

Modern Introduction and Product Performance ADM

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How to Use this Manual

Manual Objectives:

The content of this manual will aid in understanding the wide variety of standards, codes, and regulations governing the use of windows and doors. Consumer-friendly information on a variety of highly-rated Marvin Window and Door products along with fenestration standards, including glazing, finishes, hardware, and overall product performance can be used to help your clients understand what products best fit their project needs.

Intended Audience:

This manual is primarily intended for professionals who:

- Provide shop drawings, sales and service to customers
- Write job specifications
- Need further product knowledge

Sources of Additional Help:

- Technical and Product Support for Architects and Design Professionals: 1-800-346-3363
- Our Website: www.marvin.com
- CSI Specifications
- Installations Instructions
- Warranty Information
- Owner's Manual
- Parts Manual

The Online version of this document is the document of record and will be the most current version. Specifications and technical data are subject to change without notice.

This manual is designed to make Marvin Windows and Doors Modern Collection product knowledge easy to find and utilize. Used in conjunction with the Modern Technical Documents, it will provide a library of Information on Marvin products.

Each window and door product has a collection chapter that covers general unit features. All individual chapters have product specific features. The line entries of the Table of Contents are linked to a specific page for assistance in locating necessary information.

Product Notes:

- Numbers in parentheses () following measurements are metric equivalents in millimeters rounded down to the nearest whole number
- Allow 1/16" (2) tolerance on all measurements
- For accessories, dimensions and applications, see the Accessories section of this manual
- All measurements for Rough Opening, Masonry Opening, Frame Size are rounded to the nearest 64th of an inch. Rounded Fraction for Glass Size, Daylight Opening are to the nearest 64th of an inch.
- E = (Egress): Window that meets the requirements for Egress. Please note that the top of the sill must be no more than 44" (1118) from the floor. Code restrictions may vary depending on your local building codes.
- T = (Tempered): For safety and/or code requirements, frame size greater than 71 1/8" (2924) tall, Marvin recommends tempered glass. Units with Frame 25.2 sq. ft. and larger may require tempered glass

Trademark Information:

The following trademarks are referenced in this manual:

- E-Gard® is a registered trademark of Truth Hardware

How to Submit Suggestions

Comments or suggestions regarding this publication can be directed to: Technical Communications, Marvin Windows and Doors, P.O. Box 100, Warroad, MN 56763, or call (218) 386-1430 or 1-800-346-5044.

Top Level Abbreviations**Modern Product Abbreviations****General Terms**

CNR	Corner Units
CR	Condensation Resistance
DLO	Daylight Opening
DP	Design Pressure
EXT	Exterior
FPAN	Flat Panel
FS	Frame Size
GS	Glass Size
HP	High Performance
IG	Insulating Glass
INACT	Inactive (X)
LF	Lineal Feet
LH	Left Hand
LPS	Low Profile Sill
LT	Lite
MO	Masonry Opening
MRF	Mull Reinforcement
OSM	Outside Measurement
OPER	Operator (X)
PG	Performance Grade
PROJ	Projection
RO	Rough Opening
RPAN	Raised Panel
SCR	Screen
SG	Single Glaze
SGL	Single
SHGC	Solar Heat Gain Coefficient
SL	Sidelite
SO	Sash Opening
SPEC	Special
ST	Stationary (O)
VLТ	Visible Light Transmittance
W	Wide-Always preceded by number wide
WDW	Window

Modern Window Products

MAWN	Modern Awning
MAWNMOTO	Modern Awning Automated
MAWNPO	Modern Awning Push Out
MCA	Modern Casement
MCAMOTO	Modern Casement Automated
MCAPO	Modern Casement Push Out
MDG	Modern Direct Glaze
MDGCNR	Modern Direct Glaze Corner Unit

Modern Door Products

MID	Modern Inswing Door
MMSD	Modern Multi-Slide Door
MOD	Modern Outswing Door
MSD	Moderating Sliding Door

Options

SDAC	Sliding Door Automatic Control
SDL	Simulated Divided Lites
LAMI	Laminated Glass
TEMP	Tempered Glass
TG	Triple Pane Glass, or Tri-pane
WOCD	Window Opening Control Device

Aluminum Colors

BZ	Bronze
EB	Ebony
SW	Stone White
GM	Gunmetal
CA	Clear Anodized

High Density Fiberglass Colors

BZ	Bronze
EB	Ebony
SW	Stone White
SL	Silver
GM	Gunmetal

Glossary of Terms

ALUMINUM SURROUND: The aluminum frame around a screen or energy panel.

ARGON GAS: An inert gas known for its ability to provide insulating properties in IG air spaces.

ASTRALGAL: A moulding applied to one stile of a French Door, Sliding French Door or Ultimate French Casement window unit which the other door panel or window sash strikes. Usually head and foot bolt devices will be found on the astragal side.

ASSEMBLY: A collection of single units mulled together.

AWNING WINDOW: A combination of frame and sash, hinged at the top of the vertical jambs which allows the unit to pivot from the top with the sash opening to the exterior of the building.

BARs: A narrow rabbeted, member in a divider system to create a series of divided lites in the daylight opening of the sash or panel. GBG and SDL Spacer bars must be connected to the rails and stiles. SDL without spacer bars may be freely attached to the glass without contacting rail and stile. Bars can be assembled into a variety of patterns including grids, radius, diamond, Queen Anne, etc.

CAM LOCK: A lever operated lock which is used to prevent intrusion through the sash. Cam locks and keepers were installed on the jambs and stiles of older Casement and awnings.

CAPILLARY TUBES: A tube inserted into the insulating glass spacer that allows the inside and outside air pressure to equalize in higher elevations. Capillary tubes will allow gas fills other than air to escape.

CASEMENT WINDOW (CA): A vertical hinged window system consisting of a frame, sash weather strip, locks, hinges and an operating crank device, on operating units. Push Out models are optionally available.

CLEAR OPENING (CO): The opening created when the window or door is completely open.

CONDENSATION RESISTANCE (CR): Measures the ability of a product to resist the formation of condensation on the interior surface of that product. The higher the CR rating the better it resists forming condensation.

DAYLIGHT OPENING (DLO): The width and the height of the visible glass.

DEPTH OF THE JAMB: The point where the exterior casing ends to the point where the interior casing begins. On clad units, the point from the backside of the nailing fins to the interior of the frame.

DESIGN PRESSURE (DP): Is a rating system that is based on testing for structural performance under static air pressure. Water leakage, air leakage, operating force and forced entry must also comply to attain a DP rating.

DIRECT GLAZE (DG): Refers to a stationary window with no sash where the glass is glazed directly into the frame.

DIVIDED LITES: See Simulated Divided Lites.

DRIP CAP: A formed aluminum or vinyl piece which is installed at the top of windows and doors that allows water to run off the casing of the unit instead of seeping around the casing and into the unit.

DUAL GLAZE: An IG with two panes of glass.

EGRESS: Refers to an escape opening in a room designated as a sleeping area. Windows and doors must meet minimum size requirements to qualify as an egress product.

ELECTRIC OPERATOR: An electrically operated device which will open Casement or awnings units by using a switch. This is used in lieu of a roto gear crank or pole crank.

EMISSIVITY: A measure of a surface's ability to emit long-wave infrared radiation or room temperature radiant heat energy. Emissivity varies from 0 (no emitted infrared) to 1 (100% emitted infrared). The lower the emissivity, the lower the resultant U-Factor and the better insulating performance of the material.

ESCUTCHEON: A decorative door handle plate attached to the stile directly behind the handle(s). Generally square or rectangular shaped.

