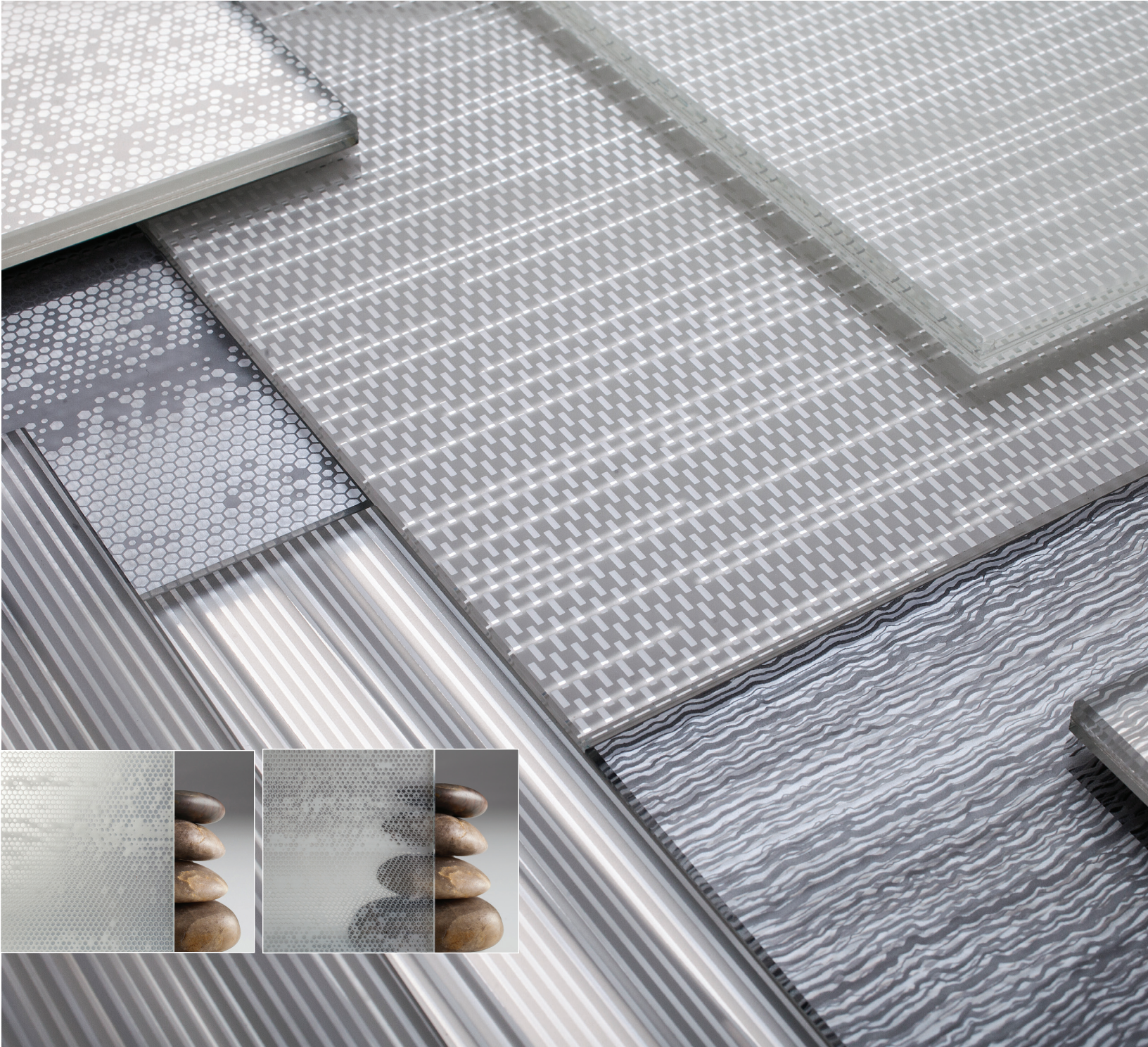




VIVISTRATA™ LAYERS GLASS

PRODUCT DATA





VIVISTRATA™ LAYERS GLASS

PRODUCT DATA

ViviStrata Layers glass features one or more color graphic interlayers laminated between two lites of glass, with etching on one or both glass lites. Each multi-layered pattern is a dynamic play between interlayer graphics, etched elements, and light. Patterns blend transparent and opaque areas, and instances of light refraction and diffusion, to create a sense of depth and dimension that appears to shift as light and viewing angles change. An invisible protective sealer repels dirt, makes the glass surface easy to clean, and ensures the long-lasting beauty of each etched surface.

