



**RWANDA
STANDARD**

**DRS
397-4**

First edition

2023-mm-dd

**Use of glass in building—
Part 4: Fire and loading**

ICS 81.040.20

Reference number

DRS397-4: 2023

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Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by technical committees are ratified by members of RSB Board of Directors for publication and gazette as Rwanda Standards.

DRS 397-4 was prepared by Technical Committee RSB/TC 9, *Civil engineering and building materials*.

In the preparation of this standard, reference was made to the following standards:

- 1) AS 1288, *Glass in buildings – Selection and installation*
- 2) BS 6262, *Code of practice for glazing for buildings*
- 3) IS 3548, *Code of practice for glazing in building*
- 4) IS 16231-3, *Use of glass in buildings — Code of practice — Part 3: Fire and loading*

The assistance derived from the above source is hereby acknowledged with thanks.

DRS 397 consists of the following parts, under the general title *Use of glass in building*:

Part 1: Terminology

Part 2: General methodology for selection

Part 3: Energy and light

Part 4: Fire and loading

Part 5: Safety related to human impact

Committee membership

The following organizations were represented on the Technical Committee on *Civil engineering and building materials* (RSB/TC 009) in the preparation of this standard.

Advanced Construction Technology Services (ACTS) Rwanda

AFRIPRECAST

Bridge to Prosperity

City of Kigali

Greenpact Africa

Mass Design Group

Ministry of Health

Rwanda Housing Authority (RHA)

Rwanda Transport Development Agency (RTDA)

Standards for Sustainability (SfS)

University of Rwanda – College of Science and Technology (UR-CST)

Rwanda Standards Board (RSB) – Secretariat

Introduction

Glazing is an important item in building construction and glass, the primary glazing element has to be selected to cater for several requirements. Fixing of glass is a specialized operation, when properly done, will avoid the hazards of broken glass. Growing trend in resorting to glazed windows/doors in buildings and structures has considerably increased the importance of glazing and the need for proper workmanship.

This standard on *Code of practice for use of glass in building* is envisaged to address the above concerns and their engineering aspects, and is brought out in various parts as listed in the foreword.

DRS397-4 is more specifically intended to provide guidance in the design glasses for fire and loading of appropriate glazing for various types for building construction.

Correct selection of materials to be used in glazing for buildings depends on many factors. Therefore, provisions in this part of the standard will be used in conjunction with those in other parts. This standard does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Use of organic coated films including safety films on glass (say *annealed*) is not classified as safety glass as per this standard, and hence users have to cautiously decide on their options.

Copy for public comments

Use of glass in building — Part 4: Fire and loading

1 Scope

This Draft Rwanda Standard covers selection and installation of glass in buildings, subject to wind loading, seismic loading and special considerations for fire-rated glass including its related materials.

This standard does not cover the following:

- a) glazing system including frameless glazing system; and
- b) patent glazing.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3009, *Fire-resistance tests — Elements of building construction — Glazed elements*

RS 114-2, *Structural design — Part 2: Actions on structures — Wind actions*

RS 397-1, *Use of glass in building — Part 1: Terminology*

RS 397-2, *Use of glass in building — Part 2: General methodology for selection*

3 Terms and definitions

For the purposes of this standard, the terms and definitions given in RS 397-1 apply.

4 Determination of appropriate glass thickness

4.1 General

This standard gives provisions to determine the minimum glass thickness to be used to resist the ultimate limit state design wind pressures. However, the location of the glass within the building requires additional considerations, such as safety with respect to human impact in accordance with DRS 397-5, which may impose either a minimum glass thickness above the basic calculation of this Part or a provision for a specific glass type or both.

In addition to the provisions herein, the design requirements such as wind loads determined in accordance with RS 114-2 and the serviceability deflection requirement limits given in this standard shall have to be complied with.

The provisions of this standard are applicable provided that the following parameters are satisfied:

- a) ultimate limit state wind pressure shall not be greater than 10.0 kPa;
- b) for laminated glass, the two sheets are of equal thickness and the interlayer material is either polyvinyl butyral (PVB) or an equivalent type of interlayer with a modulus of elasticity of about 24 MPa and a Poisson's ratio of 0.50 at 20°C; and
- c) design flexural tensile strength of 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 up to 6 mm is 16.7 N/mm² and for thickness above 6 mm is 15.2 N/mm².

4.2 Design considerations

The following design considerations shall be considered in determination of appropriate thickness of glass:

- a) the maximum area of glass panel is restricted to 15 m²;
- b) the maximum span of window is restricted to 4 m;
- c) aspect ratio of the glass panel shall be greater than 1.5. If it is less than 1.5, next higher available thickness shall be selected;
- d) the factor of safety used is 2.5 considering the variability in strength of glass;
- e) applicable to normal, reflective, laminated, tempered and insulating glass;
- f) applicable to rectangular panels properly secured; and
- g) design minimum thickness of laminated glass should be the maximum value of thickness in accordance with Table 5 of RS 397-2.

4.3 Empirical relationship

Empirical relation between the wind pressure, area of the glass panel and the required glass thickness can be used:

$$P_{net}A = 200T^k \text{ (for } T < 6 \text{ mm)}$$

$$P_{net}A = 200T^k + 1900 \text{ (for } T > 6 \text{ mm)}$$

where

P_{net} is Net design wind pressure (N/m²) as per 4.4;

A is Area of glass panel (m²);

T is Standard Nominal Thickness (SNT) of glass (mm) from Table 1;

K is Constant from the table 1.

Table 1 — K value for the corresponding standard nominal thickness

T	3 mm	4 mm	5 mm	6 mm	8 mm	10 mm	12 mm	15 mm	19 mm	25 mm
k	1.683	1.732	1.753	1.765	1.57	1.578	1.583	1.579	1.569	1.569

4.3.1 Glass supported on two opposite sides

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

1) For $T \leq 6\text{mm}$

$$b = \frac{4.39 T}{\sqrt{\left(\frac{P_{net}}{P_f}\right)}}$$

2) For $T > 6\text{mm}$

$$b = \frac{4.22 T}{\sqrt{\left(\frac{P_{net}}{P_f}\right)}}$$

4.3.1.2 Tempered/toughened panel on two opposite sides can be designed using following empirical relations:

1) For $T \leq 6\text{mm}$

$$b = \frac{3.2688 T}{\sqrt{\left(\frac{P_{net}}{P_f}\right)}}$$

2) For $T \geq 6\text{mm}$

$$b = \frac{2.9069 T}{\sqrt{\left(\frac{P_{net}}{P_f}\right)}}$$

where

b is span, in m;

P_f is strength factors as in Table 2.

4.3.1.3 For insulated 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.

4.3.1.4 For laminated glass, the thickness of PVB has not been considered. The value to be used is:

T = standard nominal thickness – thickness of PVB.

4.4 Determination of design wind pressure

4.4.1 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 as given below, among others:

- a) location of the building (wind zone);
- b) construction patterns around buildings (terrain category);
- c) topography of site; and
- d) building plan and height.

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

$$P_{net} = p_z C_p$$

where

C_p is net pressure coefficient as per RS 114-2;

p_z is Design wind pressure in N/m² as per RS 114-2.

$$p_z = 0.6V_z^2$$

$$V_z = V_b k_1 k_2 k_3$$

where

V_b is basic wind speed based on location as per RS 114-2;

k_1 is risk co-efficient factor as per RS 114-2;

k_2 terrain factor as per RS 114-2;

k_3 topography factor as per RS 114-2;

V_z design wind speed in m/s.

4.4.1 Laminated/Tempered/Insulating glass

4.4.1.1 To determine the thickness of laminated/ tempered/ insulating glass, the design wind pressure P_{net} is modified by dividing it with the strength or pressure factor P_f , dependent on the type of glass. The values of the P_f are given in table 2.

4.4.1.2 Using the modified values of P_{net} , the thickness of other glass types can be obtained in accordance with 4.3.

Table 2 — Strength factor P_f

S/N	Glass Type	P_f
1.	Normal (Annealed)	1.00
2.	Laminated	0.80
3.	Tempered	2.50
4.	Insulated	1.50
5.	Heat strengthened	1.60
6.	Wired glass	0.50

4.5 Aspect Ratio (AR_{max})

The design of the thickness using empirical relation in accordance with 4.3 is valid up to a limiting aspect ratio AR_{max} . The value of AR_{max} for different thickness (T) of glass is given in table 3

Table 3 — Thickness and corresponding AR_{max} values

T (mm)	3	4	5	6	8	10	12	15	19	25
AR_{max} (in m^2)	7.3	6.8	6.5	6.3	5.9	4.9	4.3	3.8	3.3	2.9

4.6 Seismic design

4.6.1 Seismic load (EQ)

4.6.1.1 The design for seismic forces shall be performed in steps to establish upper and lower bound force and movement response parameters. In addition, the response of the structure sensitive to certain parameters such as the damping and the stiffness of the support points may be evaluated.

4.6.1.2 The principal design criteria for the seismic design are:

- the structure shall remain elastic during the design seismic event.
- The hangers shall stiffen the cantilever 'tree' structure.

c) The hangers shall not go slack.

4.6.2 Non-structural elements

Depending on response sensitivity, non-structural elements can be classified as deformation sensitive, acceleration sensitive, or both deformation and acceleration sensitive. Table 4 classifies non-structural elements according to their response sensitivity.

Table 4 — Response sensitivity of architectural component

S/N	Component	Sensitivity	
		Acc	Def
i)	Exterior skin		
	a) Adhered Veneer	S	P
	b) Anchored Veneer	S	P
	c) Glass Blocks	S	P
	d) Prefabricated panel	S	P
	e) Glazing system	S	P
ii)	Partitions		
	a) Heavy	S	P
	b) Light	S	P
iii)	Interior veneers		
	a) Stone, including marble	S	P
	b) Ceramic tile	S	P
iv)	Parapets and appendages	P	-
v)	Canopies and marquees	P	-
vi)	Stairs	P	S

Note: Acc = Acceleration sensitive; Def = Deformation sensitive; P = Primary response; S = Secondary response

4.6.3 Design seismic force

Design seismic force, F_p , on the non-structural element shall be calculated using the following expression as:

$$F_p = \frac{Z}{2} \left(1 + \frac{x}{h} \right) \frac{a_p}{R_p} I_p W_p$$

$$\geq 0.10W_p$$

where

Z is zone factor as per Table 5;

x is height of point of attachment of the non-structural element above the foundation;

h is height of the structure;

a_p is component amplification factor as per Table 6;

R_p is the component response modification factor as per Table 6;

I_p is importance factor of the non-structural element (to be taken as 1.5); and

W_p is weight of the non-structural element.

Table 5 — Seismic zone factor Z

Seismic zone factor	IV	V	VI	VII
Z	0.10	0.16	0.24	0.36

Table 6 — Modification factors

S/N	Architectural component or element	a_p	R_p
i)	Interior non-structural walls and partitions:		
	Plain (unreinforced) masonry walls	1.0	1.5
	All other walls and partitions	1.0	2.5
ii)	Cantilever elements (braced to structural frame above its centre of mass):		
	Parapets	1.0	1.5
	Chimneys and stacks	1.0	2.5
	Exterior non-structural walls	1.0	2.5
iii)	Exterior non-structural wall elements and connections		
	Wall element	1.0	2.5
	Body of wall panel connection	1.0	2.5
	Fasteners of the connecting system	1.25	1.0
iv)	Veneer		
	High deformability element and attachments	1.0	2.5
	Low deformability elements and attachments	1.0	1.5

A lower value of a_p is permitted provided that a detailed dynamic analysis is performed which justifies a lower value. The value of a_p shall not be less than 1.0. The value of $a_p = 1.0$ is for equipment generally regarded as rigid and rigidly attached. The value of $a_p = 2.5$ is for flexible components or flexibly attached components.

4.6.4 Seismic relative displacement

4.6.4.1 For two connection points on the same structure A, one at a height h_x , and other at a height h_y , seismic relative displacement shall be determined as:

$$D_p = \delta_{xA} - \delta_{yA}$$

D_p is not required to be taken as greater than

$$R(h_x - h_y) \frac{\Delta_{aA}}{h_{sx}}$$

where

δ_{xA} is deflection at building level x of structure A due to design seismic load determined by elastic analysis, and multiplied by response reduction factor (R) of the building;

δ_{yA} is deflection at building level y of structure A due to design seismic load determined by elastic analysis, and multiplied by response reduction factor (R) of the building;

h_x is height of level x to which upper connection point is attached;

h_y is height of level y to which lower connection point is attached;

Δ_{aA} is allowable storey drift for structure which shall not exceed 0.004 times storey height; and

h_{sx} is storey height below level x.

4.6.4.2 For two connection points on separate structures A and B, or separate structural systems, one at height, h_x , and the other at a height, h_y , D_p shall be determined as:

$$D_p = |\delta_{xA}| + |\delta_{yB}|$$

D_p is not required to be taken as greater than

$$R \left(h_x \frac{\Delta_{aA}}{h_{sx}} + h_y \frac{\Delta_{aB}}{h_{sy}} \right)$$

where

δ_{yB} is deflection at building level y of structure B due to design seismic load determined by elastic analysis, and multiplied by response reduction factor, R, of the building as given in Annex D;

Δ_{aB} is allowable storey drift for structure B.

4.7 Imposed loads

The uniform distributed load and point load is to be considered based on application and is to be selected in accordance with 114-2. Appropriate uniform distributed load (UDL) and concentrated load are selected in accordance with 114-2 based on nature of building (e.g., residential, institutional, industrial building, etc.) and nature of activity under each building type.

4.8 Load contribution

4.8.1 Wind load

The wind load is the effect of wind pressure which is dependent on the location, building height, topography and ground roughness factor. The wind speed is taken from 114-2 for the geographic location.

4.8.2 Dead load

In case of inclined sloped glazing, the dead weight of the glazing should be considered. In case of component of sloped glazing, the following corresponding component of the total glazing may be used:

- the point load shall be applied as a uniformly distributed load over a circular area of 0.01 m²;
- for a glazed panel supported on all edges, the point loading shall be applied at the centre;
- for free glazing edges, the point load shall be applied adjacent to the centre of the free edge;
- the ultimate limit state design wind pressure shall not be greater than 1.2 kPa. For greater design wind pressures, the glass shall be separately designed to withstand wind loading in accordance with 4.4.

4.9 Reference chart relating wind load, maximum allowable area for a thickness of glass with respect to terrain category

tables 7, 8, 9, 10, 11, 12, 13, 14 and 15 and figures 1, 2, 3, 4, 5, 6, 7, 8 and 9 below provide relationship between design wind pressure and maximum allowable area for a thickness of glass with respect to specific terrain category. User may select the type of glass depending on the support conditions. The deflection at the centre of glass pane can be calculated using the formula in accordance with Annex B. Typical model calculation to calculate and determine wind load and deflection at the centre of the glazing, is given in Annex B.

