Bringing Quality To Light

Soft-Lite® Windows

WARNING

COPYRIGHTED MATERIAL

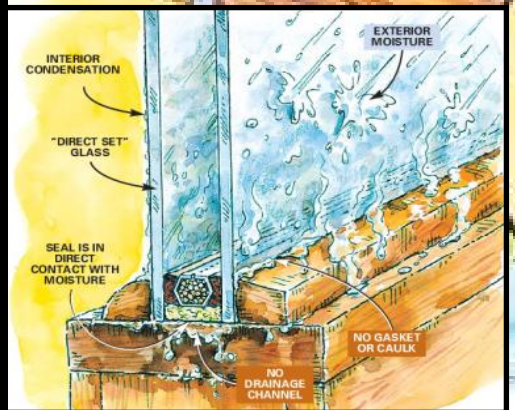
Bringing Quality To Light

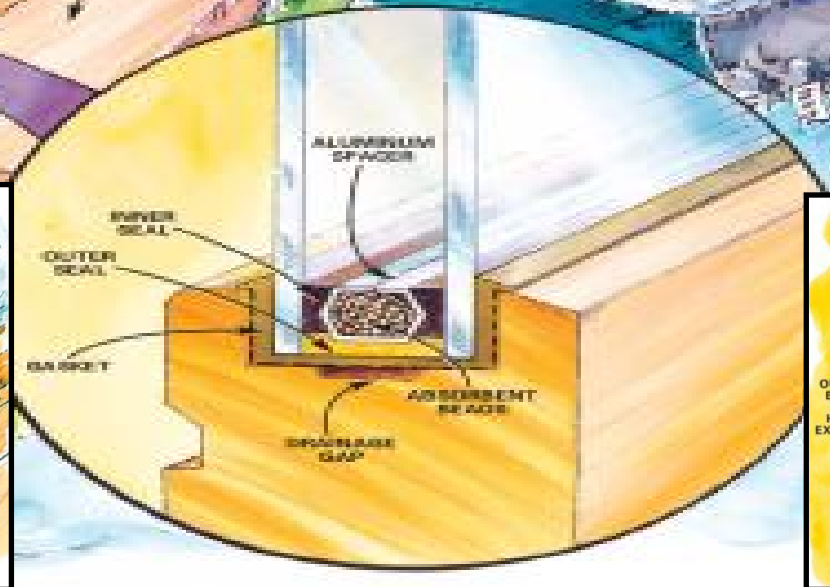
SoftLite® Windows

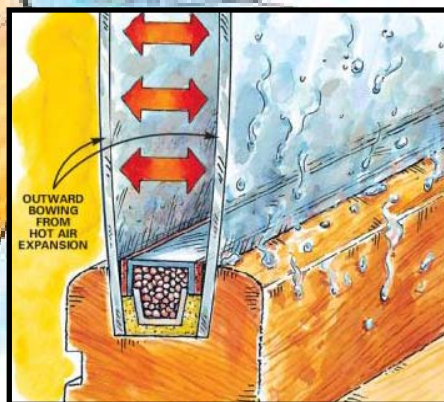
Soft-Lite
Training Session
Glass and Glazing Basics

Glass Issues and Opportunities

From Popular Mechanics Magazine, 2006







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Types of Residential Window Glass

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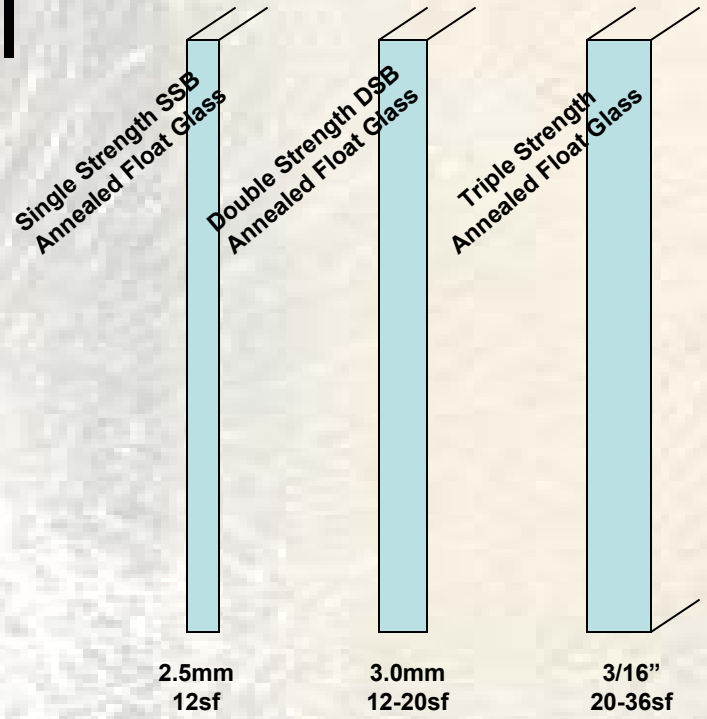
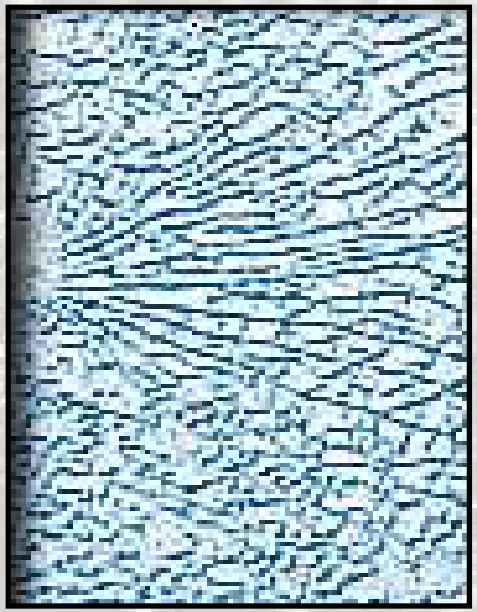
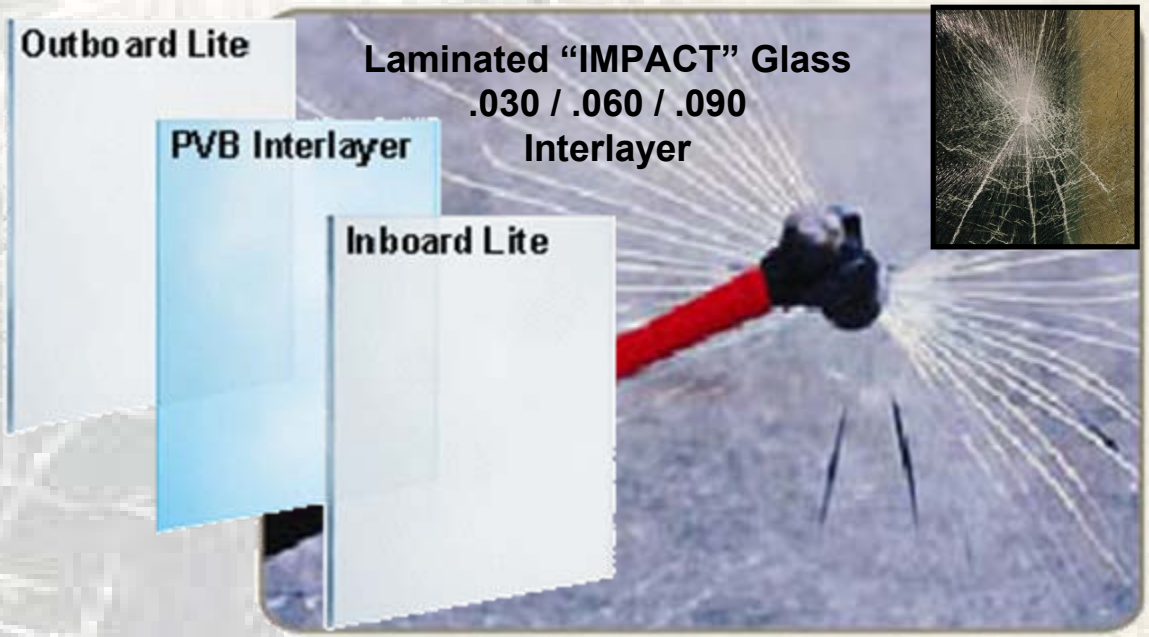
TEMPERED
HEAT STRENGTHENED