PRODUCT FEATURES

- Suitable for interior and exterior applications.
- Requires minimal maintenance: interlayers are protected inside the glass, and an invisible sealer repels dirt and makes the etched surface easy to clean.
- Configurations include popular architectural glass thicknesses and types: tinted, annealed, heat strengthened, tempered, flat or curved, single or double glazed.
- Products are manufactured to specification and provided cut to size and ready to install.

MATERIAL DESCRIPTION

ViviStrata Layers is defined by four parameters that are key to product specification:

CONFIGURATION	GRAPHIC INTERLAYER	LUMILEVEL™	ETCH
<p>Refers to the amount of light transmitted - or not - through the glass. As outlined below, two standard options exist.</p> <p>View is a double-sided configuration that consists of a color graphic interlayer between two transparent lites of glass.</p> <p>Reflect is a single-sided configuration comprised of a color graphic interlayer between a transparent lite of glass and a reflective glass backer.</p>	<p>A combination of two elements: pattern + pattern color(s). Numerous standard and custom pattern and color options are available. See pages 3-4 for details.</p>	<p>LumiLevel is a measurement of the translucency of View glass. It can also be used to diffuse light from the reflective glass backer in Reflect glass. Refer to page 5 for additional information.</p>	<p>Defines the surface appearance of your glass selection. A design is physically etched into the glass surface. Patterns shown on pages 3-4 incorporate both etch and interlayer.</p>

PRODUCTS & APPLICATIONS

GLASS LITES	F+S SYSTEMS
<p>ViviStrata Layers glass is ideal for architectural accents such as columns, railings, partitions, and other custom applications. Processing options include polished edges, tempering, notches, cutouts and pattern cuts. Layers can be specified in any size up to 60" x 120" (1524 mm x 3048 mm). Please contact us for information on larger custom sizes.</p> <p>ViviStrata Layers glass lites can be used with commonly available glass hardware components to address a wide range of glass mounting and installation scenarios. Please contact our project management team for help with your project-specific needs.</p>	<ul style="list-style-type: none"> • LEVELr Wall Cladding System • LEVELr Column System • LEVELr Elevator Interiors • LEVELe Wall Cladding System • LEVELe Column System • LEVELe Elevator Interiors • LEVELc-2000 Elevator Interiors • LightPlane Panels • Glass Doors • Stile & Rail Doors

GLASS CHARACTERISTICS

ROUTINE MAINTENANCE	SAFETY	FIRE RATING	PROFILE
<p>VividGlass is a non-porous surface. It can be maintained using standard commercial, non-streaking cleaners and polishes formulated for use on glass. Additional details can be found on page 6 of this PDS and in the Architectural Surfaces Care & Maintenance document on our website.</p>	<p>ViviStrata Layers glass is available in annealed, tempered or heat strengthened glass. We recommend heat strengthening for glass over 50 square feet. Tempering is required for glass with holes and cutouts. For questions about glass strengthening and safety, please contact us.</p>	<p>ViviStrata Layers glass is Class A fire rated in accordance with ASTM designation E84-09, standard test method of surface burning characteristics of building materials. The foregoing test procedure is comparable to UL 723, ANSI/NFPA No. 255, and UBC No. 8-1.</p>	<p>ViviStrata Layers glass can be made to fit a flat or curved profile. Curved profiles are subject to certain limitations. If a curved profile is needed, please contact us to discuss guidelines and documentation needed for specification.</p>