Table 7 — Maximum areas (m²) for normal (annealed) glass fixed on all four sides

Design wind pressure in N/Sqm	Standard nominal thickness of glass 'T' in mm									
	3	4	5	6	8	10	12	15	19	25
500	2.54	4.41	6.72	9.45	14.27	15	15	15	15	15
550	2.31	4.01	6.11	8.59	12.97	15	15	15	15	15
600	2.12	3.68	5.6	7.88	11.89	15	15	15	15	15
650	1.95	3.4	5.17	7.27	10.98	14.57	15	15	15	15
700	1.82	3.15	4.8	6.75	10.19	13.53	15	15	15	15
750	1.69	2.94	4.48	6.3	9.51	12.63	15	15	15	15
800	1.59	2.76	4.2	5.91	8.92	11.84	15	15	15	15

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850	1.49	2.6	3.95	5.56	8.39	11.14	14.26	15	15	15
900	1.41	2.45	3.73	5.25	7.93	10.52	13.46	15	15	15
950	1.34	2.32	3.54	4.97	7.51	9.97	12.76	15	15	15
1000	1.27	2.21	3.36	4.73	7.13	9.47	12.12	15	15	15
1050	1.21	2.1	3.2	4.5	6.79	9.02	11.54	15	15	15
1100	1.16	2.01	3.05	4.3	6.49	8.61	11.02	14.81	15	15
1150	1.1	1.92	2.92	4.11	6.2	8.23	10.54	14.17	15	15
1200	1.06	1.84	2.8	3.94	5.95	7.89	10.1	13.58	15	15
1250	1.02	1.77	2.69	3.78	5.71	7.58	9.69	13.03	15	15
1300	0.98	1.7	2.58	3.64	5.49	7.28	9.32	12.53	15	15
1350	0.94	1.63	2.49	3.5	5.28	7.01	8.98	12.07	15	15
1400	0.91	1.58	2.4	3.38	5.1	6.76	8.66	11.64	15	15
1450	0.88	1.52	2.32	3.26	4.92	6.53	8.36	11.23	15	15
1500	0.85	1.47	2.24	3.15	4.76	6.31	8.08	10.86	14.8	15
1550	0.82	1.42	2.17	3.05	4.6	6.11	7.82	10.51	14.32	15
1600	0.79	1.38	2.1	2.95	4.46	5.92	7.57	10.18	13.87	15
1650	0.77	1.34	2.04	2.86	4.32	5.74	7.34	9.87	13.45	15
1700	0.75	1.3	1.98	2.78	4.2	5.57	7.13	9.58	13.06	15
1750	0.73	1.26	1.92	2.7	4.08	5.41	6.92	9.31	12.68	15
1800	0.71	1.23	1.87	2.63	3.96	5.26	7.73	9.05	12.33	15
1850	0.69	1.19	1.82	2.55	3.86	5.12	6.55	8.81	12	15
1900	0.67	1.16	1.77	2.49	3.76	4.98	6.38	8.57	11.68	15
1950	0.65	1.13	1.72	2.42	3.66	4.86	6.21	8.35	11.38	15
2000	0.64	1.1	1.68	2.36	3.57	4.73	6.06	8.15	11.1	15
2050	0.62	1.08	1.64	2.31	3.48	4.62	5.91	7.95	10.83	15
2100	0.61	1.05	1.6	2.25	3.4	4.51	5.77	7.76	10.57	15
2150	0.59	1.03	1.56	2.2	3.32	4.4	5.64	7.58	10.32	15
2200	0.58	1	1.53	2.15	3.24	4.3	5.51	7.4	10.09	15
2250	0.56	0.98	1.49	2.1	3.17	4.21	5.39	7.24	9.86	14.72
2300	0.55	0.96	1.46	2.05	3.1	4.12	5.27	7.08	9.65	14.4
2350	0.54	0.94	1.43	2.01	3.04	4.03	5.16	6.93	9.44	14.09
2400	0.53	0.92	1.4	1.97	2.97	3.95	5.05	6.79	9.25	13.8
2450	0.52	0.9	1.37	1.93	2.91	3.86	4.95	6.65	9.06	13.52
2500	0.51	0.88	1.34	1.89	2.85	3.79	4.85	6.52	8.88	13.25
2550	0.5	0.87	1.32	1.85	2.8	3.71	4.75	6.39	8.7	12.99
2600	0.49	0.85	1.29	1.82	2.74	3.64	4.66	6.27	8.54	12.74
2650	0.48	0.83	1.27	1.78	2.69	3.57	4.57	6.15	8.38	12.5
2700	0.47	0.82	1.24	1.75	2.64	3.51	4.49	6.03	8.22	12.27
2750	0.46	0.8	1.22	1.72	2.59	3.44	4.41	5.92	8.07	12.04

2800	0.45	0.79	1.2	1.69	2.55	3.38	4.33	5.82	7.93	1.83
2850	0.45	0.77	1.18	1.66	2.5	3.32	4.25	5.72	7.79	11.62
2900	0.44	0.76	1.16	1.63	2.46	3.27	4.18	5.62	7.65	11.42
2950	0.43	0.75	1.14	1.6	2.42	3.21	4.11	5.52	7.52	11.23
3000	0.42	0.74	1.12	1.58	2.35	3.16	4.04	5.43	7.4	11.04
3050	0.42	0.72	1.1	1.55	2.34	3.1	3.97	5.34	7.28	10.86
3100	0.41	0.71	1.08	1.52	2.3	3.05	3.91	5.26	7.16	10.68
3150	0.4	0.7	1.07	1.5	2.26	3.01	3.85	5.17	7.05	10.51
3200	0.4	0.69	1.05	1.48	2.23	2.96	3.79	5.09	6.94	10.35
3250	0.39	0.68	1.03	1.45	2.2	2.91	3.73	5.01	6.83	10.19
3300	0.39	0.67	1.02	1.43	2.16	2.87	3.67	4.94	6.73	10.04
3350	0.38	0.66	1	1.41	2.13	2.83	3.62	4.86	6.63	9.89
3400	0.37	0.65	0.99	1.39	2.1	2.78	3.56	4.79	6.53	9.74
3450	0.37	0.64	0.97	1.37	2.07	2.74	3.51	4.72	6.43	9.6
3500	0.36	0.63	0.96	1.35	2.04	2.71	3.46	4.65	6.34	9.46
3550	0.36	0.62	0.95	1.33	2.01	2.67	3.41	4.59	6.25	9.33
3600	0.35	0.61	0.93	1.31	1.98	2.63	3.37	4.53	6.17	9.2
3650	0.35	0.6	0.92	1.29	1.95	2.59	3.32	4.46	6.08	9.07
3700	0.34	0.6	0.91	1.28	1.93	2.56	3.28	4.4	6	8.95
3750	0.34	0.59	0.9	1.26	1.9	2.53	3.23	4.34	5.92	8.83
3800	0.33	0.58	0.88	1.24	1.88	2.49	3.19	4.29	5.84	8.72
3850	0.33	0.57	0.87	1.23	1.85	2.46	3.15	4.23	5.76	8.6
4000	0.32	0.55	0.84	1.18	1.78	2.37	3.03	4.07	5.55	8.28
4050	0.31	0.54	0.83	1.17	1.76	2.34	2.99	4.02	5.48	8.18
4100	0.31	0.54	0.82	1.15	1.74	2.31	2.96	3.97	5.41	8.08
4150	0.31	0.53	0.81	1.14	1.72	2.28	2.92	3.93	5.35	7.98
4200	0.3	0.53	0.8	1.13	1.7	2.25	2.89	3.88	5.28	7.89
4250	0.3	0.52	0.79	1.11	1.68	2.23	2.85	3.83	5.22	7.79
4300	0.3	0.51	0.78	1.1	1.66	2.2	2.82	3.79	5.16	7.7
4350	0.29	0.51	0.77	1.09	1.64	2.18	2.79	3.74	5.1	7.61
4400	0.29	0.5	0.76	1.07	1.62	2.15	2.72	3.66	4.99	7.44
4450	0.29	0.5	0.76	1.06	1.6	2.13	2.72	3.66	4.99	7.44
4500	0.28	0.49	0.75	1.05	1.59	2.1	2.69	3.62	4.93	7.36
4550	0.28	0.49	0.74	1.04	1.57	2.08	2.66	3.58	4.88	7.28
4600	0.28	0.48	0.73	1.03	1.55	2.06	2.66	3.58	4.83	7.2
4650	0.27	0.47	0.72	1.02	1.53	2.04	2.61	3.5	4.77	7.12
4700	0.27	0.47	0.71	1.01	1.52	2.01	2.58	3.47	4.72	7.05
4750	0.27	0.46	0.71	0.99	1.5	1.99	2.55	3.43	4.67	6.97

4800	0.26	0.46	0.7	0.98	1.49	1.97	2.52	3.39	4.62	6.9
4850	0.26	0.46	0.69	0.97	1.47	1.95	2.5	3.36	4.58	6.83
4900	0.26	0.45	0.69	0.96	1.46	1.93	2.47	3.32	4.53	6.76
4950	0.26	0.45	0.68	0.95	1.44	1.91	2.45	3.29	4.48	6.69
5000	0.25	0.44	0.67	0.95	1.43	1.89	2.42	3.26	4.44	6.62
Maximum Aspect Ratio	7.3	6.8	6.5	6.3	5.9	4.9	4.3	3.8	3.3	2.9

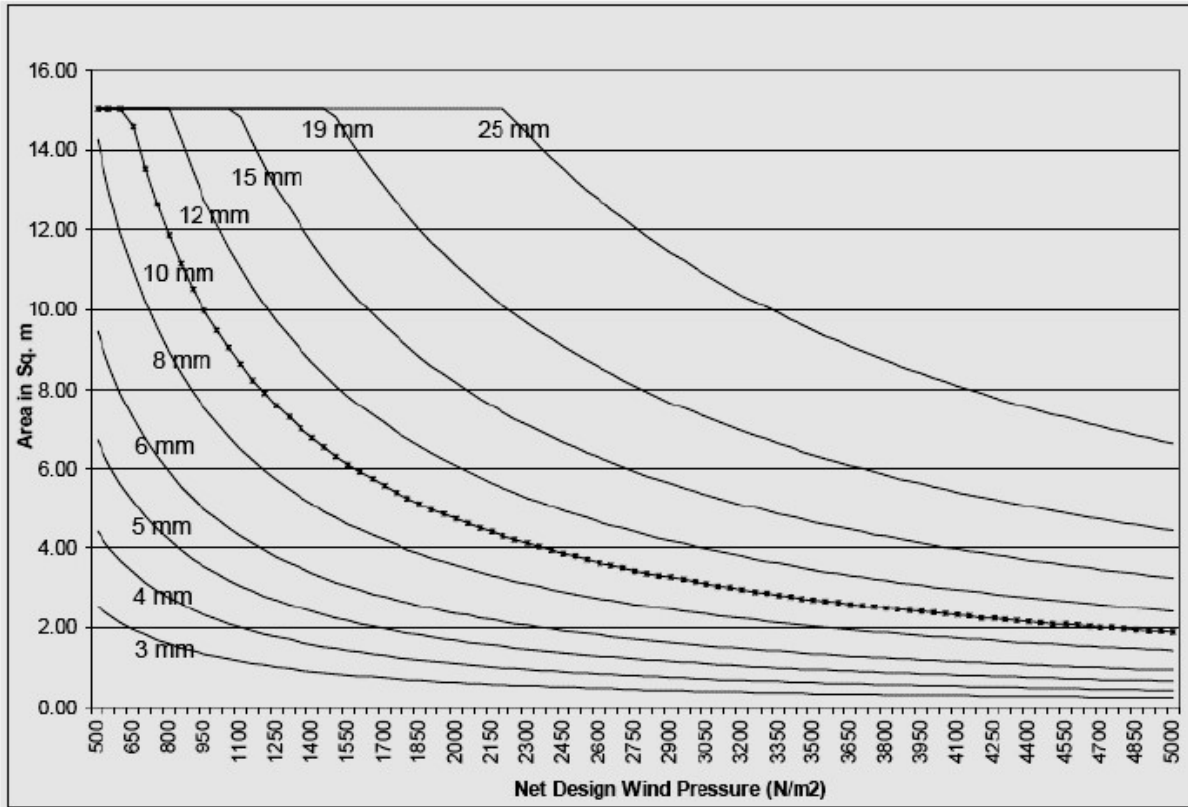


Figure 1 — Normal (annealed) glass fixed on all four sides

Table 8 — Maximum areas (m²) for laminated glass fixed on all four sides

Design wind pressure in N/Sqm	Standard nominal thickness of glass 'T' in mm					
	5.38	6.38	8.38	10.38	12.38	16.38
500	5.38	7.56	11.42	15	151	15
550	4.89	6.87	10.38	13.77	15	15
600	4.48	6.3	9.51	12.63	15	15
650	4.14	5.82	8.78	11.65	14.91	15
700	3.84	5.4	8.15	10.82	13.85	15

750	3.58	5.04	7.61	10.1	12.93	15
800	3.36	4.73	7.13	9.47	12.12	15
850	3.16	4.45	6.71	8.91	11.41	15
900	2.99	4.2	6.34	8.42	10.77	14.48
950	2.83	3.98	6.01	7.97	10.2	13.72
1000	2.69	3.78	5.71	7.58	9.69	13.03
1050	2.56	3.6	5.44	7.21	9.23	12.41
1100	2.44	3.44	5.19	6.89	8.81	11.85
1150	2.34	3.29	4.96	6.59	8.43	11.33
1200	2.24	3.15	4.76	6.31	8.08	10.86
1250	2.15	3.02	4.57	6.06	7.76	10.43
1300	2.07	2.91	4.39	5.83	7.46	10.02
1350	1.99	2.8	4.23	5.61	7.18	9.65
1400	1.92	2.7	4.08	5.41	6.92	9.31
1450	1.85	2.61	3.94	5.22	6.69	8.99
1500	1.79	2.52	3.81	5.05	6.25	8.41
1550	1.73	2.44	3.68	4.89	6.25	8.41
1600	1.68	2.36	3.57	4.73	6.06	8.15
1650	1.63	2.29	3.46	4.59	5.88	7.9
1700	1.58	2.22	3.36	4.46	5.7	7.67
1750	1.54	2.16	3.26	4.33	5.54	7.45
1800	1.49	2.1	3.17	4.21	5.39	7.24
1850	1.45	2.04	3.09	4.09	5.24	7.04
1900	1.41	1.99	3	3.99	5.1	6.86
1950	1.38	1.94	2.93	3.88	4.97	6.68
2000	1.34	1.89	2.85	3.79	4.85	6.52
2050	1.31	1.84	2.78	3.7	4.73	6.36
2100	1.28	1.8	2.72	3.61	4.62	6.21
2150	1.25	1.76	2.65	3.52	4.51	6.06
2200	1.22	1.72	2.59	3.44	4.41	5.92
2250	1.19	1.68	2.54	3.37	4.31	5.79
2300	1.17	1.64	2.48	3.29	4.22	5.67
2350	1.14	1.61	2.43	3.22	4.13	5.55
2400	1.12	1.58	2.38	3.16	4.04	5.43
2450	1.1	1.54	2.33	3.09	3.96	5.32
2500	1.08	1.51	2.28	3.03	3.88	5.21
2550	1.05	1.48	2.24	2.97	3.8	5.11
2600	1.03	1.45	2.2	2.91	3.73	5.01

