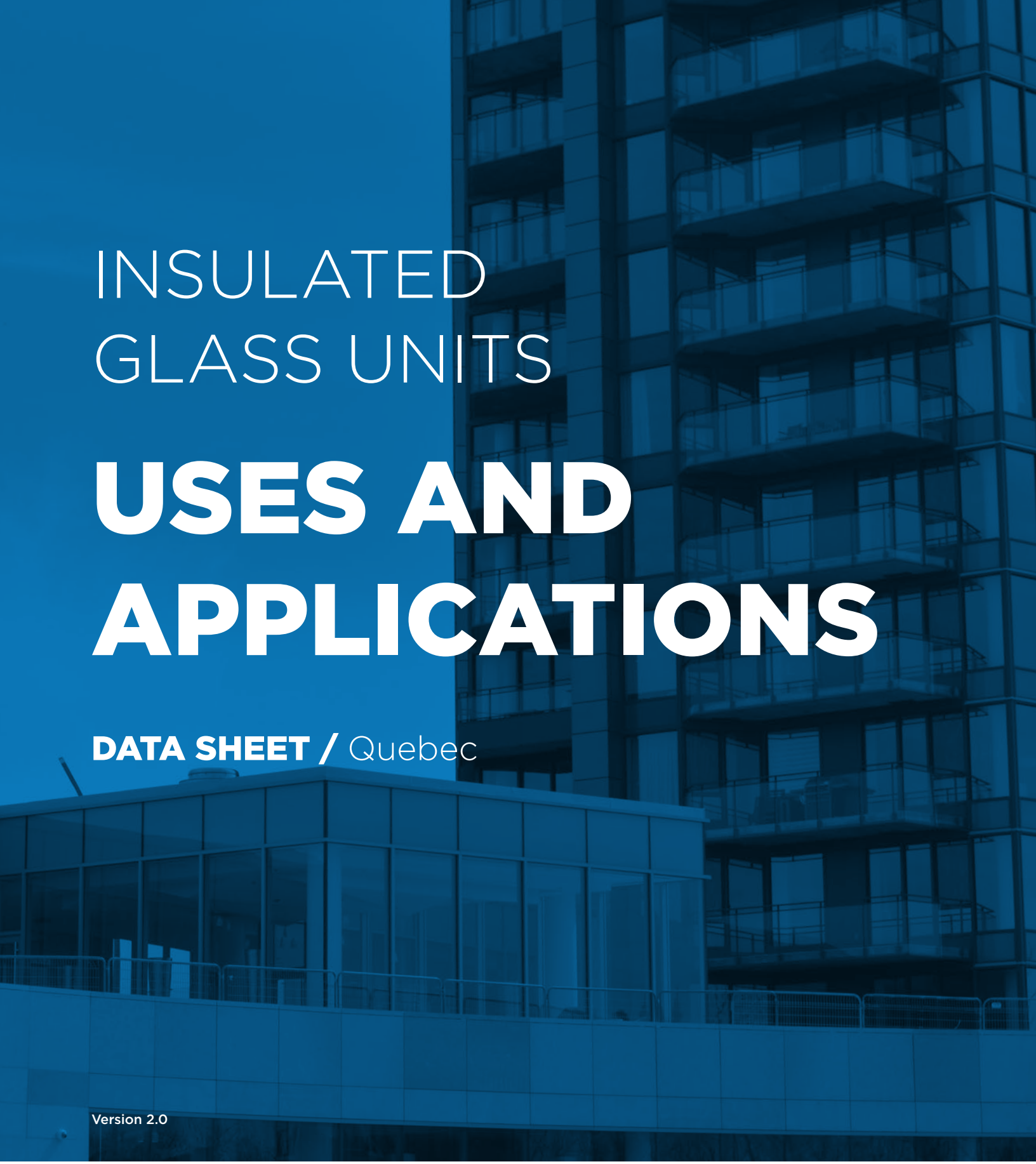

INSULATED GLASS UNITS

USES AND APPLICATIONS

DATA SHEET / Quebec

Version 2.0

MULTIVER Ltd
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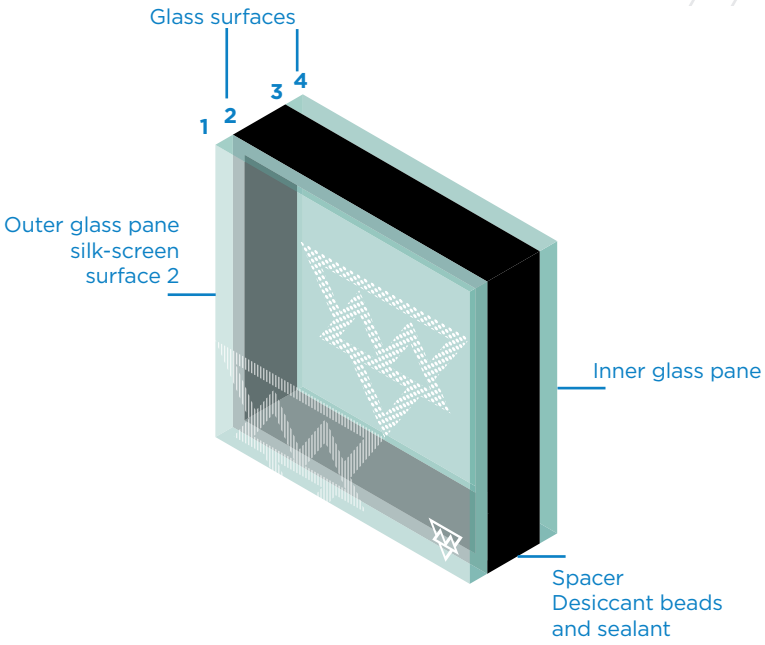
tel. : 1 800 463-2810 and fax : 418 687-0804

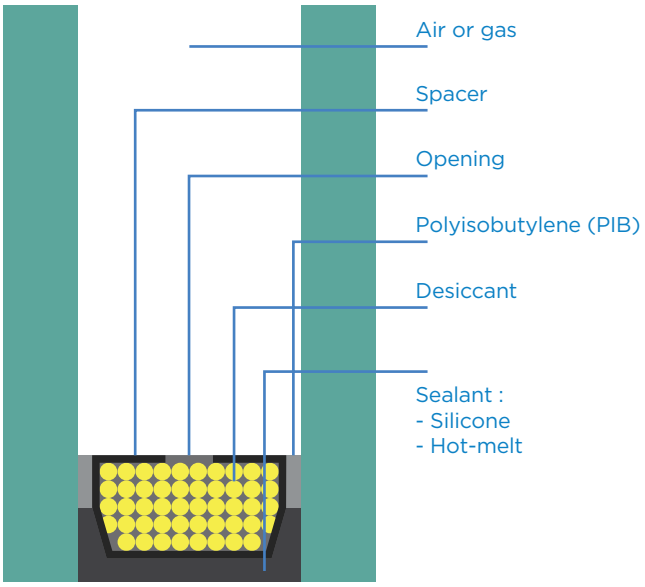
MULTIVER
Cutting edge of the glass industry

Multiver
INSULATED UNITS

With the ultimate goal of improving thermal resistance while preserving as much of the design and practical benefits of glass, especially when it comes to building envelopes, the double and tripleglazed insulated unit market has boomed. With a high demand and the evolution of technology, infinite options are now available to customers.



It is important to specify that Multiver's primary objective has always been to offer its customers unparalleled quality, outstanding service and unbeatable prices. **A team of passionate people, an ongoing commitment to improve as well as highend specialized equipment** allow us each year to build up our reputation as the leading business in both the residential and commercial sectors.



STANDARDS AND CERTIFICATES

Multiver meets the following requirements :

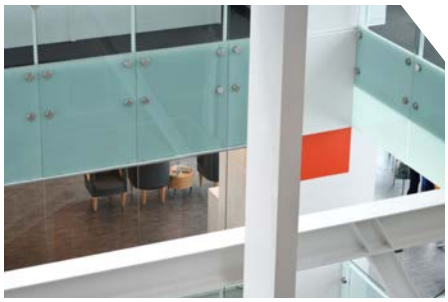
·ASTM E2190 - Insulating Glass Unit Performance and Evaluation
·CAN/CGSB 12.8 - Insulating Glass Units
·IGCC/IGMA - Certification Program for the Harmonized Insulating Glass

*Other standards and certificates may apply.

