

Technical Bulletin

1013 – Double Glazed Unit
Design Limitations

March 2022 - V1.2



**Australian
GlassGroup®**

TB 1013 – Double Glazed Unit Design Limitations

Cited National Standards

- **AS 1288** Glass in buildings – Selection and installation
- **AS 4055** Wind Loads for Housing

Insulating Glass Units (IGU's) commonly made as Double Glazed Units (DGU/DG), are becoming more commonplace in domestic and commercial buildings to provide improved insulation, comfort, condensation and noise control.

In fact, proposed NCC 2022 changes suggest the need for double glazed units in several colder states as code minimum on new residential builds. However, specifiers need to understand the principles of IGU's and the limitations these place on design.

The Basics

Clear monolithic glass accounts for less than 5% of a window's insulation value, the rest being supplied by the still air layers of the environments on either side of the glass. Since the heat flow resistance of still air is much greater than that of glass, a double glazed unit will have approximately twice the insulation (half the heat loss) compared to single glazing. Triple glazed units with two sealed airspaces and three panes of glass have an insulating value 3 times that of single glazing.

This is why double and triple glazed units are also referred to as insulating glass units as they provide insulation to the walls of a building.

Insulation

Insulation of an IGU is measured with the U value. The U value is a measure of the rate of heat loss per square meter of glass for a temperature difference of 1°C between interior and exterior ($W/m^2 \text{ } ^\circ\text{C}$). The lower the U value, the better the insulation. U value is the inverse of R value ($U = 1/R$ and $R = 1/U$)

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Pressure and Temperature Effects

An IGU is made by sealing air or gas (most commonly Argon) between panes of glass. When the unit is sealed, the pressure and temperature of the trapped air are the same as what is outside the unit at that time. As long as the unit remains sealed, the mass of air between the panes remains constant.

According to Charles' Law, the product of its volume and pressure, divided by its absolute temperature is also constant. If all the boundaries to the contained air/gas were rigid then the volume would be constant too and external pressure or temperature changes would have no effect on the pressure inside the unit. However, the glass panes comprising an IGU are thin and flexible so they will deflect when there is a difference in exterior and interior pressure. As such, an IGU can be considered as a sealed flexible chamber.

If the pressure outside the unit is higher than the internal pressure, this will cause the glass panes to deflect inwards and decrease the volume of the trapped air. If the external pressure is lower than the pressure inside the unit, the panes will bow outwards.

This is why for special applications such as high altitude glazing it is important to consider the relative pressure between manufacture site and glazing location and capillary tubes may be needed in some circumstances.

There are five common causes of pressure changes that affect IGU's:

- Barometric pressure changes from weather conditions
- Barometric pressure change from altitude difference between manufacturing and glazing locations
- Wind
- Air density difference from indoor and outdoor temperatures
- HVAC systems operating in a building

The barometric pressure at sea level is 101.3kPa, and will drop approximately 1kPa for every 100m increase in altitude. The change in pressure induced by a temperature rise of 2.7°C is the same as that caused by a barometric drop of 1kPa.

The net result is that an installed IGU is forever deflecting in and out with changes in climate. This deflection puts stress on the edge seals which can shorten their life if excessive. This deflection can also create changes in the appearance of transmission and reflection images, especially if the units are made from tinted or reflective glass.

If a unit is large and/or square in geometry it will need a larger spacer as units of this geometry deflect more than narrower rectangular shaped units. If the spacer is small enough that the units deflect enough that the panes touch, they are susceptible to an effect called Newton's Rings. As the panes are touching, the unit is no longer providing any insulation benefits and it is possible the panes could rub against each other and cause permanent surface damage to the glass.

Conversely, small thick glass units and long skinny units should be avoided as they do not flex. This increases the stress in the unit's edge seals, and in some cases the seal sizes need to be increased to cope with this.

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Wind Pressure Effects

The windows of a building must be strong enough to withstand the effects of wind without breakage. Wind pressure may be positive (acting to push into a building) or negative (acting to tear off components – typically common at building corners). See **Technical Bulletin 1009 - Wind Loads** for more detail on wind pressures.

When the outer pane is subject to positive pressure, it will deflect inwards. This compresses the air or gas inside the unit, which in turn pushes on the internal pane. These forces on the inner and outer pane are not equal, and the relationship between them is a complex one. **AS 1288** includes a load sharing formula for IGU glass panes to calculate the load on each pane, which can then be used with charts included in **AS 1288** section 4 to design each pane individually for wind loads.

Deflection

Currently, **AS 1288** does not contain a deflection limit for IGU's. It does contain a guidance limit of 20mm deflection. This is primarily due to the load sharing effect mentioned above, where due to the compression of the air/gas component of the IGU, the inner and outer panes deflect at slightly different intervals. Coupled with larger deflections of more than 20mm, this may become visually disturbing to any observer.

