0**	**5.0**	**6.0**	**8.0**	**10.0**	**12.0**	**15.0**	**19.0**	**25.0**
500	0.69	0.92	1.16	1.39	1.84	2.3	2.76	3.45	4.00	4.00
550	0.66	0.88	1.1	1.32	1.75	2.19	2.63	3.29	4.00	4.00
600	0.63	0.84	1.05	1.27	1.68	2.10	2.52	3.15	3.99	4.00
650	0.61	0.81	1.01	1.22	1.61	2.02	2.42	3.02	3.83	4.00
700	0.59	0.78	0.98	1.17	1.55	1.94	2.33	2.91	3.69	4.00
750	0.57	0.75	0.94	1.13	1.50	1.88	2.25	2.81	3.57	4.00
800	0.55	0.73	0.91	1.10	1.45	1.82	2.18	2.73	3.45	4.00
850	0.53	0.71	0.89	1.06	1.41	1.76	2.12	2.64	3.35	4.00
900	0.52	0.69	0.86	1.03	1.37	1.71	2.06	2.57	3.25	4.00
950	0.50	0.67	0.84	1.01	1.33	1.67	2.00	2.50	3.17	4.00
1000	0.49	0.65	0.82	0.98	1.30	1.63	1.95	2.44	3.09	4.00
1050	0.48	0.64	0.80	0.96	1.27	1.59	1.90	2.38	3.01	3.96
1100	0.47	0.62	0.78	0.94	1.24	1.55	1.86	2.32	2.94	3.87
1150	0.46	0.61	0.76	0.91	1.21	1.52	1.82	2.27	2.88	3.79
1200	0.45	0.60	0.75	0.90	1.19	1.48	1.78	2.23	2.82	3.71
1250	0.44	0.58	0.73	0.88	1.16	1.45	1.74	2.18	2.76	3.63
1300	0.43	0.57	0.72	0.86	1.14	1.43	1.71	2.14	2.71	3.56
1350	0.42	0.56	0.70	0.84	1.12	1.40	1.68	2.10	2.66	3.50
1400	0.41	0.55	0.69	0.83	1.10	1.37	1.65	2.06	2.61	3.43
1450	0.41	0.54	0.68	0.81	1.08	1.35	1.62	2.02	2.56	3.37
1500	0.40	0.53	0.67	0.80	1.06	1.33	1.59	1.99	2.52	3.32
1550	0.39	0.53	0.66	0.79	1.04	1.31	1.57	1.96	2.48	3.26
1600	0.39	0.52	0.65	0.78	1.03	1.28	1.54	1.93	2.44	3.21
1650	0.38	0.51	0.64	0.76	1.01	1.27	1.52	1.90	2.40	3.16
1700	0.38	0.50	0.63	0.75	1.00	1.25	1.50	1.87	2.37	3.12
1750	0.37	0.49	0.62	0.74	0.98	1.23	1.47	1.84	2.33	3.07
1800	0.37	0.49	0.61	0.73	0.97	1.21	1.45	1.82	2.30	3.03
1850	0.36	0.48	0.60	0.72	0.96	1.19	1.43	1.79	2.27	2.99
1900	0.36	0.47	0.59	0.71	0.94	1.18	1.41	1.77	2.24	2.95
1950	0.35	0.47	0.59	0.70	0.93	1.16	1.40	1.75	2.21	2.91
2000	0.35	0.46	0.58	0.69	0.92	1.15	1.38	1.72	2.18	2.87
2050	0.34	0.46	0.57	0.68	0.91	1.13	1.36	1.70	2.16	2.84
2100	0.34	0.45	0.56	0.68	0.90	1.12	1.35	1.68	2.13	2.80
2150	0.33	0.45	0.56	0.67	0.89	1.11	1.33	1.66	2.11	2.77
2200	0.33	0.44	0.55	0.66	0.88	1.10	1.31	1.64	2.08	2.74
2250	0.33	0.44	0.54	0.65	0.87	1.08	1.30	1.63	2.06	2.71
2300	0.32	0.43	0.54	0.65	0.86	1.07	1.29	1.61	2.04	2.68
2350	0.32	0.43	0.53	0.64	0.85	1.06	1.27	1.59	2.01	2.65
2400	0.32	0.42	0.53	0.63	0.84	1.05	1.26	1.57	1.99	2.62
2450	0.31	0.42	0.52	0.63	0.83	1.04	1.25	1.56	1.97	2.60
2500	0.31	0.41	0.52	0.62	0.82	1.03	1.23	1.54	1.95	2.57
2550	0.31	0.41	0.51	0.61	0.81	1.02	1.22	1.53	1.93	2.54
2600	0.30	0.41	0.51	0.61	0.81	1.01	1.21	1.51	1.91	2.52
2650	0.30	0.40	0.50	0.60	0.80	1.00	1.20	1.50	1.90	2.50
2700	0.30	0.40	0.50	0.60	0.79	0.99	1.19	1.48	1.88	2.47