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CONFIGURATION OPTIONS

VIEW	
	<p>ViviStrata Layers, View, is a single- or double-sided configuration that consists of a color interlayer between two transparent lites of glass.</p> <p>Typical Applications: View is ideal for use in doors, and in other applications where semi-privacy is desired. It can also be used in backlit configurations for displays.</p> <p>(Configuration shown: ViviStrata Layers, View, Hive)</p>
REFLECT	
	<p>ViviStrata Layers, Reflect, is a single-sided configuration that consists of a color interlayer between a transparent lite of glass and a reflective glass backer.</p> <p>Typical Applications: Reflect is ideal for one-sided applications where glass will be used against another surface, for example, LEVELe and LEVELc-2000 Elevator Interiors, LEVELr and LEVELe Wall Cladding Systems, or custom fabrications.</p> <p>(Configuration shown: ViviStrata Layers, Reflect, Hive)</p>



VIVISTRATA™ LAYERS GLASS

PRODUCT DATA

STANDARD PATTERNS

ViviStrata Layers glass is available in eight standard patterns. The patterns utilize an interlayer and a surface etch, adding dimension to the surface of the glass. The different shades of grey on the swatches indicate the interlayer and surface etch. For custom patterns, please provide artwork when specifying and contact us for details. In addition, we can color match any Pantone, Benjamin Moore or Sherwin Williams color.

