

Technical Assistance

Pella is dedicated to helping you surpass not only your clients' expectations but your own. And we make it easy, with an unmatched level of service and support. In fact, Pella Corporation was cited in Architectural Record's Readers' Choice Awards as "the manufacturer most helpful in solving site-specific, design or technical problems."

Our highly qualified architectural support team members are on call and ready to provide full technical service and project support to make your job easier. Architectural support team members can assist you at every stage of your project, from schematic design to construction documents.

Your Pella architectural support team members will also provide replacement or renovation assessments, and visit the project site to determine time- and cost-efficient installation methods, and measure openings.

In short, we offer an array of valuable resources to help you execute your project efficiently, on time, and within budget requirements.

- Initial consultation
- Performance analysis
- Code compliance
- Site survey
- On-site installation guidance
- CAD details and shop drawings
- Design assistance and implementation
- Field testing
- Custom product design
- Specifications, product mock-ups and samples
- Budgets

CAD and Building Information Modeling Support

Visit www.pella.com to obtain window and door cross sections, BIM models, specifications and additional product information.



Continuing Education

As an AIA/CES Registered Provider Charter Member since 1995, Pella Corporation has been committed to developing quality learning activities in accordance with AIA/CES and Health/Safety/Welfare (HSW) criteria.

Pella's architectural support team members can present continuing education programs at your office. They have also partnered with many AIA components on programs at local, state, regional and national meetings and conventions. Distance learning opportunities are also available.

Throughout the year, Pella Corporation invites architects, builders and contractors to visit the company's headquarters in Pella, Iowa. Attendees earn continuing education credits for both AIA and AIBD courses. While in Pella, participants are invited to attend plant tours and breakout sessions (forums where design and building professionals can brainstorm and share their comments and feedback on Pella products and programs).

Pella also awards scholarships to top students at the country's leading universities and schools of architecture.

Please contact your local Pella architectural support team members for more information and the most current list of face-to-face and distance learning programs.

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The information published in this document is believed to be accurate at the time of publication. However, because we are constantly working to improve our products, content is subject to change without notice. Consult your local Pella representative for the most current information.

Environmental Stewardship

"We recognize our responsibilities as stewards of our natural resources and the environment, and will avoid wasteful or harmful disregard of the environmental effects of our operation." - Pete Kuyper, 1950, Founder, Pella Corporation.

Our history is rooted in caring for communities, and we are proud to build on our legacy year after year. We are continuously enhancing our effort to be stewards of the earth. Our commitment to continuous improvement means our efforts are never complete in the journey to an improved, more sustainable future.

Pella takes a comprehensive approach to environmental stewardship that practices responsible forest management, maximizes recycling opportunities, minimizes waste and pollution, reduces energy consumption, uses the latest in waste management strategies, and ensures that Pella products are made to last.

- Pella reclaims excess or left-over stain and recycles it to create our coveted black stain finish. This recycled stain is rigorously tested to meet our strict quality and durability standards while creating a look our customers love.
- 94% of the sawdust is recycled or reused.

As a founding member of the National Fenestration Rating Council (NFRC) and volunteer partner in the Environmental Protection Agency's (EPA) ENERGY STAR® program, Pella promotes the use of highly energy-efficient products.

Pella manufactures and distributes pine and Douglas fir windows that comply with wood chain-of-custody (CoC) standards to help achieve LEED certification. Pella partners with the Sustainable Forestry Initiative (SFI) as one of the top certifiers of wood Chain-of-Custody and is an industry created certification group focused on developing the next generation of environmentally focused forest stewards and loggers.

LEED for New Construction and Major Renovations

As a member of the U.S. Green Building Council (USGBC), Pella encourages the use of the LEED® certification processes and offers products that can contribute to many LEED® points. As a result, Pella products have been used in a number of nationally recognized green projects, including the Phillip Merrill Environmental Center (LEED® Platinum), Aldo Leopold Legacy Center (LEED® Platinum), Island Wood (LEED® Gold) and Schlitz Audubon Nature Center (LEED® Gold).

Listed below are possible points for New Construction and Major Renovations for Commercial Buildings, including the following categories, prerequisites and credits.

Energy and Atmosphere

- Minimum energy performance
- Optimize energy performance

Materials and Resources

- Construction waste management
- Recycled content
- Regional materials
- Certified wood

Indoor Environmental Quality

- Minimum indoor air quality performance
- Increased ventilation
- Controllability of systems – lighting
- Controllability of systems – thermal comfort
- Thermal comfort – design
- Daylight and views – daylight
- Daylight and views – views
- Enhanced acoustical performance



Passive House

Passive House building standards uses strategies based on building science to minimize the use of energy while maximizing comfort and indoor air quality. The ultimate goal, using climate-appropriate energy targets, is to construct a building to PHIUS (Passive House Institute US) standards and reduce its carbon footprint. Passive House buildings allow for energy savings up to 90% compared with typical building stock and over 75% compared to average new builds.

PHIUS ZERO certification goes beyond the core requirements by netting out energy use on an annual basis with renewable energy to reach operational carbon neutrality and be energy independent.

For residential projects, the PHIUS standards build upon 3rd party programs such as ENERGY STAR, EPA Indoor airPLUS, and DOE Zero Energy Ready Home. These programs provide a baseline quality framework for design and construction.

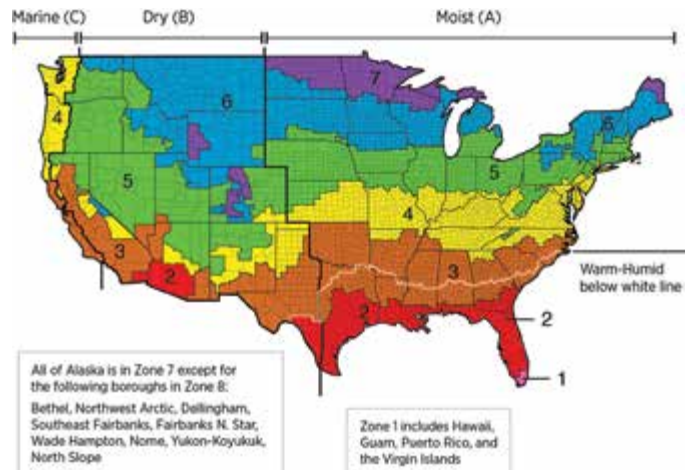
Pella has a variety of products that qualify as High-Performance Window Systems. A current listing can be found in the database maintained at: <https://www.phius.org/certified-product-database>. All factors in the building envelope must be considered to determine if a products performance will help your project meet Passive House building requirements.

Contact Pella Architectural Solutions for thermal modeling and installation information to provide your PHIUS consultant for your project.

Requirements may be offset or balanced with:

- High-Performance Thermal Enclosure - Window installation method (thermal bridge avoidance), High-Performance Insulation System, Whole-House Draft Barrier, Continuous Thermal Blanket Construction, Comprehensive Draft Protection, Sun Barriers.
- High-Performance Comfort Systems – Including a system to supply constant fresh air using a high efficiency heat recovery system and High-Efficiency or Ultra-Efficient Components.

For further information visit the Building America Solution Center hosted on the office of Energy Efficiency & Renewable Energy at Energy.gov or PHIUS.org.



*Source: LEED Reference Guide for Green Building Design and Construction - v4 Edition (www.usgbc.org)

Elements of Fenestration Performance

In addition to aesthetics and ventilation, there are numerous performance criteria that are important when selecting or specifying windows and doors. Among them are:

- Air, Water and Structural Performance
- Thermal Performance and Glazing
- Security and Forced Entry Resistance
- Operating Force and Accessibility
- Sound Transmission Resistance
- Wind-Borne Debris Protection
- Exterior Finish Durability
- Warranty

Air, Water and Structural Performance

The International Building Code (IBC) and the International Residential Code (IRC) state that exterior windows and doors must be tested and labeled as conforming to the AAMA/WDMA/CSA101/I.S.2/A440 standard (also known as the North American Fenestrations Standard (NAFS)) or, at a minimum, be designed and/or tested to resist the appropriate wind load design pressures. Standard Pella products are tested and labeled under the NAFS standard.



The WDMA Hallmark Certification Program provides specifiers a method of identifying windows, doors and skylights that are manufactured in accordance with WDMA standards. The WDMA Hallmark is considered a mark of excellence among architects, contractors and other specifiers and is accepted industry-wide. WDMA Standards are referenced by HUD/ FHA in their Minimum Property Standards and by many other government agencies in their construction specifications.