Contd.

	3.0	4.0	5.0	6.0	8.0	10.0	12.0	15.0	19.0	25.0
2750	0.30	0.39	0.49	0.59	0.78	0.98	1.18	1.47	1.86	2.45
2800	0.29	0.39	0.49	0.59	0.78	0.97	1.17	1.46	1.85	2.43
2850	0.29	0.39	0.48	0.58	0.77	0.96	1.16	1.44	1.83	2.41
2900	0.29	0.38	0.48	0.58	0.76	0.95	1.15	1.43	1.81	2.39
2950	0.29	0.38	0.48	0.57	0.76	0.95	1.14	1.42	1.8	2.37
3000	0.28	0.38	0.47	0.57	0.75	0.94	1.13	1.41	1.78	2.35
3050	0.28	0.37	0.47	0.56	0.74	0.93	1.12	1.40	1.77	2.33
3100	0.28	0.37	0.46	0.56	0.74	0.92	1.11	1.38	1.75	2.31
3150	0.28	0.37	0.46	0.55	0.73	0.92	1.1	1.37	1.74	2.29
3200	0.27	0.37	0.46	0.55	0.73	0.91	1.09	1.36	1.73	2.27
3250	0.27	0.36	0.45	0.54	0.72	0.9	1.08	1.35	1.71	2.25
3300	0.27	0.36	0.45	0.54	0.72	0.89	1.07	1.34	1.7	2.24
3350	0.27	0.36	0.45	0.54	0.71	0.89	1.07	1.33	1.69	2.22
3400	0.27	0.35	0.44	0.53	0.71	0.88	1.06	1.32	1.67	2.20
3450	0.26	0.35	0.44	0.53	0.70	0.87	1.05	1.31	1.66	2.19
3500	0.26	0.35	0.44	0.52	0.69	0.87	1.04	1.30	1.65	2.17
3550	0.26	0.35	0.43	0.52	0.69	0.86	1.03	1.29	1.64	2.16
3600	0.26	0.34	0.43	0.52	0.69	0.86	1.03	1.28	1.63	2.14
3650	0.26	0.34	0.43	0.51	0.68	0.85	1.02	1.28	1.62	2.13
3700	0.25	0.34	0.42	0.51	0.68	0.84	1.01	1.27	1.61	2.11
3750	0.25	0.34	0.42	0.51	0.67	0.84	1.01	1.26	1.59	2.1
3800	0.25	0.34	0.42	0.50	0.67	0.83	1.00	1.25	1.58	2.08
3850	0.25	0.33	0.42	0.50	0.66	0.83	0.99	1.24	1.57	2.07
3900	0.25	0.33	0.41	0.50	0.66	0.82	0.99	1.23	1.56	2.06
3950	0.25	0.33	0.41	0.49	0.65	0.82	0.98	1.23	1.55	2.04
4000	0.25	0.33	0.41	0.49	0.65	0.81	0.98	1.22	1.54	2.03
4050	0.24	0.32	0.41	0.49	0.65	0.81	0.97	1.21	1.53	2.02
4100	0.24	0.32	0.40	0.48	0.64	0.80	0.96	1.20	1.52	2.01
4150	0.24	0.32	0.40	0.48	0.64	0.80	0.96	1.20	1.52	1.99
4200	0.24	0.32	0.40	0.48	0.63	0.79	0.95	1.19	1.51	1.98
4250	0.24	0.32	0.40	0.48	0.63	0.79	0.95	1.18	1.5	1.97
4300	0.24	0.32	0.39	0.47	0.63	0.78	0.94	1.18	1.49	1.96
4350	0.24	0.31	0.39	0.47	0.62	0.78	0.93	1.17	1.48	1.95
4400	0.23	0.31	0.39	0.47	0.62	0.77	0.93	1.16	1.47	1.94
4450	0.23	0.31	0.39	0.46	0.62	0.77	0.92	1.16	1.46	1.93
4500	0.23	0.31	0.39	0.46	0.61	0.77	0.92	1.15	1.46	1.92
4550	0.23	0.31	0.38	0.46	0.61	0.76	0.91	1.14	1.45	1.90
4600	0.23	0.30	0.38	0.46	0.61	0.76	0.91	1.14	1.44	1.89
4650	0.23	0.30	0.38	0.45	0.60	0.75	0.90	1.13	1.43	1.88
4700	0.23	0.30	0.38	0.45	0.60	0.75	0.90	1.12	1.42	1.87
4750	0.22	0.30	0.37	0.45	0.60	0.75	0.89	1.12	1.42	1.86
4800	0.22	0.30	0.37	0.45	0.59	0.74	0.89	1.11	1.41	1.85
4850	0.22	0.30	0.37	0.45	0.59	0.74	0.89	1.11	1.40	1.84
4900	0.22	0.30	0.37	0.44	0.59	0.73	0.88	1.10	1.39	1.84
4950	0.22	0.29	0.37	0.44	0.58	0.73	0.88	1.10	1.39	1.83
5000	0.22	0.29	0.37	0.44	0.58	0.73	0.87	1.09	1.38	1.82