It is recommended that IGU units be limited to a deflection of span/90 to reduce the stress on the edge seals during the lifetime of the IGU. Spacer size is typically limited to span/150 or deflection/1.5 with the latter being more accurate as it takes into account the shape of the unit (rectangular or square) and local wind pressures. The tables have been created using both deflection limits.

Human Impact

Glass components of an IGU must also be suitable for human impact when used in human impact situations. If a pane is subject to human impact on both sides such as ground floor glazing or balcony glazing, then the minimum area for each glass & type from table 5.1 can be increased by a factor of 1.5 as per clause 5.22 (a) of **AS 1288**. However, if the IGU is only susceptible to human impact from one side then the 1.5 factor is not applicable, refer clause 5.22(b) of **AS 1288**.

A good example of this is a 6 outer/12 air/ 6 inner IGU. If this unit is located on the ground floor, then *both* panes are subject to human impact and therefore must be safety glass. The maximum area from table 5.1 for 6mm monolithic toughened glass is 4m², but including the factor of 1.5, the maximum area of this IGU is 6m². However, if this unit was located on level 5, *only the inner pane* is subject to human impact and therefore, the inner pane is limited to a maximum area of 4m². Also note that as the outer pane of this IGU is not subject to human impact, it does not have to be Grade A safety glass and could be Heat Strengthened.

The below tables have been created using the 1.5 factor from clause 5.22(a) of **AS 1288** and are therefore suitable for IGU's that are subject to human impact on both sides, such as ground floor glazing, balcony glazing or internal partitions. Note that this applies to both double glazing and triple glazing.

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N1 & N2 0.86kPa ULS, 0.37kPa SLS

Minimum Toughened IGU Glass & Spacer Chart

	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700
2000	4-8-4	5-10-5	5-10-5	5-10-5	5-12-5	5-12-5	5-12-5	5-14-5	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6
2100	4-8-4	5-10-5	5-10-5	5-10-5	5-12-5	5-12-5	5-12-5	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6
2200	4-8-4	5-10-5	5-10-5	5-10-5	5-12-5	5-12-5	5-12-5	6-14-6	6-14-6	6-14-6	6-16-6	6-16-6	6-16-6	6-16-6	6-16-6	6-16-6
