MULTIVER GLASS

GLASS HEAT TREATMENT

TEMPERED GLASS
HEAT-STRENGTHENED GLASS
HEAT SOAK TESTED TEMPERED GLASS

DATA SHEET / Quebec

Version 2.1

MULTIVER Ltd
436, Berube Street, Quebec (Quebec) G1M 1C8
tel. : 1 800 463-2810 and fax : 418 687-0804

MULTIVER
Cutting edge of the glass industry

Type of Glass Offered by Multiver
TEMPERED GLASS

To **increase the strength and safety factor of the glass,** Multiver has acquired high quality heat treatment furnaces. Multiver offers the following heat treatment processes :

TEMPERED GLASS

Tempered glass has greater mechanical strength and thermal resistance than heat-strengthened glass. It is about **four to five times more impact resistant** than regular non-tempered glass. In the event of breakage, tempered glass will break with a high energy release of small fine round pieces, **which reduces the risk of injury** to those nearby. According to standards currently applicable to heat-treated glass (ANSI Z97.1- 04, ASTM C1048-04 and CAN/CGSB-12.1-M90), **tempered glass is considered a type of safety glass.**

HEAT-STRENGTHENED GLASS

Heat-strengthened glass provides **thermal resistance and mechanical strength superior to that of annealed glass.** Glass that has undergone this type of treatment is about twice as impact resistant as regular non-tempered glass. In the event of breakage, heat-strengthened glass will break into large pieces (lower release of energy) because the glass has been subject to less stress during the tempering process, unlike tempered glass. For this reason, when heat-strengthened glass breaks it is highly probable that the glass will completely remain in its frame or sealant. **Heat-strengthened glass is not considered a type of safety glass.**

HEAT SOAK TESTED TEMPERED GLASS (UPON REQUEST)

After the tempering process, we can perform **a heat soak test,** upon request. During this test, the tempered glass is transferred to a furnace specially designed to complete specific heat cycles. The main purpose of this test is to produce spontaneous glass breakage due to nickel sulfide inclusions and/or impurities in the raw materials used in the manufacture of the glass. **Following this test, there is virtually no risk of spontaneous glass breakage.** Most Multiver glass products can undergo the heat soak test. Heat soak testing is recommended in cases where tempered glass is used in an application where spontaneous glass breakage could pose a risk to those nearby.

MULTIVER Ltd
436, Berube Street, Quebec (Quebec) G1M 1C8
tel. : 1 800 463-2810 and fax : 418 687-0804

THE PRODUCTS LISTED BELOW MUST USUALLY BE TEMPERED :

- Glass panes and insulated glass units larger than 55 square feet (approximately 5.11 square metres)
- Highly efficient low emissivity glass with a strong tint
- Most tinted and reflective glass products
- Ceramic frit spandrel glass
- OPACI-COAT 300® spandrel glass
- Silk-screened glass products
- Balustrade glass
- Door glass or glass that could be mistaken for a door
- Insulated glass units with glass extending beyond the spacer frame

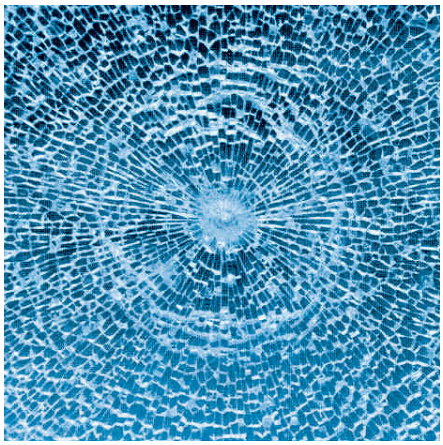
STANDARDS AND CERTIFICATES

Multiver meets the following requirements :

·ASTM C1036 – Flat Glass
·ASTM C1048 – Heat-treated flat glass
·CAN/CGSB 12.1 – Tempered or Laminated Safety Glass
·ANSI Z97.1 – Safety glazing materials used in buildings
·CPSC 16 CFR- 1201 – Safety Standard for Architectural Glazing Materials

*Other standards and certificates may apply.

Broken heat-strengthened glass



Broken tempered glass

MULTIVER Ltd
436, Berube Street, Quebec (Quebec) G1M 1C8
tel. : 1 800 463-2810 and fax : 418 687-0804

Manufacturing Process of Multiver
TEMPERED AND HEAT-STRENGTHENED GLASS

1 **Precise glass cutting** using our computer numerical control (CNC) machine.