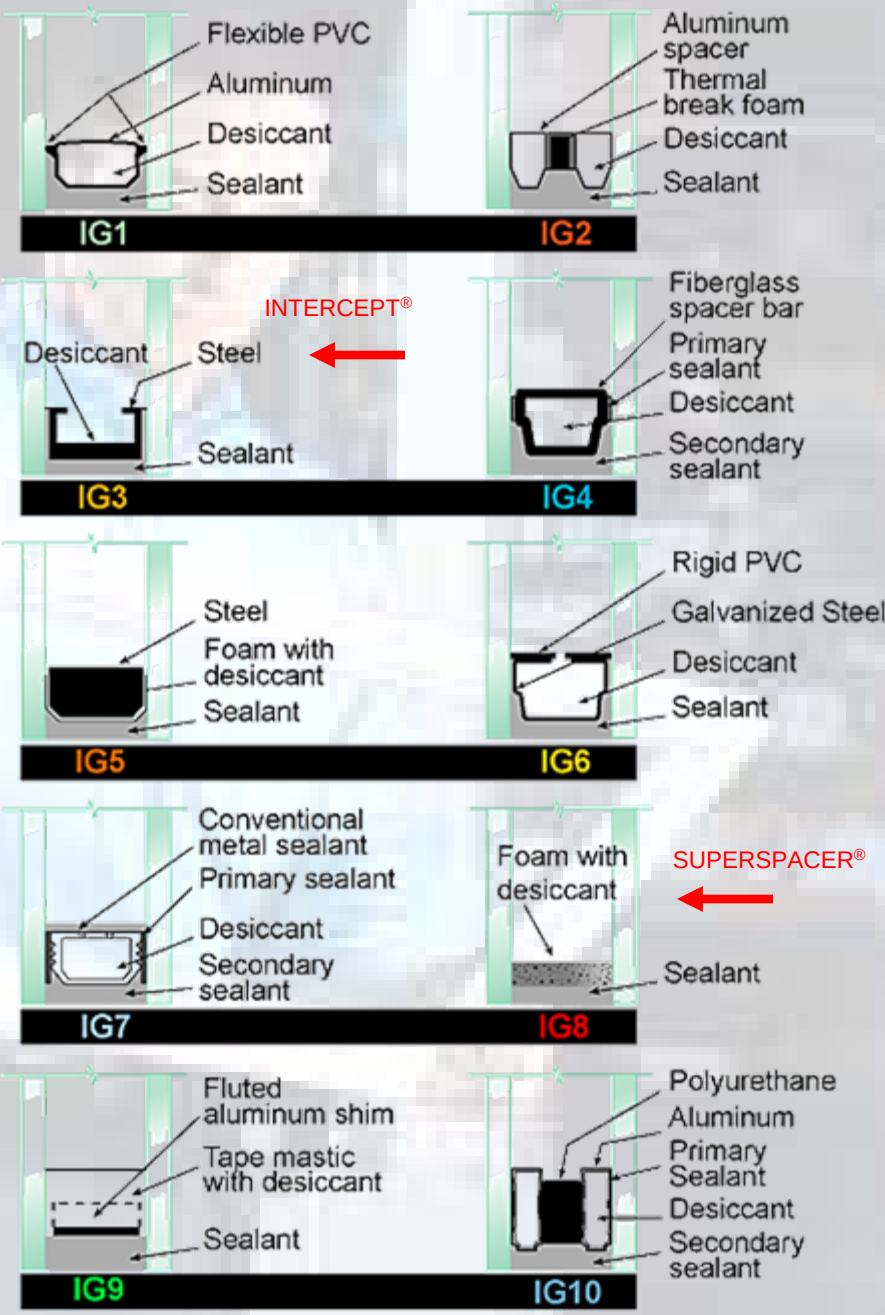
Types of Residential Window IG

Market Leaders:

- ***SuperSpacer® S-Class™***
- ***SuperSpacer® E-Class™***
- ***Stainless Intercept®***
- ***Intercept®***
- ***"High-Performance"***
- ***"Fully Automated"***
- ***"True Warm"™***
- ***"Warm Edge"™***

Market Losers:

- ***Old-Fashioned***
- ***Conventional***
- ***Out-Dated***
- ***Low-Performance***
- ***Box Spacers***
- ***Hollow Metal Spacers***
- ***Jointed Metal Spacers***
- ***Snap-Together Spacers***



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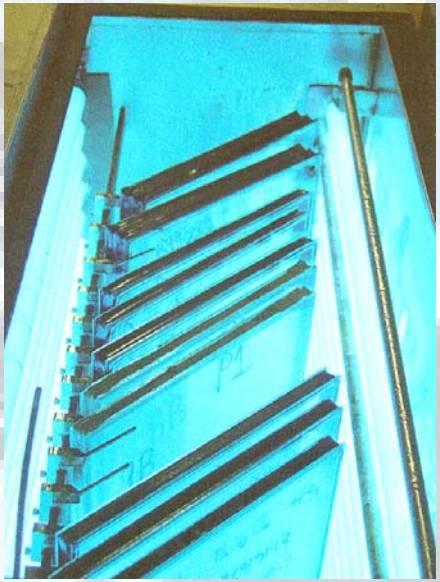
Is Your IG Certified? ASK!

High heat and humidity chamber above tortures the sealed IGU 24 hours every day for six months to simulate over 20 years in the "real world"

Direct, point-blank ultra-violet (UV) light with a spectrum closely matched to the sun's rays is designed to break down the adhesive bond of the hermetic seal of any one of the 10 IGU's shown, which would lead to seal failure and moisture between the panes – and failure to certify! This UV test is a component of the 6-month torturing of the IGU specimens.