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2650	1.01	1.43	2.15	2.86	3.66	4.92
2700	1	1.4	2.11	2.81	3.59	4.83
2750	0.98	1.37	2.08	2.75	3.53	4.74
2800	0.96	1.35	2.04	2.71	3.46	4.65
2850	0.94	1.33	2	2.66	3.4	4.57
2900	0.93	1.3	1.97	2.61	3.34	4.49
2950	0.91	1.28	1.93	2.57	3.29	4.42
3000	0.9	1.26	1.9	2.53	3.23	4.34
3050	0.88	1.24	1.87	2.48	3.18	4.27
3100	0.87	1.22	1.84	2.44	3.13	4.2
3150	0.85	1.2	1.81	2.4	3.08	4.14
3200	0.84	1.18	1.78	2.37	3.03	4.07
3250	0.83	1.16	1.76	2.33	2.98	4.01
3300	0.81	1.15	1.73	2.3	2.94	3.95
3350	0.8	1.13	1.7	2.26	2.89	3.89
3400	0.79	1.11	1.68	2.23	2.85	3.83
3450	0.78	1.1	1.65	2.2	2.81	3.78
3500	0.77	1.08	1.63	2.16	2.77	3.72
3550	0.76	1.06	1.61	2.13	2.73	3.67
3600	0.75	1.05	1.59	2.1	2.69	3.62
3650	0.74	1.04	1.56	2.08	2.66	3.62
3700	0.73	1.02	1.54	2.05	2.62	3.52
3750	0.72	1.01	1.52	2.02	2.59	3.48
3800	0.71	0.99	1.5	1.99	2.55	3.43
3850	0.7	0.98	1.48	1.97	2.52	3.39
3900	0.69	0.97	1.46	1.94	2.49	3.34
3950	0.68	0.96	1.44	1.92	2.45	3.3
4000	0.67	0.95	1.43	1.89	2.42	3.26
4050	0.66	0.93	1.41	1.87	2.39	3.22
4100	0.66	0.92	1.39	1.85	2.36	3.18
4150	0.65	0.91	1.38	1.83	2.34	3.14
4200	0.64	0.9	1.36	1.8	2.31	3.1
4250	0.63	0.89	1.34	1.78	2.28	3.07
4300	0.63	0.88	1.33	1.76	2.25	3.03
4350	0.62	0.87	1.31	1.74	2.23	3
4400	0.61	0.86	1.3	1.72	2.2	2.96
4450	0.6	0.85	1.28	1.7	2.18	2.93
4500	0.6	0.84	1.27	1.68	2.15	2.9
4550	0.59	0.83	1.25	1.66	2.13	2.86

4600	0.58	0.82	1.24	1.65	2.11	2.83
4650	0.58	0.81	1.23	1.63	2.08	2.8
4700	0.57	0.8	1.21	1.61	2.06	2.77
4750	0.57	0.8	1.2	1.59	2.04	2.74
4800	0.56	0.79	1.19	1.58	2.02	2.72
4850	0.55	0.78	1.19	1.58	2.02	2.72
4900	0.55	0.77	1.16	1.55	1.98	2.66
4950	0.54	0.76	1.14	1.52	1.94	2.61
5000	0.54	0.76	1.14	1.52	1.94	2.61
Maximum Aspect Ratio	6.5	6.2	5.7	4.8	4.3	3.6

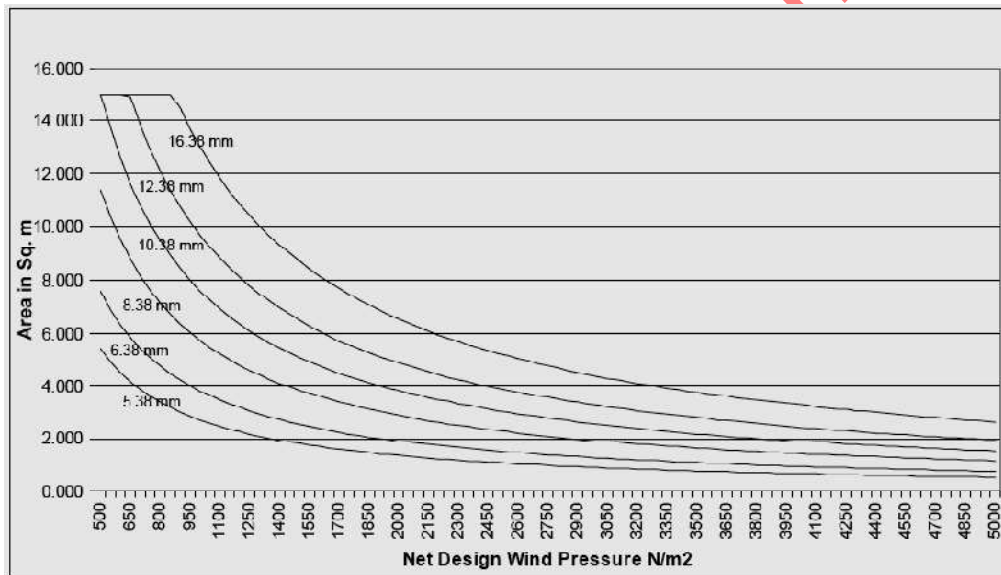


Figure 2 — Laminated glass fixed on all four sides

Table 9 —Maximum areas (m²) for tempered glass fixed on all four sides

Design wind pressure in N/Sqm	Standard nominal thickness of glass 'T' in mm									
	3	4	5	6	8	10	12	15	19	25
500	6.35	11.03	15	15	15	15	15	15	15	15
550	5.78	10.03	15	15	15	15	15	15	15	15
600	5.29	9.2	14	15	15	15	15	15	15	15
650	4.89	8.49	12.92	15	15	15	15	15	15	15
700	4.54	7.88	12	15	15	15	15	15	15	15
750	4.24	7.36	11.2	15	15	15	15	15	15	15

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800	3.97	6.9	10.5	14.77	15	15	15	15	15	15
850	3.74	6.49	9.88	13.9	15	15	15	15	15	15
900	3.53	6.13	9.33	13.13	15	15	15	15	15	15
950	3.54	5.81	8.84	12.44	15	15	15	15	15	15
1000	3.18	5.52	8.4	11.81	15	15	15	15	15	15
1050	3.03	5.25	8	11.25	15	15	15	15	15	15
1100	2.89	5.02	7.64	10.74	15	15	15	15	15	15
1150	2.76	4.8	7.3	10.27	15	15	15	15	15	15
1200	2.65	4.6	7	9.85	14.86	15	15	15	15	15
1250	2.54	4.41	6.72	9.45	14.27	15	15	15	15	15
1300	2.44	4.24	6.46	9.09	13.72	14	15	15	15	15
1350	2.35	4.09	6.22	8.75	13.21	15	15	15	15	15
1400	2.27	3.94	6	8.44	12.74	15	15	15	15	15
1450	2.19	3.81	5.79	8.15	12.3	15	15	15	15	15
1500	2.12	3.68	5.6	7.88	11.89	15	15	15	15	15
1550	2.05	3.56	5.42	7.62	11.51	15	15	15	15	15
1600	1.99	3.45	5.25	7.38	11.15	14.8	15	15	15	15
1650	1.93	3.34	5.09	7.16	10.81	14.35	15	15	15	15
1700	1.87	3.25	4.94	6.95	10.49	13.92	15	15	15	15
1750	1.82	3.15	4.8	6.75	10.19	13.53	15	15	15	15
1800	1.76	3.07	4.67	6.56	9.91	13.15	15	15	15	15
1850	1.72	2.98	4.54	6.39	9.64	12.8	15	15	15	15
1900	1.67	2.9	4.42	6.22	9.39	12.46	15	15	15	15
1950	1.63	2.83	4.31	6.06	9.15	12.14	15	15	15	15
2000	1.59	2.76	4.2	5.91	8.92	11.84	15	15	15	15
2050	1.55	2.69	4.1	5.76	8.7	11.55	14.78	15	15	15
2100	1.51	2.63	4	5.63	8.49	11.27	14.43	15	15	15
2150	1.48	2.57	3.91	5.5	8.3	11.01	14.09	15	15	15
2200	1.44	2.51	3.82	5.37	8.11	10.76	13.77	15	15	15
2250	1.41	2.45	3.73	5.25	7.93	10.52	7.93	15	15	15
2300	1.38	2.4	3.65	5.14	7.75	10.29	13.17	15	15	15
2350	1.35	2.35	3.57	5.03	7.59	10.07	12.89	15	15	15
2400	1.32	2.3	3.5	4.92	7.43	9.86	12.62	15	15	15
2450	1.3	2.25	3.43	4.82	7.28	9.66	12.37	15	15	15
2500	1.27	2.21	3.36	4.73	7.13	9.47	12.12	15	15	15
2550	1.25	2.16	3.29	4.63	6.99	9.28	11.88	15	15	15
2600	1.22	2.12	3.23	4.54	6.86	9.1	11.65	15	15	15
2650	1.2	2.08	3.17	4.46	6.73	8.93	11.43	15	15	15
2700	1.18	2.04	3.11	4.38	6.61	8.77	11.22	15	15	15

2750	1.16	2.01	3.05	4.3	6.49	8.61	11.02	14.81	15	15
2800	1.13	1.97	3	4.22	6.37	8.45	10.82	14.55	15	15
2850	1.11	1.94	2.95	4.15	6.26	8.31	10.63	14.19	15	15
2900	1.1	1.9	2.9	4.07	6.15	8.16	10.45	14.04	15	15
2950	1.08	1.87	2.85	4	6.05	8.02	10.27	13.81	15	15
3000	1.06	1.84	2.8	3.94	5.95	7.89	10.1	13.58	15	15
3050	1.04	1.81	2.75	3.87	5.85	7.76	9.93	13.35	15	15
3100	1.02	1.78	2.71	3.81	5.75	7.64	9.77	13.14	15	15
3150	1.01	1.75	2.67	3.75	5.66	7.51	9.62	12.93	15	15
3200	0.99	1.72	2.62	3.69	5.57	7.4	9.47	12.73	15	15
3250	0.98	1.7	2.58	3.64	5.49	7.28	9.32	12.53	15	15
3300	0.96	1.67	2.55	3.58	5.4	7.17	9.18	12.34	15	15
3350	0.95	1.65	2.51	3.53	5.32	7.07	9.04	12.16	15	15
3400	0.93	1.62	2.47	3.47	5.25	6.96	8.91	11.98	15	15
3450	0.92	1.6	2.43	3.42	5.17	6.86	8.78	11.8	15	15
3500	0.91	1.58	2.4	3.38	5.1	6.76	8.66	11.64	15	15
3550	0.89	1.55	2.37	3.33	5.02	6.67	8.66	11.64	15	15
3600	0.88	1.53	2.33	3.28	4.95	6.58	8.42	11.31	15	15
3650	0.87	1.51	2.3	3.24	4.89	6.49	8.3	11.16	15	15
3700	0.86	1.49	2.27	3.19	4.82	6.4	8.19	11.01	15	15
3750	0.85	1.47	2.24	3.15	4.76	6.31	8.08	10.86	14.8	15
3800	0.84	1.45	2.21	3.11	4.69	6.23	7.97	10.72	14.6	15
3850	0.83	1.43	2.18	3.07	4.63	6.15	7.87	10.58	14.41	15
3900	0.81	1.41	2.15	3.03	4.57	6.07	7.77	10.44	14.23	15
3950	0.8	1.4	2.13	2.99	4.52	5.99	7.67	10.31	14.05	15
4000	0.79	1.38	2.1	2.95	4.46	5.92	7.57	10.18	13.87	15
4050	0.78	1.36	2.07	2.95	4.4	5.84	7.48	10.06	13.7	15
4100	0.77	1.35	2.05	2.88	4.35	5.77	7.39	9.93	13.53	15
4150	0.77	1.33	2.02	2.85	4.3	5.7	7.3	9.81	13.37	15
4200	0.76	1.31	2	2.81	4.25	5.64	7.21	9.7	13.21	15
4250	0.75	1.3	1.98	2.78	4.2	5.57	7.13	9.58	13.06	15
4300	0.74	1.28	1.95	2.75	4.15	5.51	7.05	9.47	12.9	15
4350	0.73	1.27	1.93	2.72	4.1	5.44	6.96	9.36	12.76	15
4400	0.72	1.25	1.91	2.69	4.05	5.38	6.89	9.26	12.61	15
4450	0.71	1.24	1.89	2.65	4.01	5.32	6.81	9.15	12.47	15
4500	0.71	1.23	1.87	2.63	3.96	5.26	6.73	9.05	12.33	15
4550	0.7	1.21	1.85	2.6	3.92	5.2	6.66	8.95	12.06	15
4600	0.69	1.2	1.83	2.57	3.88	5.15	6.59	8.85	12.06	15

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4650	0.68	1.19	1.81	2.54	3.84	5.09	6.52	8.76	11.93	15
4700	0.68	1.17	1.79	2.51	3.79	5.04	6.45	8.67	11.81	15
4750	0.67	1.16	1.77	2.49	3.76	4.98	6.38	8.57	11.68	15
4800	0.66	1.15	1.75	2.46	3.72	4.93	6.31	8.48	11.56	15
4850	0.65	1.14	1.73	2.44	3.68	4.88	6.25	8.4	11.44	15
4900	0.65	1.13	1.71	2.41	3.64	4.83	6.18	8.31	11.32	15
4950	0.64	1.11	1.7	2.39	3.6	4.78	6.12	8.23	11.21	15
5000	0.64	1.1	1.68	2.36	3.57	4.73	6.06	8.15	11.1	15
Maximum Aspect Ratio	7.3	6.8	6.5	6.3	5.9	4.9	4.3	3.8	3.3	2.9

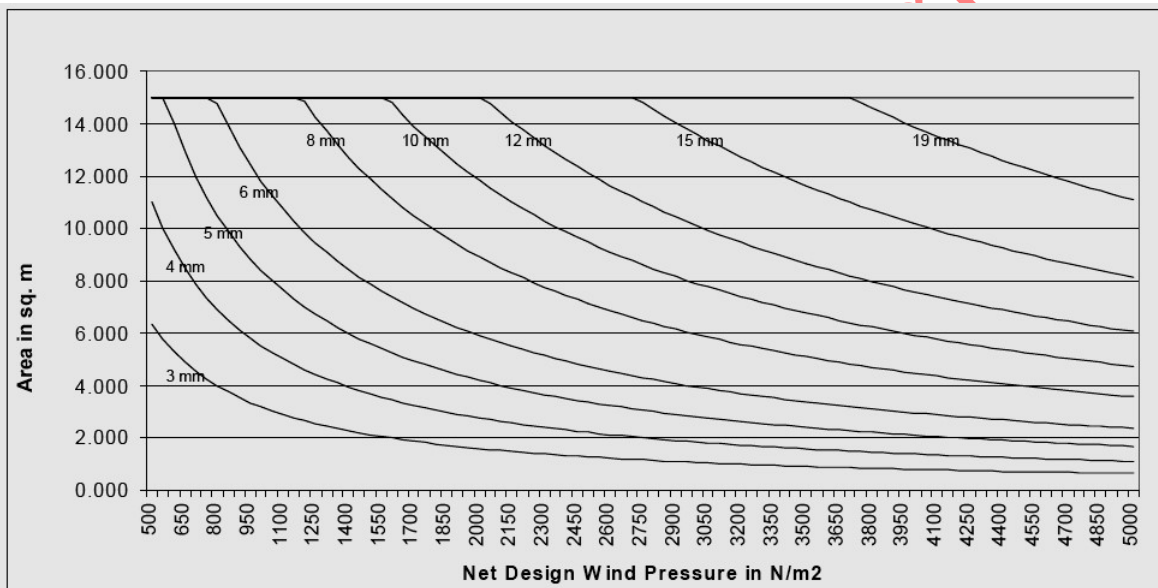


Figure 3 — Tempered glass fixed on all four sides

Table 10 — Maximum areas (m²) for insulating glass fixed on all four sides

Design wind pressure in N/Sqm	Standard nominal thickness of glass 'T' in mm						
	3 + 3	4+4	5+5	6+6	8+8	10+10	12+12
500	3.81	6.62	10.08	14.18	15	15	15
550	3.47	6.02	9.16	12.89	15	15	15
600	3.18	5.52	8.4	11.81	15	15	15
650	2.93	5.09	7.75	10.91	15	15	15
700	2.73	4.73	7.2	10.13	15	15	15
750	2.54	4.41	6.72	9.45	14.27	15	15