EXTRUSION: A linear component of plastic or metal made by the process of heating the raw material and forcing it through a die as it cools to provide a specific cross-sectional shape.

FENESTRATION: Anything designed to fill an opening in a structure. Used in our industry to specifically apply to doors and windows.

FLANKER: A former term used to describe a side or lateral part. Also previously used to describe the side units in a 3-wide picture unit.

FOOT BOLT: A locking rod device installed vertically in the stile or astragal of a door or screen which when activated secures the panel or screen in a stationary position.

Glossary of Terms

FRAME: The stationary portion of a window that encloses either the glass (direct glaze) or the sash (operating or stationary) and consists of the following parts:

1. HEAD JAMB: The top frame member.
2. SILL: The bottom frame member.
3. SUB-SILL: The supplemental member used under most awning and casement units as an additional sill with the primary purpose being to hold multiple units together at the sill.
4. SIDE JAMB: Side or vertical frame members.

GLASS SIZE (GS): The measurement of the actual glass, not the visible glass.

GLAZING: Installing glass into windows and doors.

1. SINGLE GLASS - Glazing with a single piece of glass.
2. INSULATING GLASS - two or more panes of glass separated by a spacer and hermetically sealed together with dead air space between the panes.

GLAZING TAPE: A two sided adhesive tape placed between the glass rabbet and the glass and/or the glazing bead and glass of some unit types.

HANDING: A term used to describe the right or left hand operation of a window or door.

HEAD BOLT: A locking rod device installed vertically in the stile or astragal of a door or screen which when activated secures the door in a stationary position.

IG: Insulating glass (see Glazing)

INACTIVE PANEL (X): Secondary operating door panel.

INSTALLATION BRACKETS: A factory installed or supplied metal strip with holes used with windows or doors to attach the unit in the rough opening in lieu of nailing through the casing, thus eliminating unsightly nail holes. Available as an option for all Marvin wood windows or door products.

INSULATING GLASS (IG): A glass assembly with two or more panes of glass sealed with a perimeter spacer.

Glossary of Terms

KEYED CYLINDER LOCK: A lock providing an exterior entry and locking convenience.

LAMINATED GLASS: Glass composed of two sheets of glass fused together with a sheet of transparent plastic between the sheets. When broken, laminated glass will generally not leave the opening and is often used as safety or security glazing.

LEVER LOCK: A lever handle and lever arm operator available as an option on awning units.

LOCKSET: A complete door lock system comprised of the lock mechanism together with knobs, keys, plates, strikes and other accessories.

LOW E GLASS: Low E stands for low emissivity. The lower the emissivity the higher the percentage of long wave radiation blocked thereby improving thermal performance. Low E glass is coated with a thin microscopic, virtually invisible, metal or metallic oxide layer. The primary function is to reduce the U-factor by suppressing radiative heat flow. A secondary feature is the blocking of short wave radiation to impede heat gain. There are two basic types of Low E glass. The first, vacuum or sputter coated Low E, is referred to as soft coat (See Low E2 definition). The second is pyrolytic Low E, commonly referred to as hard coat. (See pyrolytic definition.)

LOW E1: A high performance Low E coating, providing excellent balance for cold winters and warm summers. It offers increased solar heat gain coefficient values allowing heat from the winter sun to enter while reducing heat loss to the exterior. The Low E1 coated glass products are specifically designed for insulating glass units normally as a third surface coating.

LOW E2: A high performance Low E2 glass, providing excellent winter and center of glass temperatures. It offers reduced solar heat gain coefficient values providing customers cool summer glass temperature. Additionally, ultraviolet light transmission is greatly reduced. The Low E2 coated glass products are specifically designed for insulating glass units normally as a second surface coating. See Low E and pyrolytic definitions.

LOW E3: A high performance Low E glass, providing the best winter U-factor and center of glass temperatures. It offers extremely low solar heat gain coefficient values providing customers a summer glass temperature that is very low. Additionally, it provides the best reduction in ultraviolet light transmission.

LOW ERS: A hard coat Low E coating for the indoor IG surface, providing excellent heat reflectance. When used in conjunction with an E2 or E3 coating, it provides exceptional thermal properties – approaching that of a tripane unit with two LOW E coatings. The Low ERS coated glass reflects additional heat back to the room. The effectiveness of this coating causes the interior surface of the glass to cool and additional condensation may be noticed.

LOW ELR: A high performance Low E coating, providing the lowest Solar Heat Gain Coefficient with a slightly darker tint. It offers very good U-factor performance with excellent glare control. This product meets requirements for the “turtle code”. It provides the best reduction in ultraviolet light transmission.

LOW PROFILE SILL: Also referred to as saddles, these sills have no more than a 1/2" (13) rise. Low profile sills are required when a door opening must meet codes associated with the Americans with Disabilities Act.

MASONRY OPENING (MO): A brick, stone or block opening into which a window or door unit is installed. Exterior casing may cause the Masonry Opening to be larger than the Rough Opening.

MEETING STILES: The vertical members of a glider sash or sliding door panel that are designed to mate with the meeting stile of the paired sash.

MULLING: The act of attaching two or more window or door units together. The joint is then finished with a mullion center cap or mull trim.

MULLION: The vertical member of a sash, window or door frame between openings in a multiple opening frame.

1. **SPACE MULL** - Two or more units mull together with a space left between the units. The jamb extension surrounds the entire unit.
2. **STUD POCKET** - Two or more units mull together with a space between the units. The jamb extension surrounds each unit separately, providing space for a support member between the units.

MULLION COVER: Aluminum cover for mull usage that covers a range from 1/2" minimum to 4 1/2" maximum.

MULTI-POINT LOCKING SYSTEM: A line of standard or optional multiple point locking mechanisms installed on the operative panel(s)/ sash of various Marvin products to enhance security and performance.

MUNTINS OR “MUNT”: A short “bar,” horizontal or vertical, extending from a bar to a stile or rail or another bar.

NAILING FIN: A factory installed vinyl strip that is inserted into a kerf in the frame of clad units. Nailing fin is designed to provide easier clad unit installation in new construction where the highest structural performance is not required.

NON-KEYED LOCK: A handle without a keyed cylinder. The door cannot be locked or unlocked from the exterior.

OBSCURE GLASS: (Pattern 62) A pattern glass that provided privacy while maintaining full light transmission. It is formed by running molten glass through special rollers that apply the pattern to one side.

OUTSIDE MEASUREMENT (OM): The measurement in width from outside of jamb to outside of jamb. Height measurement from top of jamb to bottom of sill. The outer edges of what is being measured.

Glossary of Terms

ONE WIDE (1W): The current term used to describe one frame with single or multiple sash or panels.

OPERATOR (X): An operating sash, panel or unit.

OX and XO: The letters OX or XO identify the operation of window or door units as viewed from the exterior. The letter O stands for stationary while the letter X stands for operating.

PANEL: An assembly of stiles and rails with glass that form the stationary or operating section of the door and is fitted in the frame.

PANNING: A term used to describe the aluminum covering extrusion components (i.e. jambs, sill and head jamb).

PERFORMANCE CLASS: A methodology to grade product performance types.

R = Residential, LC = Light Commercial, CW = Commercial, AW =Architectural

PERFORMANCE GRADE (PG): A numeric designator that defines performance that applies to; air leakage resistance, water penetration resistance and deflection resistance according to Standard Specifications.

PITCH: A term used to describe the angle of a roof. For example: A 4-12 pitch indicates that the roof rises 4" (102) vertically for each 12" (305) horizontally.

POLE CRANK: An extension pole used to open or close awnings or casements which would otherwise be inaccessible because of their height.

POLYGON (POLY): A high level term used to describe any shape with three or more straight sides. Typical fenestration shapes are triangles, trapezoids, pentagons, hexagons and octagons.