VIEW CONFIGURATION PATTERNS



CANOPY™



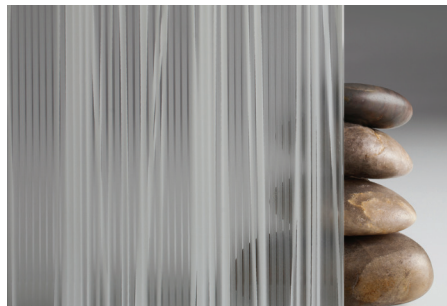
GLIDE



GLINT™



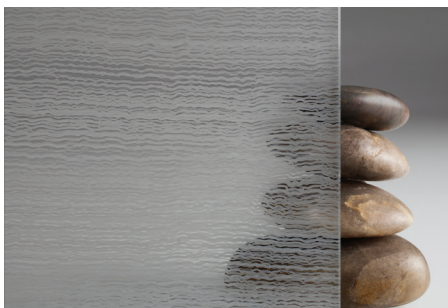
HIVE™



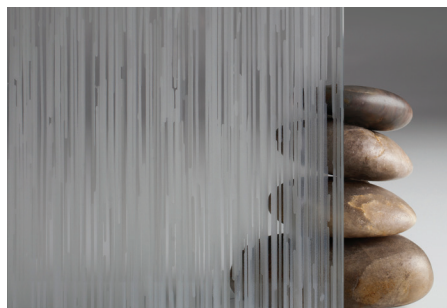
PALISADE™



PLOT™



RIPPLE™



SURGE™



REFLECT CONFIGURATION PATTERNS



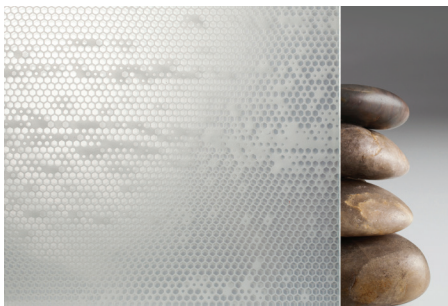
CANOPY™



GLIDE™



GLINT™



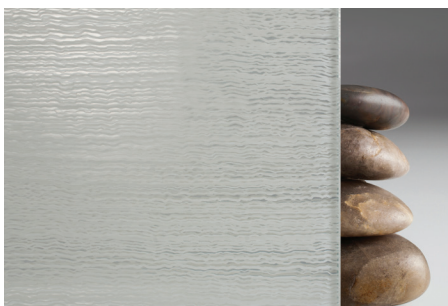
HIVE™



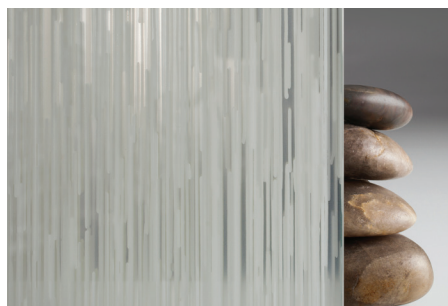
PALISADE™



PLOT™



RIPPLE™



SURGE™



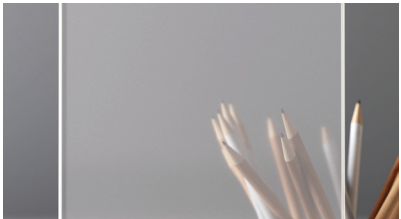

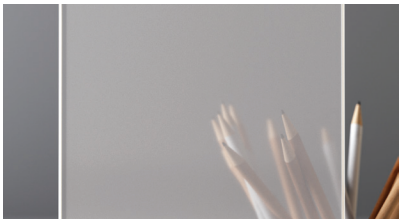

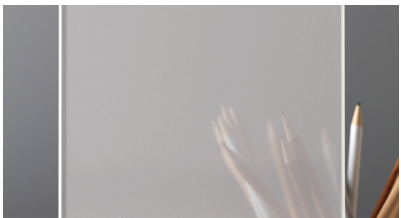

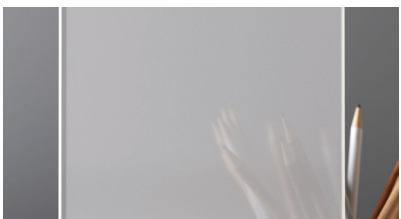




VIVISTRATA™ LAYERS GLASS

PRODUCT DATA

LUMILEVEL™ OPTIONS

LumiLevel is a measurement of the translucency of View glass. It can also be used to diffuse light from the reflective glass backer in Reflect glass. One LumiLevel can be used per glass selection. All six are shown below in the View configuration.

		LUMILEVEL #1
		LUMILEVEL #2
		LUMILEVEL #3
		LUMILEVEL #4
		LUMILEVEL #5
		LUMILEVEL #6



GLASS HANDLING GUIDELINES

ORDERING
<ul style="list-style-type: none">• Plan the order to avoid off-site storage and to minimize rehandling and time in storage at the job site before installation.• Prepare boxing, trailer and floor loading schedules in consideration of weight limitations and handling and distribution needs.
RECEIVING
<ul style="list-style-type: none">• VividGlass is sold and shipped on an F.O.B. FACTORY basis. Inspect all glass upon arrival.• Before unloading, inspect handling equipment, rigging and surrounding conditions for safety compliance and inspect the general condition of the shipment for load shifting or possible damage in transit.• Inspect the shipment for any shortage, abuse, wetness or other transit damage; note such on the bill of lading or delivery ticket and obtain the driver's signature as acknowledgment.• Inventory received materials; immediately report any shortage to Forms+Surfaces and report concealed damage to the carrier.• If necessary, file a written freight claim with the carrier and order replacement glass from Forms+Surfaces.
STORAGE
<ul style="list-style-type: none">• Store indoors at moderate temperature (above the dew point).• If outdoor storage is required, shade from direct sunlight and cover with tarp or plastic (for plastic, particularly, allow for air circulation in and around the cases—condensation can lead to glass surface staining).• Support both sides of vertically stored cases.• Wet glass must be towel dried prior to storage as prolonged moisture exposure can cause permanent surface staining.
HANDLING
<ul style="list-style-type: none">• During handling, wear hard-hats, safety shoes, gloves, and glazing gauntlets and follow all established safety procedures.• Remove the lid of the crate and unpack lite-by-lite; never end-pick glass or move partially unpacked cases.• Exercise care to prevent damage to the glass; edge damage may lead to thermally associated glass breakage after installation.• Cushion lites at bottom-edge quarter points on soft, firm blocks, free from glass chips, dirt or foreign matter.• Stack glass on edge and lean against a structural column or other sturdy upright or rack at an angle of five to seven degrees from vertical; place interleaving between lites. Never slide one lite against another.• Check finished surfaces and glass edges for damage before installation; set only acceptable material.
PROTECTION
<ul style="list-style-type: none">• Install finished materials after potentially damaging construction activities nearby—such as welding, sandblasting and fireproofing—have been completed. If the construction schedule does not allow for this, protect the glazing from damage by other processes.• Immediately after glass is set, identify the openings with streamers or ribbons suitably attached to the framing or surround and held free from the glass; do apply warning markers directly to the glass.
MAINTENANCE
<ul style="list-style-type: none">• Shortly after glazing, remove grease or excess glazing materials by cleaning the glass with commercial solvents such as mineral spirits or naphtha, followed by a normal wash and rinse.• Never use fluoride salts or hydrogen-fluoride producing compounds to wash the glass or surrounding surfaces; avoid use of razor blades or abrasive cleansers.• Use soft, clean, grit-free cloths and a mild soap, detergent or slightly acidic solution for normal washing, rinse with clean water, and squeegee dry; ordinary commercial window-washing techniques are appropriate.• Remove any stains from weathering steel by washing frequently during the weathering period (according to the steel manufacturer's recommendations).• Remove any runoff from concrete, stucco or other alkaline materials by frequent window washing.• Please refer to the Architectural Surfaces Care & Maintenance document on our website for additional information.