800	2.38	4.41	6.72	9.45	14.27	15	15
850	2.24	3.89	5.93	8.34	12.59	15	15
900	2.12	3.68	5.6	7.88	11.89	15	15
950	2.01	3.48	5.31	7.46	11.27	14.95	15
1000	1.91	3.31	5.04	7.09	10.7	14.2	15
1050	1.82	3.15	4.8	6.75	10.19	13.53	15
1100	1.73	3.01	4.58	6.44	9.73	12.91	15
1150	1.66	2.88	4.38	6.16	9.31	12.35	15
1200	1.59	2.76	4.2	5.91	8.92	11.84	15
1250	1.52	2.65	4.03	5.67	8.56	11.36	14.54
1300	1.47	2.55	3.88	5.45	8.23	10.93	13.98
1350	1.41	2.45	3.73	5.25	7.93	10.52	13.46
1400	1.36	2.36	3.6	5.06	7.64	10.15	12.98
1450	1.31	2.28	3.48	4.89	7.38	9.8	12.54
1500	1.27	2.21	3.36	4.73	7.13	9.47	12.12
1550	1.23	2.14	3.25	4.57	6.9	9.16	11.73
1600	1.19	2.07	3.15	4.43	6.69	8.88	11.36
1650	1.16	2.01	3.05	4.3	6.49	8.61	11.02
1700	1.12	1.95	2.96	4.17	6.3	8.35	10.69
1750	1.09	1.89	2.88	4.05	6.12	8.12	10.39
1800	1.06	1.84	2.8	3.94	5.95	7.89	10.1
1850	1.03	1.79	2.72	3.83	5.78	7.68	9.83
1900	1	1.74	2.65	3.73	5.63	7.48	9.57
1950	0.98	1.7	2.58	3.64	5.49	7.28	9.32
2000	0.95	1.66	2.52	3.54	5.35	7.1	9.09
2050	0.93	1.61	2.46	3.46	5.22	6.93	8.87
2100	0.91	1.58	2.4	3.38	5.1	6.76	8.66
2150	0.89	1.54	2.34	3.3	4.98	6.61	8.45
2200	0.87	1.5	2.29	3.22	4.86	6.46	8.26
2250	0.85	1.47	2.24	3.15	4.76	6.31	8.08
2300	0.83	1.44	2.19	3.08	4.65	6.18	7.9
2350	0.81	1.41	2.14	3.02	4.55	6.04	7.74
2400	0.79	1.38	2.1	2.95	4.46	5.92	7.57
2450	0.78	1.35	2.06	2.89	4.37	5.8	7.42
2500	0.76	1.32	2.02	2.84	4.28	5.68	7.27
2550	0.75	1.3	1.98	2.78	4.2	5.57	7.13
2600	0.73	1.27	1.94	2.73	4.12	5.46	6.99
2650	0.72	1.25	1.9	2.67	4.04	5.36	6.86

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2700	0.71	1.23	1.87	2.63	3.96	5.16	6.73
2750	0.69	1.2	1.83	2.58	3.89	5.16	6.61
2800	0.68	1.18	1.8	2.53	3.82	5.07	6.49
2850	0.67	1.16	1.77	2.49	3.76	4.98	6.38
2900	0.66	1.14	1.74	2.44	3.69	4.9	6.27
2950	0.65	1.12	1.71	2.4	3.63	4.81	6.16
3000	0.64	1.1	1.68	2.36	3.57	4.73	6.06
3050	0.62	1.09	1.65	2.32	3.51	4.66	5.96
3100	0.61	1.07	1.63	2.29	3.45	4.58	5.86
3150	0.61	1.05	1.6	2.25	3.4	4.51	5.77
3200	0.6	1.03	1.57	2.22	3.4	4.44	5.68
3250	0.59	1.02	1.55	2.18	3.29	4.37	5.59
3300	0.58	1	1.53	2.15	3.24	4.3	5.51
3350	0.57	0.99	1.5	2.12	3.19	4.24	5.43
3400	0.56	0.97	1.48	2.08	3.15	4.18	5.35
3450	0.55	0.96	1.46	2.05	3.1	4.12	5.27
3500	0.54	0.95	1.44	2.03	3.06	4.06	5.19
3550	0.54	0.93	1.42	2	3.01	4	5.12
3600	0.53	0.92	1.4	1.97	2.97	3.95	5.05
3650	0.52	0.91	1.38	1.94	2.93	3.89	4.98
3700	0.52	0.89	1.36	1.92	2.89	3.84	4.91
3750	0.51	0.88	1.34	1.89	2.85	3.74	4.78
3800	0.5	0.87	1.33	1.87	2.82	3.74	4.78
3850	0.5	0.86	1.31	1.84	2.78	3.69	4.72
3900	0.49	0.85	1.29	1.82	2.74	3.64	4.66
3950	0.48	0.84	1.28	1.79	2.71	3.6	4.6
4000	0.48	0.83	1.26	1.77	2.68	3.55	4.54
4050	0.47	0.82	1.24	1.75	2.64	3.51	4.49
4100	0.46	0.81	1.23	1.73	2.61	3.46	4.43
4150	0.46	0.8	1.21	1.71	2.58	3.42	4.38
4200	0.45	0.79	1.2	1.69	2.55	3.38	4.33
4250	0.45	0.78	1.19	1.67	2.52	3.34	4.28
4300	0.44	0.77	1.17	1.65	2.49	3.3	4.23
4350	0.44	0.76	1.16	1.64	2.46	3.27	4.18
4400	0.43	0.75	1.15	1.61	2.43	3.23	4.13
4450	0.43	0.74	1.13	1.59	2.4	3.19	4.08
4500	0.42	0.74	1.12	1.58	2.38	3.16	4.04
4550	0.42	0.73	1.11	1.56	2.35	3.12	4
4600	0.41	0.7	1.1	1.54	2.33	3.09	3.95

4650	0.41	0.71	1.08	1.52	2.3	3.05	3.91
4700	0.41	0.7	1.07	1.51	2.28	3.02	3.87
4750	0.4	0.7	1.06	1.49	2.25	2.99	3.83
4800	0.4	0.69	1.05	1.48	2.23	2.96	3.79
4850	0.39	0.68	1.04	1.46	2.21	2.93	3.75
4900	0.39	0.68	1.03	1.45	2.28	2.9	3.71
4950	0.39	0.67	1.02	1.43	2.16	2.87	3.67
5000	0.38	0.66	1.01	1.42	2.14	2.84	3.64
Maximum Aspect Ratio	7.3	6.8	6.5	6.3	5.9	4.9	4.3

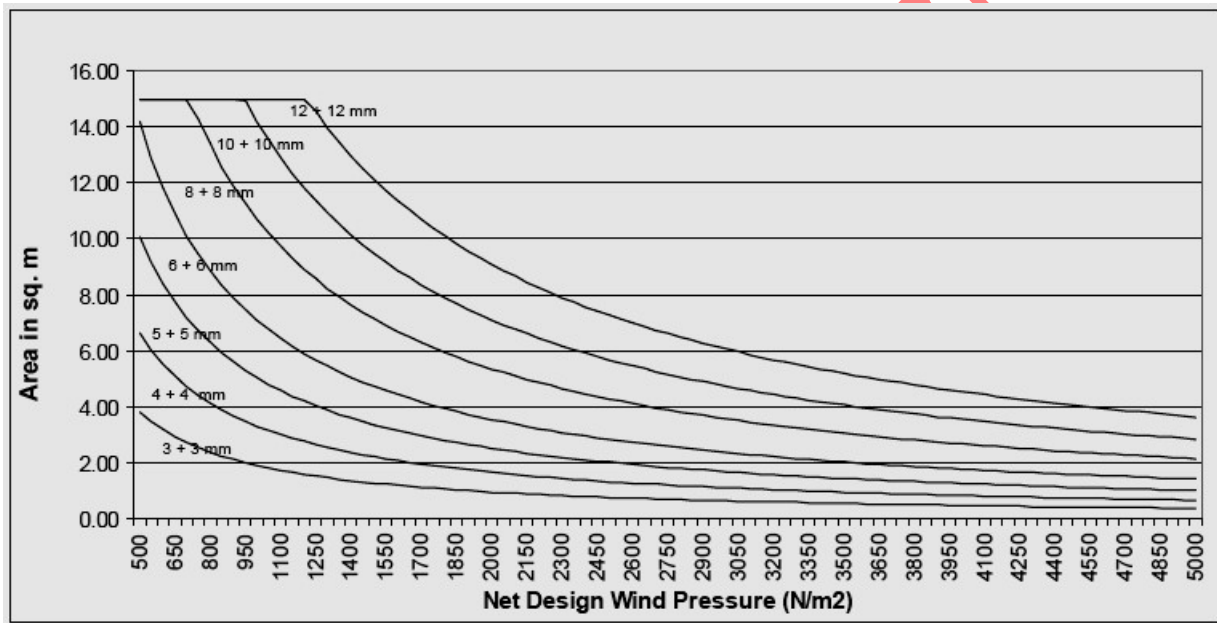


Figure 4— Insulating glass fixed on all four sides

Table 11— Maximum area (m²) for heat strengthened glass fixed on four sides

Design wind pressure in N/Sqm	Standard nominal thickness of glass 'T' in mm									
	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

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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	14.1	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
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	13.32
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	1.098	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
Maximum Aspect Ratio	7.3	6.8	6.5	6.3	5.9	4.9	4.3	3.8	3.3	2.9

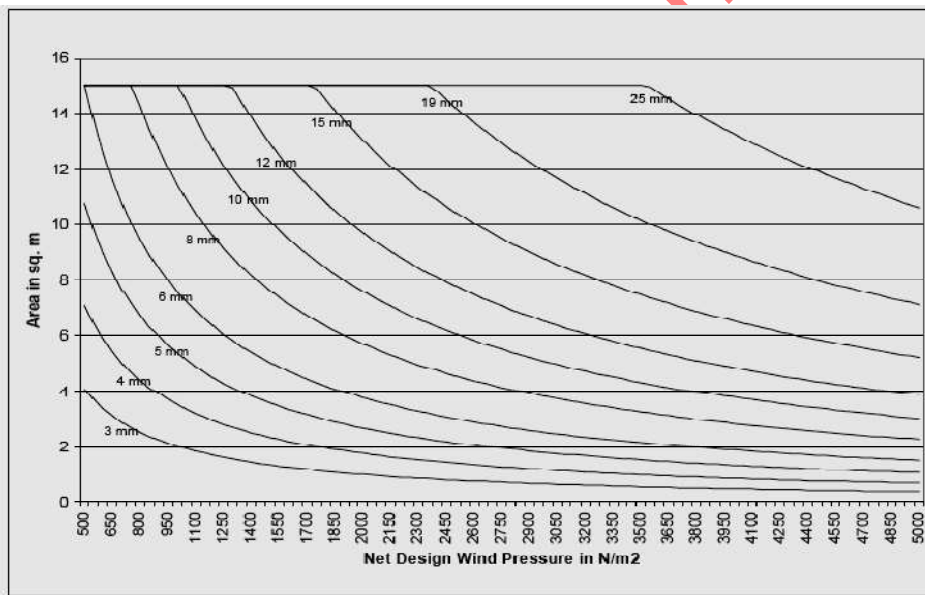


Figure 5 — Heat strengthened glass fixed on four sides

Table 12 — Maximum span (m) for normal (Annealed) glass fixed on two opposite sides

Design wind pressure in N/Sqm	Standard nominal thickness of glass 'T' in mm									
	3	4	5	6	8	10	12	15	19	25
500	0.59	0.78	0.98	1.18	1.51	1.89	2.26	2.83	3.59	4
550	0.56	0.75	0.93	1.12	1.44	1.8	2.16	2.7	3.42	4
600	0.54	0.72	0.89	1.07	1.38	1.72	2.07	2.58	3.27	4

650	0.52	0.69	0.86	1.03	1.32	1.66	1.99	2.48	3.14	4
700	0.5	0.66	0.83	0.99	1.28	1.6	1.91	2.39	3.03	3.99
750	0.48	0.64	0.8	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	0.6	0.75	0.9	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	1.1	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	0.4	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	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

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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
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	0.63	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	0.85	1.7	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	0.53	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	0.63	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

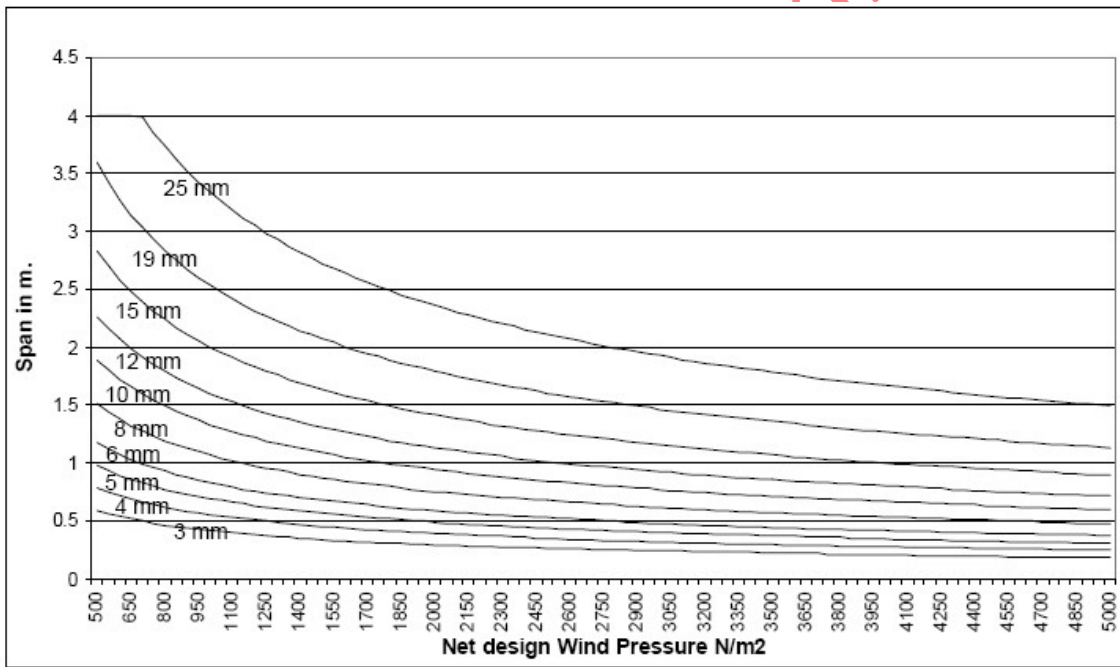


Figure 7 — Normal (annealed) glass fixed on two opposite sides

Table 13 —Maximum span (m) for laminated glass fixed on two opposite sides

Design wind pressure in N/Sqm	Standard nominal thickness of glass 'T' 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	1.29	1.61	1.93	2.41
600	0.8	0.96	1.23	1.54	1.85	2.31

