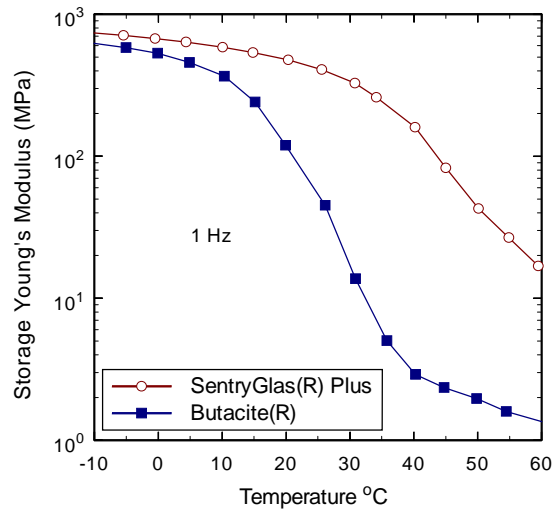
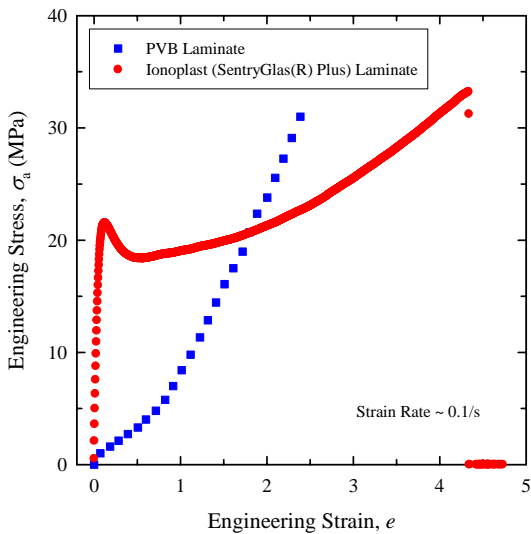




The miracles of science

As the premier polymer science company, DuPont is uniquely able to offer a range of glass laminating products that meet rapidly growing demands and new standards for improvements in glass security and safety with durable aesthetics. DuPont offers the products, the knowledge and final systems value for the entire glass industry to meet these needs effectively and profitably.

- Butacite® polyvinyl butyral interlayer (PVB)** has been continuously improved over the past 67 years from its inception as the preferred material for safety glass. It has established all of the advantages of laminated glass: Safety and security, sound dampening; ability to offer solar control for energy savings; protection of interiors from fading; and added beauty.
 - SentryGlas® Plus interlayer (SGP)** for laminated safety glazing is the latest innovation in DuPont's family of glass laminating products. It extends the performance of laminated glass beyond current technologies. SentryGlas® Plus Interlayer offers five times the tear strength and 100 times the rigidity of conventional PVB interlayer. Because of its added strength, clarity, durability, fabrication and installation ease, it is an excellent candidate for demanding applications in the architectural market place. It can offer improved ballistic protection or thinner constructions than are now possible with conventional laminated glass.
- SentryGlas® Plus Is Designed for Today's Architectural Needs.
 - Same Safe Breakage and Fragment Retention.
 - Enhanced Impact Performance; Greater Security from Range of Threats; e.g. Severe Weather and Man-Made Threats,
 - No Head Impact Criterion, Greater Retention: Can Use Stiffer, Tougher Interlayers.
 - More Demanding Strength/Deflection Performance Both Pre & Post Glass Breakage; Overhead Glazing.
 - Greater Durability/Lifetime Demands at Elevated Temperatures.
 - Excellent Weather and Edge Stability.



sgplus_1Hz.axg

Figure 1. SentryGlas® Plus vs. PVB for Laminated Glass

- SentryGlas® Plus is elasto-plastic, high tear energy (5 x PVB).
- Glass transition temperature ~ 55° C. (Stiffness 30 – 100 x PVB).