PULTRUSION: Lineal profiles of constant cross section manufactured by combining plastic resin and continuous glass fiber reinforcement. These thermally insulating and structural components are ideally suited for applications where strength, thermal stability and weather resistance are required.

RAILS: The cross or horizontal members of the framework of a sash, door or other panel assembly.

ROTO-GEAR: A term used to describe the steel drive worm, gears and crank device used for opening awning and casement windows.

ROUGH OPENING (RO): The opening in the wall where a window or door unit is to be installed. Openings are larger than the size of the unit to allow room for insulation, shimming and squaring of the unit.

SASH: An assembly of stiles and rails with glass that form the stationary or operating section of the window and is fitted into the frame. The operating and/or stationary portion of the window unit that is separate from the frame. The sash consists of the following parts:

1. STILES - Vertical sash members.
2. RAILS - Horizontal sash members.
3. BARS - Divisional members extending from rail to rail or from stile to stile in an authentic divided lite unit.
4. MUNTINS - Divisional members extending from a bar to a rail or stile or another bar.

SASH LIMITER: An optional metal device which attaches to an Ultimate Casement sill and bottom rail which limits the sash to a specified opening -5, 10, 15 or 20 degrees.

SASH LOCK: A device which holds a window shut and prohibits it from being opened from the outside.

SASH WIDTH: Horizontal measurement across the face of a sash.

SCREEN OM (outside measurement): The width and the height of a screen including wood or metal surrounds.

SCREENS: A close-mesh woven screen material of fiberglass attached to an aluminum surround. Screens inhibit entry of insects, yet permit light, air and vision. Most Marvin window and door products utilize full screens.

SIDELITE: A stationary glass panel mulled to or installed next to a door.

SILL: The horizontal member forming the bottom of a window or exterior door frame; the lowest member of the frame of a structure, resting on the foundation and supporting the frame.

Glossary of Terms

SLOPE: The measure of the tilt of a line; rise over run.

SOLAR HEAT GAIN COEFFICIENT (SHGC): The ratio of the solar heat gain entering the space through the fenestration product to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation which is then re-radiated, conducted, or convected into space. The lower a window's SHGC, the less solar heat it transmits to the interior, and the greater its shading ability.

SPACER: A perimeter member of an IG used to separate and seal two more pieces of glass.

SQUARE FOOT (Sq. Ft.): For measuring the area of a unit. RO width (inches) x RO height (inches) divided by 144 equals the area in square feet of a unit.

STATIONARY (O): A non-operating sash, panel or unit.

STILES: The upright or vertical perimeter pieces of a sash, panel or screen.

TEMPERED GLASS: Float glass panels heated and then cooled rapidly in a controlled environment. This process makes the glass several times stronger than regular glass. It also makes it safer because when broken it yields small pebble-like fragments.

THREE WIDE (3W): Current term referring to any product or unit when three frames (i.e. separate jambs) are mulled together as a multiple unit.

TRANSOM: A window above a window or door. Transoms can be either stationary or operating.

Triple Pane (TG): An IG with three panes of glass. (often called Tripane)

TWO WIDE (2W): Current term referring to any product or unit when two frames (i.e. separate jambs) are mulled together as a multiple unit.

ULTREX: A pultruded composite material made of polyester resin and glass fibers with an acrylic cap on primary surfaces.

U-FACTOR: (Btu/hr.-sq. ft. - *F.) A measurement of the amount of heat flow through a product. The lower the U-factor, the greater the resistance to heat flow and better its insulating value.

UV BLOCKAGE: Low E glass options will screen out ultraviolet waves while allowing visible light into a structure, reducing fading damage to interior surfaces.

UNIT: One single product such as a one-wide casement.

VENT OPENING: The total opening created when a door or window is completely open.

VISIBLE LIGHT TRANSMITTANCE (VT): Percentage of visible light transmitted through the unit.

WATER RESISTIVE BARRIER: A material behind an exterior wall covering that is intended to resist liquid water that has penetrated behind the exterior covering from further intruding into the exterior wall assembly.

WEATHER STRIP: A strip of resilient material designed to seal the sash and frame members in order to reduce air and water infiltration.

WINDOW OPENING CONTROL DEVICE (WOCD): A device that controls a window sash opening to be opened with normal operation of the sash such as to prohibit the free passage of a four inch (102mm) diameter rigid sphere at the lowest opening portion of the window opening, with a release mechanism that allows the sash to be opened to a larger opening area as required for emergency escape and rescue, and that automatically resets when the window sash is fully closed.

WIRE GLASS: Glass with wire embedded into the glass when the glass is still in a molten state. This prevents the shattered glass from falling out of the sash if it should break.

XO: See OX entry.

Unit Features on Windows and Doors

Marvin offers an assortment of products and features to fit your window and door requirements. Each product offers similarities that allow multiple products to be positioned in your project and look similar yet distinctive. Below is a collection of the similar characteristics you will find throughout our product lines. For product specific features, refer to the collection or individual chapters for additional information.

Frame and Sash

- Exterior: High Density Fiberglass
 - Standard colors: Ebony, Bronze, Gunmetal, Silver, Stone White
- Interior: Extruded Aluminum
 - Standard colors: Ebony Bronze, Gunmetal, Clear Anodized, Stone White

Insect Screen

- Windows
 - Extruded aluminum with Marvin Bright View screen mesh,
 - Screen color matches interior finish.
- Sliding Door
 - Extruded aluminum with Marvin Bright View screen mesh,
 - Screen surround matches exterior frame finish.
- See Swinging Door Collection chapters for retractable screen options.

Simulated Divided Lites (SDL):

- Bar (interior and exterior): 7/8" (22), 1 1/8" (29), 2 7/8" (73) wide bars
- Exterior bar matches exterior color
- Interior bar matches interior color
- Insulated glass units available with stainless steel spacer.

NOTE: Due to the inherent qualities of tempered glass, daylight gaps may be seen when using simulated divided lite bars. Daylight gaps could be visible between the internal spacer bar and surface applied bars when viewing from an acute angle to the glass on the following applications:

- *Tempered glass over 91" high while using 7/8" SDL bars.*

Egress Code: International Building Code

International Building Code

Chapter 10, Section 1031 in the 2021 and 2024 Code - Emergency Escape and Rescue

Minimum Size: Emergency escape and rescue openings shall have a minimum net clear opening of 5.7 square feet (.053 m²). Exception: The minimum net clear opening for grade-floor emergency escape and rescue openings shall be 5.0 square feet (0.46m²).