2 **Shaping,** washing and drying of the glass. The shaping of the glass allows us to refine the edges of the glass, thus limiting the risk of breakage in the tempering furnace. At this stage of the manufacturing process, it is possible to make notches or holes into the glass, under certain conditions. Contact us for more detailed technical studies. The glass is then washed to remove any impurities or dirt that could still be on the glass.

3 **Increasing glass temperature** in one of our heat treatment furnaces. During this step, the glass reaches a temperature of approximately 600 degrees Celsius and remains at that temperature for a certain period of time based on a number of elements, including the thickness of the glass, its emissivity, as well as its heat absorption and transmission.

4 **Quick cooling of the glass.** The glass is then rapidly cooled using several air jets located above and below the glass. This cooling process creates a state of compression of the glass surface while the centre of the glass is in tension. **It is the glass cooling rate that allows to produce tempered or heatstrengthened glass.**

5 **The glass is then inspected** to ensure that it is consistent with the tolerances established by the industry.

6 Upon request, we can conduct a **heat soak test** at this stage. The tempered glass is then wrapped up for delivery or transformed again in laminated glass or an insulated glass unit.

SIZE OF OUR HEAT TREATMENT FURNACES

Minimum : **12 inches (305 mm) diagonally**
Maximum : **96 inches X 144 inches (2.438 mm X 3.658 mm)**
Thickness of glass : **Minimum 3.3 mm and maximum 19 mm**

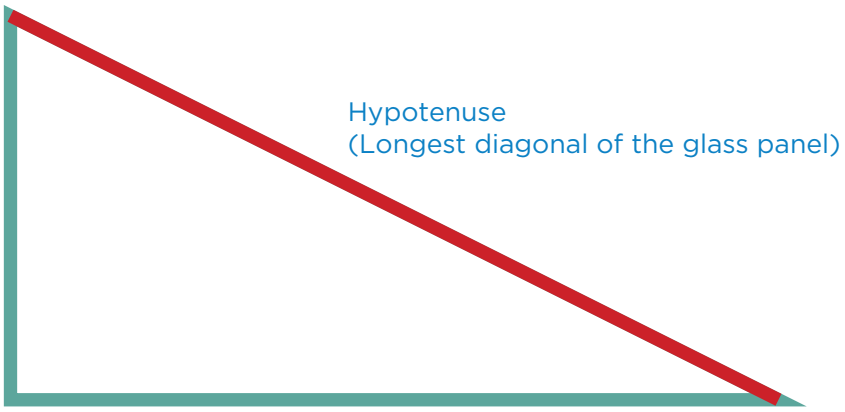
Upon request, we can **heat treat oversized glass.**
For further information, please contact us.

DETAILED TABLE OF THICKNESS TOLERANCES FOR GLASS TEMPERING

Glass Thickness		Minimum size		Maximum size		Size tolerances	
mm	in.	mm	in.	mm	in.	mm	in.
3	1/8	305 hypotenuse	12 hypotenuse	914 x 1,829	36 x 72	± 1.6	± 1/16
4	5/32			1.219 x 2.438	48 x 96	± 1.6	± 1/16
5	3/16			2.438 x 3.65	96 x 144	± 1.6	± 1/16
6	1/4			2.438 x 3.65	96 x 144	± 1.6	± 1/16
8	5/16			2.438 x 3.65	96 x 144	± 2.0	± 5/64
10	3/8			2.438 x 3.65	96 x 144	± 2.4	± 3/32
12	1/2			2.438 x 3.65	96 x 144	± 3.2	± 1/8
15	5/8			10.03 m^2	108 f^2	± 4.0	± 5/32
19	3/4			8.18 m^2	88 f^2	± 4.8	± 3/16

* Due to the weight of 15 and 19 mm glass, maximum sizes may vary.

* Please contact us for more information.



MULTIVER Ltd
436, Berube Street, Quebec (Quebec) G1M 1C8
tel. : 1 800 463-2810 and fax : 418 687-0804

INSTALLATION

Make sure that the installation complies with the regulation currently in effect. The installation of insulated units must be approved by a curtain wall specialist or supplier.

MAINTENANCE

Once the heat-treated glass is installed, it is recommended that all exposed surfaces be cleaned, if needed, in order to preserve the esthetic qualities of the product. Rub gently with a soft cloth, using cold or warm water and non-aggressive chemicals for all glass surfaces. Caution should be exercised when choosing cleaners. Abrasive cleaners must never be used as they can cause damage to the glass surface. Several products are specifically designed to clean glass. Metallic objects should not be used because they could scratch the glass.