Hallmark Certification verifies conformance with AAMA/WDMA/CSA 101/I.S.2/A440-11 and AAMA/WDMA/CSA 101/I.S.2/A440-17, and is determined by in-plant inspection of the manufacturing facilities and by sampling and testing of product. Website: www.wdma.com

NAFS uses product type, performance class and performance grade (PG) designators to categorize products and their performance levels. In order for a product to meet a given performance class and/or grade, a number of requirements must be met. For example, to achieve a C-R50 (Performance Class R, Performance Grade 50) rating, a casement with a minimum frame size of 24" x 60" must surpass all of the air, water, structural and hardware sub-requirements pertaining to that class and grade. The following tables are intended to provide an overview of the NAFS requirements:

Product Type Designators

Product Type 101/ I.S.2 / A440-08, 11 and 17	Performance Class	Sample Product Designation
AP = Awning Windows	R	C - R 50
C = Casement Windows	LC	50 = Performance Grade (Design Pressure, psf)
FW = Fixed Windows	CW	R = Performance Class
H = Hung Windows (single, double)	AW	C = Product Type
SW = Sliding Windows		
SHD = Side-Hinged Doors		
SD = Sliding Doors		

Minimum Performance Class Requirements

	Standard	Class / Rating / Grade	Performance Requirement			
			Maximum Air Infiltration	Maximum Air Exfiltration	Minimum Water Test Pressure (psf)	Minimum Design Pressure (psf)
Current Standards	AAMA/WDMA/CSA 101/I.S.2/ A440-17	R	0.3 cfm/sq. ft. @ 1.57 psf	0.3 cfm/sq. ft. @ 1.57 psf	2.92	15.1
		LC	0.3 cfm/sq. ft. @ 1.57 psf	0.3 cfm/sq. ft. @ 1.57 psf	3.76	25.1
		CW (sliding seal)	0.2 cfm/sq. ft. @ 1.57 psf	0.2 cfm/sq. ft. @ 1.57 psf	4.59	30.1
		CW (compression seal)	0.1 cfm/sq. ft. @ 1.57 psf	0.1 cfm/sq. ft. @ 1.57 psf	4.59	30.1
		AW (sliding seal)	0.3 cfm/sq. ft. @ 6.27 psf	0.1 cfm/sq. ft. @ 1.57 psf	8.15	40.1
		AW (Compression seal)	0.1 cfm/sq. ft. @ 6.27 psf	0.1 cfm/sq. ft. @ 1.57 psf	8.15	40.1
Previous Standards	AAMA/WDMA/CSA 101/I.S.2/ A440-08 AAMA/WDMA/CSA 101/I.S.2/ A440-11	R	0.3 cfm/sq. ft.	0.3 cfm/sq. ft.	2.92	15.1
		LC	0.3 cfm/sq. ft.	0.3 cfm/sq. ft.	3.76	25.1
		CW	0.3 cfm/sq. ft.	0.3 cfm/sq. ft.	4.59	30.1
		AW	0.3 cfm/sq. ft.	0.3 cfm/sq. ft.	8.15	40.1

Optional Performance Grade Requirements

Optional Performance Grade	Product Performance Class	Design Pressure (psf)	Structural Test Pressure (psf)	Water Resistance Test Pressure	
				R, LC, CW (psf)	AW (psf)
20	R	20.05	30.08	3.13	—
25	R	25.06	37.59	3.76	—
30	R, LC	30.08	45.11	4.59	—
35	R, LC, CW	35.09	52.63	5.43	—
40	R, LC, CW	40.10	60.15	6.06	—
45	R, LC, CW, AW	45.11	67.67	6.89	9.19
50	R, LC, CW, AW	50.13	75.19	7.52	10.03
55	R, LC, CW, AW	55.14	82.71	8.35	11.07
60	R, LC, CW, AW	60.15	90.23	9.19	12.11
65	R, LC, CW, AW	65.16	97.74	9.82	12.11
70	R, LC, CW, AW	70.18	105.26	10.65	12.11
75	R, LC, CW, AW	75.19	112.78	11.28	12.11
80	R, LC, CW, AW	80.20	120.30	12.11	12.11
85	R, LC, CW, AW	85.21	127.82	12.11	12.11
90	R, LC, CW, AW	90.23	135.34	12.11	12.11
95	R, LC, CW, AW	95.24	142.86	12.11	12.11
100	R, LC, CW, AW	100.25	150.38	12.11	12.11
105	AW	No limit	1.5 x Design Pressure	12.11	12.11

Standard: AAMA/WDMA/CSA 101/I.S.2/ A440-17

Field water test pressures conducted in accordance with AAMA 502 at 2/3 the rated laboratory test pressure.

Minimum Performance Class and Grade Requirements Summary

Product Type	Performance Class	Minimum Performance Grade	Gateway Minimum Frame Test Size		Minimum Design Pressure (lb/ft ²)	Minimum Structural Pressure (lb/ft ²)	Minimum Water Pressure (lb/ft ²)	Air Leakage Resistance				Maximum Operating Force (lb)		Max Lock Force (lb)	Max Deflection at Design Pressure	Max Permanent Set After STP	Minimum ASTM Security Grade
			Width (inches)	Height (inches)				Infiltration Pressure (lb/ft ²)	Infiltration Allowable (cfm/ft ²)	Exfiltration Pressure (lb/ft ²)	Exfiltration Allowable (cfm/ft ²)	Start	Run				
AP Awning	R	15	48	16	15.04	22.56	2.92	1.57	0.30	1.57 ₁	0.30 ₁	13	6	22	—	0.4% L	10
	LC	25	48	32	25.06	37.59	3.76	1.57	0.30	1.57 ₁	0.30 ₁	13	6	22	—	0.4% L	10
	CW	30	48	32	30.08	45.11	4.59	1.57	0.10	1.57	0.10	15	10	22	L/175	0.3% L	10
	AW	40	59	36	40.10	60.15	8.15	6.27	0.10	1.57	0.10	15	10	—	L/175	0.2% L	10
C Casement	R	15	24	59	15.04	22.56	2.92	1.57	0.30	1.57 ₁	0.30 ₁	13	6	22	—	0.4% L	10
	LC	25	32	60	25.06	37.59	3.76	1.57	0.30	1.57 ₁	0.30 ₁	13	6	22	—	0.4% L	10
	CW	30	32	60	30.08	45.11	4.59	1.57	0.10	1.57	0.10	15	6	22	L/175	0.3% L	10
	AW	40	36	60	40.10	60.15	8.15	6.27	0.10	1.57	0.10	20	10	—	L/175	0.2% L	10
FW Fixed Window	R	15	48	48	15.04	22.56	2.92	1.57	0.30	1.57 ₁	0.30 ₁	—	—	—	—	0.4% L	10
	LC	25	55	55	25.06	37.59	3.76	1.57	0.30	1.57 ₁	0.30 ₁	—	—	—	—	0.4% L	10
	CW	30	59	59	30.08	45.11	4.59	1.57	0.10	1.57	0.10	—	—	—	L/175	0.3% L	10
	AW	40	59	99	40.10	60.15	8.15	6.27	0.10	1.57	0.10	—	—	—	L/175	0.2% L	10
H Hung	R	15	40	63	15.04	22.56	2.92	1.57	0.30	1.57 ₁	0.30 ₁	45	34	22	—	0.4% L	10
	LC	25	44	75	25.06	37.59	3.76	1.57	0.30	1.57 ₁	0.30 ₁	51	40	22	—	0.4% L	10
	CW	30	55	91	30.08	45.11	4.59	1.57	0.20	1.57	0.20	63	45	22	L/175	0.3% L	10
	AW	40	59	98	40.10	60.15	8.15	6.27	0.30	1.57	0.10	63	45	—	L/175	0.2% L	10
SW Sliding Windows	R	15	63	43	15.04	22.56	2.92	1.57	0.30	1.57 ₁	0.30 ₁	25	20	22	—	0.4% L	10
	LC	25	71	55	25.06	37.59	3.76	1.57	0.30	1.57 ₁	0.30 ₁	40	25	22	—	0.4% L	10
	CW	30	71	59	30.08	45.11	4.59	1.57	0.20	1.57	0.20	40	25	22	L/175	0.3% L	10
	AW	40	98	79	40.10	60.15	8.15	6.27	0.30	1.57	0.10	40	25	—	L/175	0.2% L	10
SHD Side Hinged Doors	R	15	36	79	15.04	22.56	2.92	1.57	0.30	1.57 ₁	0.30 ₁	—	—	22	—	0.4% L	—
	LC	25	36	83	25.06	37.59	3.76	1.57	0.30	1.57 ₁	0.30 ₁	—	—	22	—	0.4% L	—
	CW	30	40	83	30.08	45.11	4.59	1.57	0.30	1.57	0.30	—	—	22	L/175	0.3% L	—
	AW	40	48	95	40.10	60.15	8.15	6.27	0.10	6.27	0.10	—	—	—	L/175	0.2% L	—
SD Sliding Doors	R	15	71	79	15.04	22.56	2.92	1.57	0.30	1.57 ₁	0.30 ₁	30	25	22	—	0.4% L	10
	LC	25	87	83	25.06	37.59	3.76	1.57	0.30	1.57 ₁	0.30 ₁	30	25	22	—	0.4% L	10
	CW	30	95	83	30.08	45.11	4.59	1.57	0.20	1.57	0.20	40	25	22	L/175	0.3% L	10
	AW	40	122	95	40.10	60.15	8.15	6.27	0.30	1.57	0.10	40	25	—	L/175	0.2% L	10