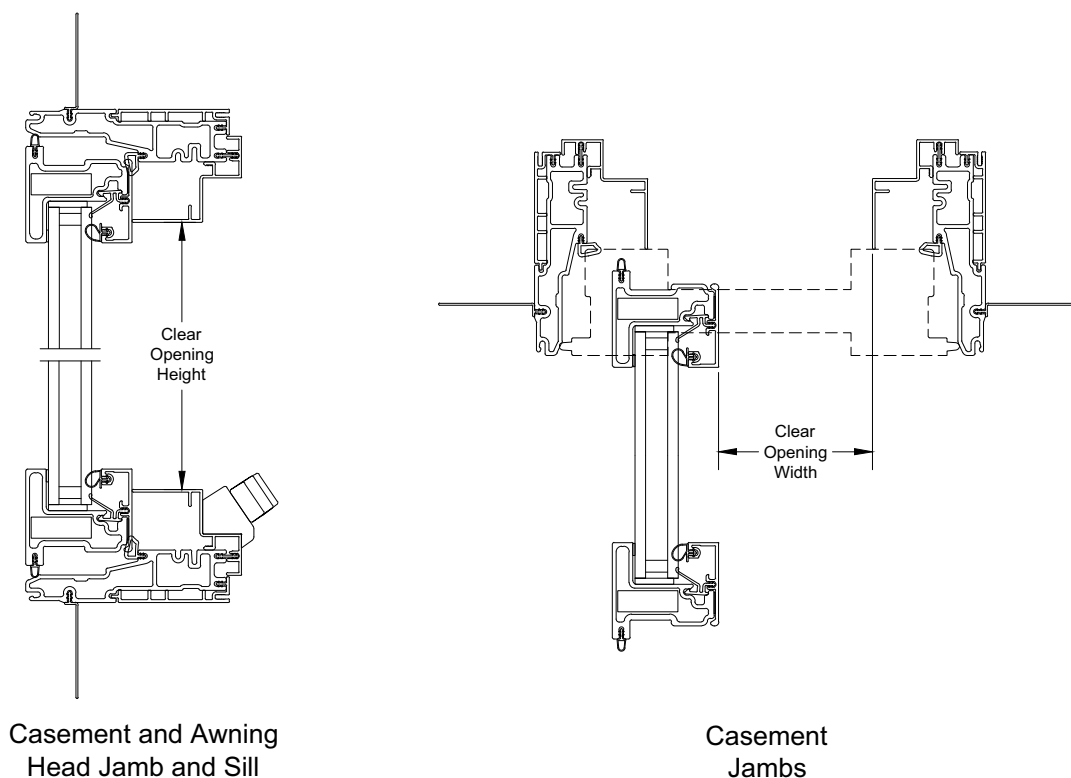
Minimum Dimensions: The minimum net clear opening height dimension shall be 24 inches (610). The minimum net clear opening width dimension shall be 20 inches (508). The net clear opening dimensions shall be the result of normal operation of the opening.

Maximum Height from Floor: Emergency escape and rescue openings shall have the bottom of the clear opening not greater than 44 inches (1118) measured from the floor.

Operational Constraints: Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys or tools. The 2018 code added the following sentence - window-opening control devices complying with ASTM F2090 shall be permitted for use on windows serving as a required emergency escape and rescue opening.

Code restrictions may vary depending on your local building code.

NOTE: Net Clear Opening drawing is located in individual chapter with measurement conversions. MCA sample below.



WDMA Hallmark Certification Program

www.wdma.com

Marvin Windows and Doors is a member of the Window and Door Manufacturers Association (WDMA) and uses their Hallmark Certification program to certify products. Please refer to product chapters for specific Hallmark Certification information.

Any manufacturer who complies with standards set by the Window and Door Manufacturer's Association's standards is eligible to participate in the Hallmark Certification program. In order to participate, products must be tested and pass one of the performance rating levels as defined in the applicable standard. In order for WDMA to ensure those manufacturers' products remain in continuing compliance; unannounced periodic in-plant inspections are conducted. Following this process authorizes the manufacturer to label the products as certified and gives the consumer and specifiers assurance that purchased products comply with industry standards.

Standard Requirements	
North American Fenestration Standard/Specification for windows, doors, and skylights	AAMA/WDMA/CSA 101/I.S.2/A440, NAFSa

Industry and Federal Performance Standards

Marvin products have been tested and passed the following applicable test procedures referenced by WDMA, AAMA, IGCC, IGMA, SMA and CMBSO.

AAMA 2603	Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels
AAMA 2605	Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels
WDMA I.S.2	Industry Standard for Water-Repellent Preservative Treatment of Millwork
WDMA TM-14	Test Methods for Factory Applied and Pigmented Interior Pre-finished Wood and Wood Cellulose Composites Used for Millwork
ANSI A 201-2	Specification for Aluminum Sliding Screen Doors; SMA 2005
ASTM C1036	Standard Specification for Flat Glass
ASTM D3310	Standard Specification for Adhesives Used in Non-Structural Glued Lumber Products
ASTM E90	Laboratory Measurement of Airborne Sound Transmission of Building Partitions
ASTM E283	Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors
ASTM E330	Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Differences
ASTM E331	Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Differences
ASTM E413	Determination of Sound Transmission Class
ASTM E547	Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Differences
ASTM E1300	Standard Practice for Determining the Load Resistance of Glass in Buildings
ASTM E1886	Standard Test Method for Performance of Exterior Windows, Curtains Walls, Doors, and Impact Protective Systems. Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
ASTM E1996	Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact. Protective Systems Impacted by Windborne Debris in Hurricanes
ASTM E2068	Standard Test Method for Determination of Operating Force of Sliding Windows and Doors
ASTM E2190	Standard Specification for Insulating Glass Unit Performance and Evaluation
ASTM E1425	Standard Practice for Determining the Acoustical Performance of Windows, Doors, Skylight, and Glazed Wall Systems
ASTM F588	Standard Test Method for Resistance of Window Assemblies to Forced Entry
ASTM F842	Standard Entry Method for Measurements of Forced Entry Resistance of Horizontal Sliding Door Assemblies
ASTM F2090	Standard Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms
SMA 1004	Specification for Aluminum Tubular Frame Screen for Windows
AAMA/WDMA/CSA 101/I.S. 2/A440	NAFS - North American Fenestration Standard/Specification for windows, doors, and skylights
ANSI/NFRC 100	Procedure for Determining Fenestration Product Thermal Attributes

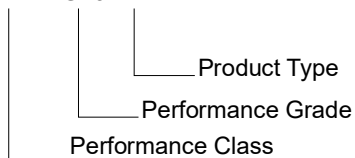
Product Rating Codes / Performance Classes

<u>Product Type</u>		<u>Performance Class and Grade</u>
AP = Awning, Hopper, Projected Window	POW = Parallel Opening Window	R = Residential
C = Casement Windows	SD = Sliding Door	LC = Light Commercial
DAW = Dual Action Windows	SGD = Sliding Glass Doors	CW=Commercial
DASHD = Dual Action Side-Hinges Door	SHD = Side-Hinged Door	AW =Architectural
FD = Fixed Door	SHW = Side-Hinges (inswinging) window	
FW = Fixed Windows	SLT = Side Lite	
H = Hung Windows	SP = Specialty Product	
HGD = Hinged Glass Doors	SSP = Secondary Storm Product	
HP = Horizontally Pivoted Window	TH = Top-Hinged Window	
HS = Horizontal Sliding Windows	VP = Vertical Pivoted Window	
LW DASHD = Limited Water Dual Action Side Hinged Door	VS = Vertical Sliding Window	
MA = Mullion Assembly		

Product Rating Code

Example

LC - PG25 - H



Product Rating Codes / Performance Classes/Design Pressure Ratings

Performance Classes (‘08, ‘11, ‘17 Standards)	(psf) Min. DP	(psf) Struct. Press.	(psf) Water Press.	(cfm/ft ²) Max. Air. Inf.
R = Residential	15	22.56	2.92	0.3 (1.57 psf)
LC = Light Commercial	25	37.59	3.76	0.3 (1.57 psf)
CW = Commercial	30	45.11	4.59	0.3 (1.57 psf)
AW = Architectural	40	60.15	7.95	0.1 or 0.3 (6.27 psf)
Metric	(Pa)	(Pa)	(Pa)	(L/s/m ²)
R = Residential	720	1080	140	1.5 (75 Pa)
LC = Light Commercial	1200	1800	180	1.5 (75 Pa)
CW = Commercial	1440	2160	220	1.5 (75 Pa)
AW = Architectural	1920	2880	380	0.5 or 1.5 (300 Pa)

NOTE: AAMA/WDMA chose to establish 2.86 psf as the minimum air pressure used during water testing although it is greater than 15% of the design pressure at DP15.