2300	4-8-4	5-10-5	5-10-5	5-10-5	5-12-5	5-12-5	6-12-6	6-14-6	6-14-6	6-14-6	6-16-6	6-16-6	6-16-6	6-16-6	6-16-6	8-16-8
2400	4-8-4	5-10-5	5-10-5	5-10-5	5-12-5	5-12-5	6-12-6	6-14-6	6-14-6	6-14-6	6-16-6	6-16-6	6-16-6	6-16-6	8-16-8	8-16-8
2500	5-8-5	5-10-5	5-10-5	5-10-5	5-12-5	5-12-5	6-12-6	6-14-6	6-14-6	6-14-6	6-16-6	6-16-6	6-16-6	8-18-8	8-18-8	8-18-8
2600	5-8-5	5-10-5	5-10-5	5-10-5	5-12-5	5-12-5	6-12-6	6-14-6	6-14-6	6-14-6	6-16-6	6-16-6	8-16-8	8-18-8	8-18-8	8-18-8
2700	5-8-5	5-10-5	5-10-5	5-10-5	5-12-5	6-12-6	6-12-6	6-14-6	6-14-6	6-14-6	6-16-6	8-16-8	8-16-8	8-18-8	8-18-8	8-18-8
2800	5-8-5	5-10-5	5-10-5	5-10-5	5-12-5	6-12-6	6-12-6	6-14-6	6-14-6	8-14-8	8-16-8	8-16-8	8-16-8	8-18-8	8-18-8	8-18-8
2900	5-8-5	5-10-5	5-10-5	5-10-5	6-12-6	6-12-6	6-12-6	6-14-6	6-14-6	8-14-8	8-16-8	8-16-8	8-16-8	8-18-8	8-18-8	8-18-8
3000	5-8-5	5-10-5	5-10-5	5-10-5	6-12-6	6-12-6	6-12-6	6-14-6	6-14-6	8-14-8	8-16-8	8-16-8	8-16-8	8-18-8	8-18-8	8-18-8
3100	5-8-5	5-10-5	5-10-5	6-10-6	6-12-6	6-12-6	6-12-6	6-14-6	8-14-8	8-14-8	8-16-8	8-16-8	8-16-8	8-18-8	8-18-8	8-18-8
3200	5-8-5	5-10-5	6-10-6	6-10-6	6-12-6	6-12-6	6-12-6	8-14-8	8-14-8	8-14-8	8-16-8	8-16-8	8-16-8	8-18-8	8-18-8	8-18-8
3300	5-8-5	5-10-5	6-10-6	6-10-6	6-12-6	6-12-6	8-12-8	8-14-8	8-14-8	8-14-8	8-16-8	8-16-8	8-16-8	8-18-8	8-18-8	8-18-8
3500	5-8-5	6-10-6	6-10-6	6-10-6	6-12-6	6-12-6	8-12-8	8-14-8	8-14-8	8-14-8	8-16-8	8-16-8	8-16-8	8-18-8	10-18-10	10-18-10
3700	5-8-5	6-10-6	6-10-6	6-10-6	6-12-6	8-12-8	8-12-8	8-14-8	8-14-8	8-14-8	8-16-8	8-16-8	8-16-8	10-18-10	10-18-10	10-18-10
3900	6-8-6	6-10-6	6-10-6	8-10-8	8-12-8	8-12-8	8-12-8	8-14-8	8-14-8	8-14-8	8-16-8	8-16-8	10-16-10	10-18-10	10-18-10	10-18-10
4100	6-8-6	6-10-6	6-10-6	8-10-8	8-12-8	8-12-8	8-12-8	8-14-8	8-14-8	8-14-8	10-16-10	10-16-10	10-16-10	10-18-10	10-18-10	10-18-10
4300	6-8-6	6-10-6	8-10-8	8-10-8	8-12-8	8-12-8	8-12-8	8-14-8	8-14-8	10-14-10	10-16-10	10-16-10	10-16-10	10-18-10	10-18-10	10-18-10
4500	6-8-6	6-10-6	8-10-8	8-10-8	8-12-8	8-12-8	8-12-8	8-14-8	8-14-8	10-14-10	10-16-10	10-16-10	10-16-10	10-18-10	10-18-10	12-18-12
4700	6-8-6	8-10-8	8-10-8	8-10-8	8-12-8	8-12-8	8-12-8	8-14-8	10-14-10	10-14-10	10-16-10	10-16-10	10-16-10	10-18-10	12-18-12	12-18-12
4900	6-8-6	8-10-8	8-10-8	8-10-8	8-12-8	8-12-8	8-12-8	10-14-10	10-14-10	10-14-10	10-16-10	10-16-10	10-16-10	12-18-12	12-18-12	12-18-12
5000	6-8-6	8-10-8	8-10-8	8-10-8	8-12-8	8-12-8	8-12-8	10-14-10	10-14-10	10-14-10	10-16-10	10-16-10	10-16-10	12-18-12	12-18-12	12-18-12