PRODUCT PERFORMANCE-COMPLIANCE WITH STANDARDS

VividGlass architectural glass meets the following industry standards, as applicable:

	GLASS QUALITY	SAFETY GLAZING
UNITED STATES	<ul style="list-style-type: none"> • ASTM C1036 – Specification for Flat Glass • ASTM C1048 – Specification for Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass where heat-treated glass is specified • ASTM C1172 – Specification for Laminated Architectural Flat Glass augmented by VividGlass inspection guidelines for laminated glass, and level CBA rated in accordance with ASTM E-773 – Test Method for Seal Durability of Sealed Insulating Glass Units • ASTM C1172-03 – Specification for Maximum Allowable Overall Bow and Warp for Laminated other than Annealed Transparent Glasses • ASTM E-774 – Specification for Sealed Insulating Glass Units where insulating glass is specified 	<ul style="list-style-type: none"> • ANSI Z-97.1 – Safety Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings • CPSC 16 CFR 1201 – Safety Standard for Architectural Glazing Materials, Category I and II
CANADA	<ul style="list-style-type: none"> • CAN/CGSB-12.1-M – Specification for M90 Tempered or Laminated Glass 	<ul style="list-style-type: none"> • CAN/CGSB-12.1-M – Safety Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings

GLASS THICKNESS & WEIGHTS

GLASS TYPE	GLASS BUILD	TOTAL THICKNESS*	WEIGHT (PER SQUARE FOOT)*
LAMINATED	3mm lite / interlayer / 3mm lite	7.7 mm (5/16")	3.6 lbs
	6mm lite / interlayer / 6mm lite	13.7 mm (9/16")	6.4 lbs
	10mm lite / interlayer / 10mm lite	22.23 mm (7/8")	10.4 lbs
MONOLITHIC	6mm lite	6 mm (1/4")	3 lbs
	10mm lite	10 mm (1/4")	5 lbs
	12mm lite	12 mm (1/2")	6.4 lbs

*Total thickness and weights are approximate; actual measurements may vary based on specific product type.

SOUND ATTENUATION

Shear damping by the VividGlass interlayer improves acoustical performance over a wide audible-frequency range and practically eliminates the coincidence dip typical of architectural glass in the 1,000 to 2,000 Hertz band—where significant levels of general environmental noise occur.

For Sound Transmission Class (STC) and Sound Transmission Loss (TL) information, please refer to the table below.

GLASS MAKEUP		FREQUENCY (HZ)																		
GLASS TYPE	TOTAL THICKNESS	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	STC
LAMINATED	7.7 mm (5/16")	25	26	27	28	28	29	30	33	34	35	36	37	37	37	36	38	42	46	35
	13.7 mm (9/16")	26	29	28	30	33	33	35	36	37	38	38	37	38	41	44	47	51	54	39
MONOLITHIC	6 mm (1/4")	23	25	25	24	28	26	29	31	33	34	34	35	34	30	27	32	37	41	31
	12 mm (1/2")	26	30	26	30	33	33	34	36	37	35	32	32	36	40	43	46	50	51	36

ULTRAVIOLET (UV) SCREENING

VividGlass laminated glass transmits less than one-tenth of one percent of UV. It blocks over 99.5% of solar radiation at wavelengths 380 NM and below, where by comparison, 1/4" clear float glass transmits over 70%.