Performance Grade					
Performance Grade	PG15	PG20	PG25	PG30	PG35
Design Pressure (DP) (psf)	15.04	20.05	25.06	30.08	35.09
Structural Test Pressure (STP) (psf)	22.56	30.08	37.59	45.11	52.63
Water penetration resistance test pressure (psf)	2.92	3.13	3.76	4.59	5.43
Performance Grade	PG40	PG45	PG50	PG55	PG60
Design Pressure (DP) (psf)	40.10	45.11	50.13	55.14	60.15
Structural Test Pressure (STP) (psf)	60.15	67.67	75.19	82.71	90.23
Water penetration resistance test pressure (psf)	6.06	6.89	7.52	8.35	9.19
Metric Performance Grade					
Metric Performance Grade	PG15	PG20	PG25	PG30	PG35
Design Pressure (DP) (Pa)	720	960	1,200	1,440	1,680
Structural Test Pressure (STP) (Pa)	1,080	1,440	1,800	2,160	2,520
Water penetration resistance test pressure (Pa)	140	150	180	220	260
Metric Performance Grade	PG40	PG45	PG50	PG55	PG60
Design Pressure (DP) (Pa)	1,920	2,160	2,400	2,640	2,880
Structural Test Pressure (STP) (Pa)	2,880	3,240	3,600	3,960	4,320
Water penetration resistance test pressure (Pa)	290	330	360	400	440

STC and OITC Class Values

Marvin Sound Transmission Class and Outdoor - Indoor Transmission Class Values							
Product Type	Exterior Glazing	Airspace	Interior Glazing	STC	OITC	Additional Information	STC Report #
Modern Casement							
MCA	3/16" (4.7) Annealed	7/16" (11.5)	1/4" (6.0) Lami	33	28		ESP034773P-1
MCA	5/32" (3.9) Annealed	19/32" (14.5)	5/32" (3.9) Annealed	31	24		ESP040134P-1
MCA Picture	1/4" (5.7) Annealed	1/2" (13)	7/16" (11.7) Lami	37	2		ESP034773P-3
Modern Direct Glaze							
MDG	3/16" (4.7) Annealed	7/16" (11.5)	1/4" (6.0) Lami	35	32		ESP031885P-2
MDG	5/32" (3.9) Annealed	19/32" (14.5)	5/32" (3.9) Annealed	29	24		ESP040134P-2
MDG	1/4" (5.7) Annealed	1/2" (13)	7/16" (11.7) Lami	37	33		ESP034773P-2
MDG	5/16" (8.0)	11/16" (17.5)	17/32" (13.6) Lami	38	34		ESP035565P-2
MDG	5/16" (8.0)	3/8" (9.8)	1/4" (5.7) Annealed	38	32	Tri-pane: two 3/8" air spaces w/ 1/4" Lami center pane,	ESP037029P-1
MDG	1/4" (5.7) Annealed	7/16" (11.5)	1/4" (5.7) Annealed	35	29	Tri-pane: two 7/16" air spaces w/ 1/8" center pane, 1/8" Clad Storm Comb	ESP040649P-1
Modern Multi-Slide Door							
MMSD	3/16" (4.7) Annealed	7/16" (11.5)	1/4" (6.0) Lami	32	28		ESP031885P-1
MMSD	5/32" (3.9) Annealed	19/32" (14.5)	5/32" (3.9) Annealed	29	25		ESP040134P-3
MMSD	1/4" (5.7) Annealed	1/2" (13)	7/16" (11.7) Lami	35	31		ESP034773P-4
Modern Inswing/Outswing Door							
MID/MOD	3/16" (4.7) Annealed	7/16" (11.5)	1/4" (6.0) Lami	35	31	PVB	ESP039035P-3
MID/MOD	1/4" (5.7) Annealed	1/2" (13)	1/4" (6.0) Lami	38	32	PVB	ESP039035P-4
MID/MOD	1/8" (3.1) Annealed	5/8" (16.0)	5/8" (16.0)	30	25		ESP039035P-1
MID/MOD	1/4" (5.7) Annealed	7/16" (11.5)	9/32" (7.0) Lami	35	30	PVB	ESP039035P-2
MID/MOD	3/16" (4.7) Annealed	1/4" (6.0) Lami	1/8" (3.1) Annealed	34	28	PVB; Tri-pane: two 5/16" air spaces w/ 1/4" center pane,	ESP039035P-5
Modern Sliding Door							
MSD	3/16" (4.7) Annealed	7/16" (11.5)	1/4" (6.0) Lami	33	29	PVB	ESP042612P-3
MSD	5/32" (3.9) Annealed	19/32" (14.5)	5/32" (3.9) Annealed	30	24		ESP042612P-4
MSD	1/4" (5.7) Annealed	1/2" (13)	7/16" (11.7) Lami	35	31	PVB	ESP042612P-1
MSD	3/16" (4.7) Annealed	1/4" (6.0) Lami	3/16" (4.7) Annealed	33	27	PVB; Tri-pane: two 5/16" air spaces w/ 1/4" center pane,	ESP042612P-2

ENERGY STAR® Program - United States

www.energystar.gov

About ENERGY STAR®

ENERGY STAR® is a program of the U.S. Environmental Protection Agency helping us all save money and protect the environment through energy efficient products and practices.

Residential Windows, Doors and Skylights

Thanks to advances in technology, today's ENERGY STAR® certified windows, doors, and skylights offer greater savings than ever before. Just look for the ENERGY STAR® label.

Save energy and money.

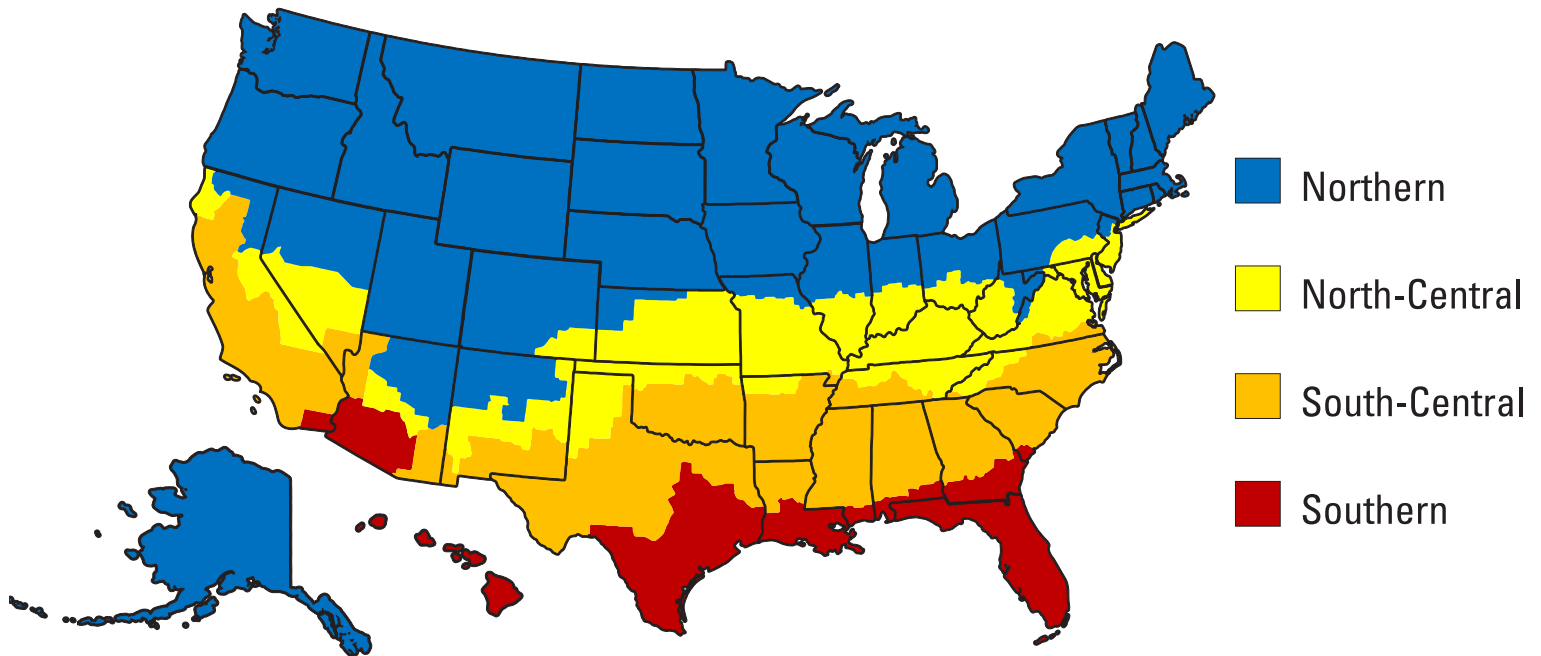
Replacing old windows with ENERGY STAR® certified windows lowers household energy bills by 7-15 percent. Lower energy consumption also reduces greenhouse gas emissions from power plants and shrinks a house's carbon footprint.