Note:

- Based on AS 4055 Wind Zones N1 & N2. 0.86kPa ULS, 0.37kPa SLS
- Does not include corner zone wind pressures
- Based on deflection limits of span/90 and 20mm
- Based on normal furnace limits for toughened glass
- Based on human impact requirements & limitations for ground level IGU's
- Does not include glazing at height as per clause 5.22(b) of AS 1288. Specifier to determine thickness of inner pane accordingly
- Also consider reduced insulating performance of IGU's with spacers narrower than 12mm
- Minimum IGU composition expressed as Outer-spacer-Inner

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N3 1.35kPa ULS, 0.55kPa SLS

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	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700
2000	4-8-4	5-10-5	5-10-5	5-10-5	5-12-5	5-12-5	5-12-5	5-14-5	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6
2100	4-8-4	5-10-5	5-10-5	5-10-5	5-12-5	5-12-5	5-12-5	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6
2200	4-8-4	5-10-5	5-10-5	5-10-5	5-12-5	5-12-5	5-12-5	6-14-6	6-14-6	6-14-6	6-16-6	6-16-6	6-16-6	6-16-6	6-16-6	6-16-6
2300	4-10-4	5-10-5	5-10-5	5-10-5	5-12-5	5-12-5	6-12-6	6-14-6	6-14-6	6-14-6	6-16-6	6-16-6	6-16-6	6-16-6	6-16-6	8-16-8
2400	4-10-4	5-10-5	5-10-5	5-10-5	5-12-5	5-12-5	6-12-6	6-14-6	6-14-6	6-14-6	6-16-6	6-16-6	6-16-6	6-16-6	8-16-8	8-16-8
2500	5-8-5	5-10-5	5-10-5	5-10-5	5-12-5	5-12-5	6-12-6	6-14-6	6-14-6	6-14-6	6-16-6	6-16-6	6-16-6	8-18-8	8-18-8	8-18-8
2600	5-8-5	5-10-5	5-10-5	5-10-5	5-12-5	5-12-5	6-12-6	6-14-6	6-14-6	6-14-6	6-16-6	6-16-6	8-16-8	8-18-8	8-18-8	8-18-8
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2800	5-8-5	5-10-5	5-10-5	5-10-5	5-12-5	6-12-6	6-12-6	6-14-6	6-14-6	6-14-6	8-16-8	8-16-8	8-16-8	8-18-8	8-18-8	8-18-8
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3000	5-8-5	5-10-5	5-10-5	5-12-5	6-12-6	6-12-6	6-12-6	6-14-6	8-14-8	8-14-8	8-16-8	8-16-8	8-16-8	8-18-8	8-18-8	8-18-8
3100	5-8-5	5-10-5	5-10-5	6-10-6	6-12-6	6-12-6	6-12-6	6-14-6	8-14-8	8-14-8	8-16-8	8-16-8	8-16-8	8-18-8	8-18-8	8-18-8
3200	5-8-5	5-10-5	5-10-5	6-10-6	6-12-6	6-12-6	6-12-6	8-14-8	8-14-8	8-14-8	8-16-8	8-16-8	8-16-8	8-18-8	8-18-8	8-18-8
3300	5-8-5	5-10-5	6-10-6	6-10-6	6-12-6	6-12-6	8-12-8	8-14-8	8-14-8	8-14-8	8-16-8	8-16-8	8-16-8	8-18-8	8-18-8	8-18-8
3500	5-8-5	6-10-6	6-10-6	6-10-6	6-12-6	6-12-6	8-12-8	8-14-8	8-14-8	8-14-8	8-16-8	8-16-8	8-16-8	8-18-8	10-18-10	10-18-10
3700	5-8-5	6-10-6	6-10-6	6-10-6	6-12-6	8-12-8	8-12-8	8-14-8	8-14-8	8-14-8	10-16-10	10-16-10	10-16-10	10-18-10	10-18-10	10-18-10
3900	6-8-6	6-10-6	6-10-6	8-10-8	8-12-8	8-12-8	8-12-8	8-14-8	8-14-8	8-14-8	10-16-10	10-16-10	10-16-10	10-18-10	10-18-10	10-18-10
4100	6-8-6	6-10-6	6-10-6	8-10-8	8-12-8	8-12-8	8-12-8	8-14-8	8-14-8	8-14-8	10-16-10	10-16-10	10-16-10	10-18-10	10-18-10	10-18-10
4300	6-8-6	6-10-6	8-10-8	8-10-8	8-12-8	8-12-8	8-12-8	8-14-8	8-14-8	10-14-10	10-16-10	10-16-10	10-16-10	10-18-10	10-18-10	10-18-10
4500	6-8-6	6-10-6	8-10-8	8-10-8	8-12-8	8-12-8	8-12-8	8-14-8	8-14-8	10-14-10	10-16-10	10-16-10	10-16-10	10-18-10	10-18-10	12-18-12
4700	6-8-6	8-10-8	8-10-8	8-10-8	8-12-8	8-12-8	8-12-8	8-14-8	10-14-10	10-14-10	10-16-10	10-16-10	10-16-10	10-18-10	12-18-12	12-18-12
4900	6-8-6	8-10-8	8-10-8	8-10-8	8-12-8	8-12-8	8-12-8	10-14-10	10-14-10	10-14-10	10-16-10	10-16-10	10-16-10	12-18-12	12-18-12	12-18-12
5000	6-8-6	8-10-8	8-10-8	8-10-8	8-12-8	8-12-8	8-12-8	10-14-10	10-14-10	10-14-10	10-16-10	10-16-10	10-16-10	12-18-12	12-18-12	12-18-12

Note:

- Based on AS 4055 Wind Zone N3. 1.35kPa ULS, 0.55kPa SLS
- Does not include corner zone wind pressures
- Based on deflection limits of span/90 and 20mm
- Based on normal furnace limits for toughened glass
- Based on human impact requirements & limitations for ground level IGU's
- Does not include glazing at height as per clause 5.22(b) of AS 1288. Specifier to determine thickness of inner pane accordingly
- Also consider reduced insulating performance of IGU's with spacers narrower than 12mm
- Minimum IGU composition expressed as Outer-spacer-Inner

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N4 & C1 2.01kPa ULS, 0.82kPa SLS