GRAPHICS DIMENSIONS AND TOLERANCES

GRAPHIC FEATURE	DIMENSION	
Size	±1/8"	±3.2 mm
Registration	±1/8"	±3.2 mm
Color Trap	+1/8"	+3.2 mm
Panel-to-Panel Match	±1/4"	±6.4 mm

Registration is placement of the interlayer within the glass area. The **Color Trap** is the overlap of adjoining imprinted densities or colors. **Panel-to-Panel Match** can be controlled more tightly in the field, during glazing, when the glazing system is designed to accommodate shimming.

INSPECTION GUIDELINES

VISION AREA GLAZING - To incorporate unique product characteristics, the following table supersedes ASTM C1172, Table 3.

CHARACTERISTIC	SIZE THRU 25 SF (2.33M2)		SIZE OVER 25 SF (2.33m2)	
	CENTRAL	OUTER	CENTRAL	OUTER
Boil (Bubble)	1/16" (1.6 mm)	3/32" (2.4 mm)	1/8" (3.2 mm)	3/16" (4.8 mm)
Blow-In, Edge Boil	N/A	C 1/4" (6.4 mm) E 1/32" (0.8 mm)	N/A	C 1/4" (6.4 mm) E 1/16" (1.6 mm)
Discoloration	None	None	None	None
Fuse	1/32" (0.8 mm)	1/16" (1.6 mm)	1/16" (1.6 mm)	3/32" (2.4 mm)
Hair, Lint (Single Strand)	Light	Medium	Light	Medium
Inside Dirt (Spot)	1/16" (1.6 mm)	3/32" (2.4 mm)	3/32" (2.4 mm)	5/32" (4.0 mm)
Concentrated Lint (Area)	Light	Light	Light	Light
Slippage, Mismatch	N/A	1/16" (1.6 mm)	N/A	3/32" (2.4 mm)
Separation, Delamination	None	1/4" (6.4 mm)	None	1/4" (6.4 mm)
Short Interlayer	N/A	C 1/4" (6.4 mm) E 1/16" (1.6 mm)	N/A	C 1/4" (6.4 mm) E 3/32" (2.4 mm)
Interlayer Scuff, Dirt Streak	Light	Light	Light	Light
Interlayer Edge Ripple 6" (15.2 cm) max length	N/A	C 1/2" (12.7 mm) E 3/8" (9.5 mm)	N/A	C 1/2" E 3/8" (9.5 mm)
Interlayer Pinholes, Voids 1/16" (1.6mm) max diameter	No Clusters	Clusters	No Clusters	Clusters
Interlayer Streaking, Mottling	Medium	Medium	Medium	Medium
Interlayer Roll-Wave Distortion	Heavy	Medium	Heavy	Medium

The **Central Area** is an area formed by an oval or circle whose axes or diameters, when centered, do not exceed 80% of the overall dimension; the **Outer Area** is the remaining perimeter.

C = Conventionally glazed, unexposed edge; **E** = Butt-glazed or other exposed edge

Light = Barely noticeable when viewed from a distance of three feet (one meter) under normal lighting conditions

Medium = Noticeable from three, but not 11 feet (one, not 3.5m)

Heavy = Plainly noticeable from any viewing distance



SEALANTS

Various non-hardening, solid sealants can be used successfully with VividGlass. In product selection, consider such factors as weather resistance and other fundamental mechanical properties, durability, cost, and compatibility with other glazing components, including the laminated glass itself, if direct sealant-to-edge contact is anticipated.

