Glass Overview

Module #3A
Product Knowledge Training
Home Center
Basic Glass Terminology

**Glass:** A transparent material compound made up of silica (sand), soda (sodium carbonate) and limestone (calcium carbonate) with small quantities of aluminum, and boric or magnesium oxides.

**Float Glass:** A fabrication process used to make flat glass by forming it in the molten stage on a bath of molten metal, usually tin. The vast majority of glass is now made this way.

**Lite:** A single piece of glass.

**SS:** Single strength glass of 3/32” thickness (normally used in lites up to 12 sq. ft.). This is often used in triple pane IG units.

**DS:** Double strength glass of 1/8” thickness (used in lites between 12 - 25 sq. ft., and it's the minimum thickness for tempered glass).

**Fogged Unit:** An insulated glass unit that has seal failure and has condensation inside it.

**Unit:** Two or more pieces of glass separated by an air tight (hermetically sealed) airspace to form an insulated window or door that reduces heat transfer for improved thermal performance.

**IG (Insulating Glass):** Sometimes called Insulated Glass, TG (Twin-Glazed), Dual-glazed, Dual-pane, Double Pane, Thermal Pane, Unit, or IG Unit. An IG unit normally consists of two pieces of glass, separated by a spacer, which is usually a metal piece filled with desiccant, then permanently sealed. Milgard Window IG units come standard with SunCoat™ Low-E glass. Triple pane units (3 pieces of glass) are also available.

**O/A (Overall Thickness):** The thickness of an insulated unit of glass, including both pieces of glass and the spacer system.
Glass Conventions

**Insulating Glass Unit Surface Numbers**

Two pieces of glass are used to make a dual pane insulating glass unit. A spacer bar is used to separate those two pieces of glass. The surface of each of those two pieces of glass can be labeled with a surface number.

- **#1** surface is the outboard surface of the exterior glass
  - Exterior of the window
- **#2** surface is the inboard surface of the exterior glass
  - Inside the air space
- **#3** surface is the outboard surface of the interior glass
  - Inside the air space
- **#4** surface is the inboard surface of the interior glass
  - Interior of the window
Glass Conventions

 Triple pane insulating glass unit surface numbers.

Three pieces of glass are used to make a triple pane insulating glass unit. Spacer bar is used to separate the three pieces of glass. The surface of each of the three pieces of glass can be labeled with a surface number.

#1 surface is the outboard surface of the exterior glass
   • Exterior of the window
#2 surface is the inboard surface of the exterior glass
   • Inside the air space
#3 surface is the outboard surface of the center glass
   • Inside the air space
#4 surface is the inboard surface of the center glass
   • Inside the air space
#5 surface is the outboard surface of the interior glass
   • Inside the air space
#6 surface is the inboard surface of the interior glass
   • Interior of the window
Types of IG Spacers

**Intercept Spacer™**

Intercept Spacer is a state-of-the-art three-sided “warm edge” spacer bar which is the standard spacer used in Milgard window and door insulating units. It is a one-piece nickel-plated tin U-channel design, eliminating the fourth side and increasing energy efficiency. In an automated process, continuous spacer is bent on three corners and riveted in the fourth, decreasing the possibility of unit failure. This spacer is referred to as “EdgeGard™” in Milgard terminology.

**Intercept Ultra Stainless™**

Ultra Stainless™ is an upgrade option warm-edge spacer which is used in Milgard window and door insulating units. A high quality stainless steel alloy is formed into a U shape. It provides excellent gas retention and thermal performance comparable to foam spacer systems. This spacer is referred to as EdgeGardMAX™ in Milgard terminology.
Intercept Spacer Bar

- Date/time of Manufacture
- Acknowledgement number
- Order line number
- Glass type
Types of IG Spacers

**Super Spacer®**

Also classified as a warm edge spacer, Super Spacer® is a closed cell polymer foam spacer bar that uses a high-performance acrylic adhesive for its structural seal (adherence to the glass). This is then backed by a moisture vapor seal. Super Spacer is used in window applications such as arches or windows with curved shapes.

**Box Spacer**

A double perforated aluminum box is used as the spacer. The spacer is filled with desiccant to absorb any moisture in the insulated unit. The spacer is sealed to the glass with a butyl sealant and then a secondary sealant of DSE (dual seal equivalent) or Silicone is used to cover the spacer. Box Spacers are also referred to as an Aluminum Spacer.
Important Energy Terminology

U-Value – *How much heat transfers through a window*
U-Value measures the heat loss or gain due to differences between indoor and outdoor air temperatures, and it is expressed in terms of BTU’s/hr/sq. ft. **The lower the U-Value, the slower the rate of heat flow, and the better the insulating performance** (also called U-Factor). At Milgard, as in the NFRC, we follow Winter U-Factors, which are based on an outdoor temperature of 0-degrees F, an indoor temperature of 70-degrees F, and a 15 mph wind velocity with no sun. This is particularly important in colder climates.