USES

Insulated units manufactured by Multiver can be used in a number of applications, such as :

Glass partitions



Windows and curtain walls

Insulated spandrel glass

Skylights

Door glazing

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BENEFITS

- From an **esthetic** point of view, insulated glass units give buildings a distinguished and/or private look.

- This product helps **reduce or increase heat gain,** thus **reducing air conditioning or heating costs and enhancing occupants' well-being** (see solar heat gain coefficient in Table 1 on insulated unit performance data).

- It can help **reduce ultraviolet radiation** inside the building, depending on its components.

    - It has better **acoustic performance.**

    - **Extremely versatile,** this product can be utilized in commercial, residential and institutional projects.

    - When combined with low emissivity (low-e) glass, it allows for **better thermal resistance and overall performance** of the insulated unit. Virtually unlimited combinations allow to modify glass performance.

        - Both surfaces or either one of them can be **sandblasted, silk-screened, shaped, laminated, bevelled or enamelled.**

        - **Indoors,** it can be used for its esthetic appeal and to complement the furniture and decoration.

        - It can be assembled with **Privavision integral blinds as well as smart glass,** thus providing the ultimate comfort.

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INSULATED UNIT PERFORMANCE DATA

Below is a comparative table of various possible performance aspects of insulated units. Performance data were collected using Window 6.3, an independent software by LBNL specially designed to determine the performance of different products.

Table 1 : Performance Data

PRODUCT	"U" VALUE BTU/ H-FT²-°F	"R" VALUE H-FT²-°F/ BTU	TRANSMITTANCE %			VISIBLE LIGHT REFLECTANCE%		SHADING COEF.	SOLAR HEAT GAIN COEF.	RELATIVE HEAT GAIN BTU/H-FT²
			VISIBLE LIGHT	SOLAR TRANSM.	UV TDW-ISO	OUT	IN			
- 6 mm clear glass	1.02	1	89.2	80.4	81.9	8.3	8.2	0.97	0.84	206.1
- 6 mm clear - 13.39 mm argon - 6 mm clear	0.445	2.2	80.1	65.7	71.0	14.9	14.8	0.84	0.73	175.5
- 6 mm Econover Select 40 (surf. 2) - 13.39 mm argon - 6 mm clear	0.251	4.1	70.	33.9	53.5	11.9	13.0	0.44	0.38	90.5
- 6 mm clear - 13.39 mm argon - 6 mm Econover Select 63 (surf. 3) - 13.39 mm argon - 6 mm Econover Select 63 (surf. 5)	0.129	7.8	66.7	35.4	52.1	14.8	14.4	0.57	0.49	115.3

GASES

Using inert gases such **as argon, krypton and xenon is strongly recommended when combining an insulated unit with low-e glass.** Inert gases have a much lower thermal conductivity than air and therefore offer significantly higher thermal performance (R-value). During the assembly of insulated units, Multiver fills the cavity between the glass panes in a controlled environment using automated production lines. Doing so allows to entrap the optimum percentage of gas in the insulated unit. **The most popular gas and best choice in terms of price/performance is argon,** which is what we use in the majority of insulated glass units we manufacture. Krypton and xenon are both very expensive gases. It should be noted that inert gases used by Multiver in manufacturing insulated units are odourless, colourless and non-toxic. Also, such gases have no known impact on the environment.

MANUFACTURING SIZE

Due to the wide selection of products available as well as the number of suppliers, maximum sizes may vary depending on the suppliers and demand. Minimum sizes may also vary depending on intended uses. That being said, the average maximum size of a glass sheet is approximately **96 inches X 144 inches (2438 mm X 3657 mm).** Upon request, we can obtain glass sheets of **102 inches X 168 inches (2590 mm X 4267 mm).**

Insulated units larger than 55 square feet (approximately 5.1 square metres) must be tempered for safer transportation and handling.

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 insulated units are 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.

Louis boheme - Isolated units and low-e glass

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GLAZING REPLACEMENT

To help us identify the insulated unit that needs to be replaced, we strongly recommend that **you look at the spacer in the insulated unit.** You will then know **who was the original manufacturer of the unit as well as its year of manufacture.** We also require **the project name and location** to conduct extensive research.