The VividGlass interlayer system is an advanced derivative of DuPont Butacite®. In direct sealant-to-edge contact, low molecular-weight sealant by-products—like water, plasticizers, solvents, acetic acid, ammonia, alcohol, and amines—may lead to potentially objectionable interlayer discoloration or minor edge separation. Because formulations vary over time and by manufacturer, compatibility testing of components should be initiated by the glazing contractor and conducted by the sealant manufacturer for critical applications. Where silicone is considered in such details, it should be non-acidic, neutral curing (alkoxy type). Acetoxy type silicone is not compatible with architectural laminated glass.

Sealants should be applied according to the manufacturer's recommendations. Work should be done only with clean, dry surfaces. Temperature during installation should be above 50°F (10°C) and for 24 hours after application. To limit thermal edge stress in conventional setting systems, the exterior watershed should be limited to 1/16".

MASTIC ADHESIVES

VividGlass products in the Reflect configuration are compatible with any high-quality mirror mastic such as CRL Gunther Mirror Mastic®. When applying mirror mastic avoid direct contact with the edges of the glass.

GLAZING GUIDELINES

GENERAL PRINCIPLES

- The glazing system must structurally support the glass, firmly and gently. It must cushion to prevent load points and excessive clamping pressures, isolate rotational forces, and minimize load transfer from the surround to the glass. For exterior applications, the glass must float in the frame and allow no metal-to-glass contact. For laminated or insulating glass, the glazing channel also must be drained to prevent prolonged moisture contact with the edge.
- Design for a properly functioning glazing system requires consideration of a number of factors including design modules, glass types and compatibility between components. Following the outlined glazing principles will assure a durable exterior installation and minimize glass breakage due to mechanical and thermal stresses. Reference to current guidelines published by the Glass Association of North America (GANA), American Architectural Manufacturers Association (AAMA), and Sealed Insulating Glass Manufacturers Association (SIGMA), as applicable, is recommended.
- Modification to these recommendations may be appropriate for special glazing systems, including pre-formed lock-strip gaskets, skylight systems, structural setting systems, bolt and plate assemblies, and interior glazing.

FRAMING SYSTEM

- Curtain wall or window anchors and expansion joints should be designed to accommodate building and wall movement without transfer of undue forces to the framing. Horizontal expansion joints should be provided at each vertical member, or at 20' maximum spacing. Vertical expansion should be allowed at each floor. The system should be designed to permit erection with expansion joints almost fully open in cold weather and almost fully closed in hot weather.
- At design loads, inward and outward deflection of glass framing members must be limited to the length of the unsupported span divided by 175, or 3/4", whichever is less. Horizontal deflection of the sill member should be limited to prevent breakage. A limit of 1/8", or 25% of design edge clearance, whichever is less, is recommended. Rotation or twisting of the sill member should be limited to one degree from horizontal plane.
- The framing system should provide openings which are square within 1/8" difference in the diagonals, have maximum corner offset of 1/32", and have maximum bow of 1/16" per 4' length.

SURROUNDING CONDITIONS

- When annealed glass is exposed to direct sunlight and set directly into a high heat-capacity material, such as concrete, it may be unable to withstand the resultant thermal stresses.
- Depending on thermal absorbance of the glass selected, the time of year, and temperature extremes, thermal stress due to exterior shading may be problematic. Maximum stress from this source occurs when a narrow shadow band, 1-2" wide, lingers at the glass edge for an hour or longer. Combinations of narrow horizontal, vertical and diagonal shadows create greater edge stress. Double-diagonal shading with the sunlit V-shape centered at an edge creates high stress.
- Please keep in mind, the position of interior shading devices and heating outlets can affect the degree of thermal stress in glass.
- Heat strengthening adds sufficient strength to withstand most adverse conditions and is recommended for the glass when the designer believes the application warrants additional thermal-stress resistance.



THE GLAZING CHANNEL

The glazing channel must be dimensioned to adequately cushion and retain the glass, while minimizing thermal stress and preventing metal-to-glass contact. It must accommodate glass fabrication tolerances and facilitate initial and replacement glazing, free from probable edge damage.

The nominal bite and minimal edge and face clearances detailed below should be provided. Units are expressed in inches (millimeters).