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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	1.1	1.38	1.65	2.07
800	0.69	0.83	1.07	1.33	1.6	2
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	0.6	0.73	0.93	1.16	1.4	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	1.6
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	0.5	0.6	0.77	0.97	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	1.1	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	0.7	0.88	1.05	1.32
1900	0.45	0.54	0.69	0.87	1.04	1.3
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	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	0.5	0.64	0.8	0.97	1.21
2250	0.41	0.5	0.64	0.8	0.95	1.19
2300	0.41	0.49	0.63	0.79	0.94	1.18
2350	0.4	0.48	0.62	0.78	0.93	1.17
2400	0.4	0.48	0.62	0.77	0.92	1.16
2450	0.4	0.47	0.61	0.76	0.92	1.14
2500	0.39	0.47	0.6	0.75	0.91	1.13
2550	0.39	0.47	0.6	0.75	0.9	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	1.1
2700	0.38	0.45	0.58	0.73	0.87	1.09
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	0.8	1
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	0.4	0.52	0.65	0.78	0.97
3450	0.33	0.4	0.51	0.64	0.77	0.96
3500	0.33	0.4	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	0.5	0.63	0.75	0.94
3650	0.32	0.39	0.5	0.62	0.75	0.94
3700	0.32	0.39	0.5	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	0.9
4000	0.31	0.37	0.48	0.6	0.72	0.9
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	0.3	0.36	0.47	0.59	0.7	0.88
4200	0.3	0.36	0.47	0.58	0.7	0.87
4250	0.3	0.36	0.46	0.58	0.69	0.87
4300	0.3	0.36	0.46	0.58	0.69	0.86
4350	0.3	0.36	0.36	0.57	0.69	0.86
4400	0.3	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	0.85
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	0.81
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	0.8
5000	0.28	0.33	0.43	0.53	0.64	0.8

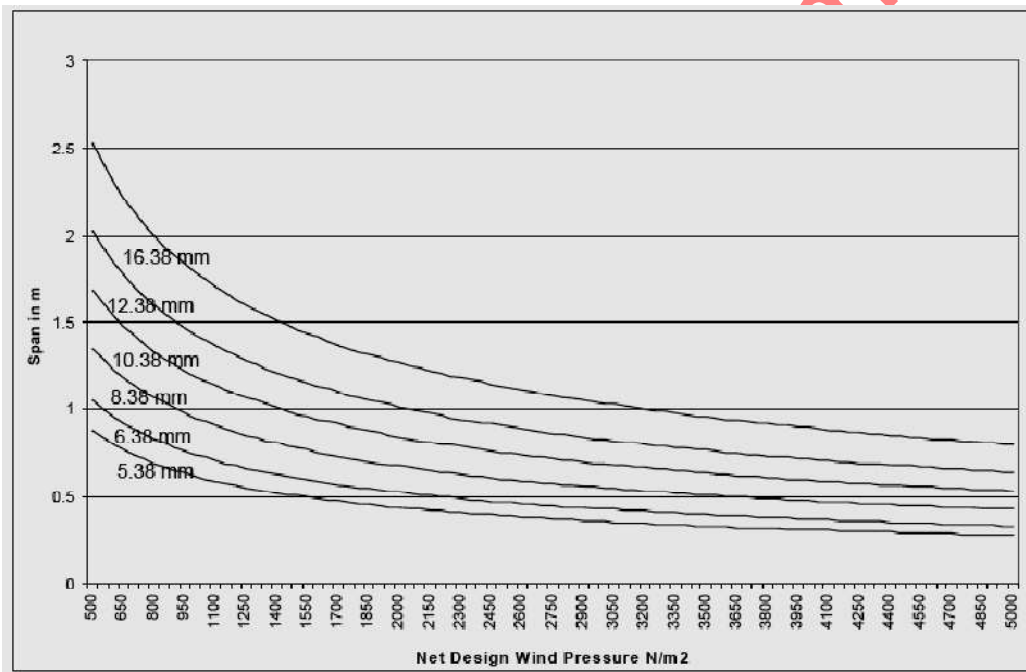


Figure7 — Laminated glass fixed on two opposite Sides

Table 14 — Maximum span (m) for tempered glass fixed on two opposite sides

Design wind pressure in N/Sqm	Standard nominal thickness of glass 'T' in mm									
	3	4	5	6	8	10	12	15	19	25
500	0.69	0.92	1.16	1.39	1.84	2.3	2.76	3.45	4	4
550	0.66	0.88	1.1	1.32	1.75	2.19	2.63	3.29	4	4
600	0.63	0.84	1.05	1.27	1.68	2.1	2.52	3.15	3.99	4
650	0.61	0.81	1.01	1.22	1.61	2.02	2.42	3.02	3.83	4

700	0.59	0.78	0.98	1.17	1.55	1.94	2.33	2.91	3.69	4
750	0.57	0.75	0.94	1.13	1.5	1.88	2.25	2.81	3.57	4
800	0.55	0.73	0.91	1.1	1.45	1.82	2.18	2.73	3.45	4
850	0.53	0.71	0.89	1.06	1.41	1.76	2.12	2.64	3.35	4
900	0.52	0.69	0.86	1.03	1.37	1.71	2.06	2.57	3.25	4
950	0.5	0.67	0.84	1.01	1.33	1.67	2	2.5	3.17	4
1000	0.49	0.65	0.82	0.98	1.3	1.63	1.95	2.44	3.09	4
1050	0.48	0.64	0.8	0.96	1.27	1.59	1.9	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	0.6	0.75	0.9	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	0.7	0.84	1.12	1.4	1.68	2.1	2.66	3.5
1400	0.41	0.55	0.69	0.83	1.1	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	0.4	0.53	0.67	0.8	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	1.9	2.4	3.16
1700	0.38	0.5	0.63	0.75	1	1.25	1.5	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	2.3	3.03
1850	0.36	0.48	0.6	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	0.7	0.93	1.16	1.4	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	1.7	2.16	2.84
2100	0.34	0.45	0.56	0.68	0.9	1.12	1.35	1.68	2.13	2.8
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	1.1	1.31	1.64	2.08	2.74
2250	0.33	0.44	0.54	0.65	0.87	1.08	1.3	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	0.61	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	2.6
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

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2600	0.3	0.41	0.51	0.61	0.81	1.01	1.21	1.51	1.91	2.52
2650	0.3	0.4	0.5	0.6	0.8	1	1.2	1.5	1.9	2.5
2700	0.3	0.4	0.5	0.6	0.79	0.99	1.19	1.48	1.88	2.47
2750	0.3	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	1.4	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	2.2
3450	0.26	0.35	0.44	0.53	0.7	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	1.3	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	0.5	0.67	0.83	1	1.25	1.58	2.08
3850	0.25	0.33	0.42	0.5	0.66	0.83	99	1.24	1.57	2.07
3900	0.25	0.33	0.41	0.5	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	0.4	0.48	0.64	0.8	0.96	1.2	1.52	2.01
4150	0.24	0.32	0.4	0.48	0.64	0.8	0.96	1.2	1.52	1.99
4200	0.24	0.32	0.4	0.48	0.63	0.79	0.95	1.19	1.51	1.98
4250	0.24	0.32	0.4	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	1.9
4600	0.23	0.3	0.38	0.46	0.61	0.76	0.91	1.14	1.44	1.89
4650	0.23	0.3	0.38	0.45	0.6	0.75	0.9	1.13	1.43	1.88
4700	0.23	0.3	0.38	0.45	0.6	0.75	0.9	1.12	1.42	1.87
4750	0.22	0.3	0.37	0.45	0.6	0.75	0.89	1.12	1.42	1.86
4800	0.22	0.3	0.37	0.45	0.59	0.74	0.89	1.11	1.41	1.85
4850	0.22	0.3	0.37	0.45	0.59	0.74	0.89	1.11	1.4	1.84
4900	0.22	0.3	0.37	0.44	0.59	0.73	0.88	1.1	1.39	1.84
4950	0.22	0.29	0.37	0.44	0.58	0.73	0.88	1.1	1.39	1.83
5000	0.22	0.39	0.37	0.44	0.58	0.73	0.87	1.09	1.38	1.82

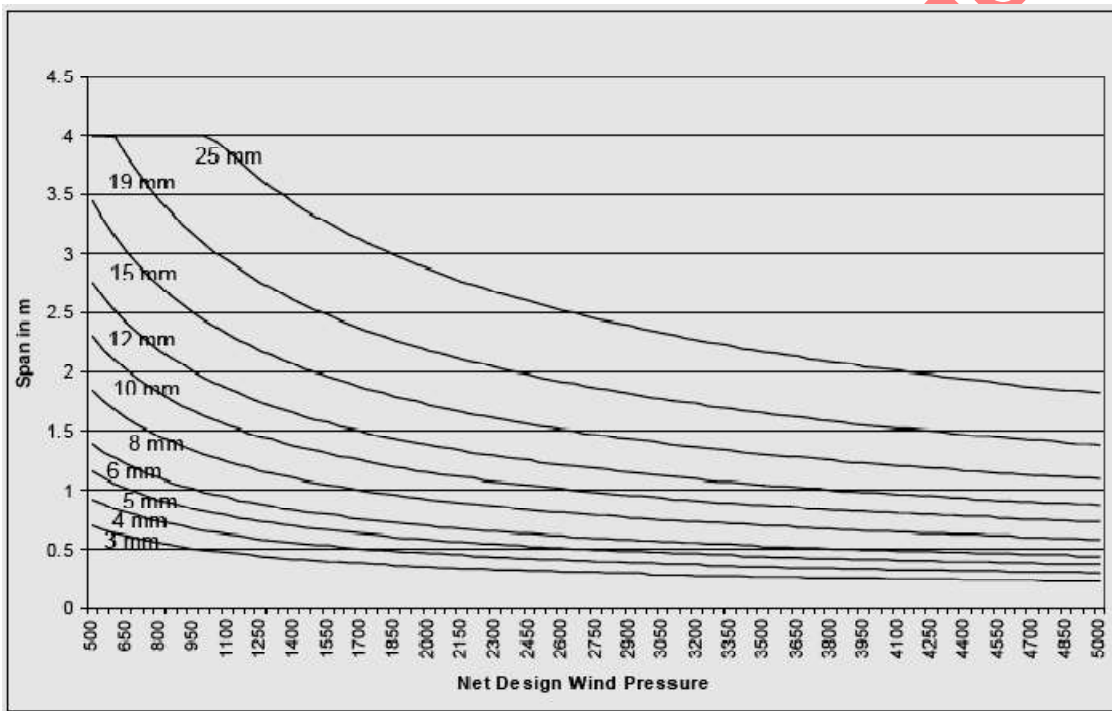


Figure 8 — Tempered glass fixed on two opposite sides

Table 15 — Maximum span (m) for heat strengthened glass fixed on two opposite sides

Design wind pressure in N/Sqm	Standard nominal thickness of glass 'T' in mm									
	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	2.52	3.14	3.98	5.23

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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	
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	0.54	0.65	0.82	1.03	1.23	1.54	1.95	2.57
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	0.6	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	0.42	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

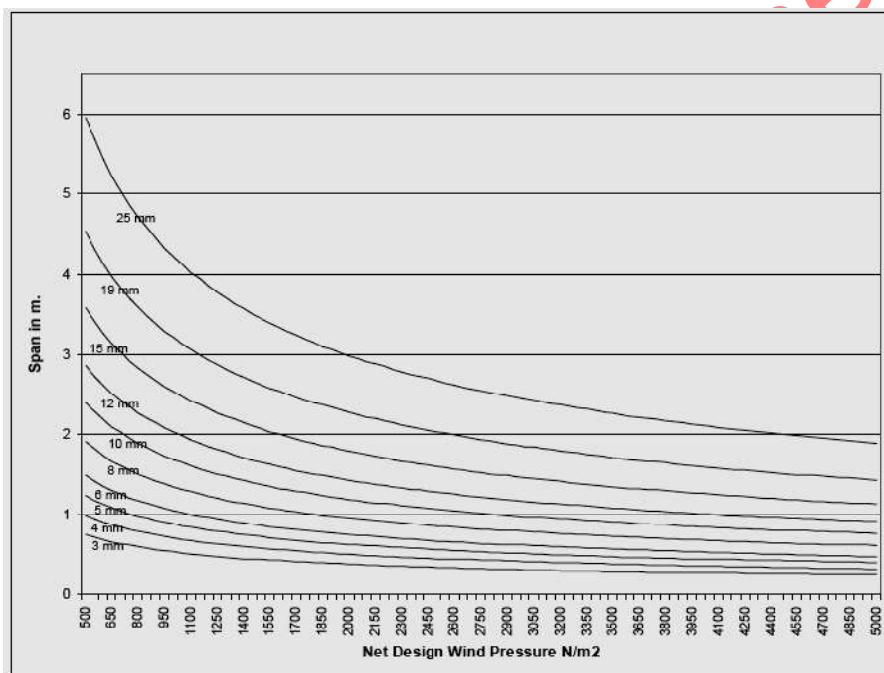


Figure9 — Heat Strengthened glass fixed on two opposite sides

5 Installation

5.1 Basic installation requirements

The basic installation requirements and materials used for glass are given below:

- a) the provisions under this item does not include the use of other methods or systems for glazing, provided that the alternate method or system can be demonstrated to satisfy the requirements for correctly supporting the glass within the frame or glazing system;
- b) patent and other proprietary systems are not described/covered in this section;and

c) installation technique for frameless glazing system is not covered in this in this section.

5.1.1 Site working and glass machining operation

Heat-strengthened and toughened glass shall not be cut or worked after heat treatment. All necessary cutting, drilling, notching, and edge-working shall be carried out to correct dimensions prior to value addition to the glass such as toughening/ tempering/ heat strengthening. The edges and surfaces of all glass types shall not be damaged during fixing. Glass damaged during or prior to installation shall not be installed.

5.1.2 Dimensional requirement

The dimensions for edge clearance, edge cover, front and back clearance, rebate depth shall be selected in accordance RS 397-2.

5.2 Glazing materials

5.2.1 Compatibility of materials

A glazing material shall be used only when compatible with contiguous materials, including the rebate surface finish, setting or location blocks, distance pieces and glass type are available.

5.2.2 Application of materials

The application of glazing materials shall be in accordance with relevant/available standard or manufacturer's instructions.

5.2.3 Life expectancy of materials

A glazing material shall only be used where its life expectancy (durability) has been established. The manufacturers' advice/guarantee should be sought for information regarding life expectancy.

5.3 Setting blocks

5.3.1 The number and location of setting blocks shall be as shown in figures 13 and 14. Generally, setting blocks shall be:

- a) positioned at quarter points or not less than 30 mm from the corner, whichever is lesser;
- b) the minimum width of each setting block shall be not less than the glass thickness; and
- c) the minimum thickness of the setting block for drained glazing systems shall be 6 mm.