Tested Durability – Worldwide Standards:

- North America – HIGS ASTM E2188, E2189, E2190
- USA- ASTM E773/E774
- Dade County Hurricane Test at ATL
- Canada - CGSB 12.8, M-90
- CEN 1279 parts 2 & 3
- Germany - DIN 1286 Teil 1 & 2
- Great Britain - BSI 5713
- Norway - NBI Testing
- China - GB11944-1989
- Spain – SELLO-INCE
- France – CSTB for CEKAL
- Industry type P-1 testing

ASTM INTERNATIONAL Standards Worldwide

NFRC ENERGY STAR IGMA AAMA

ANSI American National Standards Institute

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Market Loser:

“Hollow Aluminum Box Spacer”

1. Outdated single-seal sealant technology

- Hand-applied bond line inconsistency
- Complex component pump system
- Difficult to mix epoxy; catalyst/base*
- Polysulphide* (shuttle “O ring” disaster)
- Polyurethane* (floors, ATB)
- Older-Generation Hot Melt Butyls (corner gaps)

2. Desiccant flaws

- Manual pour from drum to spacer box misses often
- Long and short fill; inconsistent
- Desiccant pre-loaded drying factory air in drum
- Over-desiccant causes vacuum stress, cracks/failure

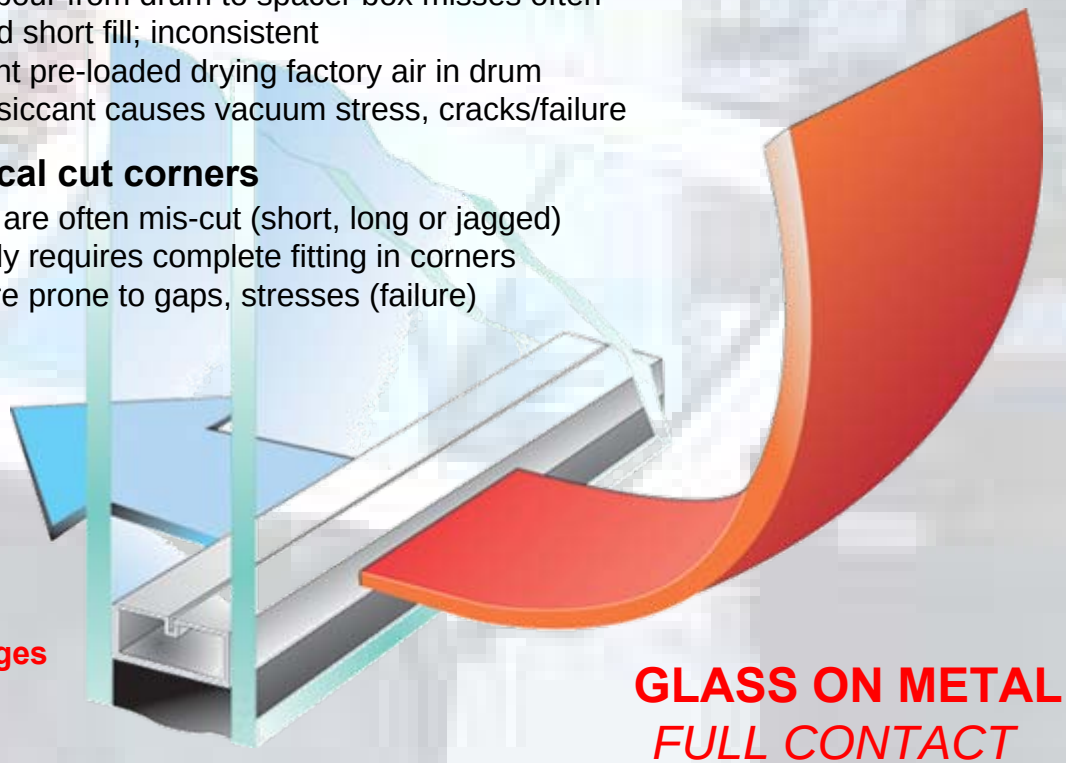
3. Mechanical cut corners

- Lengths are often mis-cut (short, long or jagged)
- Assembly requires complete fitting in corners
- Joints are prone to gaps, stresses (failure)

Ask me about the desiccant!

Market Loser:

- ***Old-Fashioned***
- ***Conventional***
- ***Out-Dated***
- ***Low-Performance***
- ***Box Spacers***
- ***Hollow Metal Spacers***
- ***Jointed Metal Spacers***
- ***Snap-Together Spacers***



Typical Problems:

- **Thermal short circuit**
- **Stress cracks**
- **Seal failure**
- **Excessive condensation around the edges**
- **Desiccant beads fall into view**

GLASS ON METAL
FULL CONTACT

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Market Loser:

"Swiggle Strip® or Swiggle Seal®"

Ask me about the desiccant!

1. First-generation revolutionary product

- Introduced by BFGoodrich in Boston, 1977
- Removed metal mass of box spacers
- Increased sealant mass, seal integrity
- Produced 1st "Warm Edge" effect
- Greatly simplified assembly
- Eliminated gaps in 3 of 4 corners
- Very popular with shapes (easy to curve along glass edge)

2. Ugly appearance, limited aesthetic appeal

- Corrugated shim causes "dragon-back" ridges visible on surface
- Prone to rounded corners intruding into vision area
- Tends to appear "rolled over" inside the IG unit
- Prone to "migration" (sucked into sightline by vacuum pressure during normal cycling)

3. Hand-applied inconsistency

- Among worst performers in seal failure
- Human error #1 issue with correct assembly
- Highly dependent upon craftsmanship
- Prone to crooked internal grid alignment issues

Market Loser:

- *Old-Fashioned*
- *Conventional*
- *Out-Dated*
- *Ugly, Wavy Appearance*
- *Low-Performance*
- *Metal-Shim Spacer*

Typical Problems:

- Thermally improved but outdated
- Old sealant technology
- Seal failure
- Spacer migration ("sag" or "droop")
- Prone to cold weather de-lamination
- Ugly

GLASS ON METAL
SOME CONTACT

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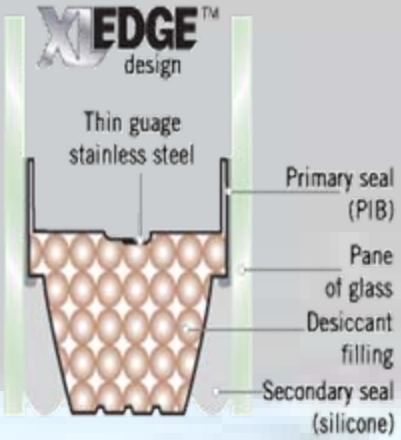
Mid-Market IG Design:



"XL Edge® from Cardinal® Glass"

1. Limited appeal, looks like old box spacer

- •Targeted major manufacturers (branding)
- •True dual-seal (poly-isobutylene and silicone)
- •Very difficult to distinguish between conventional spacers
- •Looks like metal-on-glass contact in sash
- •Completely automated; not produced by window mfr.

Ask me about the desiccant!