Fig 6.8: Tempered Glass Supported on Two Opposites Sides

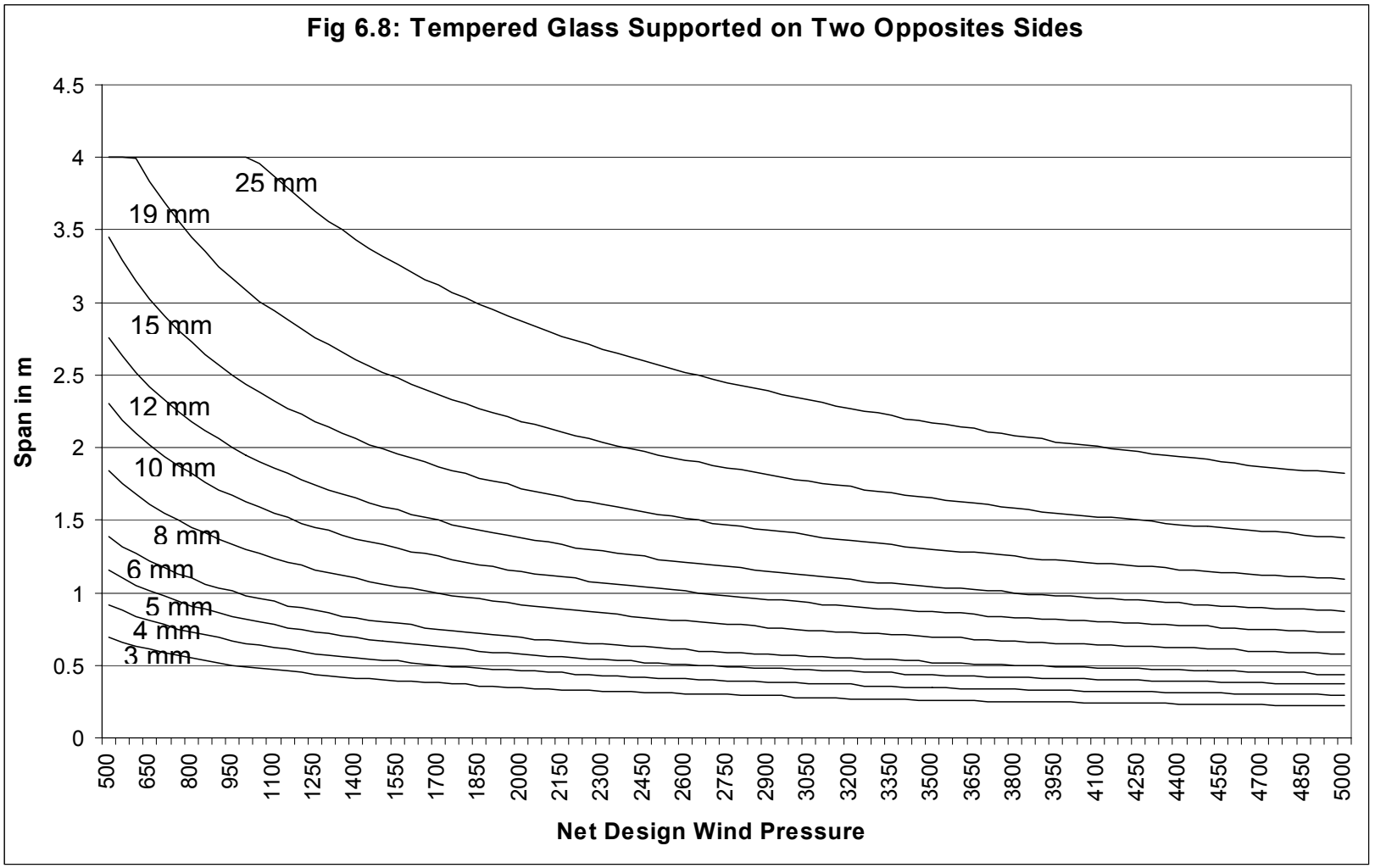