In the case of insulated units including one or more tempered or heat-strengthened glass layers, **you should be able to see a laser-engraved logo** in one of the corners of the heat-treated glass, unless it is 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 colour variations** can occur during the manufacturing process and result in a colour different from the original tint, in the event of a replacement.

Hilton Garden Inn

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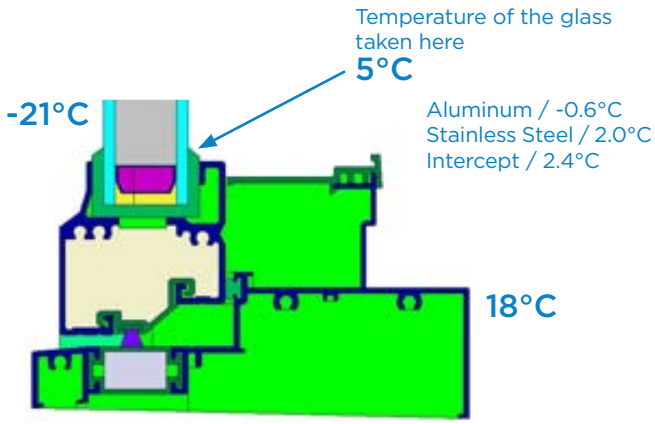
USEFUL INFORMATIONS

The selection of spacers is of **paramount importance** in relation to the performance of insulated units. Insulated unit performance data sheets do not take spacers into account. However, **low-conductivity spacers greatly reduce heat loss as well as condensation.**

The image below is a sectioned diagram of a window with an insulated unit and various spacers offered by Multiver.



M-Spacer

Spacers are ranked from the most to the least conductive. It demonstrates that at an outdoor temperature of -21 degrees Celsius, **the temperature of surface 4 is higher with a less conductive spacer.** If the temperature of surface 4 is higher, and above freezing point, the risk of condensation inside the building should be lower. It is important to specify that nothing else differs between the compared insulated units; their composition is the same.

It is essential to always ensure **the compatibility of sealants** that are close to or in contact with Multiver products.

Failure to comply with this instruction could result in the voiding of the Multiver warranty. Consult our documents on **sealant compatibility** to avoid potential problems with our products.

Depending on the thickness of a given tinted glass, its colour will be more or less intense. It is therefore recommended that the same glass thickness be used for a given project, unless the designer wishes to produce such effect

The chosen glass thickness and tint as well as its level of reflection, the building's surroundings, the lighting and many other factors significantly influence the appearance of the selected colour. It is recommended to **ask that samples be provided (see the Sample Request form)** before making your final decision on tinted glass.

With our **glass etching and silk-screen processes,** you can choose **any design** and we will transfer it onto the surface(s) of the insulated units. If you opt for silk-screen printing, you can choose one colour of your choice (certain conditions apply).