2. First spacer made of Stainless Steel

- •Stainless steel performs better thermally than aluminum and most metals
- •Hyper-thin walls limit metal mass in system

3. Mid-Range thermal performance

- •Better than prior systems, not as good as newer systems
- •Very good seal durability (GTP, MVTP)
- •Failures are rare

Mid-Market Design:

- ***Out-dated technology***
- ***Shiny metal glare***
- ***Rounded corners***
- ***Mid-level thermal performance***
- ***Metal-Shim spacer system***
- ***Desiccant balls can fall into airspace***

Typical Problems:

- **•Thermally improved but outdated**
- **•Too shiny, very high glare reflection**
- **•Lowest thermals of Hi-Performance IG systems**

GLASS ON METAL
NO CONTACT

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Journey to High Performance IG

"The Continuing Evolution of Warm Edge Technology"

Less metal Low Performance	Less metal Mid Performance	NO-Metal High Performance
• Intercept® • Swiggle® (alum) • Thermal Edge® • Warmlite® • XL Edge®	• Intercept® (stainless) • Swiggle® (stainless) • DuraSeal®	• Super Spacer® • Inex™ • TPS • TSS® •DuraLite®
-0.01 U-Factor*	-0.02 U-Factor*	-0.03 U-Factor*

** Improvement for average NFRC (overall) window rating*

Drop .03 from a U-Factor of .28 = *11% Better* U-Factor of .25

"The On-Going Battles of Product Differentiation"

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Hi-Performance IG:

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Soft-Lite® Windows

Standard Intercept™ from PPG

1. Completely automated assembly

- Continuous perimeter shim (barrier to entry/exit)
- Perfect sealant application (no gaps, voids)
- New-generation hot melt sealant technology
- Computer-controlled roll forming (consistent quality)
- Perfect grid alignment, fastened mechanically

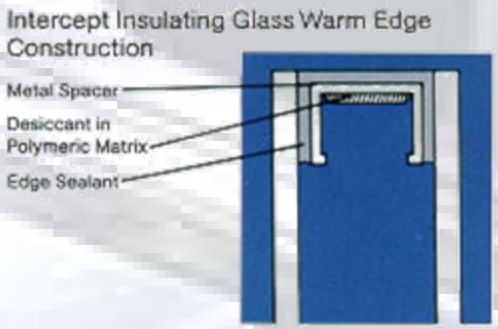
Ask me about the desiccant "matrix"!

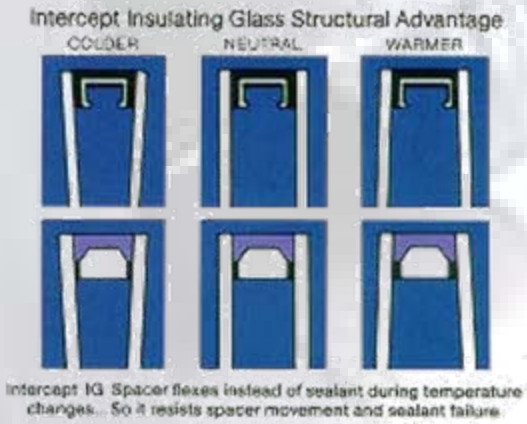
2. Excellent thermal performance

- Best in mid-range warm edge class
- Reduces condensation problems around glass perimeter

3. Attractive sight lines in reveal

- Perfect consistency around glass edge
- Unobtrusive appearance in sash
- Little or no reflective "shine"
- Continuous, tight 90° corners
- Excellent seal durability (GTP, MVTP)
- Failures are very rare





Superior flexibility fights cycling stresses that can lead to seal failure or stress cracks

GLASS ON METAL
NO CONTACT

Hi-Performance IG:

Great Thermals!

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Stainless Steel Intercept™ from PPG

1. All the same features of Standard Intercept™

- Made with stainless steel, thermally better than tin
- Perfect sealant application (no gaps, voids)
- New-generation hot melt sealant technology
- Computer-controlled roll forming (consistent quality)
- Perfect grid alignment, fastened mechanically
- Attractive sight lines in reveal

2. Superior thermal performance

- Top performer in hi-performance warm edge class
- Fights condensation problems

3. Beautiful aesthetics

- Perfect consistency around glass edge
- Unobtrusive appearance in sash
- Attractive reflective "shine" of 2 rails
- Continuous, tight 90° corners
- Excellent seal durability (GTP, MVTP)
- Failures are very rare

.0077" Gauge

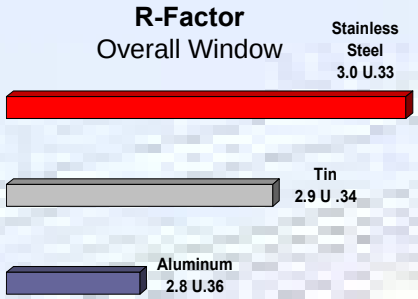
Ultra Thin Walls
Structurally Strong

Custom Alloy

Designed for IG

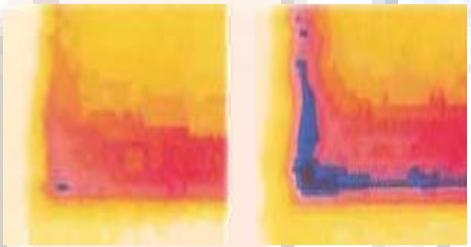
Compatible

Existing Equipment
Same Sealants



Conductivity

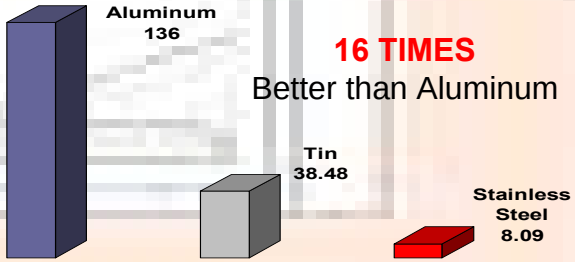
Measured in BTU's
The Lower the Better



Thermal Photography

(Red hot; Blue cold)

Left: Stainless Steel Intercept
Right: Box Aluminum Spacer



16 TIMES
Better than Aluminum

5 TIMES
Better than Tin

Superior thermal performance of stainless steel makes this product a top performer among all warm edge systems

GLASS ON METAL
NO CONTACT

Source: http://www.engineersedge.com/properties_of_metals.htm

Hi-Performance IG:

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Edgetech
BETWEEN YOU AND THE ELEMENTS.

Super Spacer®

Super Spacer® HELPED Health Smart Windows®

Super Spacer™ from Edgetech

1. First Metal-Free IG System

- Continuous perimeter shim (barrier to entry/exit)
- New-generation hot melt sealant technology
- Massive sealant mass behind spacer

2. Best available thermal performance

- Best available warm edge class: ZERO METAL MASS
- Best at preventing condensation problems

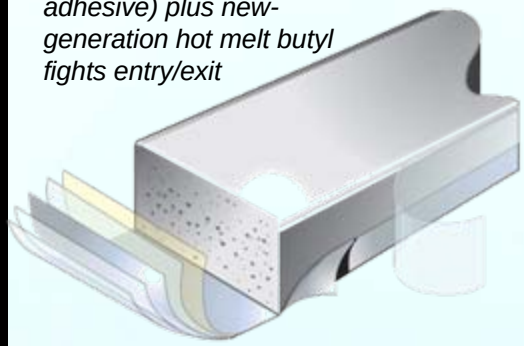
3. Attractive sight lines in reveal

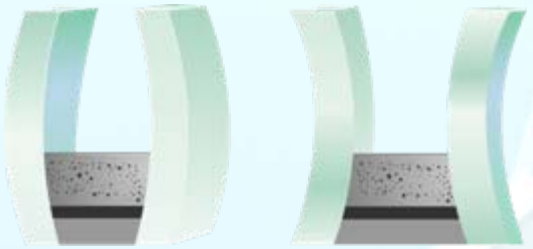
- Perfect consistency around glass edge
- Unobtrusive appearance in sash
- Zero reflective “shine”
- Excellent seal durability (GTP, MVTP)
- Failures are very rare

Ask me about the desiccant!