Standard: AAMA/WDMA/CSA 101/I.S.2/ A440-17
 1 - Exfiltration values are Canadian specific requirements for R & LC

Specifying Air, Water and Structural Performance

When specifying performance class and grade requirements for a project, the performance grade (PG) should be greater than or equal to the allowable design pressure for components and cladding as determined using the ASCE 7 calculation method. The design pressure (DP) increases as the importance factor/risk category and design wind speed for the building increases. Exposure category, building height, topographical factors and location of the window or door on the wall of the building also affect the design pressure. Fenestration in the corner zones (as defined by ASCE 7) have higher negative design pressures. The window or door must meet or exceed those negative pressures structurally, but not necessarily the corresponding water resistance test pressures, since water resistance acts against positive pressures.

The air, water and structural performance summary can be found in the product information pages of this manual. Field testing for air leakage and water penetration resistance shall be conducted in accordance with AAMA 502-21

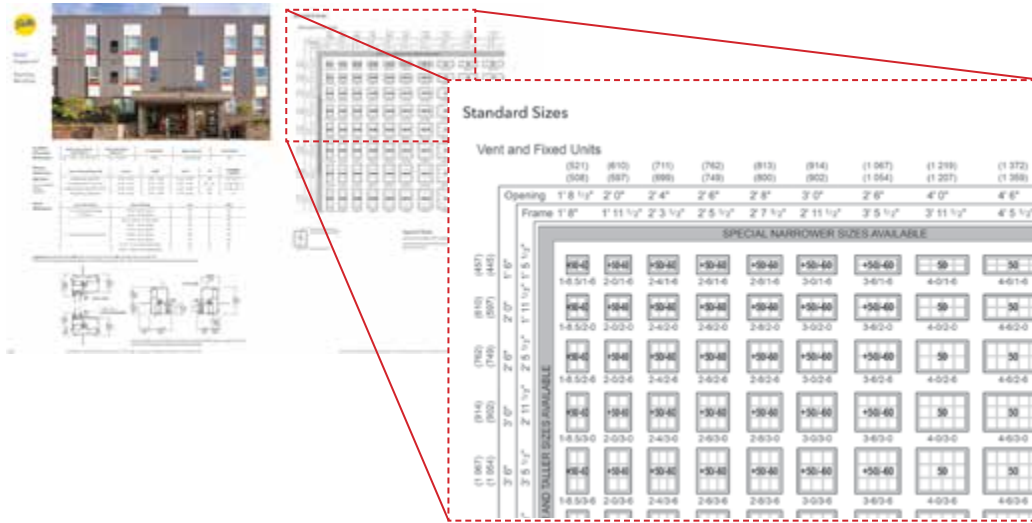


More information on performance options may be available by using the QR code included on each product page to access the on-line complete product information or by searching for complete product information on www.pella.com/professionals/architect/.

Air, Water, & Structural Performance	Performance Class & Grade Rating	Water Penetration Resistance	Air Infiltration	Design Pressure	Forced Entry
	AP - LC30 - LC+50+60	4.5 - 7.5 pcf	0.05	+50+60 pcf	40

More detailed information about the performance of a specific size can be found by using the QR code to access complete product information or by searching for complete product information on www.pella.com/professionals/architect/.

The performance shown is the maximum performance when the appropriate glass thickness and installation method is used.



Pella Products Air, Water and Structural Performance Summary

	AWNING		CASEMENT		DOUBLE HUNG		SINGLE HUNG		SLIDING WINDOW		FIXED FRAME		SLIDING DOOR		HINGED DOOR	
	Performance Class	Performance Grade (P.G)	Performance Class	Performance Grade (P.G)	Performance Class	Performance Grade (P.G)	Performance Class	Performance Grade (P.G)	Performance Class	Performance Grade (P.G)	Performance Class	Performance Grade (P.G)	Performance Class	Performance Grade (P.G)	Performance Class	Performance Grade (P.G)
Pella® Reserve® Contemporary	LC-CW	30-50	R-CW	30-50	—	—	—	—	—	—	CW-AW	30-90	*	*	LC	40-70
Pella® Reserve® Traditional	LC-CW	30-50	LC-CW	30-50	CW	30-50	CW	30-50	—	—	CW-AW	30-90	*	*	LC	40-70
Lifestyle Series Triple-Pane	R-CW	20-50	R-CW	20-50	—	—	—	—	—	—	CW-AW	30-90	*	*	LC	55
Lifestyle Series Dual-Pane	LC	30-50	LC	30-50	LC	30-50	—	—	—	—	CW-AW	30-90	*	*	LC	50
Pella® Impervia® Fiberglass	LC	30-50	LC	45-50	LC	30-50	LC	30-50	LC	30-50	CW	30-50	LC	35-50	—	—
Pella® 250 Series Vinyl	R-LC	15-50	R-LC	15-50	R	15-50	R	15-50	R	15-50	R-CW	15-50	LC	35-50	—	—
Encompass by Pella® Vinyl	—	—	—	—	R	20-50	R	20-50	R	20-35	R	25-55	R	35-50	—	—

Refer to the product information pages for performance of actual sizes and frame types. Products may require laminated or tempered glass, performance upgrades or specific installation methods to reach performance values shown.

* Performance and certifications were not available at time of printing. See available on-line documentation or consult your local Pella Sales Representative for current information.

Encompass by Pella® vinyl window products are intended only for use less than 40 feet above ground level.

There are several elements of thermal and glazing performance, including U-Factor, Solar Heat Gain Coefficient (SHGC), Visible Light Transmission (VLT %) and Condensation Resistance (CR). Thermal and glazing performance is measured at the center of glass or across the whole unit. The NFRC 100, 200 and 500 standards control the calculation procedures.

Glazing performance data is based on the WINDOW 5.2 and THERM 5.2 computer programs for analyzing energy performance. When comparing performance with other manufacturers, it is important to verify how the values were determined.



The National Fenestration Rating Council (NFRC) develops and administers energy-related rating and certification programs and their goal is to serve the public by providing fair, accurate, and credible information on fenestration performance. Pella products labeled with the NFRC Energy Performance label are rated in accordance with NFRC standards. This allows for direct comparisons with other NFRC labeled products. NFRC ratings are based on a combination of computer simulations and physical testing of product samples. For details go to www.NFRC.org.

Thermal Performance Definitions

Term	Definition
U-Factor	The rate of heat transfer (BTU per hour-sq. ft.) through a window or door (total-unit) or glazing system (center-glass) (Assumes 0° F outside at night with an approximate 15 mph wind and 70° F inside). The lower the U-Factor, the better the insulating properties of the unit or glazing system. R value = 1/U.
Solar Heat Gain Coefficient	The amount of solar heat that enters a room through a window or door (total unit) or glazing system (center-glass), divided by the amount that is actually contacting the exterior of the unit (Assumes 89° F outside and 75° F inside). The lower the value, the better the unit or glazing keeps out solar heat.
Visible Light Transmission	The percentage of visible light that is transmitted through the window or door (total-unit) or glazing system (center-glass).
Condensation Resistance	A relative indicator of a fenestration product's ability to resist the formation of condensation at a specific set of environmental conditions. The higher the Condensation Resistance value the greater the resistance to the formation of condensation. Actual condensation performance is a function of temperature, humidity and air movement. For more information see NFRC 501-2010, "User Guide to the Procedure for Determining Fenestration Product Condensation Resistance Rating Values".
Shading Coefficient	The amount of solar heat that passes through a particular glazing system divided by the amount that passes through a single piece of 1/8" thick clear glass (Assumes 89° F outside and 75° F. inside). The lower the value, the better the glass keeps out solar heat.
Relative Heat Gain	The actual amount of heat energy (BTU per hour-sq. ft.) that enters a room through a glazing system (Assumes typical daytime summer conditions of 89° F outside and 75° F inside). The lower the value, the better the unit keeps out heat energy.
Inside Glass Surface Temperature	The temperature on the inside surface of the glass at the center of the glass. It is based on an outside temperature of 0° F, inside temperature of 70° F, and an approximate 15 mph outside wind. Room side barriers to interior air flow (blinds, shades, drapes, screens) tend to lower inside glass surface temperature and humidity levels at which condensation occurs. Outside screens tend to raise inside glass surface temperature and level of humidity at which condensation occurs.
UV Transmission	The percentage of ultra violet rays that enter a room through the glazing system. It is a predictor of potential fading damage. Lower percentages indicate less fading potential (UV rays are those with a wavelength ranging from 0.30 to 0.38 microns).
LBL Damage Function	This function, developed by Lawrence Berkeley Laboratories, is another way of expressing UV Transmission. It is a better predictor of potential fading damage than UV Transmission. Lower values indicate less fading potential.