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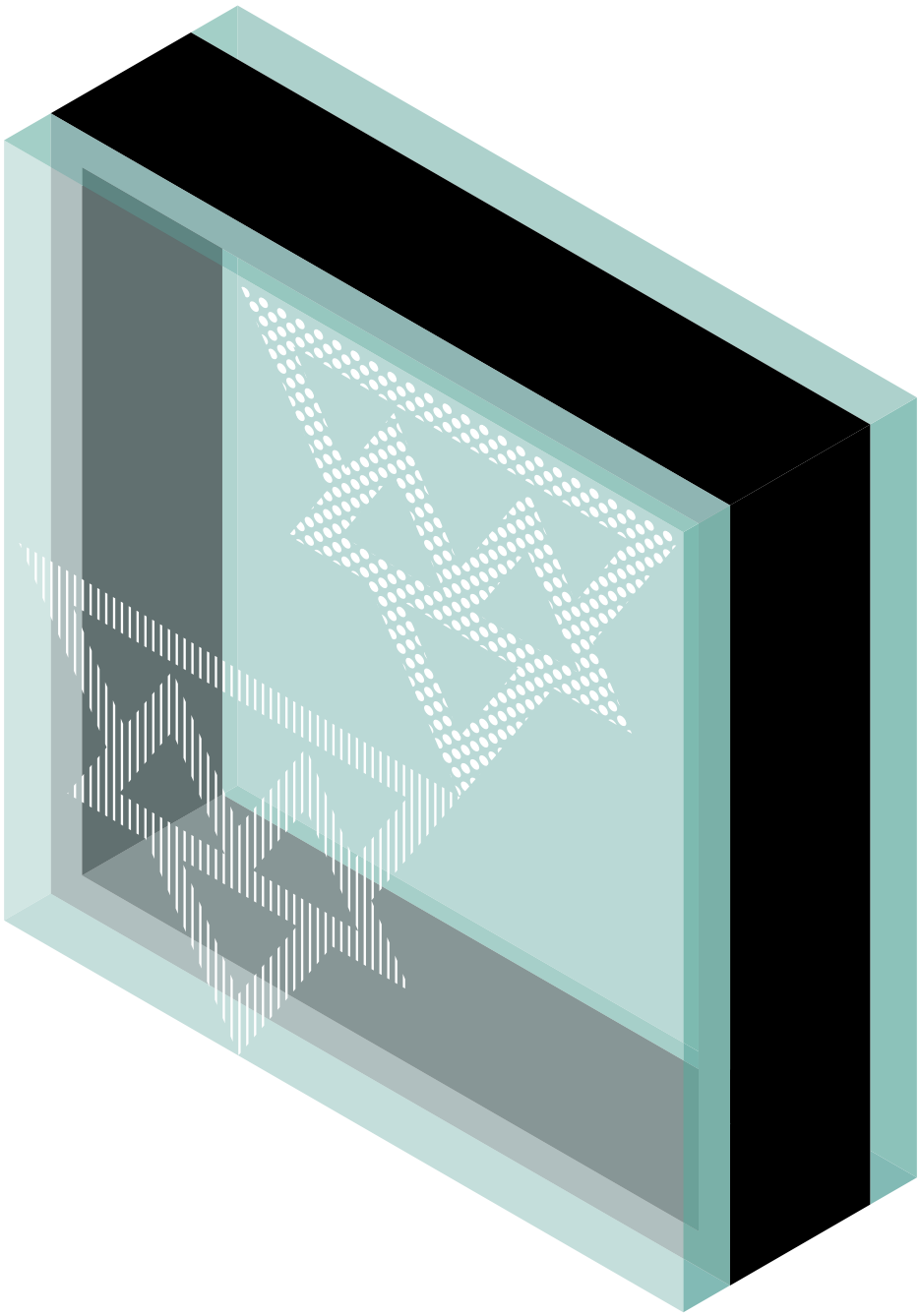
Insulated units can now be fitted with magnetic or electric **Privavision integral blinds.** For further information, consult the documents on integral blinds available on our Web site.



Insulated unit with an exemple of a Multiver silk-screened pattern

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ADVICE ON APPLICATIONS WITH LAMINATED GLASS

Here are a few options we recommend :

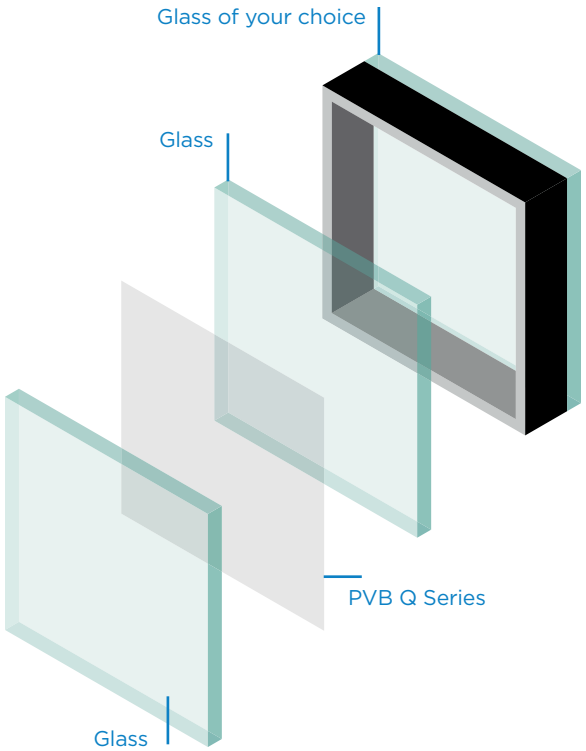
FOR ENHANCED ACOUSTIC PERFORMANCE :

Glass laminated with an acoustic polyvinyl butyral interlayer, commonly known as **Saflex® Q series acoustic PVB interlayer** (see the Laminated Glass document), and laminated with another type of glass of your choice. Several layers can be laminated, offering virtually endless combination possibilities.