Current Specification Effective Date: October 23, 2023

As of October 23, 2023, ENERGY STAR® certified windows, doors, and skylights meet new performance levels, see below.

Windows and skylights must meet NFRC U-Factor and, where applicable, Solar Heat Gain Coefficient (SHGC) requirements based on climate zone. Doors must meet U-Factor and, where applicable, SHGC requirements based on glazing level (amount of glass).

At this time, many Marvin product lines are certified for the ENERGY STAR® program. For more specific information, please refer to the individual product sections in your Marvin catalog.



ENERGY STAR® Program - United States

www.energystar.gov

WINDOWS			
Climate Zone	U-Factor ¹	SHGC ²	
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	

Air Leakage ≤ 0.3 cfm/ft²

¹ Btu/h·ft²·°F

² Solar Heat Gain Coefficient

DOORS			
Glazing Level	Climate Zone	U-Factor ¹	SHGC ²
Opaque	All Zones	≤ 0.17	No Rating
≤ ½-Lite	All Zones	≤ 0.23	≤ 0.23
> ½-Lite	Northern	≤ 0.26	≤ 0.40
	North-Central		
	South-Central	≤ 0.28	≤ 0.23
	Southern		

Air Leakage for Sliding Doors ≤ 0.3 cfm/ft²

Air Leakage for Swinging Doors ≤ 0.5 cfm/ft²

¹ Btu/h·ft²·°F

² Solar Heat Gain Coefficient

ENERGY STAR® Most Efficient - United States

The ENERGY STAR® Most Efficient mark is an extension of the ENERGY STAR® brand and is designed to recognize and advance the most efficient products among those that qualify for ENERGY STAR®. This recognition is for specific categories and awarded for a specific year.

Marvin has long been a leader in providing our customers with energy efficient options. We are pleased to announce that Marvin meets the US ENERGY STAR® Most Efficient criteria with over 40 product types and 27,000+ glazing options.

MOST EFFICIENT CRITERIA

Climate Zone	U-factor	SHGC
Northern	≤ 0.20	≥ 0.20
North-Central	≤ 0.20	≤ 0.40
South-Central	≤ 0.20	≤ 0.23
Southern	≤ 0.21 $= 0.22$	≤ 0.23 ≤ 0.21

As more product and glazing options are certified throughout the year, additional qualifying options will become available. The EPA has set up a page on its website where consumers can go to find all of the Marvin options that meet the Most efficient criteria.

To view the latest listing of Most Efficient-qualifying products, click [here](#).



ENERGY STAR® Program - Canada

This technical specification determines how residential windows, doors, and skylights sold in Canada are certified for the ENERGY STAR® program. This specification is issued by Natural Resources Canada (NRCAN). NRCAN has been authorized by the U.S. Environmental Protection Agency (EPA) to promote and administer the ENERGY STAR name and symbol in Canada. A product must meet this specification in order to be promoted as ENERGY STAR certified in Canada by its manufacturer or authorized agent. Manufacturers must also sign a Fenestration Administrative Arrangement with NRCAN.

Performance metrics

U-Factor: The heat transfer per time per area and per degree of temperature difference in $W/m^2 \cdot K$ ($Btu/h \cdot ft^2 \cdot ^\circ F$). The U-factor multiplied by the interior-exterior temperature difference and by the projected fenestration product area yields the total heat transfer through the fenestration product due to conduction, convection, and long-wave infra-red radiation. A U-factor in $Btu/h \cdot ft^2 \cdot ^\circ F$ multiplied by 5.678263 converts the value to $W/m^2 \cdot K$. The U-factor in $Btu/h \cdot ft^2 \cdot ^\circ F$ shall conform with Table 1 before the conversion to $W/m^2 \cdot K$.

Solar heat gain coefficient (SHGC): The ratio of the solar heat gain entering the space through the fenestration product to the incident solar radiation.

Air leakage: the flow of air that passes through fenestration products in $L/s \cdot m^2$. Air leakage infiltration is the flow of air into the building envelope and exfiltration is the flow of air out of the building envelope. An air leakage in cfm/ft^2 multiplied by 5.08 converts the value to $L/s \cdot m^2$. The air leakage value in cfm/ft^2 shall conform with Table 1 before the conversion to $L/s \cdot m^2$.

Energy rating (ER): a unitless value derived from a formula that balances heat loss (U-factor), air leakage loss and potential passive solar gain of a fenestration product. The ER is applied to fenestration systems intended to be installed in a vertical orientation in low-rise residential buildings. The simplified ER equation is as follows:

$$ER = (57.76 \times SHGC_w) - (21.90 \times U_w) - (1.97 \times L_{75}) + 40 \text{ where}$$

i. $SHGC_w$ = fenestration system solar heat gain coefficient

ii. U_w = fenestration system U-factor (W/m^2)

iii. L_{75} = fenestration system air leakage rate at a pressure difference of 75 Pa, established in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 (North American Fenestration Standard) in $L/s \cdot m^2$. The L_{75} shall be the average of the infiltration and exfiltration measurements.

A complete explanation of the ER equation may be found in the CSA A440.2 Standard.

U-factor Criteria for Residential Windows and Doors

Product	Maximum U-factor $W/m^2 \cdot K$	Maximum U-factor $Btu/h \cdot ft^2 \cdot ^\circ F$
Windows and Doors	1.22	0.21

Alternate ER Criteria for Residential Windows and Doors

Product	Minimum ER (unitless)
Windows and Doors	34

U-factor Criteria for Unit Skylights

Product	Maximum U-factor $W/m^2 \cdot K$	Maximum U-factor $Btu/h \cdot ft^2 \cdot ^\circ F$
Skylights	2.29	0.40

Air Leakage requirements: Fenestration models must have an air infiltration rate and an air exfiltration rate less than or equal to 1.5 $L/s \cdot m^2$.

Marvin options that meet the ENERGY STAR Canada criteria can be viewed in the NRCAN listing for [NRCAN ENERGY STAR Searchable Product List](#).