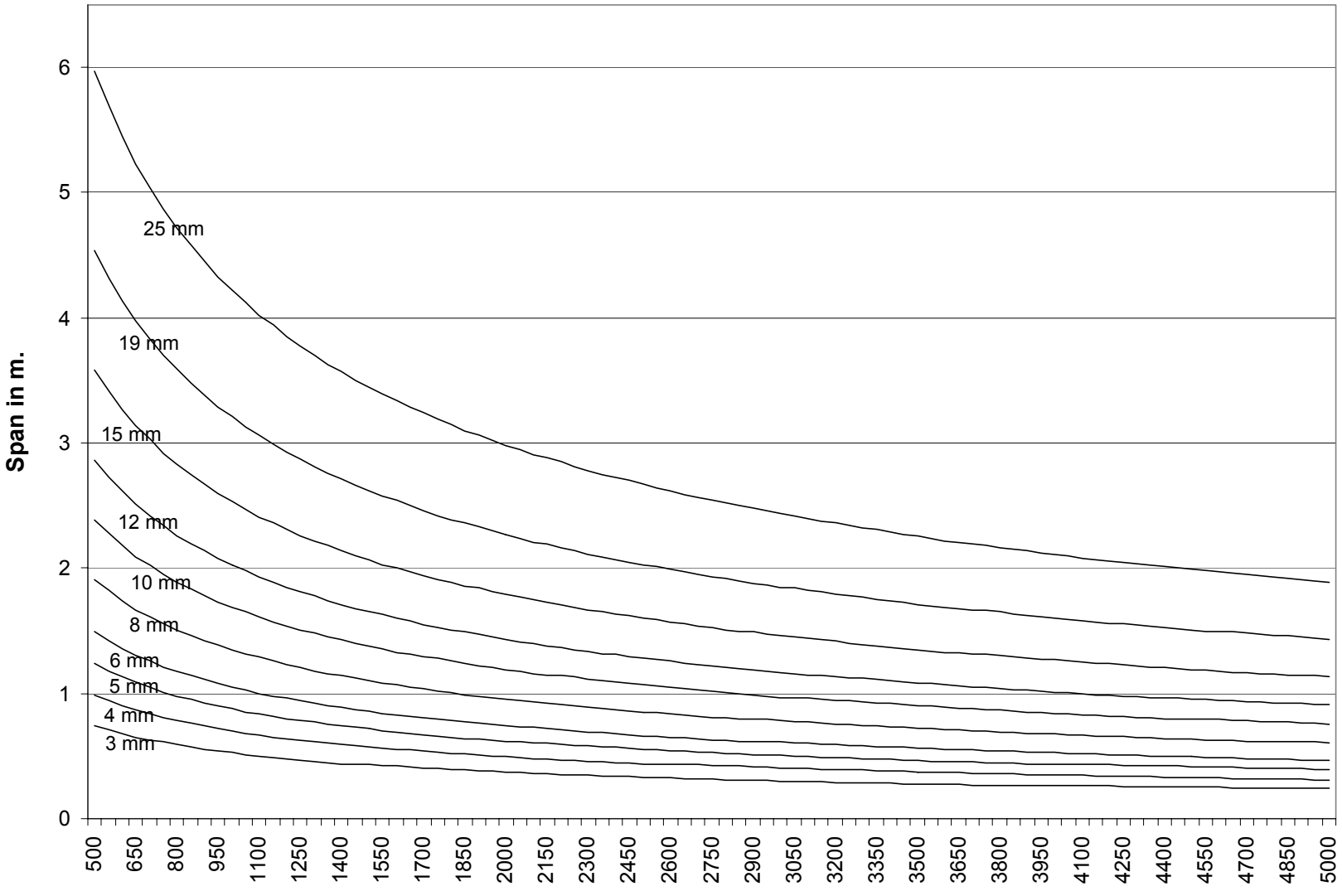
Table 6.13: Maximum Span (m) for Heat Strengthened Glass Fixed on two opposite sides.