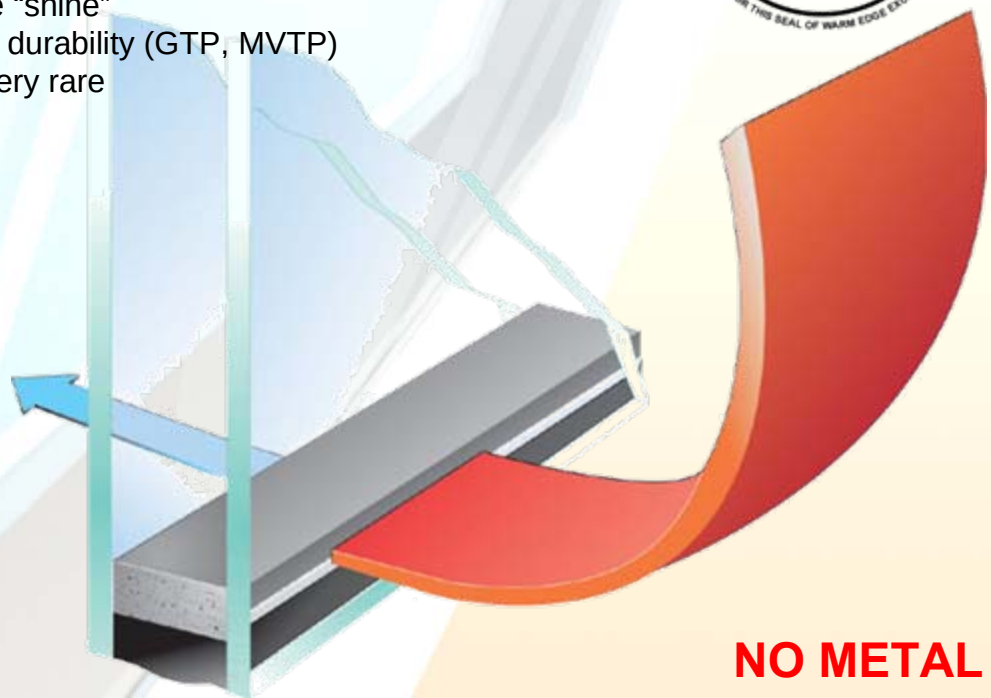
Super Spacer® SEALED
LOOK FOR THIS SEAL OF WARM EDGE EXCELLENCE

Multiple mylar layers with PSA (pressure-sensitive adhesive) plus new-generation hot melt butyl fights entry/exit





Superior flexibility fights cycling stresses that can lead to seal failure or stress cracks



NO METAL

Hi-Performance IG:

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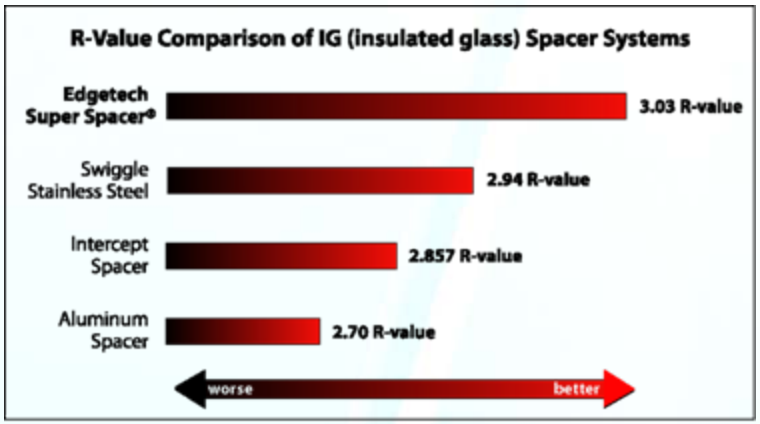
Edgetech
BETWEEN YOU AND THE ELEMENTS.

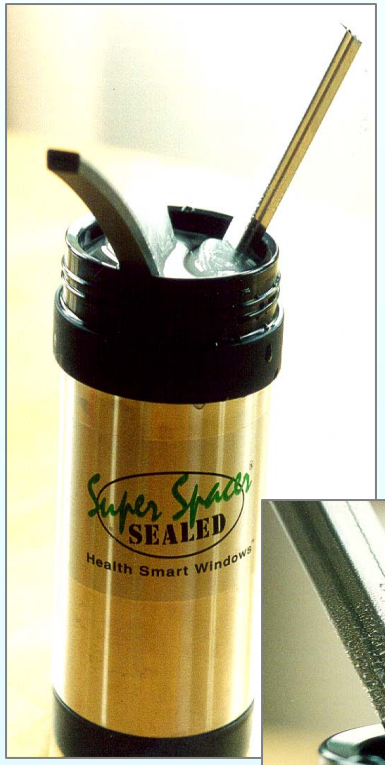
Super Spacer®

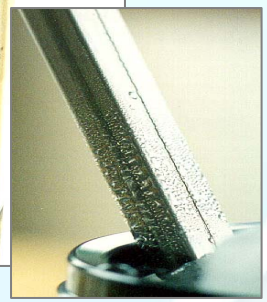
Super Spacer® SEALED
Health Smart Windows®

Super Spacer™ from Edgetech



Computer simulations conducted by Enermodal Engineering, a certified independent third party testing facility.





An effective thermal demonstration with samples of box, Intercept™ and Super Spacer ™ systems involves placing the specimens in icy water to witness by sight and touch the thermal differences in the materials.