High Altitude Glazing

When standard insulating glass manufactured at one altitude is shipped to a higher altitude, the decreased air pressure will cause the glass to deflect. The amount of glass deflection depends upon many factors, such as glass thickness, air space width, air space temperature, difference in altitude, and size of the piece of glass. These recommendations are intended help prevent glass breakage, but may allow for visual bowing of the glass. More conservative utilization of high altitude glazing is recommended to address aesthetic concerns. The following table can serve as a guideline for when high altitude glazing for standard insulating glass is required:

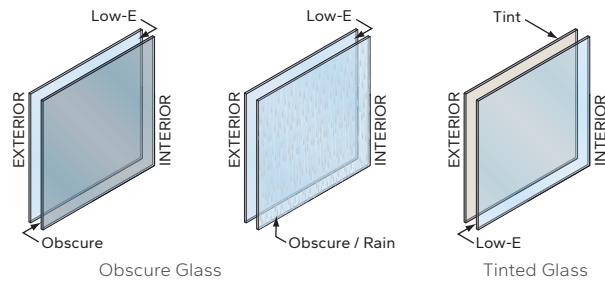
<1" Dual-Pane Insulating Glass		≥1" Dual-Pane or Triple-Pane Glazing	
Shortest Glass Dimension (inches)	Altitude Limit for Standard Glass (feet above sea level)	Shortest Glass Dimension (inches)	Altitude Limit for Standard Glass (feet above sea level)
≤ 10	3,000	≤ 15	3,000
≥10 and <15	5,000	≥15 and <20	3,500
≥15 and <20	6,000	≥20 and <30	4,500
≥20 and <25	7,000	≥30 and <40	6,000
≥25 and <30	9,000	≥40 and <50	8,000
≥30	10,000	≥50	10,000

The above table is a guideline for standard insulating glass only. Laminated glass and Asymmetrical glass should use high altitude glazing when above 3,500 feet from sea level.

Additional Glazing Options

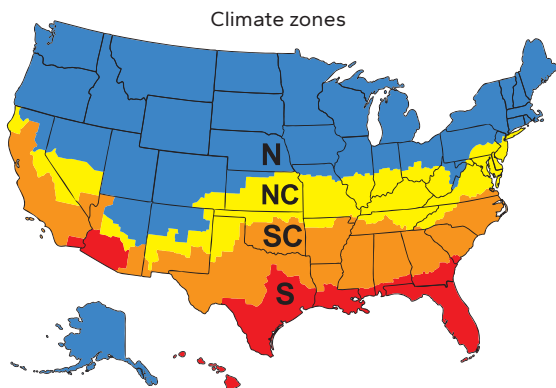
Term	Definition
Obscure Glass	Commonly used in intimate spaces such as the bathroom and bedroom. Creates privacy while allowing natural light to enter. Available in a variety of textured surfaces, will let sunshine in to increase comfort. Thermal and SHGC of obscure IG is equal to clear glass when combined in IG with the same Low-E coatings.
Tempered Glass	Standard Pella windows are glazed with annealed glass designed to meet a minimum of 20 psf design pressure. Tempered glass is available where safety glass is required by code or to increase glazing strength as required.
Tinted Glass (Bronze, Gray and Green)	Commonly used in rooms that receive a lot of sun exposure. Like sunglasses, windows with tinted glass block the sun's rays, so they're useful in controlling glare; plus, they keep rooms that get direct sun cooler. The tint also helps block the view into a home.
Spandrel Glass	Commonly used between sections of a building including the area between floors, columns, ceilings, and other small or large spaces. The main aesthetic purpose of spandrel glass is to create an overall uniform appearance. Spandrel is created using fired-on frit methods. This process includes a ceramic frit that is fused to the glass using high-heat fusing methods. This technique creates a glass that will not fade over time. In addition, spandrel is up to five times stronger than annealed glass.
Laminated Glass	Commonly used in locations in need of added security, ultraviolet (UV) protection and noise reduction. A polymer layer sandwiched between two layers of glass that cuts outside noise and harmful UV rays and offers added protection against intruders and forced entry. The interlayer holds the glass together if it's shattered.
Impact-Resistant Glass	Available in Impact-Resistant products, commonly used in locations that endure hurricane-force winds or where additional security or noise reduction is desired. An advanced polymer layer is sandwiched between two layers of glass, offering strong protection from flying debris - while increasing the safety, security, ultraviolet protection and energy efficiency of a home.
High altitude	For locations at high altitude the air filled insulating glass assembly is typically vented to prevent over pressurization of the system. If argon gas fill is used, the IG is filled to a pressure level tailored for higher elevations.

Refer to the product information pages or www.pella.com/professionals/architect/ for more detailed information.



ENERGY STAR® Performance Requirements

The U.S. Environmental Protection Agency's (EPA) ENERGY STAR program uses "whole unit" (glass and frame) SHGC ratings and U-Factors to measure Window and door or energy efficiency. To ensure your product will deliver ENERGY STAR performance, refer to the chart and map below to help determine ENERGY STAR guidelines for your area of the country. Then compare these numbers with the "whole unit" SHGC ratings and U Factors printed on the NFRC label found on every Window and door or. Pella has some of the lowest U-Factors in the industry and offers the energy-efficient options that will meet or exceed ENERGY STAR criteria in all 50 states.



ENERGY STAR "Whole Unit" Residential Performance Guidelines: 2023 (Version 7) Criteria

Windows	U-Factor	SHGC	
Northern	≤ 0.22	≥ 0.17	Prescriptive
	0.23	≥ 0.35	Equivalent Energy Performance
	0.24		
	0.25	≥ 0.40	
	0.26		
North-Central	≤ 0.25	≤ 0.40	
South-Central	≤ 0.28	≤ 0.23	
Southern	≤ 0.32	≤ 0.23	

Swinging and Sliding Glass Doors	U-Factor	SHGC
Opaque (all regions)	≤ 0.17	No rating
1/2-light or less (all regions)	≤ 0.23	≤ 0.23
1/2-light or Larger		
Northern	≤ 0.26	≤ 0.40
North-Central		
South-Central	≤ 0.28	≤ 0.23
Southern		

U-Factor = Btu/h ft² °F, SHGC = Solar Heat Gain Coefficient
 Maximum Air Leakage for Windows and Sliding Doors: ≤ 0.3 cfm/ft². Maximum Air Leakage for Hinged Doors: ≤ 0.5 cfm/ft²

Center of Glass Performance

Glazing Diagram	Type of Glazing	Glass Thickness	U-Factor	Solar Heat Gain Coefficient (SHGC)	Shading Coefficient (SC)	Relative Heat Gain	% Visible Light Transmission		% Solar Transmission	Total Solar Reflectance		Inside Glass Surface Temp (°F)	% Relative Humidity @ 70° F when condensation appears on room side	% UV Transmission	LBL Damage Function	Low-E Coating on Surfaces #
							% Out	% In		% Out	% In					