Minimum Toughened IGU Glass & Spacer Chart

	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700
2000	5-8-5	5-10-5	5-10-5	5-10-5	5-12-5	5-12-5	5-12-5	5-14-5	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6
2100	5-8-5	5-10-5	5-10-5	5-10-5	5-12-5	5-12-5	5-12-5	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-8
2200	5-8-5	5-10-5	5-10-5	5-10-5	5-12-5	5-12-5	5-12-5	6-14-6	6-14-6	6-14-6	6-16-8	6-16-8	6-16-8	6-16-8	6-16-8	6-16-8
2300	5-8-5	5-10-5	5-10-5	5-12-5	5-12-5	5-12-5	6-12-6	6-14-6	6-14-6	6-14-6	6-16-8	6-16-8	6-16-8	6-16-8	6-16-8	8-16-8
2400	5-8-5	5-10-5	5-10-5	5-12-5	5-12-5	5-14-5	6-12-6	6-14-6	6-14-6	6-14-6	6-16-8	6-16-8	6-16-8	6-16-8	8-16-8	8-16-8
2500	5-8-5	5-10-5	5-12-5	5-12-5	6-12-6	6-12-6	6-12-6	6-14-6	6-14-6	6-14-6	6-16-8	6-16-8	6-16-8	8-18-8	8-18-8	8-18-8
2600	5-10-5	5-10-5	6-10-6	6-10-6	6-12-6	6-12-6	6-12-6	6-14-6	6-14-6	6-14-6	6-16-8	6-16-8	8-16-8	8-18-8	8-18-8	8-18-8
2700	5-10-5	6-10-6	6-10-6	6-10-6	6-12-6	6-12-6	6-12-6	6-14-6	6-14-6	6-14-8	6-16-8	8-16-8	8-16-8	8-18-8	8-18-8	8-18-8
2800	5-10-5	6-10-6	6-10-6	6-10-6	6-12-6	6-12-6	6-14-6	6-14-6	6-14-8	6-14-8	8-16-8	8-16-8	8-16-8	8-18-8	8-18-8	8-18-10
2900	5-10-5	6-10-6	6-10-6	6-10-6	6-12-6	6-12-6	6-14-6	6-14-8	6-14-8	8-16-8	8-16-8	8-16-8	8-16-8	8-18-8	8-18-10	8-18-10
3000	6-8-6	6-10-6	6-10-6	6-12-6	6-12-6	6-14-6	6-14-6	6-14-8	6-14-8	8-16-8	8-16-8	8-16-8	8-16-8	8-18-10	8-18-10	8-18-10
3100	6-8-6	6-10-6	6-10-6	6-12-6	6-12-6	6-14-6	6-12-8	6-14-8	8-14-8	8-16-8	8-16-8	8-16-8	8-16-10	8-18-10	8-18-10	8-18-10
3200	6-8-6	6-10-6	6-10-6	6-12-6	6-12-6	6-12-8	6-12-8	8-14-8	8-14-8	8-16-8	8-16-8	8-16-10	8-16-10	8-18-10	8-18-10	8-18-10
3300	6-8-6	6-10-6	6-10-6	6-12-6	6-12-8	6-12-8	6-12-8	8-14-8	8-14-8	8-16-8	8-16-8	8-16-10	8-16-10	8-18-10	8-18-10	8-18-10
3500	6-8-6	6-10-6	6-10-6	6-10-8	6-12-8	6-12-8	8-12-8	8-14-8	8-14-8	8-16-8	8-16-10	8-16-10	8-16-10	8-18-10	10-18-10	10-18-10
3700	6-8-6	6-10-6	6-10-6	6-10-8	6-12-8	8-12-8	8-12-8	8-14-8	8-14-8	8-14-10	8-16-10	8-16-10	8-16-10	10-18-10	10-18-10	10-18-10
3900	6-8-6	6-10-6	6-10-8	6-10-8	8-12-8	8-12-8	8-12-8	8-14-8	8-14-8	8-14-10	8-16-10	8-16-10	10-16-10	10-18-10	10-18-10	10-18-10
4100	6-8-6	6-10-6	6-10-8	8-10-8	8-12-8	8-12-8	8-12-8	8-14-8	8-14-10	8-14-10	10-16-10	10-16-10	10-16-10	10-18-10	10-18-10	10-18-10
4300	6-8-6	6-10-6	8-10-8	8-10-8	8-12-8	8-12-8	8-12-8	8-14-8	8-14-10	10-14-10	10-16-10	10-16-10	10-16-10	10-18-10	10-18-10	10-18-10
4500	6-8-6	6-10-6	8-10-8	8-10-8	8-12-8	8-12-8	8-12-8	8-14-10	8-14-10	10-14-10	10-16-10	10-16-10	10-16-10	10-18-10	10-18-10	12-18-12
4700	6-8-6	8-10-8	8-10-8	8-10-8	8-12-8	8-12-8	8-14-8	8-14-10	10-14-10	10-14-10	10-16-10	10-16-10	10-16-10	10-18-10	12-18-12	12-18-12
4900	6-8-6	8-10-8	8-10-8	8-10-8	8-12-8	8-12-8	8-14-8	10-14-10	10-14-10	10-14-10	10-16-10	10-16-10	10-16-10	12-18-12	12-18-12	12-18-12
5000	6-8-6	8-10-8	8-10-8	8-10-8	8-12-8	8-12-8	8-14-8	10-14-10	10-14-10	10-14-10	10-16-10	10-16-10	10-16-10	12-18-12	12-18-12	12-18-12