Thickness	3	4	5	6	8	10	12	15	19	25
500	0.74	0.99	1.24	1.49	1.91	2.39	2.86	3.58	4.54	5.97
550	0.71	0.94	1.18	1.42	1.82	2.28	2.73	3.41	4.32	5.69
600	0.68	0.9	1.13	1.36	1.74	2.18	2.62	3.27	4.14	5.45
650	0.65	0.87	1.09	1.3	1.67	2.09	2.51	3.14	3.98	5.23
700	0.63	0.84	1.05	1.26	1.61	2.02	2.42	3.03	3.83	5.04
750	0.61	0.81	1.01	1.21	1.56	1.95	2.34	2.92	3.7	4.87
800	0.59	0.78	0.98	1.18	1.51	1.89	2.26	2.83	3.59	4.72
850	0.57	0.76	0.95	1.14	1.46	1.83	2.2	2.75	3.48	4.58
900	0.55	0.74	0.92	1.11	1.42	1.78	2.14	2.67	3.38	4.45
950	0.54	0.72	0.9	1.08	1.39	1.73	2.08	2.6	3.29	4.33
1000	0.53	0.7	0.88	1.05	1.35	1.69	2.03	2.53	3.21	4.22
1050	0.51	0.68	0.85	1.03	1.32	1.65	1.98	2.47	3.13	4.12
1100	0.5	0.67	0.84	1	1.29	1.61	1.93	2.41	3.06	4.02
1150	0.49	0.65	0.82	0.98	1.26	1.57	1.89	2.36	2.99	3.94
1200	0.48	0.64	0.8	0.96	1.23	1.54	1.85	2.31	2.93	3.85
1250	0.47	0.63	0.78	0.94	1.21	1.51	1.81	2.26	2.87	3.77
1300	0.46	0.61	0.77	0.92	1.18	1.48	1.78	2.22	2.81	3.7
1350	0.45	0.6	0.75	0.9	1.16	1.45	1.74	2.18	2.76	3.63
1400	0.44	0.59	0.74	0.89	1.14	1.43	1.71	2.14	2.71	3.57
1450	0.44	0.58	0.73	0.87	1.12	1.4	1.68	2.1	2.66	3.5
1500	0.43	0.57	0.72	0.86	1.1	1.38	1.65	2.07	2.62	3.45
1550	0.42	0.56	0.7	0.84	1.08	1.36	1.63	2.03	2.58	3.39
1600	0.42	0.55	0.69	0.83	1.07	1.33	1.6	2	2.54	3.34
1650	0.41	0.55	0.68	0.82	1.05	1.31	1.58	1.97	2.5	3.29
1700	0.4	0.54	0.67	0.81	1.04	1.29	1.55	1.94	2.46	3.24
1750	0.4	0.53	0.66	0.79	1.02	1.28	1.53	1.91	2.42	3.19
1800	0.39	0.52	0.65	0.78	1.01	1.26	1.51	1.89	2.39	3.15
1850	0.39	0.52	0.64	0.77	0.99	1.24	1.49	1.86	2.36	3.1
1900	0.38	0.51	0.64	0.76	0.98	1.22	1.47	1.84	2.33	3.06
1950	0.38	0.5	0.63	0.75	0.97	1.21	1.45	1.81	2.3	3.02
2000	0.37	0.5	0.62	0.74	0.95	1.19	1.43	1.79	2.27	2.98
2050	0.37	0.49	0.61	0.73	0.94	1.18	1.41	1.77	2.24	2.95
2100	0.36	0.48	0.6	0.73	0.93	1.16	1.4	1.75	2.21	2.91
2150	0.36	0.48	0.6	0.72	0.92	1.15	1.38	1.73	2.19	2.88
2200	0.35	0.47	0.59	0.71	0.91	1.14	1.37	1.71	2.16	2.85
2250	0.35	0.47	0.58	0.7	0.9	1.13	1.35	1.69	2.14	2.81
2300	0.35	0.46	0.58	0.69	0.89	1.11	1.34	1.67	2.11	2.78
2350	0.34	0.46	0.57	0.69	0.88	1.1	1.32	1.65	2.09	2.75
2400	0.34	0.45	0.57	0.68	0.87	1.09	1.31	1.63	2.07	2.72
2450	0.34	0.45	0.56	0.67	0.86	1.08	1.29	1.62	2.05	2.7
2500	0.33	0.44	0.55	0.66	0.85	1.07	1.28	1.6	2.03	2.67
2550	0.33	0.44	0.55	0.66	0.85	1.06	1.27	1.59	2.01	2.64
2600	0.33	0.43	0.54	0.65	0.84	1.05	1.26	1.57	1.99	2.62
2650	0.32	0.43	0.54	0.65	0.83	1.04	1.24	1.56	1.97	2.59
2700	0.32	0.43	0.53	0.64	0.82	1.03	1.23	1.54	1.95	2.57