GLASS TYPE	NOMINAL THICKNESS	MINIMAL FACE CLEARANCE	MINIMAL EDGE CLEARANCE	NOMINAL BITE
SINGLE	Overall Thickness 9/32" (6.9 mm) Glass Lites, Interlayer 2 lites 1/8", 0.037" (3 mm, 0.9 mm)	1/8" (3.2 mm)	1/4" (6.4 mm)	3/8" (9.5 mm)
	Overall Thickness 5/16" (7.7 mm) Glass Lites, Interlayer 2 lites 1/8", 0.067" (3 mm, 1.7 mm)	1/8" (3.2 mm)	1/4" (6.4 mm)	3/8" (9.5 mm)
	Overall Thickness 17/32" (12.9 mm) Glass Lites, Interlayer 2 lites 1/4", 0.037" (6 mm, 0.9 mm)	1/8" (3.2 mm)	1/4" (6.4 mm)	1/2" (12.7 mm)
	Overall Thickness 9/16" (13.7 mm) Glass Lites, Interlayer 2 lites 1/4", 0.067" (6 mm, 1.7 mm)	1/8" (3.2 mm)	1/4" (6.4 mm)	1/2" (12.7 mm)
	Overall Thickness 25/32" (20.9 mm) Glass Lites, Interlayer 2 lites 3/8", 0.037" (10 mm, 0.9 mm)	3/16" (4.8 mm)	1/4" (6.4 mm)	1/2" (12.7 mm)
	Overall Thickness 13/16" (21.7 mm) Glass Lites, Interlayer 2 lites 3/8", 0.067" (10 mm, 1.7 mm)	3/16" (4.8 mm)	5/16" (7.9 mm)	1/2" (12.7 mm)
	INSULATING	Overall Thickness 1-1/32" (26.2 mm) Glass Lites, Interlayer 1 lite 9/32" (7 mm) lam 1/2" cavity 1 lite 1/4" (6 mm)	3/16" (4.8 mm)	1/4" (6.4 mm)
Overall Thickness 1-1/16" (27 mm) Glass Lites, Interlayer 1 lite 5/16" (8 mm) lam 1/2" cavity 1 lite 1/4" (6 mm)		3/16" (4.8 mm)	1/4" (6.4 mm)	1/2" (12.7 mm)

The system must drain adequately to assure that the edge of the glass will not be submersed in water for prolonged periods of time. If weep holes are used, they should be minimally 5/16" diameter, or elongated slots of similar area, so they will not become easily plugged or bridge over due to surface tension. Three holes should be used at each sill in the bottom of the glazing channel—one in the center and two flanking, between jamb and setting block.

SETTING BLOCKS	SPACERS AND OTHER GLAZING ACCESSORIES
<ul style="list-style-type: none"> Setting blocks made of permanently resilient neoprene, silicone, or other material compatible with the sealants used, 80-90 Shore A Durometer hardness, should be located in the sill glazing channel to support the glass. Two should be used per lite, centered at quarter points to support half the weight of the lite. The length of each block should be 0.100" for each square foot of glass area, but not less than 6"; width should be 1/16" less than the full channel width; and height should be appropriate to provide proper bite and edge clearance. 	<ul style="list-style-type: none"> Continuous rubber-like sealant beads, gaskets or spacers should be used to maintain face clearances within the glazing channel. For wet-glazing systems, intermittent shims, 40-60 durometer, inserted on both sides of the glass, opposite each other on 18-24" centers around the perimeter, sized minimally 4" long, to provide at least 1/8" purchase on the edge, and to fit snugly, may be used for centering until the sealant cures. Gaskets or spacers should be made of permanently resilient sealant-compatible material. Their hardness will depend on specific design function. For large lites in dry-glazing systems, edge blocks should be used to in the vertical glazing channels to limit any potential lateral shifting of the glass due to vibration, wind loading, or thermal forces. These should be pre-cured, resilient neoprene, silicone, or other material compatible with the sealants used; 40-60 Shore A Durometer hardness; and sized 6" in length by full-channel width by edge clearance less 1/8" height to allow a little initial space between the block and the edge of the glass. The joints of dry-glazing gaskets should be cut and sealed in accordance with the manufacturers' recommendations to create a watertight and airtight seal.