Dual-Pane Insulating Glass, Argon filled 11/16" overall thickness

	Clear (air filled)	3mm ₁	0.49	0.78	0.89	186	82	15	15	73	13	13	44	39	58	0.61	
1	SunDefense™ Low-E	3mm ₁	0.24	0.27	0.31	66	65	11	12	25	44	47	56	61	5	0.21	2
1	Advanced Low-E	3mm ₁	0.25	0.37	0.42	88	70	12	13	34	39	41	56	61	14	0.31	2
2	AdvancedComfort Low-E	3mm ₁	0.20	0.36	0.42	86	69	12	12	33	39	31	47	44	14	0.31	2, 4
3	NaturalSun Low-E	3mm ₁	0.26	0.68	0.79	161	79	15	15	60	21	21	55	59	29	0.42	3 or 2*
4	Bronze Advanced Low-E	5mm/3mm	0.25	0.32	0.37	78	45	7	11	22	18	38	56	61	7	0.19	3
4	Gray Advanced Low-E	5mm/3mm	0.25	0.30	0.34	73	39	6	10	19	16	38	56	61	7	0.18	3
4	Green Advanced Low-E	5mm/3mm	0.25	0.37	0.42	88	61	10	11	26	13	38	56	61	5	0.19	3
5	Advanced Laminated Low-E	3mm/6mm	0.28	0.37	0.42	88	69	13	13	32	39	32	53	55	0	0.2	2 or 3**
5	SunDefense™ Laminated Low-E	3mm/6mm	0.27	0.28	0.32	67	63	11	13	24	45	37	53	55	0	0.16	2 or 3**
2	NaturalSun+ Low-E	3mm ₁	0.21	0.62	0.72	46	77	15	14	55	21	17	46	42	27	0.4	2, 4
2	SunDefense+ Low-E	3mm ₁	0.20	0.27	0.31	64	63	11	11	24	44	36	48	46	5	0.2	2, 4

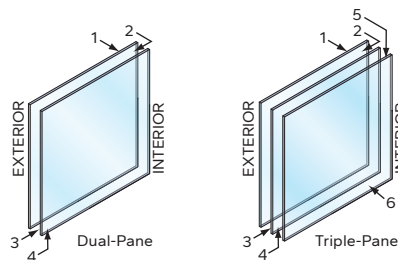
Dual-Pane Insulating Glass, Argon filled 1" overall thickness

	Clear (air filled)	6mm	0.47	0.72	0.83	172	80	15	15	63	12	12	46	41	54	0.58	
1	SunDefense Low-E	6mm	0.25	0.27	0.31	65	63	10	11	24	36	38	56	61	4	0.2	2
1	Advanced Low-E	6mm	0.25	0.35	0.41	84	68	12	12	31	32	34	56	61	13	0.3	2
2	AdvancedComfort Low-E	6mm	0.20	0.35	0.40	82	66	12	12	30	32	26	47	44	12	0.29	2, 4
3	NaturalSun Low-E	6mm	0.26	0.64	0.74	150	77	14	15	52	18	18	55	59	24	0.38	3 or 2*
4	Bronze Advanced Low-E	6mm	0.25	0.30	0.34	71	40	7	10	19	16	31	56	61	6	0.16	3
4	Gray Advanced Low-E	6mm	0.25	0.27	0.31	64	34	6	10	17	14	31	56	61	6	0.16	3
4	Green Advanced Low-E	6mm	0.25	0.35	0.40	83	59	10	11	24	11	32	56	61	4	0.17	3
5	Advanced Laminated Low-E	5mm/10mm	0.25	0.36	0.41	85	67	12	12	N/A	N/A	N/A	56	61	0	0.17	2 or 3**
5	SunDefense™ Laminated Low-E	5mm/10mm	0.24	0.27	0.31	66	62	11	12	N/A	N/A	N/A	56	61	0	0.14	2 or 3**
2	NaturalSun+ Low-E	4mm	0.22	0.61	0.7	142	77	15	14	52	19	16	46	42	26	0.39	2, 4
2	SunDefense+ Low-E	4mm	0.2	0.27	0.31	63	63	11	11	24	41	34	47	44	5	0.2	2, 4

Triple-Pane Insulating Glass, 1" overall thickness – Pella® 250 Series

6	Advanced Low-E	3mm	0.16	0.31	0.36	74	55	15	15	22	41	41	60	71	4	0.19	2, 5
6	NaturalSun Low-E	3mm	0.17	0.56	0.64	131	70	20	20	47	25	25	60	71	13	0.29	2, 5
6	Advanced Low-E	4mm	0.19	0.31	0.35	73	53	15	15	21	38	38	59	68	4	0.19	2, 5
6	NaturalSun Low-E	4mm	0.20	0.54	0.62	127	69	20	20	43	23	23	59	68	12	0.28	2, 5

Total Solar Reflectance is accounting for the reflectance of the light wavelengths across the total solar spectrum and includes the wavelengths for UV, Visible, and IR. Visible Light Reflectance only accounts for the reflectance of light wavelengths in the visible light spectrum, i.e. 380 – 780 nanometers.



(1) Performance of products with 3/4", 13/16" IG or 2.5mm glass is within 10% of those stated for 3mm glass.

(2) 4mm and 5mm glass construction perform similar to 3mm within 10%.

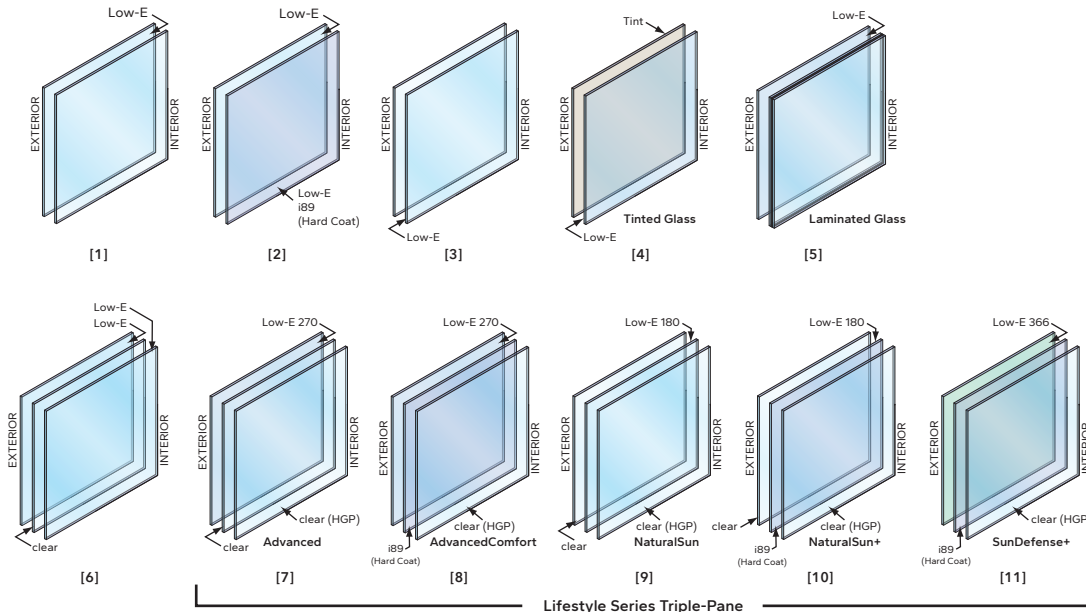
* Wood products and Pella Impervia: Side 3, Pella 250 Series and Encompass by Pella: Side 2

** Varies by product.

Center of Glass Performance (Continued)