Assembling the laminated glass described above **in an insulated unit** offers a wide range of new options.

PURPOSE :

Reduce inside and ouside noise opposite insulated glass units, glass partitions or even skylights.



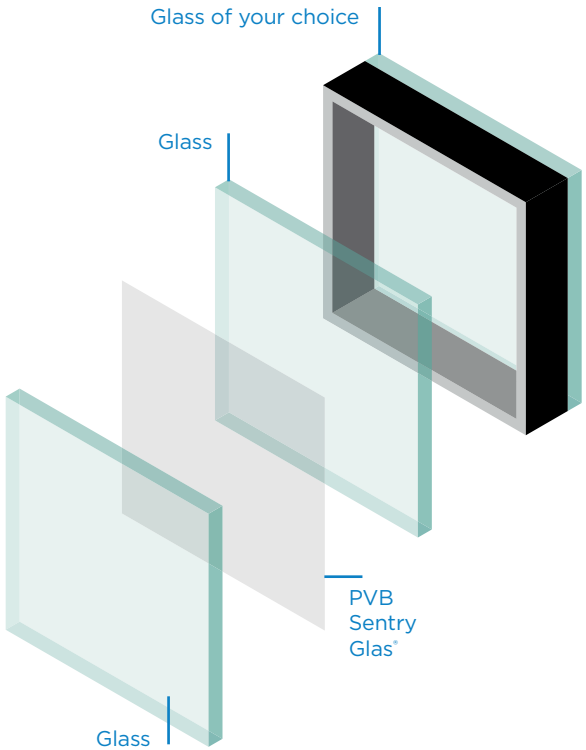
TO INCREASE GLASS SAFETY FACTOR AND MECHANICAL STRENGTH :

Glass laminated to a **PVB DuPont™ SentryGlas®** interlayer, and laminated with another type of glass. PVB SentryGlas® is nearly 100 times stiffer and five times stronger than standard PVB.

Assembling the laminated glass described above **in an insulated unit** offers a wide range of new options.

PURPOSE :

Insulated glass units resistant to impacts, powerful wind gusts, gunfire, explosions, vandalism, falling broken glass, etc. (certain conditions apply). Useful for protecting valuables against theft. Note that other combinations should be considered to meet your specific needs.



ADVICE ON APPLICATIONS WITH LAMINATED GLASS

Here are a few options we recommend :

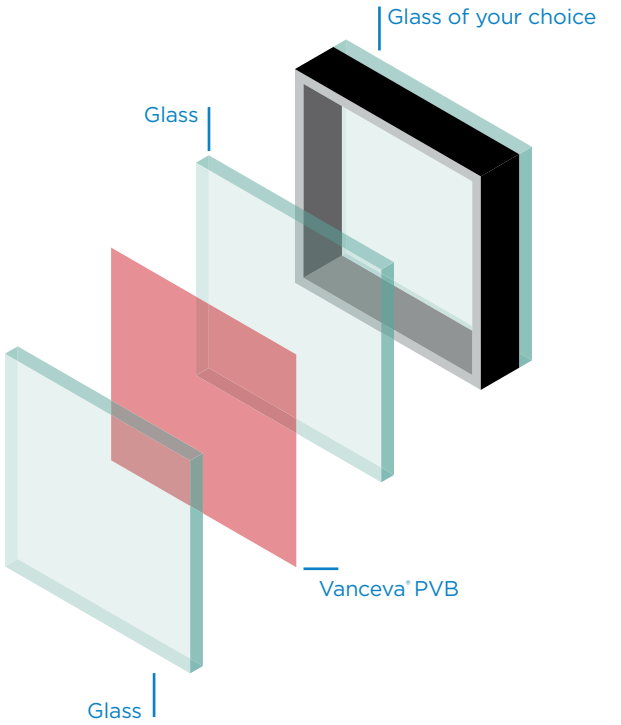
FOR AN OPAQUE GLAZING OR ORIGINAL COLOURS :

Glass laminated to an **opaque black or white PVB interlayer and/or a Saflex® Vanceva® colour PVB interlayer,** and laminated with another type of glass of your choice. To discover the impressive range of colours we offer, go to Vanceva's Web site (www.vanceva.com). Once again, numerous combinations are possible.