ENERGY STAR® Most Efficient - Canada**Most Efficient criteria for windows and sliding glass doors 2023**

The window or sliding glass door must:

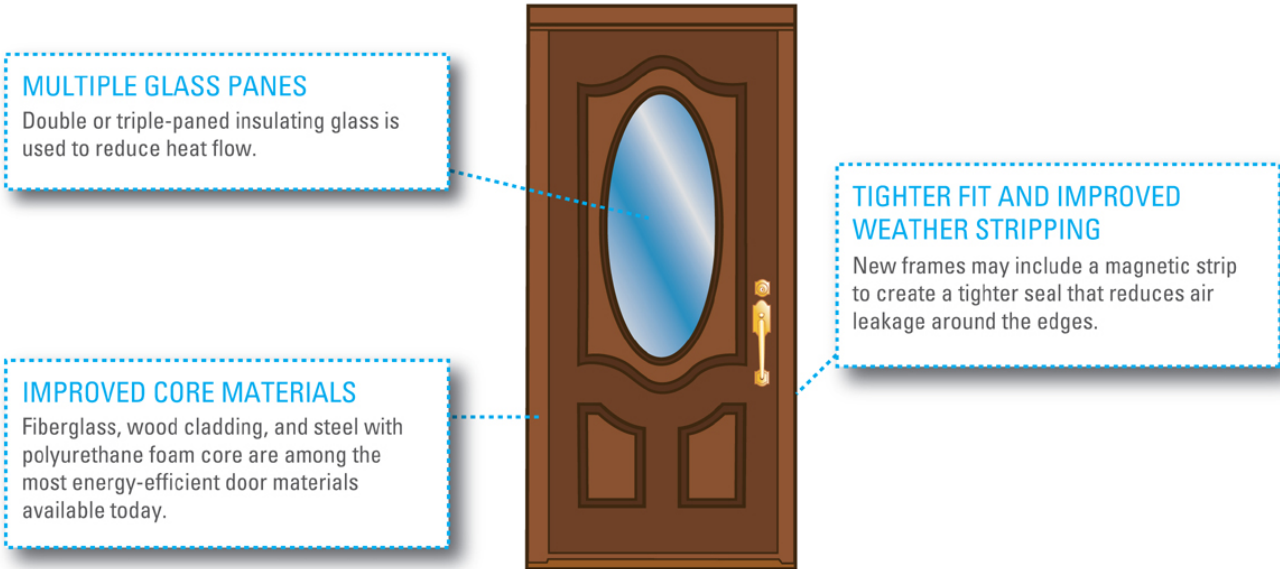
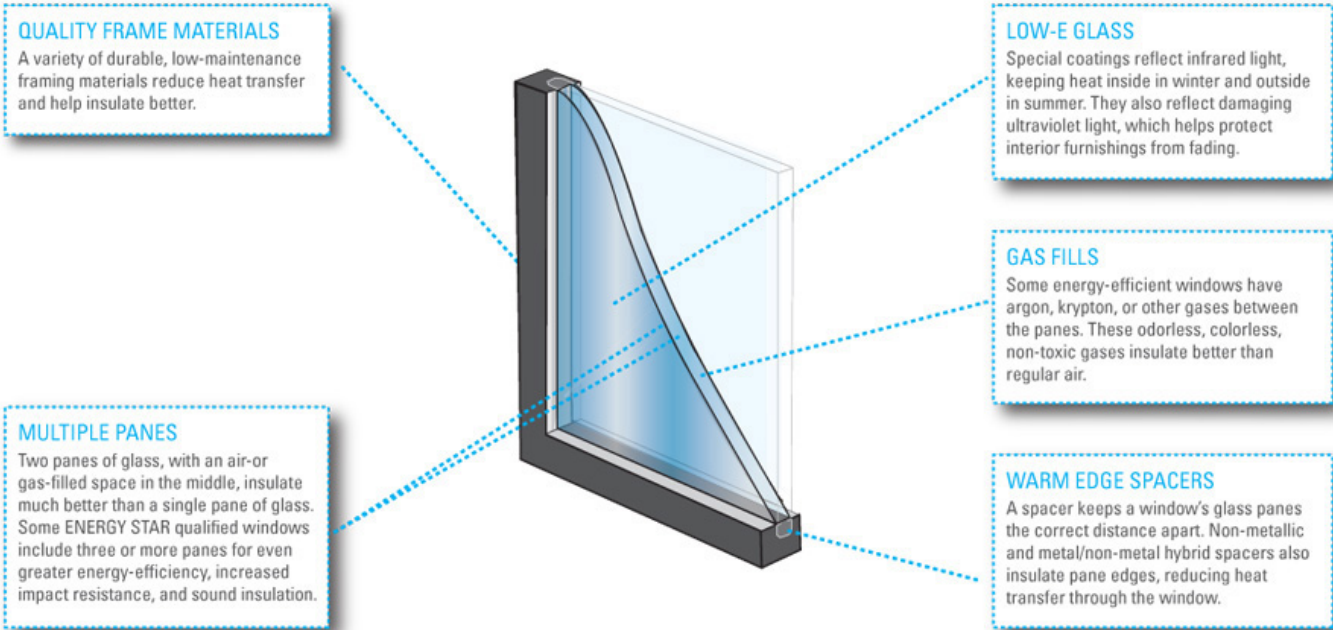
- be manufactured by an ENERGY STAR Canada Participant
 - be sold in Canada, registered with NRCan as ENERGY STAR certified and posted on the Canada/NRCan website
 - meet the labeling section of the *Requirements for the labeling and promotion of ENERGY STAR certified fenestration products sold in Canada*.
 - meet the following specific criteria:
 - A U-factor of $1.05 \text{ W/m}^2\cdot\text{K}$ ($0.18 \text{ Btu/h}\cdot\text{ft}^2\cdot^\circ\text{F}$) or lower
- OR**
- An Energy Rating (ER) of 40 (unitless) or higher

Marvin options that meet the Most efficient criteria can be viewed in the NRCan listing for [NRCan Most Efficient Windows and Sliding Glass Doors](https://www.nrcan.gc.ca/energy/efficiency/energy-star/energy-star-certified-products/2023-most-efficient-windows-sliding-glass-doors).



ENERGY STAR® Program

Today, manufacturers use an array of technologies to make ENERGY STAR qualified windows.



NFRC Certification Program

Who is the NFRC?

The National Fenestration Rating Council (NFRC) is a non-profit public/private group of manufacturers, builders, designers, specifiers, code officials, utilities, regulators and consumers formed to establish a national energy performance rating system for fenestration products.

Sanctioned by the federal government under the Energy Policy Act of 1992, NFRC will, over the next several years, in addition to U-Factor (thermal transmission), rate other factors, including solar heat gain, optical properties, air infiltration and condensation resistance.

It is important to note that the NFRC is not setting minimum performance standards or mandating specific performance levels. NFRC has established a single rating system with a rigorous process for comparing product performance. By certifying and labeling their products in accordance with the NFRC program, manufacturers demonstrate their commitment to provide accurate energy performance information.

Whole Product Performance

NFRC ratings are based on “whole product performance”. Although a window, door, or skylight may have high performance glazing, its overall performance may be reduced by a poorly performing frame. Similarly, a very energy efficient frame may be wasted on ineffective glazing and sealing. Whole product performance helps builders and consumers compare products of different construction and attributes directly.

When reading a NFRC Label, it is important to remember that the U-Factor, SHGC, and VT, values represent the whole window, not the center-of-glass

NFRC Labeling

Certification and Labeling Process

Window and door manufacturers attempting to certify their fenestration products are required to have them evaluated by two different types of independent NFRC accredited laboratories.

1. The first type of laboratory is a computer simulation lab which evaluates a window or door's thermal efficiency by computer simulation programs. The computer program takes into account the product's frame and glazing system attributes and derives an overall product U-Factor.
2. The second type of laboratory is a physical testing laboratory which takes an actual product and evaluates it in a thermal chamber. The physical test lab will also derive an overall product U-Factor.