Up to
+16.6˚F/ 9.23˚C
average sightline temperature difference

Low-e Glass
“Emissivity”
“Emit”

MSVD Equipment
Sputter-Coat “Soft Coat”
Magnetic Sputter Vacuum Deposition

Coating Control Room

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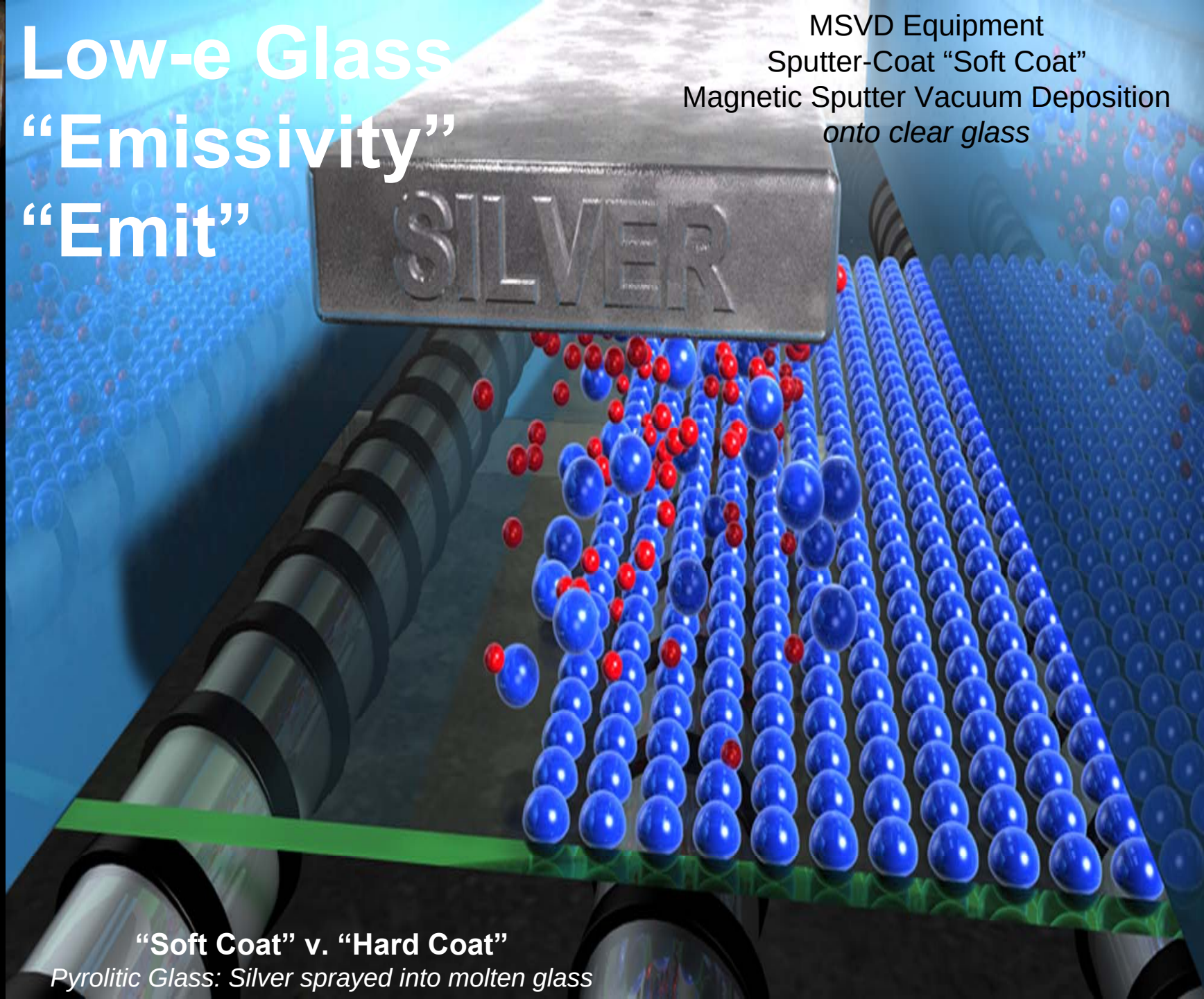
Low-e Glass
“Emissivity”
“Emit”

MSVD Equipment
Sputter-Coat “Soft Coat”
Magnetic Sputter Vacuum Deposition
onto clear glass



“Soft Coat” v. “Hard Coat”
Pyrolitic Glass: Silver sprayed into molten glass

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Low-e Glass: Coating Chambers

8 Vacuum Chambers "sputter" (apply) Silver plus Protective Layers

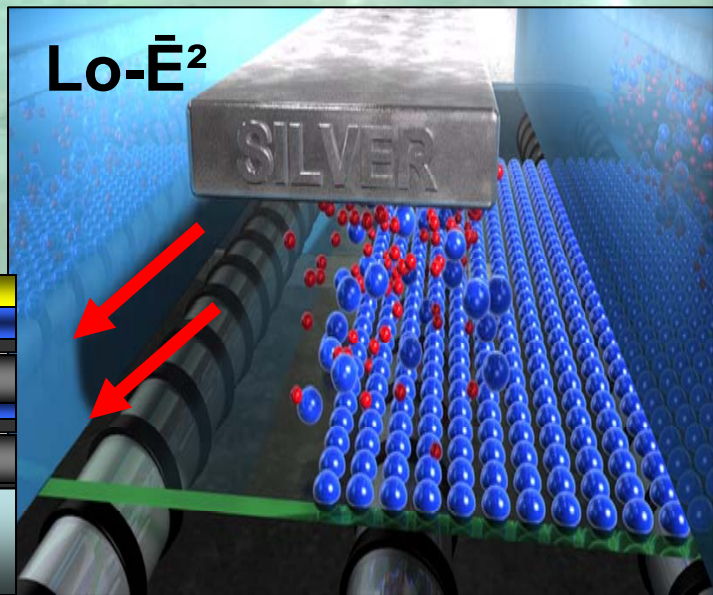
Two Silver Sputter Deposits

Glass Washer

Active Ingredient

Titanium Dioxide
Protective Layers

Zinc, Tin "Heavy Metals"
Supplemental to enable washing, sealant adhesion, tempering heat



Titanium Dioxide

Zinc, Tin Oxide (other heavy metals)

Silver – 2nd Sputter Coat on same surface

Silver – Very High Reflectivity (mirrors)

Annealed Float Glass Substrate

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Low-e Glass Competitive Comparisons: MSVD Hi-Performance

SELL THE TRUTH™
Numbers are GLASS only

	LoE²-170	LOF EA HARD COAT	PPG 1000	Gu PPII	AFG Ti-R	AFG Ti-AC	AFG Ti-PS
Vis Trans	70%	75%	71%	**69%**	71%	62%	77%
Ref Ext	12%	18%	12%	**19%**	21%	29%	13%
Ref Int	13%	17%	13%	**17%**	19%	24%	15%
SHGC	0.36	**0.72**	0.39	**0.40**	0.47	0.39	0.58
U-Value Argon	0.25	0.29	0.25	**0.25**	0.25	0.25	0.25
U-Value Air	0.29	**0.34**	0.30	**0.30**	0.29	0.29	0.30
UV Damage Function	31%	**50%**	32%	**31%**	39%	36%	43%
UV Transmission	14%	**45%**	16%	**20%**	29%	29%	33%