Assembling the laminated glass as described above **in an insulated unit** offers a wide range of new options.

PURPOSE :

There is a whole variety of uses to choose from for both indoor and outdoor glazing designs that are **anything but ordinary.**



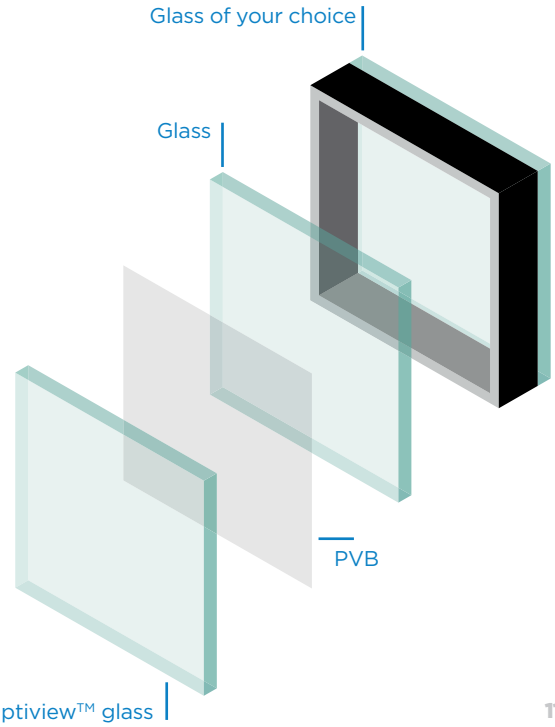
TO REDUCE GLARE :

OptiView™ anti-reflective glass laminated to a PVB interlayer of your choice as well as another type of glass. By reducing reflections and increasing visible light transmittance, this product offers **better visibility through the glass.**

Assembling the laminated glass as described above **in an insulated unit** offers a wide range of new options.

PURPOSE :

For any projects where **reflections are undesirable,** such as condos, museums, storefronts, car dealerships, etc.



ADVICE ON APPLICATIONS WITH LOW-E GLASS

Here are a few options we recommend :

***** NEW *****

FOR MAXIMUM IMPROVEMENT OF THE THERMAL RESISTANCE (R-VALUE) OF DOUBLE-GLAZED INSULATED GLASS UNITS :

Assembling a low-e glass of your choice in position 2 with another low-e glass in position 4.

PURPOSE :

Improve the thermal resistance of a building without having to use tripleglazed insulated glass units, which are thicker and more expensive. Multiple purposes.

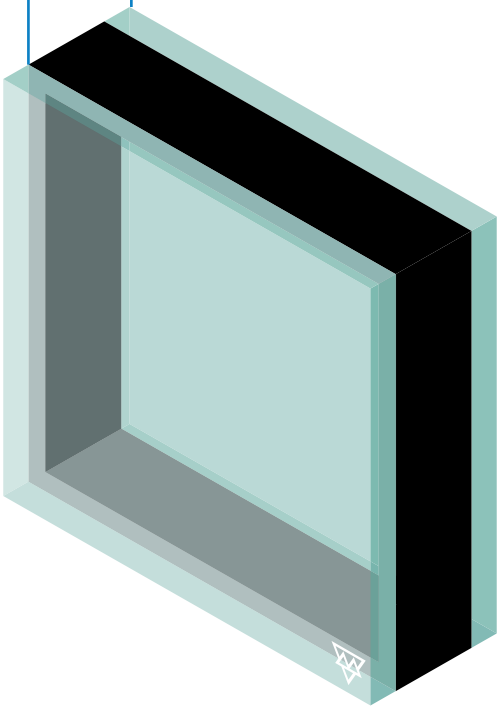
REDUCE HEAT GAIN (LOWER AIR CONDITIONING COSTS) :

Assembling a **low-e glass of your choice in position 2** with another glass of your choice.