5.3.2 Setting blocks shall be located to equally support all panes of glass, and shall be fixed to prevent displacement during installation and service.

5.3.3 The minimum length of each setting block (or two blocks side by side) shall be 25 mm in length for every square meter of glass area, with a minimum length of 50 mm.

5.3.4 When wood is used as the material for setting blocks, only the seasoned ones should be used as green wood may shrink laterally (in the process of attaining equilibrium moisture content over a period of time) and result in loosened installations.

NOTE For example, a 3.0 m² glass area, 3.0 × 25 mm = 75 mm long, i.e., 75 mm is the length of each setting block.

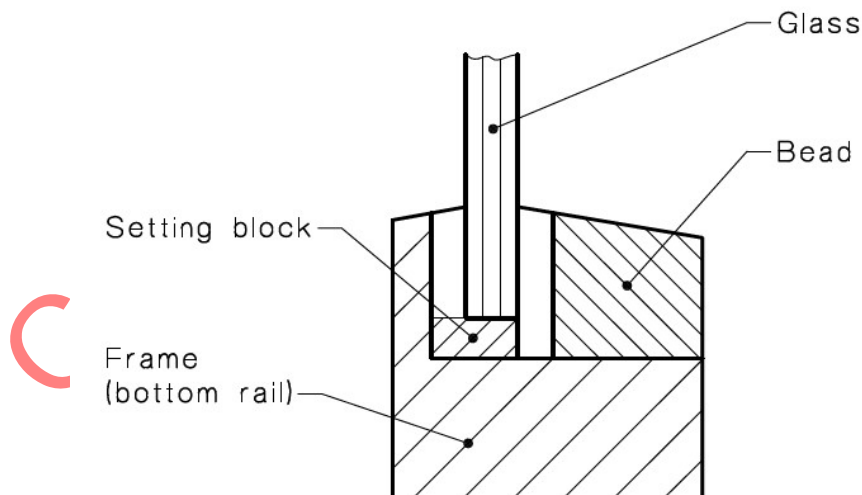
5.3.5 Setting blocks shall be of resilient, load-bearing, non-absorbent, rot-proof, and material that is compatible with all other glazing materials conforming to available standards (if any) that may come into contact with the blocks.

NOTE 1 Setting blocks are used between the bottom edge of the unit and the frame to centralize and equally support both panes of glass.

NOTE 2 Setting block width and location should not restrict water drainage.

NOTE 3 Extruded rubber material with 80 - 90 shore-A hardness is recommended.

NOTE 3 Shaped setting blocks will be required for a glazing platform.



a) Figure 12 — Position of setting block

5.4 Location blocks

The number and position of location blocks shall be as shown in figures 12 and 14. Location blocks shall be:

- a) of minimum of 25 mm in length;
- b) at least as wide as the glass thickness;
- c) positively located to prevent displacement in service; and
- d) sufficiently resilient to accommodate movement within the frame, without imposing stress on the glass, and of resilient, non-absorbent material.

NOTE1 Location blocks are used between the edges of the glass and the frame to prevent movement of the glass within the frame by thermal expansion or when the window or door is opened or closed. They are required to prevent the weight of the glass from causing the frame to become out of square.

NOTE 2 Extruded rubber material with 55 - 65 shore-A hardness is recommended.

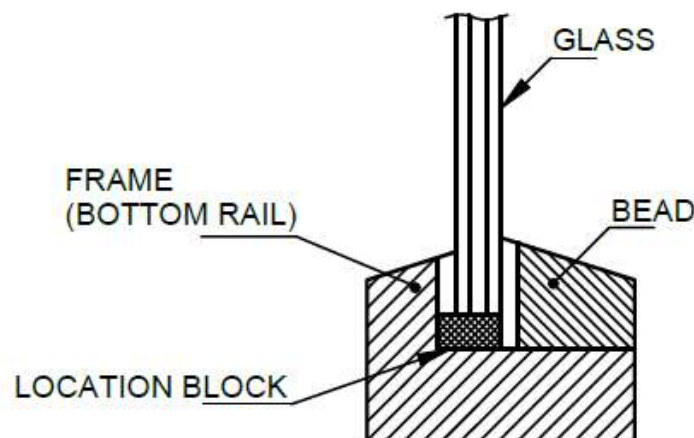


Figure 13— Position of location block

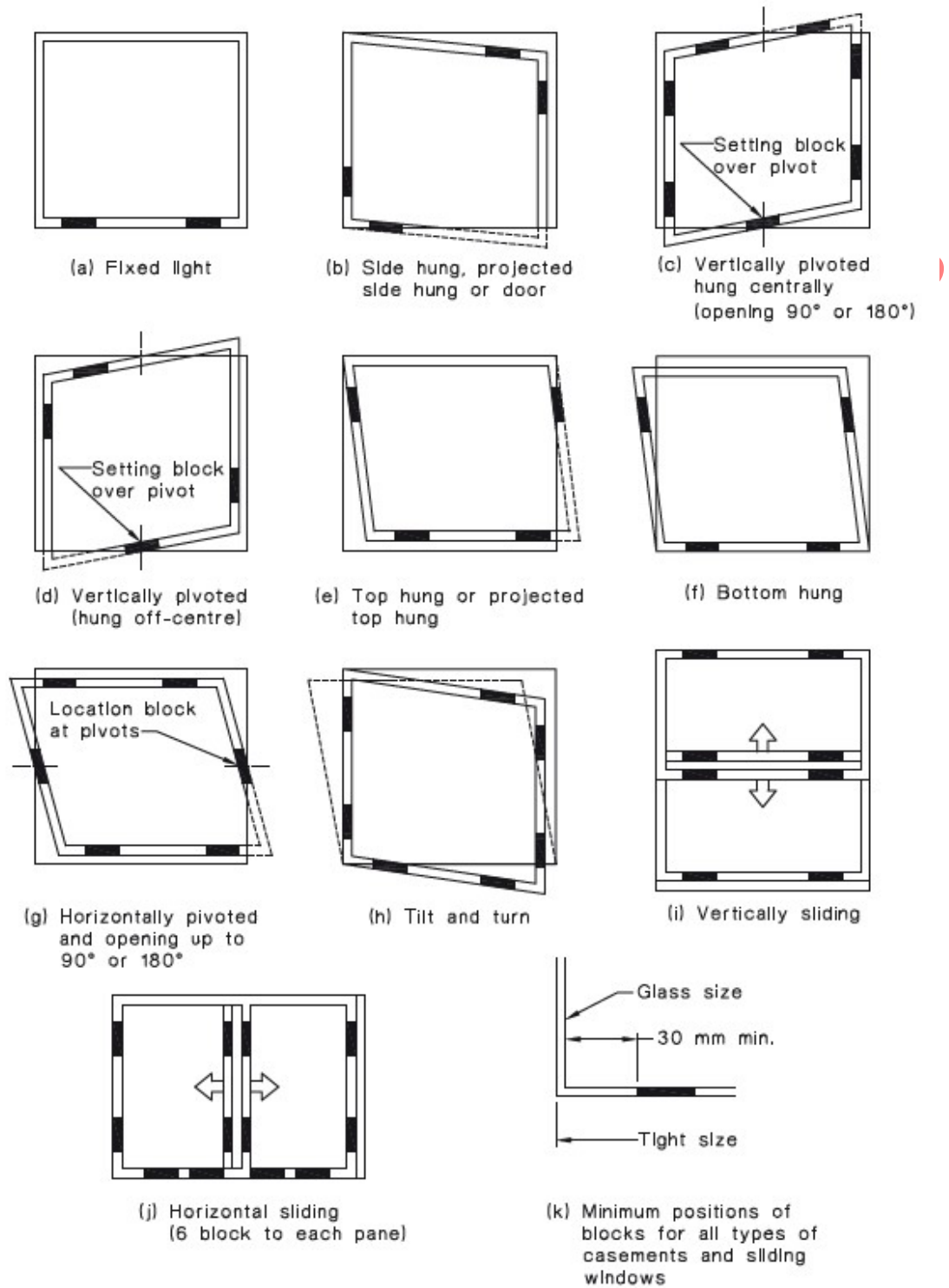


Figure 14 — Recommended positions of setting and location blocks for the site glazing of some types of doors and windows

5.5 Distance Pieces

5.5.2 Distance pieces, as shown in Figure 15, used where required, shall be:

- a) of resilient, non-absorbent material;
- b) 25 mm long and of a height to suit the depth of the rebate and the method of glazing; and
- c) spaced opposite each other, approximately 50 mm from each corner at intervals of not more than 300 mm.

5.5.2 The thickness shall be equal to the front and back clearance, to retain the glass firmly in the frame.

NOTE 1 Distance pieces are required to prevent displacement of glazing compounds or sealant by external loading, such as wind pressure

NOTE 1 Extruded rubber material with 55 - 65 shore A hardness is required.

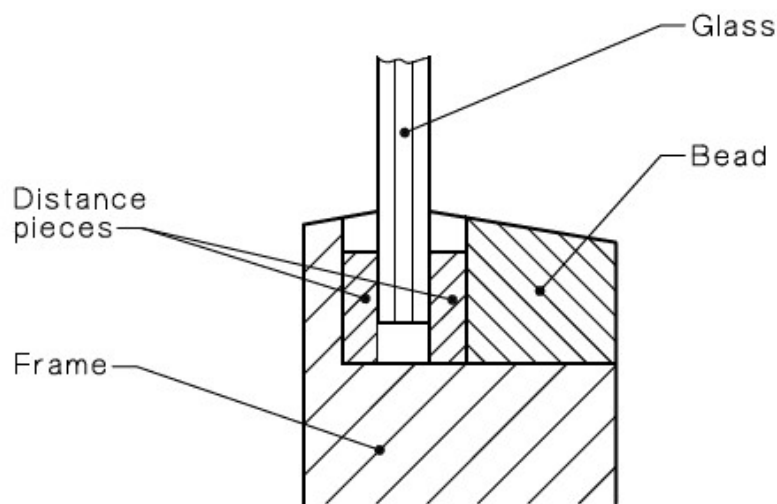


Figure 15 — Position of distance pieces

5.6 Rebates and grooves for installation

5.6.1 Rebates, grooves and beads shall be cleaned and free from grease, moisture and other contaminants. All sealant surfaces shall be primed or sealed in accordance with the recommendations of the manufacturer of the glazing material.

5.6.2 The number and location of setting blocks and location blocks shall be as shown in figures 12, 13 and 14, wherever necessary to maintain the requisite edge clearance. Each block shall support the full thickness of the glass.

5.7 Glazing beads

Where used, glazing beads shall be capable of restraining the glass under all design forces.

5.8 Structural sealants

5.8.1 Structural silicone shall be installed such that a full adhesive bond to the substrate is achieved. Application of structural silicone may require prior cleaning and or priming of the substrate.

5.8.2 Applied structural silicones shall not be installed adjacent to other materials that may be chemically incompatible with the structural sealant and cause a loss of adhesion or adverse chemical changes within the structural silicone that could lead to a loss of strength in the structural silicone.

NOTE For guidance on the installation of structural silicone, see ASTM C 1401 and ASTM C 1184.

6 Design criteria

6.1 Frame support condition

6.1.1 Maximum area of glass panels subjected to wind loading

6.1.1.1 The maximum span for a given standard nominal thickness of ordinary annealed, laminated, heat-strengthened and toughened glass for a given panel size shall be determined in accordance with clause 6.2, 6.3 and 6.4 as applicable for the relevant support conditions. For heat strengthened laminated and toughened laminated glass, maximum allowable span shall be determined in accordance with 6.3. For 3 mm monolithic annealed glass, the maximum area shall not exceed 0.85 m².

6.1.1.2 The minimum thickness of the nominal glass size shall be as given in the respective specification standards in Annex A.

6.1.1.3 For laminated glass composites, the combined minimum thickness of the glass sheets shall be used excluding the interlayer thickness.

6.2 Rectangular glass supported on all four edges

For rectangular glass supported on all four edges, the maximum area for the design wind pressure shall be determined either graphically from figures 6 to 9 or using the corresponding tables provided above the figure for each type of glass. Linear interpolation may be used for any value in between those given therein while maintaining the aspect ratio.

6.3 Rectangles of glass supported on two opposite edges

For rectangles of glass supported on two opposite edges, the maximum glass area for the design wind pressure shall be determined from figures 6 to 9 for ordinary annealed, laminated, heat-strengthened and toughened glass respectively.

6.4 Rectangles of glass supported on three edges

For rectangles of glass supported on three edges, the maximum glass area shall be determined as for two-edge support spanning along the unsupported edge. Alternatively, basic engineering principles shall be adopted in determining the glass thickness for all applications where only three edges of the panel are supported.

NOTE Butt glazing of adjacent panels in the same plane should not be considered as a support when using figures 6 to 13.

6.5 Heat-strengthened laminated and toughened laminated glass

For heat-strengthened laminated and toughened laminated glass, the maximum span for a given standard nominal thickness for a given panel size shall be determined from figures 5 and 9 and figures 2 and 7 respectively, with the design wind pressure being divided by the appropriate glass type factor, P_f (see Table 2), as applicable for the relevant support conditions.

6.6 Serviceability checks

6.6.1 Glass complying with Tables 7 to 15 are deemed to meet the serviceability deflection limits specified (in the absence of any other specified values) or the following values may be had for guidance.

6.6.2 Maximum allowable deflection of framing members

a) for mullions:

1) single height glazing: $\text{Span}/175$ or 19 mm whichever is less; and

2) double height glazing: For spans up to 4110 mm, same as single height glazing; and for spans above 4110 mm, the same shall be $(\text{Span}/240) + 6.35$ mm.

b) for transoms:

1) $\text{span}/500$ or 3 mm, whichever is the least for dead load; and

2) $\text{span}/175$ or 19 mm, whichever is the least for wind load.

c) deflection at the centre of the glass:

1) monolithic glass: $\text{shorted span}/60$ or 19 mm, whichever is the least; and

2) double glazed unit: $\text{shortest span}/90$ or 19 mm, whichever is the least.

d) deflection at the edge of the glass shall be limited to 15 mm.

6.7 Ultimate stresses

The ultimate stresses for various types of glass are given in Table 16.

6.8 Insulating glass units

6.8.1 Determining thickness of structural silicone

The structural bite requirement is directly proportional to the wind load and the dimension of glass. Higher the wind load and larger the dimensions of the glass are, the greater the amount of structural bite required. The controlling variables which affect the structural bite requirement are the maximum short span dimension of glass and the design wind load that the structural glazing system must be designed to accommodate.