Note:

- Based on AS 4055 Wind Zones N4 & C1. 2.01kPa ULS, 0.82kPa SLS
- Does not include corner zone wind pressures
- Based on deflection limits of span/90 and 20mm
- Based on normal furnace limits for toughened glass
- Based on human impact requirements & limitations for ground level IGU's
- Does not include glazing at height as per clause 5.22(b) of AS 1288. Specifier to determine thickness of inner pane accordingly
- Also consider reduced insulating performance of IGU's with spacers narrower than 12mm
- Minimum IGU composition expressed as Outer-spacer-Inner

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N5 & C2 2.96kPa ULS, 1.19kPa SLS

Minimum Toughened IGU Glass & Spacer Chart

	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700
2000	6-8-6	6-10-6	6-10-6	6-12-6	6-12-6	6-12-6	6-12-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-8	6-14-8	6-14-8	8-14-8	8-14-8
2100	6-8-6	6-10-6	6-10-6	6-12-6	6-12-6	6-12-6	6-12-6	6-14-6	6-14-6	6-14-6	6-14-6	6-14-8	8-14-8	8-14-8	8-14-8	8-14-8
2200	6-8-6	6-10-6	6-10-6	6-12-6	6-12-6	6-12-6	6-12-6	6-14-6	6-14-6	6-14-6	6-16-8	6-16-8	8-16-8	8-16-8	8-16-8	8-16-8
2300	6-8-6	6-10-6	6-10-6	6-12-6	6-12-6	6-12-6	6-14-6	6-14-6	6-14-8	6-14-8	6-16-8	8-16-8	8-16-8	8-16-8	8-16-8	8-16-10
2400	6-8-6	6-10-6	6-10-6	6-12-6	6-12-6	6-12-6	6-14-6	6-14-8	6-14-8	8-14-8	8-16-8	8-16-8	8-16-8	8-16-8	8-16-10	8-16-10
2500	6-8-6	6-10-6	6-10-6	6-12-6	6-12-6	6-12-6	6-14-6	6-14-8	6-14-8	8-14-8	8-16-8	8-16-8	8-16-8	8-18-10	8-18-10	8-18-10
2600	6-8-6	6-10-6	6-10-6	6-12-6	6-12-8	6-12-8	6-12-8	6-14-8	8-14-8	8-14-8	8-16-8	8-16-8	8-16-10	8-18-10	8-18-10	10-18-10
2700	6-8-6	6-10-6	6-10-8	6-12-8	6-12-8	6-12-8	6-14-8	6-14-8	8-14-8	8-14-8	8-16-8	8-16-10	8-16-10	8-18-10	10-18-10	10-18-10
2800	6-8-6	6-10-6	6-10-8	6-12-8	6-12-8	6-12-8	6-14-8	8-14-8	8-14-8	8-14-8	8-16-10	8-16-10	8-16-10	10-18-10	10-18-10	10-18-10
2900	6-10-6	6-10-6	6-10-8	6-12-8	6-12-8	6-14-8	6-14-8	8-14-8	8-14-8	8-14-8	8-16-10	8-16-10	10-16-10	10-18-10	10-18-10	10-18-10
3000	6-10-6	6-10-8	6-10-8	6-12-8	6-12-8	6-14-8	8-12-8	8-14-8	8-14-8	8-14-10	8-16-10	8-16-10	10-16-10	10-18-10	10-18-10	10-18-12
3100	6-10-6	6-10-8	6-10-8	6-12-8	6-12-8	8-12-8	8-12-8	8-14-8	8-14-8	8-14-10	8-16-10	10-16-10	10-16-10	10-18-10	10-18-12	10-18-12
3200	6-10-6	6-10-8	6-10-8	6-12-8	8-12-8	8-12-8	8-12-8	8-14-8	8-14-10	8-14-10	10-16-10	10-16-10	10-16-10	10-18-10	10-18-12	10-18-12
3300	6-10-6	6-10-8	6-10-8	6-12-8	8-12-8	8-12-8	8-14-8	8-14-8	8-14-10	8-14-10	10-16-10	10-16-10	10-16-10	10-18-12	10-18-12	12-18-12
3500	6-8-8	6-10-8	6-10-8	8-12-8	8-12-8	8-12-8	8-14-8	8-14-10	8-14-10	10-14-10	10-16-10	10-16-10	10-16-12	10-18-12	12-18-12	12-18-12
3700	6-8-8	6-10-8	6-10-8	8-12-8	8-12-8	8-12-8	8-12-10	8-14-10	8-14-10	10-14-10	10-16-10	10-16-12	10-16-12	12-18-12	12-18-12	12-18-12
3900	6-8-8	6-10-8	6-12-8	8-12-8	8-12-8	8-14-8	8-12-10	8-14-10	10-14-10	10-14-10	10-16-12	10-16-12	12-16-12	12-18-12	12-18-12	12-18-15
4100	6-8-8	6-10-8	6-12-8	8-12-8	8-12-8	8-12-10	8-12-10	8-14-10	10-14-10	10-14-10	10-16-12	10-16-12	12-16-12	12-18-12	12-18-15	12-18-15
4300	6-8-8	6-10-8	8-10-8	8-12-8	8-12-8	8-12-10	8-12-10	10-14-10	10-14-10	10-14-12	10-16-12	12-16-12	12-16-12	12-18-15	12-18-15	12-18-15
4500	6-8-8	6-10-8	8-10-8	8-12-8	8-12-8	8-12-10	8-14-10	10-14-10	10-14-10	10-14-12	10-16-12	12-16-12	12-16-12	12-18-15	12-18-15	12-18-15
4700	6-8-8	6-10-8	8-10-8	8-12-8	8-12-10	8-12-10	8-14-10	10-14-10	10-14-10	10-14-12	12-16-12	12-16-12	12-16-15	12-18-15	12-18-15	15-18-15
4900	6-8-8	6-10-8	8-10-8	8-12-8	8-12-10	8-12-10	8-14-10	10-14-10	10-14-12	10-14-12	12-16-12	12-16-12	12-16-15	12-18-15	12-18-15	15-18-15
5000	6-8-8	6-10-8	8-10-8	8-12-8	8-12-10	8-12-10	8-14-10	10-14-10	10-14-12	10-14-12	12-16-12	12-16-12	12-16-15	12-18-15	15-18-15	15-18-15