Glazing Diagram	Type of Glazing	Gap Fill	Glass Thickness	U-Factor	Solar Heat Gain Coefficient (SHGC)	Shading Coefficient (SC)	Relative Heat Gain	% Visible Light Transmission	Visible Light Reflectance % Out	Visible Light Reflectance % In	% Solar Transmission	Total Solar Reflectance % Out	Total Solar Reflectance % In	Inside Glass Surface Temp (F)	% Relative Humidity @ 70° F when condensation appears on room side	% UV Transmission	LBL Damage Function	Low-E Coating on Surfaces #
Triple-Pane Insulating Glass, 11/16" with Hinged Glass Panel – Lifestyle Series																		
7	SunDefense™ Low-E	Argon	3mm ₁	0.18	0.25	0.29	60	59	14	18	23	46	41	59	68	4	0.19	2
7	Advanced Low-E	Argon	3mm ₁	0.19	0.34	0.39	81	64	16	19	30	40	37	59	68	12	0.28	2
8	AdvancedComfort Low-E	Argon	3mm ₁	0.15	0.33	0.38	78	63	16	18	29	40	30	61	73	12	0.27	2, 4
9	NaturalSun Low-E	Argon	3mm ₁	0.20	0.63	0.72	147	73	20	21	53	24	23	58	66	24	0.37	3
10	NaturalSun+ Low-E	Argon	3mm ₁	0.13	0.42	0.48	97	56	19	11	21	30	57	51	51	2	0.16	2, 4
11	SunDefense+ Low-E	Argon	3mm ₁	0.12	0.22	0.26	53	45	13	10	15	45	57	52	52	0	0.11	2, 4
Triple-Pane Insulating Glass, 1" – Pella® Reserve™																		
6	Advanced Low-E	Argon	3mm	0.17	0.33	0.38	79	62	16	19	29	40	34	60	73	7	0.23	2, 5
6	NaturalSun Low-E	Argon	3mm	0.17	0.56	0.64	131	70	20	20	47	25	25	60	73	13	0.29	2
6	SunDefense Low-E	Argon	3mm	0.16	0.25	0.29	59	57	14	18	21	46	38	60	73	2	0.16	2, 5
6	Advanced Low-E	Argon	4mm	0.19	0.33	0.38	78	61	16	19	27	38	31	59	69	7	0.22	2, 5
6	NaturalSun Low-E	Argon	4mm	0.20	0.54	0.62	127	69	20	20	43	23	23	59	69	12	0.28	2
6	SunDefense Low-E	Argon	4mm	0.19	0.25	0.29	60	56	14	18	21	42	34	59	69	2	0.16	2, 5
Triple-Pane Insulating Glass, 1-1/8" – Aluminum-Clad Fixed Frame Direct Set																		
6	Advanced Low-E	Argon	3mm	0.15	0.33	0.38	79	62	16	19	29	40	34	61	73	7	0.23	2, 5
6	NaturalSun Low-E	Argon	3mm	0.15	0.56	0.64	131	70	20	20	47	25	25	61	73	13	0.29	2
6	SunDefense Low-E	Argon	3mm	0.14	0.25	0.28	59	57	14	18	21	46	38	61	73	2	0.16	2, 5
Triple-Pane Insulating Glass, 1-1/4" – Aluminum-Clad Fixed Frame Direct Set																		
6	Advanced Low-E	Argon	4mm	0.15	0.32	0.37	77	61	16	19	27	38	31	61	73	7	0.22	2, 5
6	NaturalSun Low-E	Argon	4mm	0.15	0.54	0.62	127	69	20	20	43	23	23	61	73	12	0.28	2
6	SunDefense Low-E	Argon	4mm	0.14	0.25	0.28	59	56	14	18	21	42	34	62	78	2	0.16	2, 5
Triple-Pane Insulating Glass, 1-3/8" – Aluminum-Clad Fixed Frame Direct Set																		
6	Advanced Low-E	Argon	5mm	0.14	0.32	0.37	76	60	15	18	27	34	29	61	73	6	0.22	2, 5
6	NaturalSun Low-E	Argon	5mm	0.15	0.53	0.61	125	68	20	20	42	22	22	61	73	12	0.27	5
6	SunDefense Low-E	Argon	5mm	0.14	0.24	0.28	58	55	14	18	20	40	32	62	78	2	0.16	2, 5

Total Solar Reflectance is accounting for the reflectance of the light wavelengths across the total solar spectrum and includes the wavelengths for UV, Visible, and IR. Visible Light Reflectance only accounts for the reflectance of light wavelengths in the visible light spectrum, i.e. 380 – 780 nano-meters.



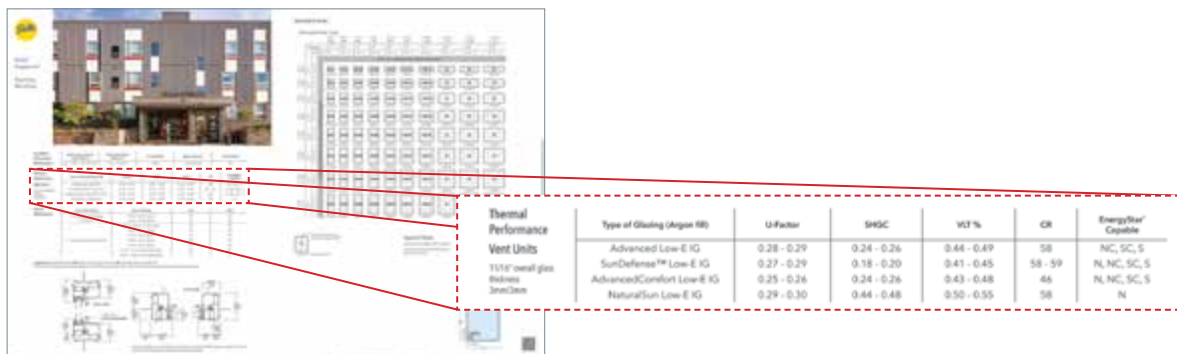
(1) Performance of products with 3/4", 13/16" IG or 2.5mm glass is within 10% of those stated for 3mm glass.

Standard Pella Products Whole Unit Thermal Performance Summary

	AWNING		CASEMENT		DOUBLE HUNG		SINGLE HUNG		SLIDING WINDOW		FIXED FRAME		SLIDING DOOR		HINGED DOOR	
	U-Factor	SHGC	U-Factor	SHGC	U-Factor	SHGC	U-Factor	SHGC	U-Factor	SHGC	U-Factor	SHGC	U-Factor	SHGC	U-Factor	SHGC
Pella® Reserve™ Contemporary	0.23-0.46	0.17-0.57	0.20-0.46	0.17-0.64	—	—	—	—	—	—	0.17-0.48	0.20-0.68	*	*	0.22-0.40	0.13-0.44
Pella® Reserve™ Traditional	0.20-0.49	0.16-0.54	0.19-0.51	0.16-0.64	0.24-0.46	0.19-0.60	0.24-0.46	0.19-0.60	—	—	0.17-0.48	0.20-0.68	*	*	0.22-0.42	0.13-0.44
Lifestyle Series Triple-Pane	0.19-0.27	0.15-0.42	0.18-0.28	0.18-0.49	—	—	—	—	—	—	0.17-0.48	0.20-0.68	*	*	0.23-0.28	0.12-0.34
Lifestyle Series Dual-Pane	0.25-0.34	0.18-0.51	0.23-0.34	0.18-0.58	0.25-0.34	0.20-0.55	—	—	—	—	0.17-0.48	0.20-0.68	*	*	0.24-0.31	0.14-0.41
Pella® Impervia® Fiberglass	0.22-0.49	0.17-0.55	0.21-0.51	0.17-0.61	0.25-0.48	0.19-0.59	0.23-0.48	0.19-0.60	0.23-0.49	0.19-0.60	0.15-0.46	0.18-0.68	0.21-0.48	0.17-0.59	—	—
Pella® 250 Series Vinyl	0.20 - 0.30	0.17 - 0.43	0.19 - 0.31	0.17 - 0.53	0.21-0.33	0.18-0.49	0.21-0.32	0.19-0.51	0.20-0.32	0.19-0.51	0.19-0.33	0.21-0.58	0.22-0.40	0.18-0.49	—	—
Encompass by Pella® Vinyl	—	—	—	—	0.24-0.47	0.18-0.60	0.24-0.47	0.20-0.64	0.23-0.47	0.20-0.64	0.26-0.49	0.20-0.69	0.23-0.48	0.20-0.64	—	—

Specifying Thermal Performance and Glazing – Whole Unit

The whole-unit thermal performance summary for common glazing types can be found on each product page in the product information pages of this manual. The thermal performance of pine is used for wood products. Other wood species may vary. Thermal performance varies by glass thickness, grille choice and other factors. For exact thermal performance values, use the QR code found on each product page or go to www.pella.com.



Refer to the product information pages or www.pella.com/professionals/architect/ for more detailed information.

* Performance and certifications were not available at time of printing. See available on-line documentation or consult your local Pella Sales Representative for current information.

Impact-Resistant Glazing

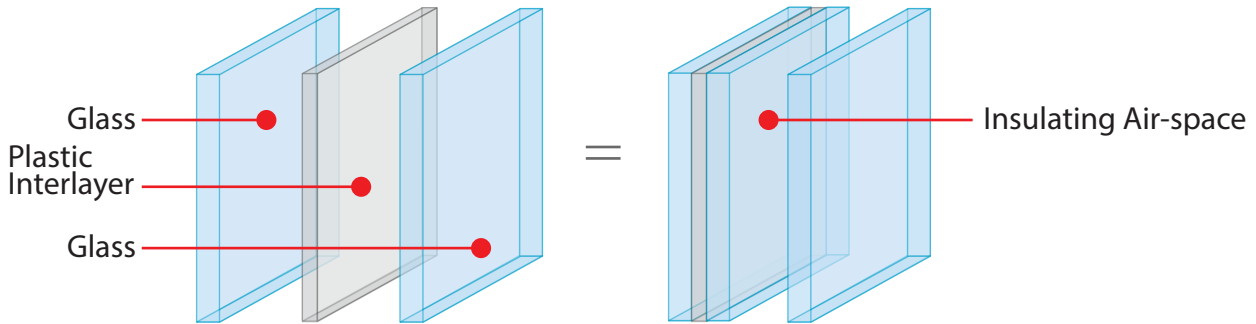
Pella® Reserve™ Traditional and Contemporary products, as well as Pella® Hurricane Shield® Series and Pella® Defender Series™ and Pella® Impervia® products are available with impact-resistant glazing. Product availability may vary by market. Please contact your local Pella representative for more details

Impact-resistant glazing is a high-performance, laminated glass with either SentryGlas® Plus (SGP) technology from DuPont® or PVB technology, also from DuPont. This laminated glass is designed to offer outstanding protection to keep the glazing intact after the glass is impacted by hurricane wind-driven flying debris, as tested per industry standards listed below. SGP has a laminate interlayer made from an advanced material called ionoplast. SGP is much stronger than PVB. PVB is a DuPont Butacite® polyvinyl butyral laminate traditionally used in automotive windshields since 1938.