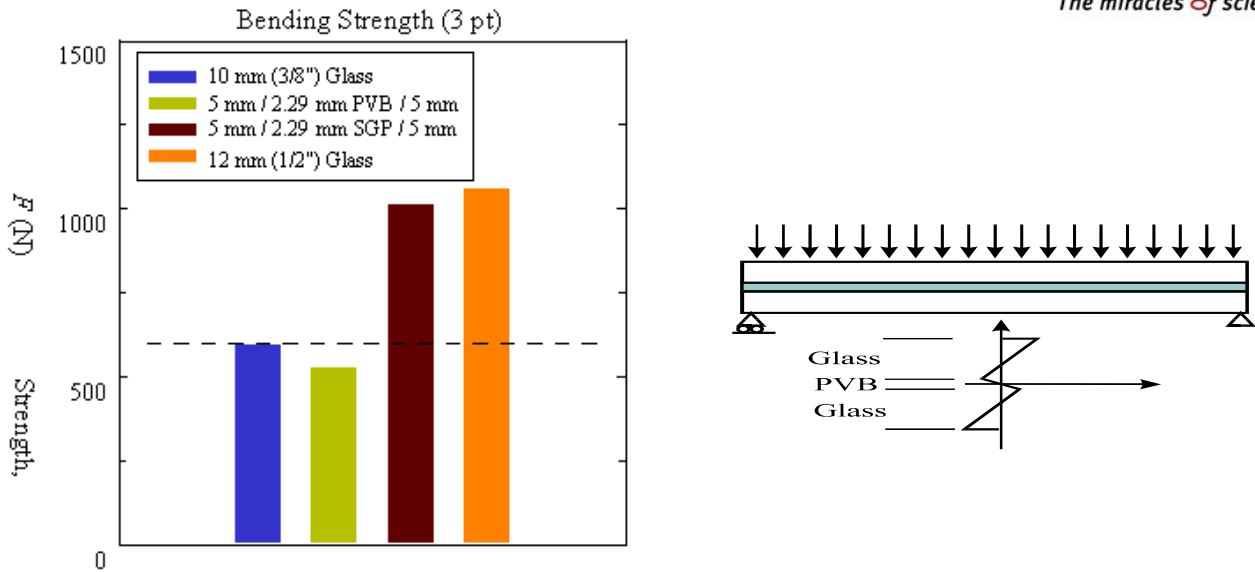


Figure 2. Strength Attributes

- SentryGlas® Plus laminates stronger than PVB laminates.
- SentryGlas® Plus laminate shows near equivalence to monolith glass of same *total* thickness.

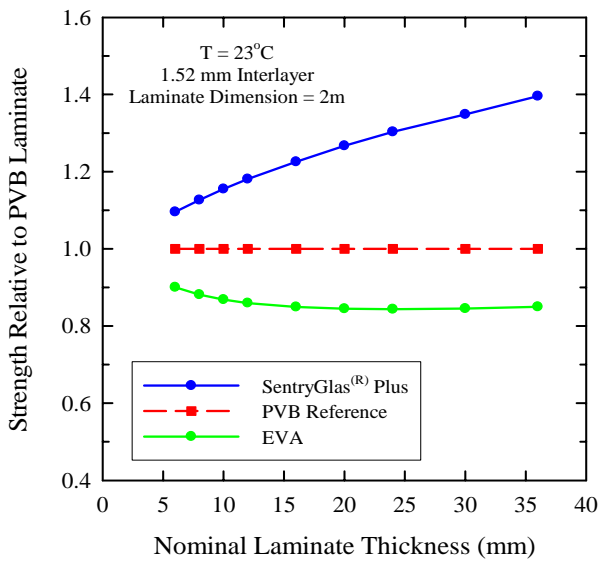


Figure 3. Relative Strength

- SentryGlas® Plus laminates show improved strength properties over other interlayers.
- Good opportunities to reduce glass thickness, particularly for thicker laminates.
- Especially beneficial for point-supported glass.

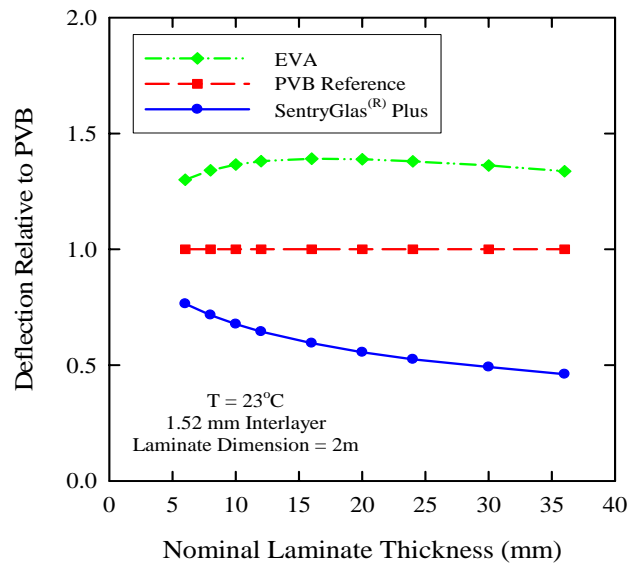


Figure 4. Relative Deflection

- SentryGlas® Plus laminates show improved stiffness properties over other interlayers.
- Good opportunities to reduce glass thickness.
- Property and design information available from DuPont.