Note:

- Based on AS 4055 Wind Zones N5 & C2. 2.96kPa ULS, 1.19kPa SLS
- Does not include corner zone wind pressures
- Based on deflection limits of span/90 and 20mm
- Based on normal furnace limits for toughened glass
- Based on human impact requirements & limitations for ground level IGU's
- Does not include glazing at height as per clause 5.22(b) of AS 1288. Specifier to determine thickness of inner pane accordingly
- Also consider reduced insulating performance of IGU's with spacers narrower than 12mm
- Minimum IGU composition expressed as Outer-spacer-Inner

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N6 & C3 3.99kPa ULS, 1.63kPa SLS

Minimum Toughened IGU Glass & Spacer Chart

	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700
2000	6-8-6	6-10-6	6-10-6	6-12-6	6-12-6	6-12-6	6-14-6	6-14-6	6-14-8	6-14-8	6-14-8	8-14-8	8-14-8	8-14-8	8-14-8	8-14-8
2100	6-8-6	6-10-6	6-10-6	6-12-6	6-12-6	6-14-6	6-14-6	6-14-8	6-14-8	6-14-8	8-14-8	8-14-8	8-14-8	8-14-8	8-14-10	8-14-10
2200	6-10-6	6-10-6	6-12-6	6-12-8	6-12-8	6-12-8	6-12-8	6-14-8	6-14-8	8-14-8	8-16-8	8-16-8	8-16-8	8-16-10	8-16-10	10-16-10
2300	6-10-6	6-10-6	6-10-8	6-12-8	6-12-8	6-12-8	6-14-8	6-14-8	8-14-8	8-14-8	8-16-8	8-16-8	8-16-10	8-16-10	10-16-10	10-16-10
2400	6-10-6	6-10-8	6-10-8	6-12-8	6-12-8	6-14-8	6-14-8	8-14-8	8-14-8	8-14-8	8-16-8	8-16-10	8-16-10	10-16-10	10-16-10	10-16-10
2500	6-8-8	6-10-8	6-10-8	6-12-8	6-12-8	6-14-8	8-12-8	8-14-8	8-14-8	8-14-8	8-16-10	8-16-10	10-16-10	10-18-10	10-18-10	10-18-10
2600	6-8-8	6-10-8	6-10-8	6-12-8	8-12-8	8-12-8	8-12-8	8-14-8	8-14-8	8-14-8	8-14-10	8-16-10	10-16-10	10-16-10	10-18-10	10-18-10
2700	6-8-8	6-10-8	6-10-8	8-12-8	8-12-8	8-12-8	8-14-8	8-14-8	8-14-8	8-14-8	8-14-10	10-16-10	10-16-10	10-16-10	10-18-10	10-18-12
2800	6-8-8	6-10-8	6-12-8	8-12-8	8-12-8	8-12-8	8-14-8	8-14-10	8-14-10	8-14-10	10-16-10	10-16-10	10-16-10	10-18-12	10-18-12	12-18-12
2900	6-8-8	6-10-8	8-10-8	8-12-8	8-12-8	8-12-8	8-14-8	8-14-10	8-14-10	10-14-10	10-16-10	10-16-10	10-16-12	10-18-12	10-18-12	12-18-12
3000	6-8-8	6-10-8	8-10-8	8-12-8	8-12-8	8-14-8	8-14-10	8-14-10	8-14-10	10-14-10	10-16-10	10-16-12	10-16-12	10-18-12	12-18-12	12-18-12
3100	6-8-8	6-10-8	8-10-8	8-12-8	8-12-8	8-12-10	8-14-10	8-14-10	8-14-10	10-14-10	10-14-10	10-16-10	10-16-12	10-16-12	12-18-12	12-18-12