Contd.

2750	0.32	0.42	0.53	0.63	0.81	1.02	1.22	1.53	1.93	2.54
2800	0.31	0.42	0.52	0.63	0.81	1.01	1.21	1.51	1.92	2.52
2850	0.31	0.42	0.52	0.62	0.8	1	1.2	1.5	1.9	2.5
2900	0.31	0.41	0.51	0.62	0.79	0.99	1.19	1.49	1.88	2.48
2950	0.31	0.41	0.51	0.61	0.79	0.98	1.18	1.47	1.87	2.46
3000	0.3	0.4	0.51	0.61	0.78	0.97	1.17	1.46	1.85	2.44
3050	0.3	0.4	0.5	0.6	0.77	0.97	1.16	1.45	1.84	2.42
3100	0.3	0.4	0.5	0.6	0.77	0.96	1.15	1.44	1.82	2.4
3150	0.3	0.39	0.49	0.59	0.76	0.95	1.14	1.43	1.81	2.38
3200	0.29	0.39	0.49	0.59	0.75	0.94	1.13	1.42	1.79	2.36
3250	0.29	0.39	0.49	0.58	0.75	0.94	1.12	1.4	1.78	2.34
3300	0.29	0.39	0.48	0.58	0.74	0.93	1.12	1.39	1.77	2.32
3350	0.29	0.38	0.48	0.57	0.74	0.92	1.11	1.38	1.75	2.31
3400	0.29	0.38	0.48	0.57	0.73	0.92	1.1	1.37	1.74	2.29
3450	0.28	0.38	0.47	0.57	0.73	0.91	1.09	1.36	1.73	2.27
3500	0.28	0.37	0.47	0.56	0.72	0.9	1.08	1.35	1.71	2.26
3550	0.28	0.37	0.46	0.56	0.72	0.9	1.08	1.34	1.7	2.24
3600	0.28	0.37	0.46	0.55	0.71	0.89	1.07	1.33	1.69	2.22
3650	0.28	0.37	0.46	0.55	0.71	0.88	1.06	1.33	1.68	2.21
3700	0.27	0.36	0.46	0.55	0.7	0.88	1.05	1.32	1.67	2.19
3750	0.27	0.36	0.45	0.54	0.7	0.87	1.05	1.31	1.66	2.18
3800	0.27	0.36	0.45	0.54	0.69	0.87	1.04	1.3	1.65	2.16
3850	0.27	0.36	0.45	0.54	0.69	0.86	1.03	1.29	1.63	2.15
3900	0.27	0.35	0.44	0.53	0.68	0.85	1.03	1.28	1.62	2.14
3950	0.26	0.35	0.44	0.53	0.68	0.85	1.02	1.27	1.61	2.12
4000	0.26	0.35	0.44	0.53	0.68	0.84	1.01	1.27	1.6	2.11
4050	0.26	0.35	0.44	0.52	0.67	0.84	1.01	1.26	1.59	2.1