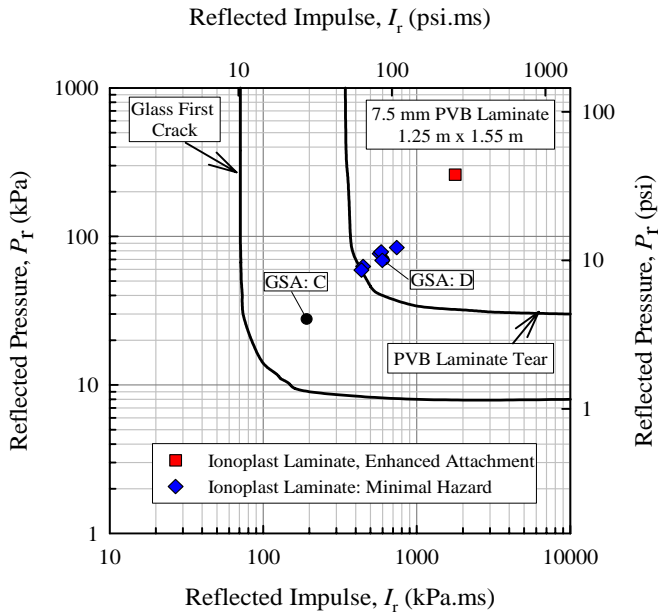


Figure 5. Blast Test Performance

- 37.8 psi (261 kPa) - 258 psi.ms (1,779 kPa.ms).
- Solves DOS needs for Embassy program.
- Provides cost-effective solution versus glass-clad polycarbonates.

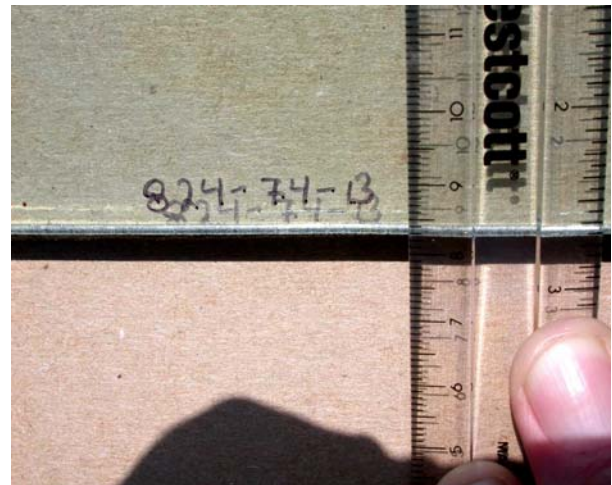


Figure6• Weathering Behavior Extensive weathering tests

- Natural, Florida Exposure (> 7 yrs); Enhanced, EMMA Arizona; Simulated, Xenon ASTM.
- SGP exhibits none of the edge defects that sometime develop in traditional PVB laminates.
- No change in color or haze.

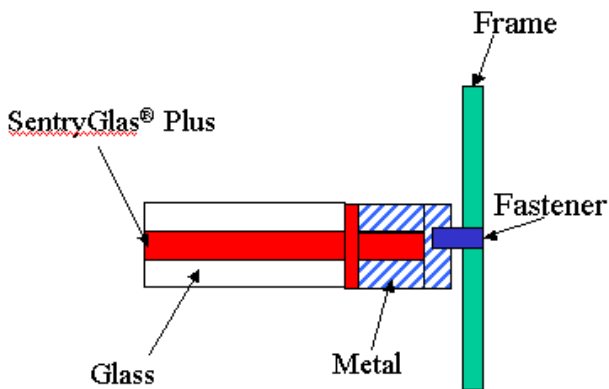


Figure 7. SentryGlas® Secure™ --Patent

- SentryGlas® Plus adheres well to metals, such as Al.
- Enhanced post-glass breakage performance.
- Design flexibility and aesthetics.
- Interlayer becomes primary structural component in system.