Pella's impact-resistant products are designed and tested to meet or exceed many but not all Gulf Coast and Atlantic Coast hurricane building code requirements. Pella has impact-resistant windows and doors approved for use in the correct wind zone, Miami-Dade County, Florida as well as other areas along the Gulf and Atlantic Coasts.

Impact-resistant windows and doors are tested to numerous industry standards consistent with the intended application. These standards include:

- ASTM E1886
- ASTM E1996
- Miami-Dade County Florida TAS 201-94
- Miami-Dade County Florida TAS 202-94
- Miami-Dade County Florida TAS 203-94



Impact-Resistant Glass

Impact-resistant windows and doors feature heavy duty impact-resistant glass that consists of a tough laminated interlayer bonded between two panes of glass. This resistant layer helps prevent flying debris from entering the building in strong/severe windstorms.

DuPont®, SentryGlas and Butacite are registered trademarks of E. I. DuPont de Nemours and Company or its affiliates.

Sound Transmission Resistance

The ability of a window or door to reduce outside noise is an important consideration in product selection. Both Sound Transmission Class (STC) and Outdoor - Indoor Transmission Class (OITC) measure the amount of noise reduction that can be achieved with a given product.

STC ratings give an indication of noise reduction that can be achieved with typical indoor (high frequency) noises such as human speech, computers, printers, etc. However, some specifiers and other manufacturers use STC ratings for exterior products because until recently, that is all that was available. OITC ratings are a much better indicator of exterior noise reduction. That is because OITC ratings include lower frequency noises such as traffic, construction equipment, and lawn and garden equipment, therefore, OITC ratings are usually a few points lower than STC ratings, because the lower frequency sounds are more difficult to attenuate.

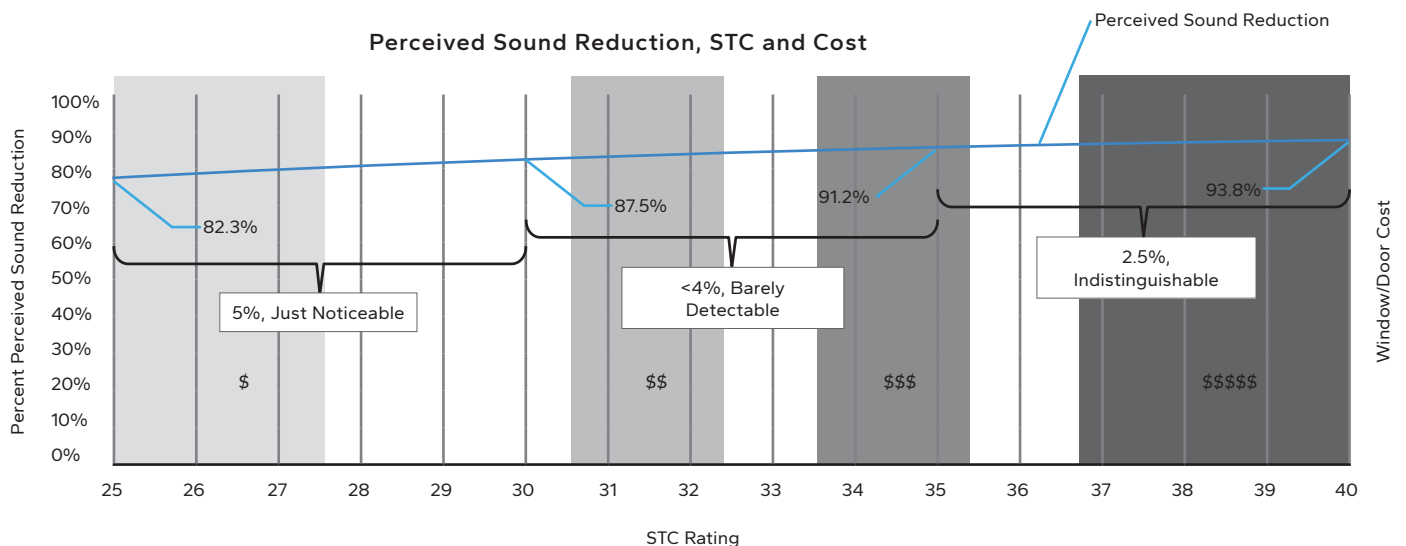
Pella will continue to show both OITC and STC ratings until the entire industry begins to use OITC. In the meantime, when comparing to other manufacturers, be sure to compare matching ratings (e.g. STC vs. STC, not STC vs. OITC).

Specifying Sound Transmission Resistance

An STC rating is a rating of an assembly's ability to reduce sound (in decibels) across a range of tested frequencies. Scientifically speaking, a reduction of 3dB is a halving of acoustical energy. However, studies show that it takes a change of 5dB before humans perceive a difference and 10 dB before the average listener perceives that the change in sound has doubled. If a noise reduction of 10 decibels represents cutting the noise level in half, as interpreted by the human ear, an STC rating of 25 means that the product reduces the outside noise by approximately 25 decibels, cutting the noise in half 2-1/2 times, or cutting it by over 80 percent.

Since the tested assembly's sound reduction performance varies across the frequency range, actual in-service sounds have varying frequencies, and the human ear gives different "weight" to different frequencies, there is no guarantee that an assembly with a given STC rating will reduce that particular sound by the number of decibels equal to its STC rating. Therefore, the specifier should use STC and OITC ratings as a tool for general comparison between assemblies and be aware that an STC or OITC increase of two or three can mean a significant cost increase with little or no change in perceived noise reduction.

The graph below illustrates the relationship between perceived sound reduction (based on studies), STC rating and cost at a conceptual level. A chart for OITC would show similar results. This graph is an illustration of the diminishing returns on the investment in sound reduction technologies in windows. While a significant difference in perceived sound reduction would occur when comparing an STC 25 to an STC 40 window, each technology considered carries a cost associated with an incremental improvement in performance. After a greater amount of perceived sound reduction using cost effective technology any incremental improvements will result in less perceived sound reduction at a much higher cost.



The individual product sections display the actual performance ratings of standard Pella products including the Sound Transmission Class (STC) and Outdoor–Indoor Transmission Class (OITC). Sizes tested are controlled by ASTM E 1425. Higher performance may be available with special glazing. Contact your Pella representative for more information.

Frame Size Tested	Type of Glazing	STC	OITC
1 1/16" Overall Glazing Thickness	2mm / 3mm glass	29	25
	4mm / 4mm glass	31	26
1" Overall Glazing Thickness	2mm / 2mm / 2mm glass	29	24
	4mm / 4mm glass	35	28
	5mm / 3mm glass	34	28
	5mm / 5mm glass	30	24
	6mm / 4mm glass	33	27
	4mm / 2mm laminated glass	36	29
	5mm / 10mm laminated glass	37	31

More information on sound performance options is available by using the QR code to access complete product information or by searching for complete product information on www.pella.com/professionals/architect/.