Visible Light Transmittance (VLT) – *How much light passes through a window*
“Visible Light” is the light that we see. It represents about 45% of the solar energy spectrum. Visible Light Transmittance is the percentage of light that is passed through the whole fenestration product to the total solar energy at the exterior. This includes the total frame, glass, and grids (if present). If there was a hole in a wall with no window, the VLT would be 100% for that opening. **The higher the VLT percentage, the more light is transferred through a window.**

Solar Heat Gain Coefficient (SHGC) - *How well a window resists heat transfer.*
SHGC indicates the percentage of solar heat energy that makes its way through the glazing, including both directly transmitted and indirectly transferred heat from energy initially absorbed by the glazing. SHGC compares the effectiveness of specific glazing options to a single pane of 1/8” DS clear glass in its ability to reduce solar heat gain. The SHGC of a 1/8” single pane of glass is 1.0. A standard IG unit has a SHGC value of about .87. **Lower SHGC values mean less heat entering building.** This is particularly important in hot climates.

Note: Milgard reports SHGC, VLT, and U-Value on the label of every window.
Important Energy Terminology

R-Value – *How well a window resists heat transfer.*
R-value measures the insulation effectiveness of a window or its resistance to heat gain or loss. The higher the R-Value, the better the insulating performance. The formula is: $R = \frac{1}{U}$, $U = \frac{1}{R}$, $RU = 1$. The fenestration industry uses U-values more commonly than R-values.

Solar Energy
Energy released by the sun from three distinct regions of the solar light spectrum: 3% is made up of UV rays, 45% is Visible Light, and 52% is Near Infrared (NIR), which is also where the heat we experience comes from.

Shading Coefficient (SC)
Shading Coefficient is not a term that is used as much as SHGC these days. In the past, Shading Coefficient was used to determine the amount of solar energy or heat that was transmitted through a particular glazing system. The relationship between SC and SHGC is as follows: $SHGC = SC \times 0.87$.

Fading Transmission – *How much fading potential comes through a window*
The portion of energy transmitted in a spectral region from 300 to 700 nanometers. This region includes all of the ultraviolet energy and part of the visible spectrum, and will give the best representation of relative fading rates. The lower the Fading Transmission number, the better the glass is for reducing fading potential of carpets and interior furnishings.
Temperature Control Solutions

Energy Control Solutions

Milgard offers a variety of glass types to help consumers find options to control temperature and temperature-related issues in their homes. Reducing Solar Heat Gain can be done by either absorbing or reflecting the sun's energy. Tinted glass absorbs the sun's energy.

Tinted Glass

Tinted glass is manufactured by the float glass process, but with an additional additive (industrial rouge) to give it its unique color. Tinted glass offers the following benefits:

- Reduces visibility to interior, adding privacy.
- Absorbs heat to reduce solar heat gain.
- Reduces ultraviolet light damage to interior.
- Certain tints give a “smoke appearance”.
- The thicker the tinted glass, the darker the IG unit.
- May be tempered.
Temperature Control Solutions

**Milgard's Standard Tinted Glass**

1. **Solar Bronze** – A brown, smoked tint. Designed to reduce solar heat gain.
2. **Solar Gray** – A gray, smoked glass designed to reduce solar heat gain.
3. **Gray lite** – Unique among tinted glass, offering a dark-gray, almost black appearance, which provides excellent glare control, shading coefficient and ultraviolet screening. Milgard offers Gray lite II (9% Visibility).
4. **Azuria (formerly Azurlite)** – This spectrally select glass has an aquamarine appearance and is excellent for high daylight transmittance.
5. **Evergreen** – A spectrally select green tinted glass that provides a high daylight transmittance and low UV transmittance. (available only 1/4”)
6. **Solexia (formerly Solex)** – A green glass with excellent light transmittance and reduces solar heat gain.
Temperature Control Solutions

Reflective Glass
The reflective coating is applied by either spraying it on (pyrolytic process) or put on using a vacuum deposition sputtering process, depending on suppliers. Benefits of reflective glass include the following:

▪ Reflects light and heat with a metal oxide giving a mirror effect.
▪ Minimizes solar heat gain and ultraviolet light damage to interior.
▪ Adds daytime privacy.
▪ May be tempered.

Two Types of Reflective Glass
1. **Solar Cool Bronze** (show on left) – Light and heat reflective. It has low daylight transmittance and shading coefficient, and low relative heat gain.

2. **Solar Cool Gray** (show on right) – Light and heat reflective. It has low daylight transmittance and shading coefficient and low relative heat gain.
Special Considerations:

1. **NOTE:** The addition of after-market tints or films to our windows may cause seal failure or glass breakage and **will void the Milgard Guarantee.**

2. It is important to remember **that the thicker the glass, the darker the tint.**

3. In regards to reflective glass:
   a. During daylight hours you can’t see inside of a building.
   b. During night-time hours, there is the opposite effect. You can see into the building but you cannot see out.
   c. If you are selling this type of glazing in a residential application, you will need to suggest that a light be placed outside the window to provide the same effect as daylight.