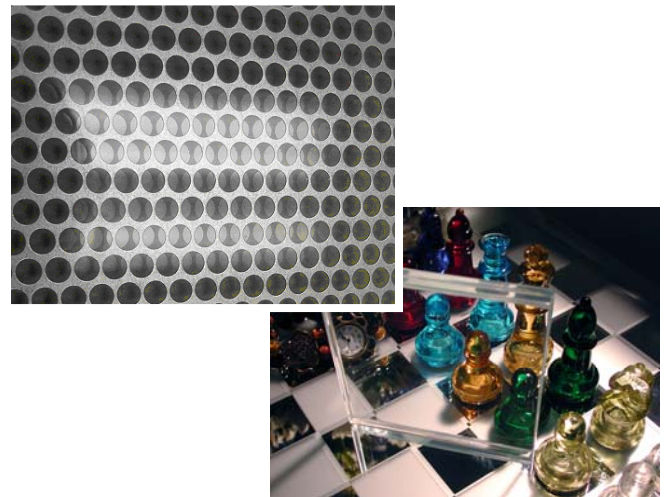


Figure 8. Aesthetics and Light Control

- SOAC Project
- SGP with super write glass

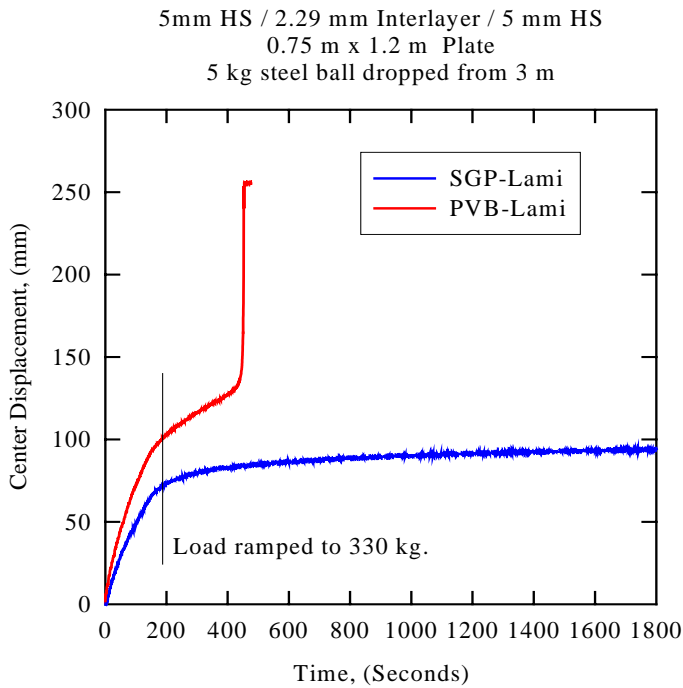


Figure 9. Creep Loading: Post-Glass Breakage

- Polymer tear energy is a major variable in determining impact performance.
- Impact performance is inversely proportional to adhesion.
- Polymer debonding a necessary precursor to polymer stretching and energy dissipation (analogous to CMCs).
- Post glass breakage performance as determined by in plane displacement of fragmented laminate affected strongly by polymer modulus.
- Improved stiffness and tear energy gives superior performance

Table 1. Performance data

Material	SGP	PVB	Standard
Performance			
Density (g/cm ³)	0.95	1.07~1.08	ASTM D-792
Coefficient of linear expansion (°C ⁻¹)	10~15x10 ⁻⁵ (-20°C ~32 °C)	4x10 ⁻⁴	ASTM D-696
Tensile strength (Mpa)	34.5	20	ASTM D-638
Tear strength (Tear energy) (MJ/m ³)	50	10-15	ASTM D-638
CSS (Mpa)	>20.7		Du Pont
Elongation (%)	400	275 (ASTM D-412)	ASTM D-638
HDT @ 66 PSI	43°C		ASTM D-696
Haze	<2%	<2	
YID %	<2.5	10-15	(interlayer)
Refractive index	1.5	1.47~1.5	
UV cutoff wavelength (nm)	310	380	
UV screening (%) 3C+0.38+3C	99.98	99.98	