Courtesy of Cardinal Glass Corp 2006©

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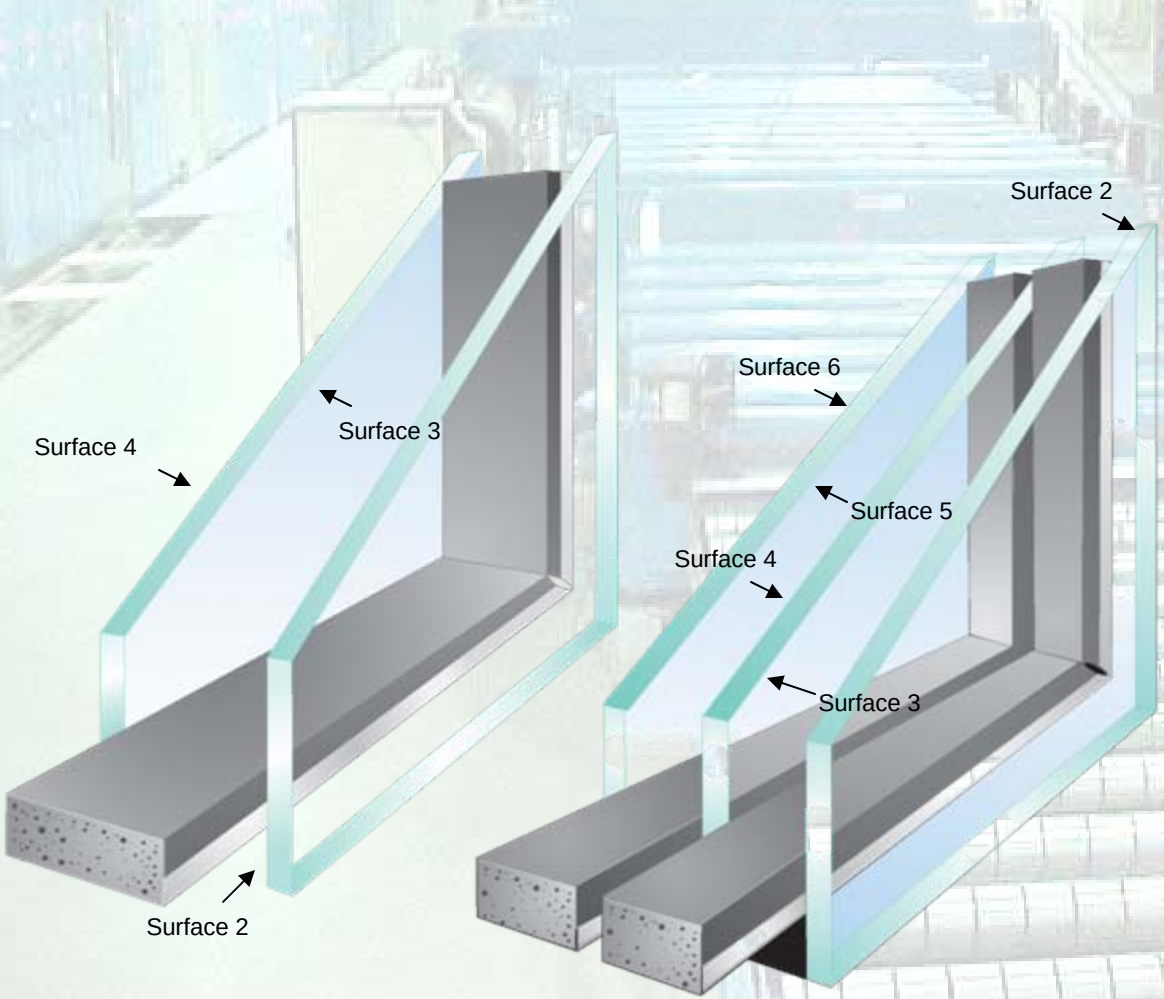
Low-e Glass
“Emissivity”
“Emit”

- “Soft Coat” is “MSVD” deposited or sputtered on a surface; typically 2 and 5
- “Hard Coat” is “Pyrolytic”; baked into the molten glass



Surface 1
Closest to the Sun

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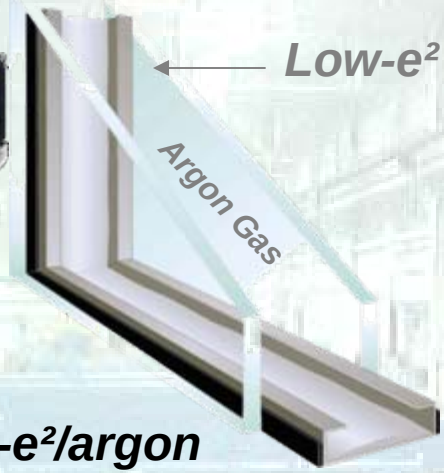
Low-e² (S2)



Low-e²/argon

Low-e²/argon with Super Spacer®

Ultimate Glass™

Low-e² (S2,5)

ULTRA GLASS™

Use Glass Sell Card

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Insulating Glass Units

AFGI-61IGCC ASTM E2190CBA 06 (IGCC 1309, 1845, 1969) http://www.igcc.org/CPD%20Certified%20Products.pdf
ALL INSULATING GLASS CERTIFIED BY INDEPENDENT LABS TO MEET OR EXCEED ASTM E-2190 CBA TEST
Many variations and thicknesses of certified insulating glass are available. Ask your Authorized Soft-Lite Dealer for details.

Ultimate Glass™
ClimaGuard SPF™ Complete UV Protection

A. Ultimate Glass™ with UV-Guard SPF™

Triple pane with low-e² (2,5), krypton (2), SPF™ (3), and Super Spacer®
1. Overall IGU Thickness (OT): **1"**
2. Center Of Glass U-value (COG): **R10/U0.10**
3. Condensation Resistance Factor (CRF): **72**
4. Visible Transmittance (VT): **.40**
5. UV-A/UV-B Protection (SPF): **99.9%**

METAL FREE

Ultimate Glass™

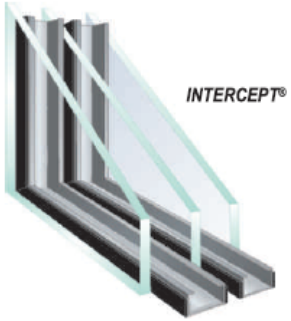
B. Ultimate Glass™

Ultimate™ Glass with no SPF™
1. Overall IGU Thickness (OT): **1"**
2. Center Of Glass U-value (COG): **R10/U0.10**
3. Condensation Resistance Factor (CRF): **72**
4. Visible Transmittance (Clarity): **.40**

ULTRA GLASS™
ClimaGuard SPF™ Complete UV Protection

C. Ultra Glass™ with UV-Guard SPF™

Triple pane with low-e² (2,5), argon (2), and Intercept® Spacer
1. Overall IGU Thickness (OT): **1"**
2. Center Of Glass U-value (COG): **R6.7/U0.15**
3. Condensation Resistance Factor (CRF): **62**
4. Visible Transmittance (VT): **.40**
5. UV-A/UV-B Protection (SPF): **99.9%**



ULTRA GLASS™

D. Ultra Glass™

Ultra™ Glass with no SPF™
1. Overall IGU Thickness (OT): **1"**
2. Center Of Glass U-value (COG): **R6.7/U0.15**
3. Condensation Resistance Factor (CRF): **62**
4. Visible Transmittance (VT): **.40**