3200	6-8-8	6-10-8	8-10-8	8-12-8	8-12-8	8-12-10	8-14-10	8-14-10	10-14-10	10-14-10	10-14-10	10-16-12	10-16-12	12-16-12	12-18-12	12-18-12
3300	6-8-8	8-10-8	8-10-8	8-12-8	8-12-10	8-12-10	8-14-10	10-14-10	10-14-10	10-14-10	10-14-10	10-16-12	10-16-12	12-16-12	12-18-12	12-18-12
3500	6-10-8	8-10-8	8-10-8	8-12-8	8-12-10	8-12-10	8-14-10	10-14-10	10-14-10	10-14-10	10-14-12	10-16-12	12-16-12	12-16-12	12-18-15	12-18-15
3700	6-10-8	8-10-8	8-10-8	8-10-10	8-12-10	8-12-10	10-12-10	10-14-10	10-14-12	10-14-12	10-14-12	12-16-12	12-16-12	12-16-15	12-18-15	12-18-15
3900	6-10-8	8-10-8	8-10-8	8-10-10	8-12-10	8-14-10	10-12-10	10-14-10	10-14-12	10-14-12	10-14-12	12-16-12	12-16-12	12-16-15	12-18-15	15-18-15
4100	6-10-8	8-10-8	8-12-8	8-10-10	8-12-10	10-12-10	10-12-10	10-14-10	10-14-12	10-14-12	12-14-12	12-16-12	12-16-15	12-16-15	12-18-15	15-18-15
4300	6-10-8	8-10-8	8-12-8	8-10-10	8-12-10	10-12-10	10-14-10	10-14-10	10-14-12	10-14-12	12-14-12	12-16-12	12-16-15	12-16-15	15-18-15	15-18-15
4500	6-10-8	8-10-8	8-10-10	8-10-10	8-12-10	10-12-10	10-14-10	10-14-12	10-14-12	10-14-12	12-14-12	12-16-15	12-16-15	12-16-15	15-18-15	15-18-15
4700	6-10-8	8-10-8	8-10-10	8-10-10	8-12-10	10-12-10	10-14-10	10-14-12	12-14-12	12-14-12	12-14-12	12-16-15	12-16-15	15-16-15	15-18-15	15-18-15
4900	6-10-8	8-10-8	8-10-10	8-10-10	10-12-10	10-12-10	10-14-10	10-14-12	12-14-12	12-14-12	12-14-12	12-16-15	12-16-15	15-16-15	15-18-15	15-18-15
5000	6-10-8	8-10-8	8-10-10	8-10-10	10-12-10	10-12-10	10-14-10	10-14-12	12-14-12	12-14-12	12-14-12	12-16-15	12-16-15	15-16-15	15-18-15	15-18-15

Note:

- Based on AS 4055 Wind Zones N5 & C3. 3.99kPa ULS, 1.63kPa SLS
- Does not include corner zone wind pressures
- Based on deflection limits of span/90 and 20mm
- Based on normal furnace limits for toughened glass
- Based on human impact requirements & limitations for ground level IGU's
- Does not include glazing at height as per clause 5.22(b) of AS 1288. Specifier to determine thickness of inner pane accordingly
- Also consider reduced insulating performance of IGU's with spacers narrower than 12mm
- Minimum IGU composition expressed as Outer-spacer-Inner
- 19mm glass not commonly stocked

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