

What is Tempered glass and how is it made?

Tempered glass is a type of safety glass. It is made by heating the float glass just below its softening temperature (>600°C) and suddenly chilling it with jets of cold air. Such treatment caused it to its strength compared with normal glass. Tempering puts the outer surfaces into compression and the inner surfaces into tension. Such stresses cause the glass, to become small cubical fragments when broken, which is less likely to cause serious injury.



Pinnacle bridge @ Sunway

Characteristic of Tempered Glass

- ◇ 4-5 times stronger than annealed or untreated glass
- ◇ Less likely to experience thermal break
- ◇ Once tempered, cannot be cut down

Tempered Glass vs Heat Strengthened Glass ?

Heat strengthened glass are different as the glass cooling process is slower compare with tempered glass. This means the compression strength is lower. Strengthened glass is approximately twice as strong as annealed or untreated glass. If safety glass is not required at that specific area, heat strengthen glass can be used.

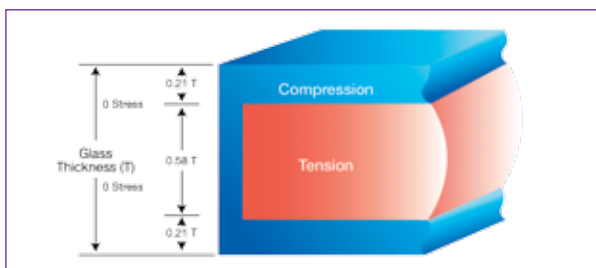


Fig.1 Tempered glass compression and tension zone

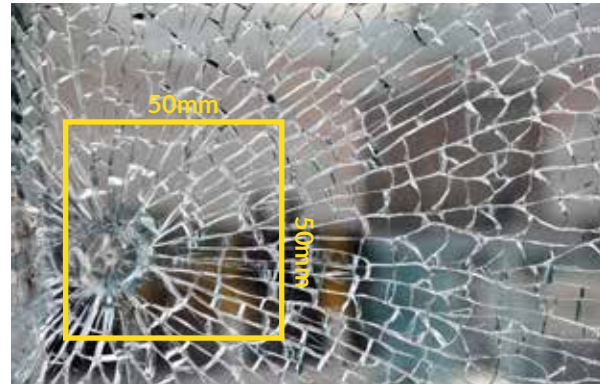


Fig.2 No of particles per square of 50mm

Nominal glazing material thickness (mm)	Minimum number of particles per square of 50mm side
3	30
4	30
5	40
6	40
8	40
10	40
12	40

NOTE: There is no reference to particle count to 15mm, 19mm, and 25mm due to lack of scientific data. (Refer to Fig.2)



Sierra Puchong

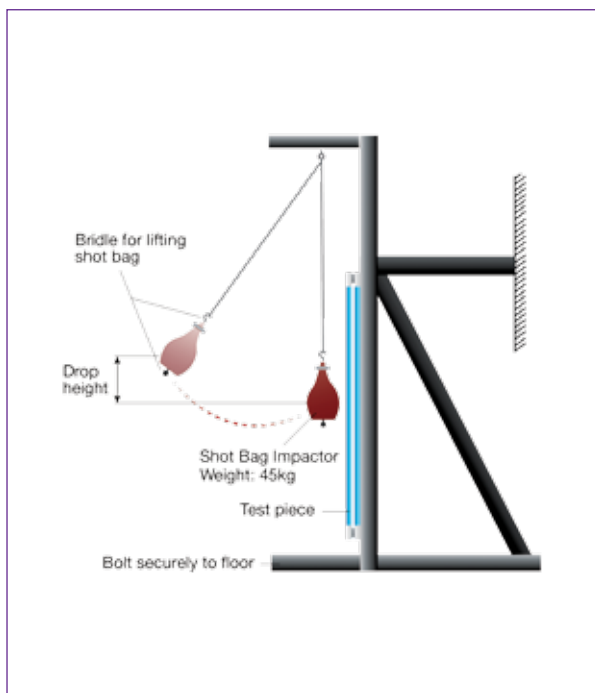
CSG Tempered Glass has been certified as Grade A safety glass since 2007 under the SIRIM product certification scheme which follows the AS/NZS 2208 Safety Glazing Materials in Building requirement and guidelines.

As Grade A safety glass, CSG Tempered Glass strictly meet the following requirement:

- ◇ Thickness requirement (4 -19mm)
- ◇ Size tolerance requirement
- ◇ Flatness
- ◇ Squareness or rectangular requirement
- ◇ Fragmentation test
- ◇ Impact Test

Impact Test

Impact testing is used to test how well a tempered glass can with stand impact.



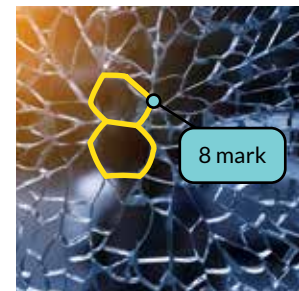
Spontaneous Breakage

There are certain instances that glass break for no apparent reason. When this occurs, it could be due to various reasons or a specific type of inclusion inside the glass. There are more than 50 types of inclusion in float glass, and while the most widely discussed is nickel sulphide stone, this type of inclusion actually occurs very rarely.

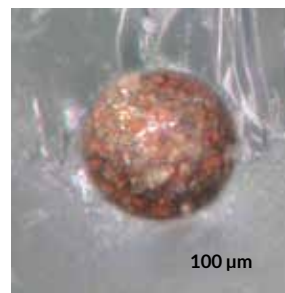
Nickel sulphide (NiS) stones that can form during the production of float glass due to nickel contamination, can end up in the centre tension zone of tempered glass. When that piece of tempered glass is later exposed to varying temperatures in its final installed position, this tiny stone – which can measure from 0.003 to 0.015 of an inch in diameter – may grow in size, and cause the glass to shatter for no apparent reason.



Tempered glass break pattern



Spontaneous breakage '8 mark' caused by NiS inclusion



Nickel sulphide inclusions found on fracture surfaces of glass that failed by "spontaneous breakage".