Table 16 — Ultimate limit state design stresses for glass subjected to wind loading

Glass type	Standard nominal thickness 'T' mm	Ultimate limit state design stress at given location	
		Away from edge (Mpa)	At edge (Mpa)
Annealed	3	41	32.8
	4	38.99	31.19
	5	37.45	29.96
	6	36.2	28.96
	8	34.33	27.46
	10	32.8	26.24
	12	31.57	25.25
	15	30.15	24.12
	19	28.72	22.98
	25	26.96	21.57
Toughened	4	97.47	77.97
	5	93.61	74.97
	6	90.49	72.39
	8	85.82	68.65
	10	82.01	65.61
	12	78.91	63.13
	15	75.37	60.3
	19	71.81	57.45
	25	67.41	53.93
Heat strengthened	3	65.6	52.8
	4	62.38	49.9

	5	59.91	47.93
	6	57.91	46.33
	8	54.92	43.94
	10	52.48	41.99
	12	50.51	40.4
Annealed laminated	5	37.73	30.18
	6	36.43	29.14
	8	34.41	27.53
	10	32.87	26.3
	12	31.62	25.3
	16	29.75	23.8
	20	28.23	22.58
	24	26.99	21.59

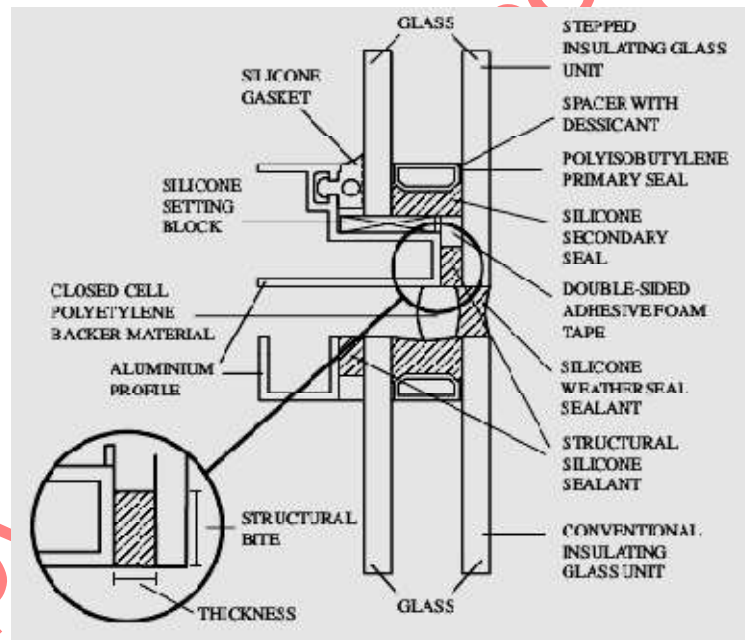


Figure 14 — Typical structural glazing detail

6.8.1.1 Structural bite calculation for wind load and glass dimension

Minimum Structural Bite = (Glass Short Span Dimension * Wind Load * 0.5)/Maximum allowable design stress

NOTE 1 Glass' Short Span Dimension (SSD) is the shorter of the two dimensions (in metre) of the rectangular glass panel.

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NOTE 2 Wind load is the maximum wind pressure in Pascal for a return period of 10 years based on local regulations.

NOTE 3 The maximum allowable design stress for type of the structural sealant is selected.

6.8.1.2 Structural bite calculation for dead load

$$\text{Minimum bite (m)} = \frac{\text{Weight of glass (kg)}}{\text{Perimeter of the glass (m)} \times \text{sealant dead load design strength (kg/m}^2\text{)}} = \frac{\rho g T A}{P S}$$

$\rho = 2500 \text{ kg/m}^3$ is the specific mass of flat glass corresponding to approximately of specific weight.

$$g = 9.81 \text{ m/S}^2$$

S = Allowable Design Stress for Dead load (DL) for selected sealant considered for design, Pa.

T = thickness of the bite, m

P = perimeter (if the horizontal frame members will not be supporting the glass or will deflect under the dead load of the glass, consider 2 x Height only)

A = area of glass panel (m^2)

6.8.2 Maximum allowable span for glass and type

Maximum allowable span is dependent on the thickness of the glass selected and type of glass used (e.g., annealed, toughened or heat strengthened glass). The maximum span is calculated in accordance with 4.9.

6.9 Safety during installation

6.9.1 Glass and the coating layer (if any) should not be, exposed to/in direct contact, with aggressive materials such as acid, solvent, cement mortar, etc.

6.9.2 The fixing system of the panel should in no case, cause shear stresses in the panel, and particularly the bonding interface between the glass sheet and the frame, either under the effect of external forces or due to differential expansion of components.

6.9.3 The protection of glass panel by means of a polyethylene sheet is recommended and shall provide ventilation for the glass in order to prevent thermal breakage.

6.10 Handling and transportation

6.10.1 Transportation

During transportation of flat glass (clear, tinted), coated glass (solar control and mirror), lacquered or painted glass the following methods (if other standard packaging specifications are not available) of storage, packing and interleaving shall be followed:

- a) flat glass shall be transported vertically;
- b) the glass panes should not come into direct contact with each other by using appropriate interleaving such as powder or foam or paper. The lacquer opacified / enamel coated / screen printed glasses shall be separated by paper or foam; and
- c) the packing and packing material shall be protected from water and if the glass is wrapped and sealed, the seal should remain closed until the product is used and precautions shall be taken not to damage the packing while handling with a hoisting apparatus.

6.10.2 Handling

During handling of flat glass (clear, tinted), coated glass (solar control and mirror), lacquered or painted glass, the following guidelines shall be followed:

- a) glass shall be handled with dry, clean gloves, specifically after washing to prevent stain marks on them;
- b) care shall be taken to avoid contact or friction of the coating or the opacified/enamel/screen printed side with any rough surface or hard objects;
- c) a better practice is to handle glass with vacuum cups, and ensure that the vacuum cups and the glass are clean; and
- d) it is recommended to keep it clean if glass sheets are stored again before their processing or installation in the facade.

6.11 Storage at site

To prevent staining, the storage area at site shall be:

- a) a dry, well-ventilated location at a sufficiently constant temperature;
- b) protected from rain and running water;
- c) protected from wide changes in temperature or humidity;
- d) protected from alkaline material;
- e) protected from direct contact of aggressive products such as corrosive vapours, acids, etc; and
- f) glass panes are stored vertically on a soft surface such as wooden boards/battens.

6.12 Storage after cutting

6.12.1 While stacking of coated glass/mirror in the unpacked condition, the glass surface shall be facing towards the front (paint/coating backing towards the back).

6.12.2 Direct stacking of the mirror/coated glass one above the other should be prevented and suitable interleaving material as mentioned in 6.9 should be used between two glass panes.

6.12.3 The support material for glass storage should not have affinity towards moisture absorption.

7 Fire safety

7.1 General

7.1.1 This section covers the requirements and selection of fire safety glass for buildings. General fire safety provisions for buildings are found in relevant parts of RS 186. It is important for any fire rated glass to provide sufficient amount of human impact safety feature even during fire or in general situations. The level of human impact safety of glass in buildings shall be in accordance with DRS 387-5. Fire rated system shall withstand the standard time-temperature curve during a fire test and shall give adequate time to the occupants for safe evacuation. This section does not deal with the safety and security of people or goods in relation to risks of:

- a) vandalism, riots, burglary or break in protection;
- b) protection from explosion (terrorist attack);
- c) natural disasters like earthquakes, cyclone, etc.;and
- d) plastic glazing, safety and security glazing, etc.

7.1.2 The requirements given in this section are minimum fire resistance requirements. In circumstances wherein the requirements of other Rwanda Standards exceed the requirements of this section, in such cases the higher requirements shall apply.

7.2 Glass for fire resistance

7.2.1 Glazing material shall be constructed, treated, or combined with other materials so as to reduce loss of life or property during an event of fire, in comparison with ordinary sheet or flat glass, thereby preventing the passage of flame, hot gases, smoke and/or providing radiation control and/or insulation.

7.2.2 The following are the products in the scope of this section that may be used for fire resistance in glazing provided that they meet the relevant available standards:

- a) wired glass;
- b) Annealed Fire Resistant glass (AFG);
- c) Tempered Fire Resistant Glass (TFG);

- d) Gel Laminated Fire Resistant Glass (LFG); and
- e) Double Glazed Fire Resistant Glass (DFG).

7.2.2.1 Wired glass is a type of glass into which a wire mesh is embedded during production. Wired glass has an impact resistance similar to that of normal glass, but in case of breakage, the mesh retains the pieces of glass. Value addition such as tempering and lamination is not possible using wired glass.

NOTE Wired glass is not recommended in doors except as vision panel and for window sizes not greater than in Table 17.

Table 17 — Limiting size of wired glass panel

Opening fire protection rating	Maximum area m ²	Maximum height (m)	Maximum width m
60 to 90 min	0.0645	0.838	0.254
45 min	0.836	1.372	1.372
20 min	Not limited	Not limited	Not limited
Fire window assembly	0.836	1.372	1.372

7.2.2.2 Annealed Fire Resistant Glass: A single piece of fire resistant glass that is tested for fire resistance for the required duration. These types of glasses can be used only in areas where human impact safety is not an issue, typically in areas like vision panels of doors.

7.2.2.3 Tempered Fire Resistant Glass: A single piece of specially heat-treated or chemically treated glass that is tested for fire resistance for the required duration and which has a stress pattern such that the piece when fractured reduces to numerous granular fragments, with no large jagged edges. Additionally, these glasses should have an impact resistance of highest classification.

7.2.2.4 Gel Laminated Fire Resistant Glass: Two or more pieces of fire resistant glass held together by an interleaving layer or layers of materials and that as a complete system is tested for fire resistance. The laminated glass will crack and break during the fire or under sufficient impact, but the pieces of glass tend to adhere to the interlayered material and do not allow the fire to penetrate the last layer of glass.

7.2.2.5 Double Glazed Fire Resistant Glass: Fire resistant glass that is used as a double glazed unit has to be tested as a complete Double Glazed Unit (DGU) or other multiple glazed units as the case may be. Fire resistant glass cannot be combined with another glass and used as a DGU unless the combined double glazed or multiple glazed unit is also tested. Both the panes of the double glazed unit shall satisfy the required impact safety as mentioned in DRS 397-5.

NOTE It may be noted that use of any fire rated glass has to be used in conjunction with a tested system. Fire rated glass alone cannot provide the desired fire resistance since the fire resistance of a partition or a door assembly or any glazed building element is a function of the glass, frames, hardware, gaskets and fixings which forms the glazed system.

7.2.1 Testing procedures

7.2.1.1 Any fire rated glazed building element needs to be tested as per ISO 3009. The standard tests any building element shall have to withstand against a fixed time – temperature curve is defined as:

$$T = 345 \log_{10}(8t + 1) + 20$$

where

T is the average furnace temperature in deg Celsius at time 't' in minutes

7.2.1.2 Different standards have different pressure standards which have to be maintained as per the standard during the testing.

7.2.1.3 The fire rating criteria of any building element is determined as per the following:

- a) integrity: prevention of passage of flames, hot gases and smoke from the fire side to the non-fire side, denoted by the letter (E);
- b) radiation control, the radiation performance category is defined at a qualifying maximum total heat flux of 15Kw/Sqm. Values are determined based on measurements at standard distance of 1 m from the glazed element at the end of standard fire test time period. This criterion can be achieved by the use of fully insulating fire-resistant glass or by using integrity only glass types with additional radiation reducing property. Providing integrity along with keeping the radiated heat through the building element below 15 kw/m² when measured at a distance of 1 m from the building element, denoted by the letters (EW); and
- c) insulation: providing integrity along with keeping the average temperatures as measured by all the thermocouples on the non-fire side below 140 °C from the initial temperature considering that no thermocouple records a temperature more than 180 °C from the initial temperature at any point of time during the test, denoted by the letters (EI).

7.2.2 Identification of glass used for fire resistance

7.2.2.1 All glass used for resisting fire shall conform to and preferably be certified against ISO 3009 requirements.

7.2.2.2 Since a fire-resistant glass is not easily distinguishable from normal types of glass, it is imperative that every fire rated glass panel should preferably have an indelible mark on all the panels of fire-resistant glass showing the name of the manufacturer and the name of the product.

7.2.2.3 Rating of the glass panel may also be provided, although the rating of glazing system is of primary concern.

7.3 Precautions

7.3.1 Fire-resistant glass alone will not be enough to protect occupants from fire. Glass is only one component of the complete system.

7.3.2 Fire test certificate report conducted for one application shall not be substituted for any other application.

7.3.2.1 For example, a report for a partition shall not be used for a door application although the glass used and the fire ratings are the same.

7.3.2.2 Approval in vertical orientation cannot be considered for acceptance in horizontal or inclined orientation.

7.3.3 The maximum glass size as mentioned in the test report should not be exceeded in practice with respect to the bigger linear dimension or area, unless otherwise validated by an assessment report issued by the testing laboratory. The aspect ratio may be modified provided that none of the linear sides has a dimension greater than that of the largest dimension of originally tested glass.

7.3.4 The dimensions of the profile need to be the same as that tested.

7.3.5 In case of any change in hardware, they should be replaced following the guidelines laid down in the standard against which the test was conducted.

7.3.6 Factors like edge cover, types of gaskets and type of fixtures also play a very vital role in achieving the fire performance of the building element. These have to be used and installed as per the test report/available standards.

7.4 Application

The use of application of fire safety glass in building shall be in concurrence with the requirement of available Rwandan Standards and other regulations in force.

7.4.1 Horizontal exit shall be equipped with at least one fire/smoke door of minimum one hour-fire resistance of self-closing type. Further, it is required to have direct connectivity to the fire escape staircase for evacuation.

7.4.2. Exit doorways, every exit doorway shall open into an enclosed stairway or a horizontal exit of a corridor or passageway providing continuous and protected means of egress. The exit doorway should have a minimum dimension of 1000 x 2000 mm.

7.4.3 Lift walls of lift shaft enclosures shall have a fire rating of 2 h.

7.4.4 Lift shafts shall have a vent at the top, of area not less than 0.2 m²; lift motor room shall be located preferably at the top of the shaft and separated from the shaft by the floor of the room.

7.4.5 Landing doors in lift enclosures shall have fire resistance of not less than 1h. A wall of 2 h rating shall separate individual shafts in a bank.

7.4.6 Lift car door shall have a fire resistance rating of half an hour. Collapsible gates shall not be permitted for lifts. They shall have solid doors with fire resistance of at least 1 h.

7.4.7 Exit from the lift lobby if located in the core of the building, shall be through a self-closing smoke stop door of half an hour fire resistance.

7.4.8 Basement- the staircase of basements shall be of enclosed type having fire resistance of not less than 2 h and shall be situated at the periphery of the basement to be entered at ground level only from the open air and in such positions that smoke from any fire in the basement shall not obstruct any exit serving the ground and upper storey of the building. It shall communicate with basement through a lobby provided with fire resisting self closing doors of one hour resistance. Glazing if used in staircase shall have fire resistance rating of minimum 2 h.

7.4.9 Separation wall- All floors shall be compartmented with area not exceeding 750 m2 by a separation wall with 2 hours fire rating. For floors with sprinklers the area may be increased by 50 %. In long building, the fire separation walls shall be at distances not exceeding 40 m. For departmental stores, shopping centers and basements, the area may be reduced to 500 m2 for compartmentation.