4100	0.26	0.35	0.43	0.52	0.67	0.83	1	1.25	1.58	2.08
4150	0.26	0.34	0.43	0.52	0.66	0.83	0.99	1.24	1.57	2.07
4200	0.26	0.34	0.43	0.51	0.66	0.82	0.99	1.24	1.56	2.06
4250	0.25	0.34	0.42	0.51	0.66	0.82	0.98	1.23	1.56	2.05
4300	0.25	0.34	0.42	0.51	0.65	0.81	0.98	1.22	1.55	2.04
4350	0.25	0.34	0.42	0.5	0.65	0.81	0.97	1.21	1.54	2.02
4400	0.25	0.33	0.42	0.5	0.64	0.8	0.97	1.21	1.53	2.01
4450	0.25	0.33	0.42	0.5	0.64	0.8	0.96	1.2	1.52	2
4500	0.25	0.33	0.41	0.5	0.64	0.8	0.95	1.19	1.51	1.99
4550	0.25	0.33	0.41	0.49	0.63	0.79	0.95	1.19	1.5	1.98
4600	0.25	0.33	0.41	0.49	0.63	0.79	0.94	1.18	1.5	1.97
4650	0.24	0.32	0.41	0.49	0.63	0.78	0.94	1.17	1.49	1.96
4700	0.24	0.32	0.4	0.48	0.62	0.78	0.93	1.17	1.48	1.95
4750	0.24	0.32	0.4	0.48	0.62	0.77	0.93	1.16	1.47	1.94
4800	0.24	0.32	0.4	0.48	0.62	0.77	0.92	1.16	1.46	1.93
4850	0.24	0.32	0.4	0.48	0.61	0.77	0.92	1.15	1.46	1.92
4900	0.24	0.32	0.4	0.47	0.61	0.76	0.92	1.14	1.45	1.91
4950	0.24	0.31	0.39	0.47	0.61	0.76	0.91	1.14	1.44	1.9
5000	0.24	0.31	0.39	0.47	0.6	0.75	0.91	1.13	1.43	1.89

Fig 6.9 : Heat Strengthened Glass Fixed on Two opposite sides.



ANNEXURE – I PRECAUTIONS FOR USE OF GLASS IN BUILDINGS

General

- Windows or doors must not be operated till the glazing components are installed and the entire glazing system is complete.

- Glazing must never be done at temperatures below 4.44^{o}C unless precautions are taken to prevent moisture where glass is to be installed.