Standard Pella Products STC - OITC Summary

	AWNING		CASEMENT		DOUBLE HUNG		SINGLE HUNG		SLIDING WINDOW		FIXED FRAME		SLIDING DOOR		HINGED DOOR	
	STC	OITC	STC	OITC	STC	OITC	STC	OITC	STC	OITC	STC	OITC	STC	OITC	STC	OITC
Pella® Reserve™ Contemporary	26-34	23-28	26-34	23-29	-	-	-	-	-	-	27-38	22-34	*	*	30-35	25-29
Pella® Reserve™ Traditional	27-33	23-29	27-34	23-29	28-31	22-27	-	-	-	-	27-38	22-34	*	*	31-35	25-30
Lifestyle Series Triple-Pane	31-37	27-33	31-37	25-34	-	-	-	-	-	-	27-38	22-34	*	*	34-35	28-31
Lifestyle Series Dual-Pane	25-32	22-28	25-31	22-26	27-31	23-27	-	-	-	-	27-38	22-34	*	*	30-32	24-28
Pella® Impervia® Fiberglass	29-37	24-31	28-37	24-32	26-29	22-26	26-32	22-27	26-33	23-30	28-36	22-31	27-33	23-30	-	-
Pella® 250 Series Vinyl	28-34	24-28	28-34	24-28	26-28	22-24	25-28	22-23	25-28	22-23	26-27	22	29-32	24-26	-	-
Encompass by Pella® Vinyl	-	-	-	-	25-26	22	25-26	21	25-26	21	25-26	21	25	22	-	-

Not all awnings shown were separately tested, but assume results to those of similarly configured casements. Refer to the product information pages or www.pella.com/professionals/architect/ for more detailed information. * Performance and certifications were not available at time of printing. See available on-line documentation or consult your local Pella Sales Representative for current information.

Aluminum-Clad Products

AAMA 2603, 2604 and 2605 are the most commonly referenced exterior finish standards for painted aluminum. Pella aluminum-clad products are offered with two levels of paint finish: EnduraClad® and EnduraClad® Plus. On Pella Reserve™ products with extruded aluminum frame and sash cladding, the standard EnduraClad finish meets the requirements of AAMA 2604. Other aluminum-clad products with roll-formed cladding and EnduraClad finish meet the AAMA 2603 requirements. EnduraClad® Plus (available on select products) exceeds all of the AAMA 2605 requirements. Since AAMA 2605 requires greater fade resistance, EnduraClad® Plus is a wise choice for dark or fade-prone colors with high UV exposure. However, the EnduraClad® finish has excellent abrasion and corrosion resistance. The following table explains the differences in each standard and the level of performance met by Pella finishes.

Included in AAMA Standard			Performance Requirement	Meets or Exceeds	
2603	2604	2605		EnduraClad®	EnduraClad® Plus
Y	Y	Y	Multi-Stage Cleaning and Pre-treatment	Y	Y
Y			Dry Film Hardness: Eagle Turquoise Pencil, H minimum	Y	Y
	Y	Y	Dry Film Hardness: Eagle Turquoise Pencil, F minimum	Y	Y
Y	Y	Y	Film Adhesion: 1/16-inch crosshatch, dry, wet and boiling water	Y	Y
Y	Y	Y	Impact Resistance: 1/10-inch distortion, no film removal	Y	Y
Y	Y		Abrasion Resistance: Falling Sand coefficient value of 20 minimum	Y	Y
		Y	Abrasion Resistance: Falling Sand coefficient value of 40 minimum		Y
Y	Y	Y	Chemical Resistance: 10% Muriatic Acid, 15 min. Mortar pat test, 24 hours	Y	Y
	Y	Y	Chemical Resistance: Nitric Acid, 30 min. < 5 Delta E	Y	Y
	Y		Chemical Resistance: Cleaner Resistance, 24 hours	Y	Y
Y	Y	Y	Detergent Resistance: 3% at 100 F0 72 hours	Y	Y
Y			Corrosion Resistance: Humidity, 1,500 hours and Salt Spray > 1,500 hours	Y	Y
	Y		Corrosion Resistance: Humidity, 3,000 hours and Salt Spray > 3,000 hours (ASTM B117)	Y	Y
		Y	Corrosion Resistance: Humidity, 4,000 hours and Salt Spray Cycle > 2,000 hours (ASTM G 85-A5)	Y	Y
Y			ASTM G7 Outdoor Exposure Test: 1 Year with no checking crazing or adhesion loss. Slight chalk and fade permitted.	Y	Y
	Y		ASTM G7 Outdoor Exposure Test: 5 Years with 30% gloss retention, <5 delta E color change, < No. 8 rating Chalk Resistance (ASTM D4214, Method A) and <10% Erosion		Y
		Y	ASTM G7 Outdoor Exposure Test: 10 Years with 30% gloss retention, <5 delta E color change, < No. 8 rating Chalk Resistance (ASTM D4214, Method A) and <10% Erosion		Y

Pella® Impervia® Fiberglass Products

Pella® Impervia® fiberglass products are finished with a durable, powder-coat paint that is seacoast worthy and meets the stringent AAMA 624 standards. Refer to the product information pages in this manual or www.pella.com for color options.

Pella Vinyl Products

Encompass by Pella® vinyl products have integral color extruded throughout frame profiles.

Pella® 250 Series has available Dual Color options that meet AAMA 307 specifications.

Refer to the product information pages in this manual or www.pella.com for complete listing of color options.

Performance Considerations and Severe Conditions

Pella® windows and doors are designed and manufactured to established engineering and industry standards which maximize satisfactory performance within the limitations of the specifications, conditions and tests listed.

Published air infiltration performance, Design Pressure (DP), Structural Test Pressure (STP) and water penetration performance numbers for all products are representative of test performance of product samples. Testing is performed on randomly selected production samples and conducted in Pella's test lab, as well as in independent testing laboratories. Products which are Hallmark Certified are noted on the product labels and on the product performance pages of the Architectural Design Manual.

Many products will exceed published specifications; however, performance of installed products may be affected by factors beyond Pella's control, such as: shipping, handling, installation, construction practices, excessive environmental conditions, normal wear and tear and ongoing care and maintenance. Although efforts are made to minimize the effects of such factors, it is not possible to guarantee that any particular unit will meet or exceed published specifications.

Projects that will be subject to severe climatic and atmospheric conditions may require that architects and specifiers address higher product performance requirements and more stringent maintenance schedules. Severe conditions that should be taken into account when selecting, specifying and designing to accommodate windows and doors may include:

Salt and Sand Exposure	Any windows and doors installed near salt water – regardless of material or manufacturer – are subjected, with other building materials, to more severe weathering than in other typical locations. Along with other building products, they should receive the additional protection which is standard and customary practice in such coastal locations at time of installation, and periodic inspection and maintenance as necessary thereafter.
Chemical Exposure	Severe chemical exposure in locations near chemical plants and some types of industrial complexes may adversely affect satisfactory performance of Pella products and substantially increase maintenance requirements. Judgments regarding the use of Pella products in such areas should be based upon local experience and customer awareness. Pella products should not be used in indoor swimming pool or hot tub enclosures or other high humidity and corrosive environments.
Climatic Exposure	Pella products are designed to perform in cold climate applications, however condensation or ice can form, mainly on interior glass surfaces, at low temperatures. Condensation or icy conditions will primarily depend upon the amount of room side humidity to which the products are exposed and generally does not indicate a product defect.
Areas of Severe Wind and Rain	Areas subject to severe wind and rain may produce temporary conditions which exceed product performance standards. No claims are made beyond compliance with the product performance levels published for each product at the time of manufacture. Special design considerations may be required, such as subsill, built-up curbs, overhang protection, or unit set back from exterior face of wall.
Unintended Use	Pella windows and doors must not be installed in conditions beyond published product limitations. Product modifications or non-vertical installations that are not approved by Pella Corporation will void the Limited Warranty. Pella products are not intended to support any structural loads from the building. Combination mullions and building components must be designed to properly support all loads transferred from Pella products.

Quality Assurance

In our state-of-the-art testing facilities, we subject the components of Pella windows and doors to harsh conditions and thorough cycle testing to understand performance of the window or doors and key hardware components.

Casement and awning windows have been tested to outlast 10,000 cycles, double-hung windows have been tested to outlast 6,000 cycles, and patio doors have been tested to outlast 100,000 cycles.

Warranty

Visit <https://www.pella.com/support/warranties/> for an in-depth view of the Pella warranty which includes additional restrictions and limitations.

Installation

All detail representations in this manual only pertain to the use of Pella products manufactured by Pella Corporation and are strictly limited to the published specifications and to the use of Pella products. Details shown herein illustrate typical general methods of installing Pella products manufactured by Pella Corporation and are to be used as guidelines only. Refer to the appropriate installation instructions and/or installation shop drawings.

Over time, all window and door or systems may have some water infiltration; it is important that the wall system be designed and constructed to properly manage moisture. Pella Corporation is not responsible for claims or damages caused by unanticipated water infiltration; deficiencies in building design, construction and maintenance; failure to install Pella products in accordance with Pella approved methods; or the use of Pella products in systems which do not allow for proper management of moisture within the wall systems. The determination of the suitability of all building components, including the use of Pella products, as well as the design and installation of flashing and sealing systems are the responsibility of the building owner, architect, contractor, installer and/or consumer.