Table 18 — Fire resistance rating of structural and non-structural element

S/N	Structural element	Type of construction				
		Type 1	Type 2	Type 3	Type 4	
		1	2	3	4	
		h	h	h	h	
1	Exterior wall					
	a) Fire separation less than 3.7 m	i) Bearing	4	2	2	1
		ii) Non-bearing	2	2.5	1	1
	b) Fire Separation less than 3.7 m or more but less than 9m	i) Bearing	4	2	2	1
		ii) Non-bearing	1.5	1	1	1
	c) Fire separation of 9m or more	i) Bearing	4	2	2	1
ii) Non-bearing		1	1	1	1	
2	Fire resisting wall	4	2	2	2	
3	Fire separation assemblies (like fire check doors)	4	2	2	2	
4	Fire enclosure of exitways elevators and staircases	2	2	2	2	
5	Shaft other than exitways elevators and hoist ways	2	2	2	2	
6	Exitway access corridor	1	1	1	1	
7	Vertical separation of tenant space	1	1	1	1	
8	Dwelling unit separation non-load bearing partitions		1	1	1	
			at least half an hour			
9	Interior bearing walls, bearing partitions, columns, girders, trusses (other than roof trusses) and framing	i) supporting more one floor	4	2	2	2
		ii) supporting one floor only	3	1.5	1	1
		iii) supporting roof only	3	1.5	1	1
10	Structural members support walls	3	1.5	1	1	
11	Floor construction including walls	3	1.5	1	1	

12		i) 5m or less height to lowest member	2	1.5	1	1
	roof construction	ii) more than 5m but less than 6.7m in height to lowest member	1	1	1	1
		iii) 6.7m or more in height to lowest member	0	0	0	0

7.5 Installation of fire-resistant glazing system

7.5.1 General requirements

7.5.1.1 Installation is just as important as correct selection of the system. Any number of test and assessment conducted on the system are completely undermined if the installation is sub-standard.

7.5.1.2 Decisions concerning changes to the specified fire-resistant glazing system should not be made on site.

7.5.1.3 Specific instructions given by manufacturers should be noted and strictly followed, and this applies in particular to labels indicating glazing orientation and direction.

7.5.2 Specific glazing provisions

7.5.2.1 The following shall be checked during installation:

- a) thermal expansion elements (which may be glass type specific);
- b) application and location of setting blocks;
- c) glazing seal as specified in test certificate;
- d) application of correct type of bead with secure fixing;
- e) edge cover in view of its importance;
- f) amount of edge cover on glass in its frame can be a critical dimension for the following reasons;
 - 1) the performance of tempered fire-resistant glass is critically dependent on the edge cover and edge clearance; and
 - 2) for some types of glass, the edge cover is not as per the test certificate. Then it is quite possible that the glass may fail due to slumping.

7.5.2.2 Before installing the glass, the work area shall be checked for dimensions, plumb and any obstructions like running cables, etc.

7.5.2.3 Frames shall be securely installed to the supporting structure by means of suitable systems such as expanding metal bolts, screws, etc. The design guidelines/test reports' specification/values need to be adhered to while fixing the glazing.

7.6 Critical location

7.6.1 General

Parts of a building that are most likely to be used for exit or movement in the event of a fire, are the critical locations from fire safety point of view.

7.6.2 Classification

Any glazing within the above critical location area requiring fire resistance, shall necessarily comply with both the fire resistance and impact safety requirements , as per relevant part of RS 186.

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Annex A (informative)

Procedure for calculation of the approximate deflection at centre of glass panel

A.1 Maximum glass deflection as a function of plate geometry and load may be calculated using the following:

$$\text{Deflection } (w) = t \cdot \exp(r_0 + r_1 X + r_2 X^2)$$

where

$$X = \ln\{\ln[q(a \cdot b)^2 / Et^4]\}$$

$$r_0 = 0.553 - 3.83 \left(\frac{a}{b}\right) + 1.11 \left(\frac{a}{b}\right)^2 - 0.0969 \left(\frac{a}{b}\right)^3$$

$$r_1 = -2.29 + 5.83 \left(\frac{a}{b}\right) - 2.17 \left(\frac{a}{b}\right)^2 + 0.2067 \left(\frac{a}{b}\right)^3$$

$$r_2 = 1.485 - 1.908 \left(\frac{a}{b}\right) + 0.815 \left(\frac{a}{b}\right)^2 - 0.0822 \left(\frac{a}{b}\right)^3$$

where

E is Young's modulus of glass, N/mm²;

q is net pressure on the pane, N/mm²;

a is longer dimension, mm;

b is shorter dimension, mm;

t is thickness of the glass pane calculated, mm.

Example: Lateral Deflection Calculation in SI Units

Determine the maximum lateral deflection (w) of a vertical 1200 mm × 1500 mm × 6 mm rectangular glass plate subjected to a uniform lateral load of 1.80 kPa. The actual thickness of the glass is 5.60 mm as determined through direct measurement.

$$a = 1500; b = 1200$$

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$$r_0 = -2.689$$

$$r_1 = 2.011$$

$$r_2 = 0.213$$

$$q = 1.80$$

$$E = 71.73 \times 10^6$$

$$t = 5.60$$

$$x = 1.490$$

Therefore, the maximum deflection at the centre of glass is:

$$w = 5.6 \times \exp(-2.689 + 2.111 \times 1.490 + 0.213 \times 1.490^2)$$

$$w = 12.2 \text{ mm}$$

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Annex B (informative)

Model calculation of glass thickness

B.1 Model calculation

B.1.1 Glass panel dimension width 1200mm and height 1800mm for location Chennai for annealed glass type

B.1.2 General checks has to be done for safety performance:

- a) the maximum area of glass panel is restricted to 15 m²;
- b) the maximum span of window is restricted to 4 m;
- c) applicable to normal, reflective, laminated, tempered and insulating glass; and
- d) applicable to rectangular panels properly fixed.

B.2 Procedure for calculating glass thickness

Step 1: Calculate Aspect Ratio (AR_{max}) from Table 3.

Aspect ratio (AR_{max}) = Longer side/shorter side of glass

Aspect ratio = 1800/1200 = 1.5

Step 2: Wind load calculation

$$P_z = 0.6 V_z^2$$

$$V_z = V_b k_1 k_2 k_3 k_4$$

where

V_b Basic Wind Speed based on Location (Table 1);

k_1 Risk Co-efficient factor taken as per;

k_2 Terrain Factor (Table 2);

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k_3 Topography Factor;

V_z Design Wind Speed;

P_z Design Wind Pressure N/m² at Height H.

Design wind Speed for Chennai location (basic wind speed = 50m/s) = 1750 N/m²

Step 3: Strength factor

Based on the types of glass (Laminated/Tempered/Insulating glass) pressure factor is calculated. To determine the thickness of laminated/tempered/insulating glass, the design wind pressure P_{net} is modified as below:

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

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 2.

For Annealed Units,

$$P_f = 1.0$$

$$P_{net} = 1750 / 1.0 = 1750 \text{ N/m}^2$$

At this Stage the glass thickness value been calculated from the table and then the deflection and Stress check been done

B.3 Deflection calculation

The deflection of the glass can be calculated using the formula in Annex A.

Actual deflection for the pane:

$$\text{Deflection (w)} = t \cdot \exp(r_0 + r_1 X + r_2 X^2)$$

where

$$X = \ln\{\ln[q(a.b)^2 / Et^4]\}$$

$$r_0 = 0.553 - 3.83 \left(\frac{a}{b}\right) + 1.11 \left(\frac{a}{b}\right)^2 - 0.0969 \left(\frac{a}{b}\right)^3$$

$$r_1 = -2.29 + 5.83 \left(\frac{a}{b}\right) - 2.17 \left(\frac{a}{b}\right)^2 + 0.2067 \left(\frac{a}{b}\right)^3$$

$$r_2 = 1.485 - 1.908 \left(\frac{a}{b}\right) + 0.815 \left(\frac{a}{b}\right)^2 - 0.0822 \left(\frac{a}{b}\right)^3$$

where

- E IS Young's modulus of glass, N/mm²;
- q is net pressure on the pane, N/mm²;
- a is longer dimension, mm;
- b is shorter dimension, mm; and
- t is thickness of the glass pane calculated, mm.

The Actual deflection is, 4mm < 11mm maximum allowable

Result: 1800 / 175 = 10.3 mm maximum allowable deflection.

Hence the glass thickness calculated is safe against deflection.

Glass thickness calculation

$$P_{net} \times A = 200.3 T^k \text{ (let } T \leq 6 \text{ mm)}$$

$$P_{net} = 1750$$

$$A = 2.16 \text{ m}^2$$

$$K = 1.765$$

$$T = 5.28 \text{ mm, therefore choose the thickness of glass as 6mm}$$

Annex C (informative)

Installation of mirrors

C.1 This annex provides general guidelines, which is to be followed during the installation of mirror. Mirrors (piece of glass silvered on one side, with a protective paint coating) are used in shops, gymnasiums, etc., where it is predominantly used as wall cladding. The mirror panels in such application use large panel size and it is recommended to follow the installation procedure in accordance with this annex.

C.1.1 The mirror should always be mounted on a perfectly flat, clean and dry surface free from acids and aggressive substances such as acid, solvent and cement mortar.

C.1.2 The mirror shall be mounted on wall or plywood and care is taken that the mirror is never stuck over unstable support (painted paper, paint or old plaster). It is recommended that the mirror installation is not done directly the mirrors supporting in order to have good ventilation, following is recommended space depending on the height of the mirror panel:

- a) a space of 5 mm for a mirror less than 1 m height;and
- b) a space of 10 mm for a mirror greater than 1 m height.

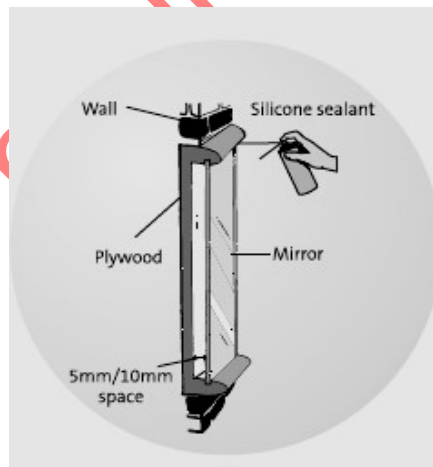


Figure C.1 — Installation of mirrors

C.1.3 During the installation of mirror panels at several levels i.e., one above the other, it is recommended to provide a space of 10 mm at the top and at the bottom for circulation of air. The side of the mirror is designed with a minimum 1 or 2 mm of interleaving space. When mirror is fixed in a profile (frame), care is to be taken to maintain perfectly dry and clean frame.

C.1.4 It is recommended that mirror is supported on hard non-metallic/plastic wedges of at least 3 mm, to raise the mirror and thus avoid contact with the condensed water which could accumulate in the profile. If the mirror is screwed on, the screws of a suitable dimension is designed, with the interleaving and washers made

of plastic to avoid any direct glass-metal contact. To minimize the risk of breakage, cracks and splinters during screw-mounting the mirror, it is recommended to use synthetic protective collars

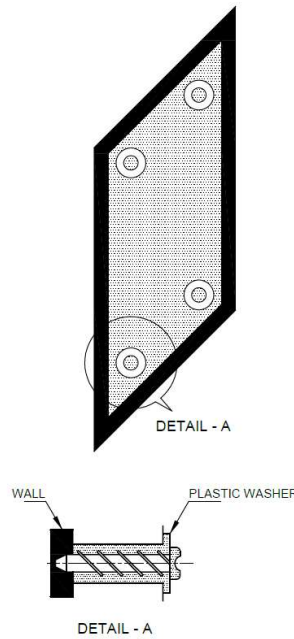


Figure C.2 — Plastic washer

C.1.5 The adhesive used to mount mirrors; care should be taken to ensure that the adhesive is compatible with the protective coatings on the mirror. It is recommended to use only neutral binding agents such as Alkoxy silicone, Oxime silicone, etc. Avoid use of acid silicones, such as Acetoxy silicones which contain acetic acid or water/rubber/polyurethane-based glues.

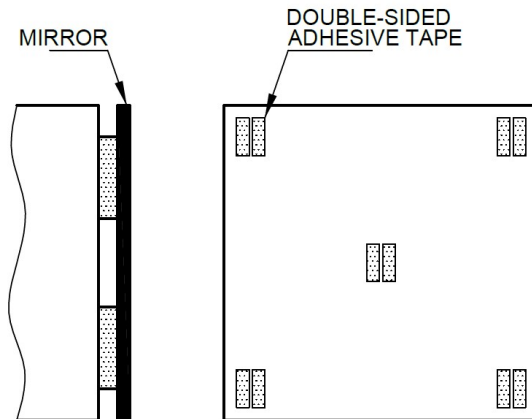


Figure C.3 — Details of double sided adhesive tapes for installing mirrors

C.1.4 In the high humidity areas (e.g. bathrooms), it is recommended to seal the edges with neutral silicone to protect the backing paint from damage due to moisture and enhanced protection from moisture. It is recommended to use double sided adhesive tapes to fix the mirror on the mounting surface. The adhesive

tapes used for installation must be certified to be compatible with the mirror and the adhesive or the adhesive tapes must always be fixed vertically.

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Annex D (informative)

Response reduction factor R for building systems

S/N	Lateral load resisting system	R
i.	Moment frame systems	
	a) RC buildings with ordinary moment resisting frame (OMRF) ^a	3.0
	b) RC buildings with special moment resisting frame (SMRF)	5.0
	c) Steel buildings with ordinary moment resisting frame (OMRF) ^a	3.0
	d) Steel buildings with special moment resisting frame (SMRF)	5.0
ii.	Braced Framr Systems^b	
	a) Buildings with ordinary braced frame (OBF) having concentric braces	4.0
	b) Buildings with special braced frame (SBF) having concentric braces	4.5
	c) Buildings with special braced frame (SBF) having eccentric braces	5.0
iii.	Structural Wall Systems³	
	a) Load bearing masonry buildings	
	1) Unreinforced masonry without horizontal RC seismic bands ^a	1.5
	2) Unreinforced masonry with horizontal RC seismic bands	2.0
	3) Unreinforced masonry with horizontal RC seismic bands and vertical reinforcing bars at corners of rooms and jambs of openings	2.5
	4) Reinforced masonry	3.0
	5) Confined masonry	3.0
	b) Buildings with ordinary RC structural walls ^a	3.0
	c) Buildings with ductile RC structural walls	4.0
	iv.	Dual systems^c
a) Buildings with ordinary RC structural walls and RC OMRFs ^c		3.0
b) Buildings with ordinary RC structural walls and RC SMRFs ^a		4.0
c) Buildings with ductile RC structural walls and RC OMRFs ^a		4.0
d) Buildings with ductile RC structural walls and RC SMRFs		5.0
v.	Flat Slab- Structural Wall Systems^d	
	RC building with the three given below:	3.0
	a) ductile RC structural walls (which are designed to resist 100% of the design lateral force); b) perimeter RC SMRFs (which are designed to independently resist 25	

	percent of the design lateral force), and preferably; and c) an outrigger and belt truss system connecting the core ductile RC structural walls and the perimeter RC SMRFs ^a .	
<p>NOTES:.</p> <p>^a RC and steel structures in seismic zones V, VI and VII shall be designed to be ductile. Hence, this system is not allowed in these seismic zones.</p> <p>^b Eccentric braces shall be used only with SBFs.</p> <p>^c Buildings with structural walls also include buildings having structural walls and moment frames, but where; Frames are not designed to carry design lateral loads, or Frames are designed to carry lateral loads, but do not fulfil the requirements of 'Dual Systems.</p> <p>^d In these buildings, (a) punching shear failure shall be avoided, and (b) lateral drift at the roof under design lateral force shall not exceed 0.1%.</p>		

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