INSULATING GLASS UNITS

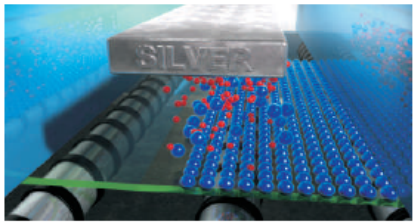
E. Low-e² Glass with *Super Spacer*™

Double pane with low-e² (2), argon (1), and Super Spacer®
1. Overall IGU Thickness (OT): **7/8"**
2. Center Of Glass U-value (COG): **R4.0/U0.25**
3. Condensation Resistance Factor (CRF): **58**
4. Visible Transmittance (VT): **.61**

METAL FREE

F. Low-e² Glass with *Intercept*™

Double pane with low-e² (2), argon (1), and Interecpt®
1. Overall IGU Thickness (OT): **7/8"**
2. Center Of Glass U-value (COG): **R4.0/U0.25**
3. Condensation Resistance Factor (CRF): **53**
4. Visible Transmittance (VT): **.61**

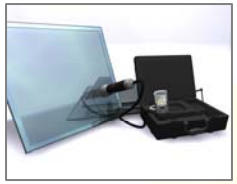


High-tech robotic equipment hermetically seals glass and automatically applies magnetic sputter vacuum deposits on annealed glass to produce low-e², SPF™.

LITSI-IGU-SCARD

Argon Gas Filling

Rapid Gas Filling with Liquid Argon
A patent pending technology injects liquid argon reducing unit dosing time from 2 minutes to 3.5 seconds compared to conventional gas filling methods



Argon Facts:

47.8% lower thermal conductance than air

38.0% more dense than air

22.2% more viscous than air

Soft-Lite® uses sophisticated laser instruments to validate the gas-fill level of insulating glass (IG). Any unit less than 90% argon-filled is rejected.

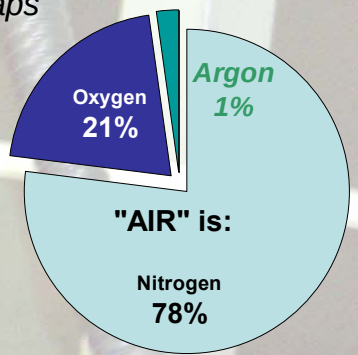
Intercept™ Argon Retention Rate:

0.4% to 0.7%

Argon loss per year is less than 1% with hot melt butyl IGU's

1. **Butyl** sealant's **Low Permeability** *blocks argon's escape*
2. **Automated sealant application** – *no gaps in the bond line, no easy way out*
3. **Continuous shim wall** *eliminates corner gaps*

"If an initial argon fill were at **90%***, the COG* **U-factor** *would be* **0.25***. If there is an argon/air exchange of as much as* **1%** *per year,* **in 20 years** *the argon level would be* **70%** *with a resulting argon COG* **U-factor** *of* **0.26***. The effect on the overall window thermal performance will be -* **insignificant***."*



ARGON makes our dead air space – deader! It fights thermal transfer and baffles sound waves

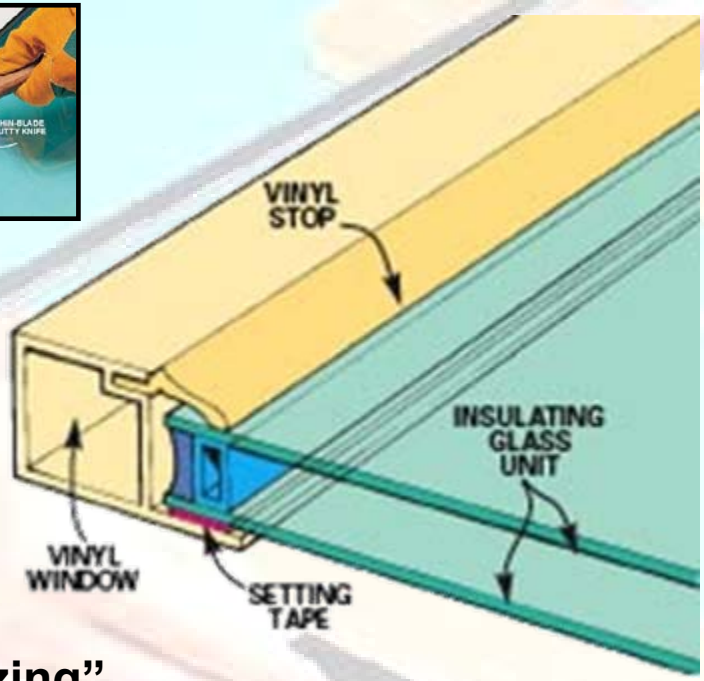
16%

U-factor improvement (center of glass) when low-e IG is argon-filled

Bringing Quality To Light

Soft-Lite® Windows

Glazing IG into Sashes



1. Apply Sealant Tape and Setting Blocks

2. Set IG Unit into Sash onto Tape

3. Apply Glazing Stops “Beads”; note setting blocks

<u>“Dry Glazing”</u>

- **Closed cell neoprene tape**
- **Butyl tape**
- **Dual-durometer**

<u>“Wet Glazing”</u>

- **Applied sealant**
- **Silicone**
- **Urethane**
- **Other compounds**

Bringing Quality To Light

SoftLite® Windows

Pop Quiz!
Win a Prize!

Soft-Lite Training Session Glass and Glazing Basics

Bringing Quality To Light

Soft-Lite® Windows

Soft-Lite® Windows
Bringing quality to light.

Presents

Educational Achievement

GLASS BASICS

To

Your Name Here

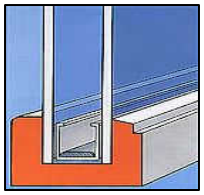
December 17, 2009

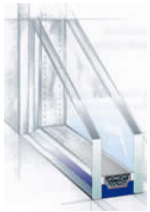
Sell The Truth™

Tom Italiano, Soft-Lite® Certified Technical Training Manager

WindowDoor Champions of Industry Ohio Partnership for Excellence AAMA NFRC ENERGY STAR

Ten Basic Glass and Glazing Questions





1. Name three glass issues that can motivate a replacement window purchase.

Condensation, seal failure, heat loss, heat gain, noise, comfort

2. Name the three basic glass pane thicknesses.

SSB/3/32”/2.3mm; DSB/1/8”/3.0mm; 3/16”

3. Name the three laminated glass interlayer thicknesses and which is strongest.

.030; .060; 0.090

4. What are three good, descriptive words for the Market Loser IG system(s)?

Old-fashioned; Conventional; Low-performance; hollow box;

5. Name three of the Market Leader IG systems by brand name.

Intercept, Stainless Intercept, Super Spacer E-Class, Super Spacer S-Class

6. How is IG Certified?

By independent agencies; specimens tortured over 6 months; high heat/humidity/UV

7. What are three typical problems of the #1 Market Loser IG system?

Thermal short circuit; Stress cracks; Seal failure; Excessive condensation around the edges

8. Name the IG systems shown on this page; are they Market Winners?

9. Thermally, stainless steel is 16 times better than aluminum and 5 times better than tin. True or False

True

10. What does the “e” stand for on “Low-e” glass; and what is the primary ingredient?

Emissivity; silver

BONUS Q: Explain everything you know about argon gas OR low-e glass.

Bringing Quality To Light

Soft-Lite® Windows