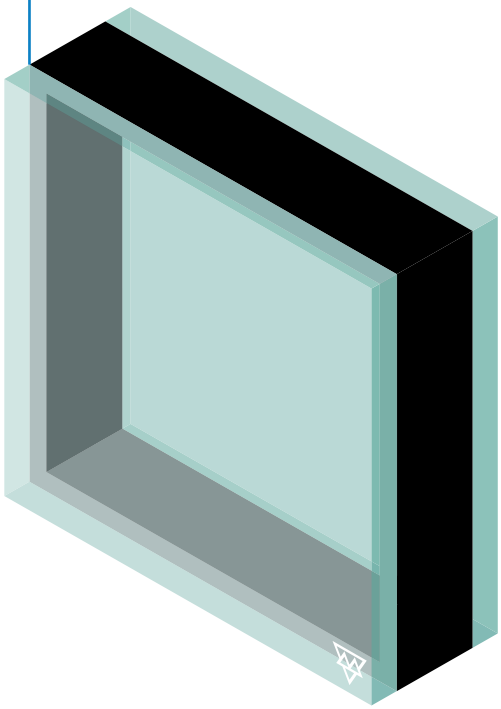
PURPOSE :

Very common in the commercial and institutional sectors. Such assembly provides occupants with comfort and results in **considerable savings in air conditioning costs.**

Low-e glass on surface 2 and 4



Low-e glass on surface 2



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ADVICE ON APPLICATIONS WITH LOW-E GLASS

Here are a few options we recommend :

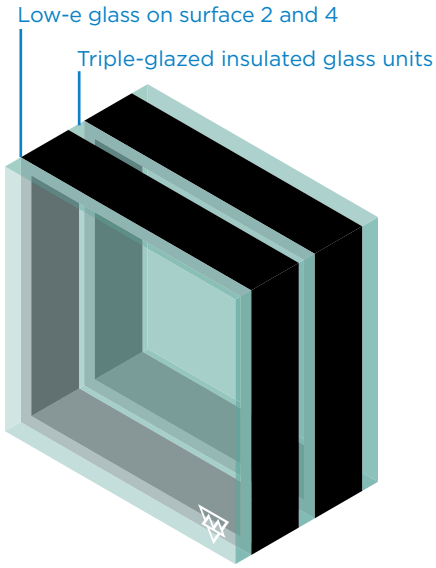
INCREASE HEAT GAIN :

Combining a glass of your choice with a low-e glass in position 3.

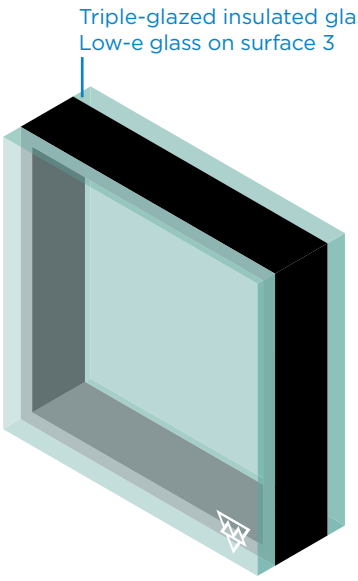
PURPOSE :

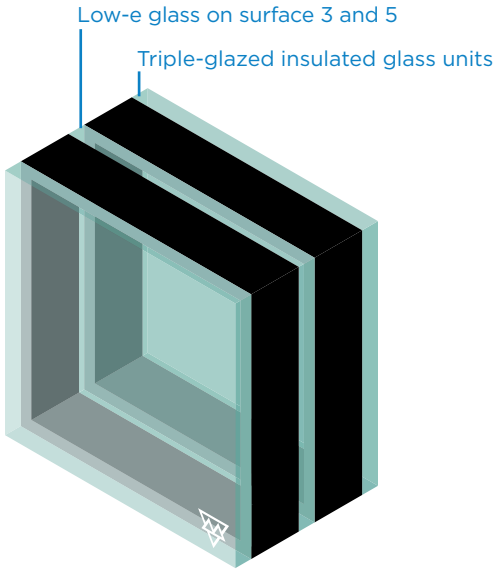
Allows our residential customers to be Energy STAR® certified with a noncon-ductive spacer. This composition is widely used to limit heating costs as well as pro-vide comfort to the occupants.

Triple-glazed insulated glass units are becoming increasingly popular because they significantly improve insulated unit performance. Here are examples of pos-sible compositions. Contact us to get more technical information, performance data and/or samples.



- Reduced heat gain coefficient
- Improved thermal resistance





- Increased heat gain coefficient
- Improved thermal resistance

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.

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