- For safety and security from vandalism, tempered / laminated glass should be preferred in windows up to a height of 8-10 meters.

- The performance of associated fittings & fixtures such as handles, bolts etc. should also be considered along with the strength of the glass with a view that if the human body strikes against the glass, while operating the fitting & fixtures, the safety of the human body is ensured. Under such situations tempered glass should be preferred.

- Details of installation vary with the type of material into which glass is to be set. This includes type of glazing material, gaskets, rope, tape, and glazing clips necessary for setting blocks, glazing compounds and sealants etc. Relevant usage details should be followed for each installation.

- Normal (annealed) glass used for glazing should be free from all defects. However, if waviness is present, it should be adjusted horizontally to minimize optical distortion.

- When using normal / tinted glass, a check should be made that there is no variation in colours among various batches of glass as this spoils the visual continuity.

- Thermal breakage may result by exposure of a part of glass to the heat of sun while the other portion remains cool. It should be ensured that such exposure is avoided. Sufficient space should be provide on the inner face of the glass so that it is well ventilated.

Laminated Glass

- The edges of a laminated lite must be grounded and not be exposed to any prolonged contact with moisture. Consideration must be given to the use of weep holes or other alternate glazing procedures to ensure a dry framing cavity.

- Laminated glass is made by joining two or more sheets of glass with a plastic medium, mostly Poly Vinyl Butyral (PVB) between the sheets. PVB itself adheres well to glass. Laminating can also be done with certain resins. Some

suppliers use PVC instead of PVB or use cheap resins which are difficult to make out at the time of supply but these materials will most certainly discolour and delaminate in a short period and such glasses will have to be changed. Precaution should be taken for right product.

Tempered Glass

- To protect human beings from injury, any facades more than 10^{o} inclination should have laminated glass. In case of fall, the laminated glass will not break and if it breaks, it will break safely.

- Manufacturers should be checked for the availability of desired sizes, as the sizes are custom made.

- All door sizes, transoms, jambs, heads, locks, and any other special requirements must be detailed and all types of hardware must be selected before tempered glass is ordered, as its size can not be altered.

Reflective Glass

- Frequent glass cleaning during construction is recommended. Immediately remove any glazing lubricants from the reflective coated surface. Prolonged contact of the reflective coating with some glazing lubricants can cause damage to the coating.

- House hold detergents should not be used as glass cleaning agents.

- Avoid any contact of the reflective coating with metals or other hard materials e.g. razor blades, belt buckles, buttons, rings or any abrasive clothing.

- Clean a small area at a time and inspect the glass surface frequently to ensure that no glass or reflective coating is damaged. Glass should be covered with plastic film during the construction.

- Clean the glass when surface is should.

- Avoid contact of the reflective coating or glass with acids or strong alkalis. Substances such as caustic soda used to clean aluminum framing as it will cause extensive damage to the reflective coating and glass surface.

- When selecting reflective glass for a curtain wall system, all other types of glass components should match the glazing glass selected.

Insulating Glass

- Regardless of edge construction, the insulating edge seal shall not be exposed to moisture for prolonged time periods.

- Weep holes should be provided to ensure dry framing cavity.

- Handle and install insulating glass with care. Damaged edges and/or corners can result in breakage later. Insulating glass units shall not be rolled on corners & consideration shall be given to weep holes or other alternate methods, which will assure a dry framing cavity.

- The glazing compound must be a non-hardening type that does not contain any materials, which will attack the metal-to-glass seal of the insulating glass. Putty should never be used.

- Openings into which insulating glass is to be installed must be square and plumb. It is necessary to check that they are correct in size to meet the clearances necessary for the type of insulating glass being installed because insulating glass cannot be changed in size once it has been manufactured.

- There should be no direct contact between the insulating glass and the frame into which it is installed.

ANNEXURE –II REFERENCE MATERIAL ON RELATED ASPECTS

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31. Indian Standard, Code of practice for natural ventilation of residential buildings IS - 3362 – 1965.
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ANNEXURE –III
TECHNICAL COMMITTEE COMPOSITION

Chairman	Representing

Members