Cleaners containing solvents must never be used.

Exposed glass surfaces must be protected during the construction or renovation of the building to minimize the risk of scratches and glass breakage.

GLAZING REPLACEMENT

In the case of heat-treated glass, you should be able to see **a laser-engraved logo** in one of the corners of the glass, that is, if it is not covered. A date as well as the name of the company that tempered the glass should also be indicated.

Multiver Logo - Tempered glass

Slight **glass or ceramic colour variations** may cause differences from the original colour of the glass, in the event of a replacement.

MULTIVER Ltd
436, Berube Street, Quebec (Quebec) G1M 1C8
tel. : 1 800 463-2810 and fax : 418 687-0804

DISTORTIONS DUE TO HEAT TREATMENTS

Glass is usually subjected to various stresses that can cause distortions. A distortion is defined as a change in the shape, orientation or position of a body. Among the factors that can cause distortions are altitude, changes in barometric pressure, temperature, wind force, the lamination method, and frame pressure on the glass or within the insulated unit.

There are various types of possible glass distortion. Here are the main types that apply more specifically to heat-treated glass.

ROLLER WAVES : In the heat treatment furnace, the glass softens due to a temperature of approximately 600 degrees Celsius. In the furnace, the glass is in a constant backand-forth motion as it moves forward on ceramic rollers. As it moves through the furnace, the glass takes on the shape of the rollers, which is why there is a noticeable wavy distortion on most heat-treated glass products. Out of the furnace, stripes on the glass show the intensity of the roller waves. There are no standards in the industry regarding acceptable tolerances for roller waves. **That being said, Multiver has nevertheless established its own maximum tolerance of 0.07 mm (0.003 inches) and up to 0.13 mm (0.005 inches) per roller wave.**

TWISTING FROM ONE SIDE TO THE OTHER AND LOCALIZED BOWING :

Heat treating glass can affect its flatness in various ways. Depending on the size, thickness and type of glass, glass can bend along its length and and width or even warp in the centre. We suggest that you consult the standards currently in effect with regard to tolerances for these types of distortion (ASTM C1048).

TENSION OR TEMPERING MARKS, COMMONLY KNOWN AS " STRAIN PATTERN " OR " QUENCH PATTERN " :

During the heat treatment, the glass exits the furnace and is then rapidly cooled using air jets uniformly arranged around the glass. At this stage, the glass surfaces harden (state of compression). However, since the air jets do not cool down both glass surfaces evenly, some marks can become noticeable under certain angles or lighting conditions. The quench pattern varies in intensity, colour and shape, depending on the heat treatment equipment used and type of glass, or on whether the glass is assembled as laminated glass or as an insulated unit.

MULTIVER Ltd
436, Berube Street, Quebec (Quebec) G1M 1C8
tel. : 1 800 463-2810 and fax : 418 687-0804

USEFUL INFORMATION

Here are a few helpful tips regarding the use of glass and heat treatments

Distortions may be more visible on heat-treated glass with higher light reflectance.

Using thicker glass and using the same glass thickness for a given project can help reduce distortions due to the heat-treatment of the glass. Distortions are usually less visible with thick glass.

You can specify in the architectural specifications to use the same heat treatment equipment to help ensure uniformity in the heat treatment process of a given project.

To minimize roller waves on tempered or heat-strengthened glass, you can also indicate in the architectural specifications to place the glass in the heat treatment furnace so that roller waves will be from bottom to top, rather than from left to right, which makes roller waves less visible to the naked eye for people moving in front of the glass. However, it is important to always take into account the manufacturing size of our heat treatment furnaces.

Heat-treated glass with a thickness ranging from 3 to 12 mm must be sandblasted on all four sides and **glass more than 15 mm thick must be polished around the edge** to avoid the risk of glass breakage in the heat treatment furnaces.

MULTIVER Ltd
436, Berube Street, Quebec (Quebec) G1M 1C8
tel. : 1 800 463-2810 and fax : 418 687-0804

This document gives a general description of the product. For further information, please contact an authorized supplier of Multiver products. The use of any of the products mentioned here in is the sole responsibility of the users. Multiver assumes no responsibility for the use of its products.

MULTIVER Ltd
436, Berube Street, Quebec (Quebec) G1M 1C8
tel. : 1 800 463-2810 and fax : 418 687-0804

MULTIVER
Cutting edge of the glass industry