For additional regional information, please contact your local Marvin Windows and Doors representative.

WDMA

Building Categories and Design Factors

Design Wind Pressure (PSF) - ASCE 7 -05												
Location	Zone	Effective Wind Area (SF)	Basic Wind Speed V (MPH)									
			110		115		120		130		140	
Walls	4	10	+22	-24	+24	-26	+26	-28	+30	-33	+35	-38
		50	+20	-21	+21	-23	+23	-25	+27	-30	+32	-35
		500	+16	-18	+18	-20	+19	-22	+23	-25	+26	-29
			150		160		180		200			
		10	+41	-44	+46	-50	+58	-63	+72	-78		
		50	+36	-40	+41	-45	+52	-57	+64	-71		
		500	+30	-34	+34	-38	+44	-48	+54	-60		
Walls	5		110		115		120		130		140	
		10	+22	-29	+24	-32	+26	-35	+30	-41	+35	-47
		50	+20	-25	+21	-27	+23	-29	+27	-34	+32	-40
		500	+16	-18	+18	-20	+19	-22	+23	-25	+26	-29
			150		160		180		200			
		10	+41	-54	+46	-62	+58	-78	+72	-96		
		50	+36	-46	+41	-52	+52	-66	+64	-81		
		500	+30	-34	+34	-38	+44	-48	+54	-60		

Metric Conversions: 1 PSF = 47.9 pascals

1 SF = 0.0929 SM

1 MPH = 0.447 M/S

NOTE:

- Design wind pressures above represent the net pressure (sum of external and internal pressures) applied normal to all surfaces.
- Values shown are for exposure B. For other exposures, multiply values shown by the following factor: exposure C: 1.40 and exposure D: 1.66
- Linear interpolation between values of tributary area is permissible.
- Values shown are for an importance factor I = 1.0. For other values of I, multiply values shown by I.
- Plus and minus signs signify pressure acting toward and away from the exterior surface, respectively.
- All component and cladding elements shall be designed for both positive and negative pressures shown in the table.
- Notation:
 - 10% of least horizontal dimension or 0.4 h, whichever is smaller, but not less than 40% of least horizontal dimension or 3 ft.
 - Mean roof height in feet (meters).

BUILDING WIND LOADS

"The information presented is provided to simplify the determination of structural wind load requirements of ASCE 7-05. ASCE 7-05 may not have local precedence. Please refer to your local codes for design pressures that apply to your area."

ASCE 7-05 Design wind load tables are based on the following:

- Wind loads tables are based on Exposure B.
- Tributary area of the structural elements is less than or equal to 10 sq. ft.
- Does not apply to roof areas.
- Roof slope is greater than 10 degrees.
- Building is less than or equal to 30 feet tall.
- The building is completely enclosed, all windows and doors are designed to withstand full wind load.
- Applicable to components and cladding, which include windows and doors.

If the tributary area is greater than 10 sq. ft. or if the roof slope is less than 10 degrees, the design wind loads from this table may be conservative. However, if the building has openings in the elevation which may allow wind to pass through, the design values in the tables may be too low. For these cases, ASCE 7-05 should be consulted.

NOTE: Windows and doors designed to resist wind loading are not considered openings.

Building Categories and Design Factors**EXPOSURES**

Exposure B: Urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions having the size of single family dwellings or larger. For buildings with a mean roof height of less than or equal to 30ft (9.1m). Exposure B shall apply where the ground surface roughness, as defined by Surface Roughness B, prevails in the upwind direction for a distance greater than 1,500ft (457m). For buildings with a mean roof height greater than 30ft (9.1m), Exposure B shall apply where Surface Roughness B prevails in the upwind direction for a distance greater than 2,600ft (792m) or 20 times the height of the building, whichever is greater.

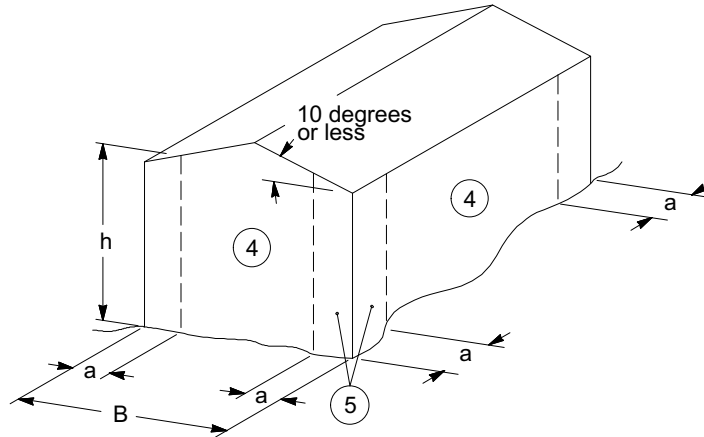
Exposure C: Open terrain with scattered obstructions having heights generally less than 30 ft. (9.1 m). This category includes flat open country, grasslands. Shall apply for all cases where Exposures B or D do not apply.

Exposure D: Flat, unobstructed areas and water surfaces. This category includes smooth mud flats, salt flats, and unbroken ice. Shall apply where the ground surface roughness, as defined by Surface Roughness D, prevails in the upwind direction for a distance greater than 5,000ft (1,524m) or 20 times the building height, whichever is greater. Exposure D shall also apply where the ground surface roughness immediately upwind of the site is B or C, and the site is within a distance of 600ft (183m) or 20 times the building height, whichever is greater, from the Exposure D condition as defined in the previous sentence. For a site located in the transition zone between exposure categories, the category resulting in the largest wind forces shall be used.

INSTRUCTIONS:

- Determine the Basic Wind Speed (V) in mph from Design Wind Load Table based on the location of the building.
- Determine the Roof Height (h) of the building in feet. This is the mean height of the roof above the lowest grade adjacent to the building. Eave height may be used for roof slope of less than 10 degrees.
- Determine least width (B) of the building in feet. This is defined as the shortest distance between two parallel lines which contain the entire building floor plan.
- Determine high pressure outside corner loading zones (a) in feet from building illustration on following page. $a = (0.10) \times (B)$ or $a = (0.4) \times (h)$, whichever is smaller, but not less than either $(0.04) \times (B)$ or 3 feet (76).
- Determine design pressure from Design Pressure Table.
- All design pressure values are assumed for buildings with an importance Factor Category of II. See Design Factors chart on following page.
- If category III, IV is more appropriate then multiply the design pressure by the corresponding Design Factor - See Design Factor chart.

Building Categories and Design Factors



RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure. • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV
III	• Buildings and other structures that represent a substantial hazard to human life in the event of failure, such as, schools, colleges, large day care facilities, resident care recipients but not having surgery or emergency treatment facilities. • Any other occupancy with an occupant load greater than 5,000. • Power-generating stations, water treatment facilities for potable water, waste water treatment facilities, other public utility facilities, buildings and other structures containing quantities of toxic or explosive materials that exceed maximum allowable quantities per control area.
IV	Buildings and other structures designated as essential facilities, such as, hospitals, surgery or emergency facilities. • Fire, rescue, ambulance and police stations and emergency vehicle garages. • Designated earthquake, hurricane or other emergency shelters, emergency preparedness, communications and operations centers and other facilities required for emergency response. • Power-generating stations, public utility facilities required as emergency backup facilities. • Buildings/structures containing quantities of highly toxic materials. • Aviation control towers, air traffic control centers and emergency aircraft hangars. • Buildings and other structures having critical national defense functions. • Water storage facilities and pump structures required to maintain water pressure for fire suppression.

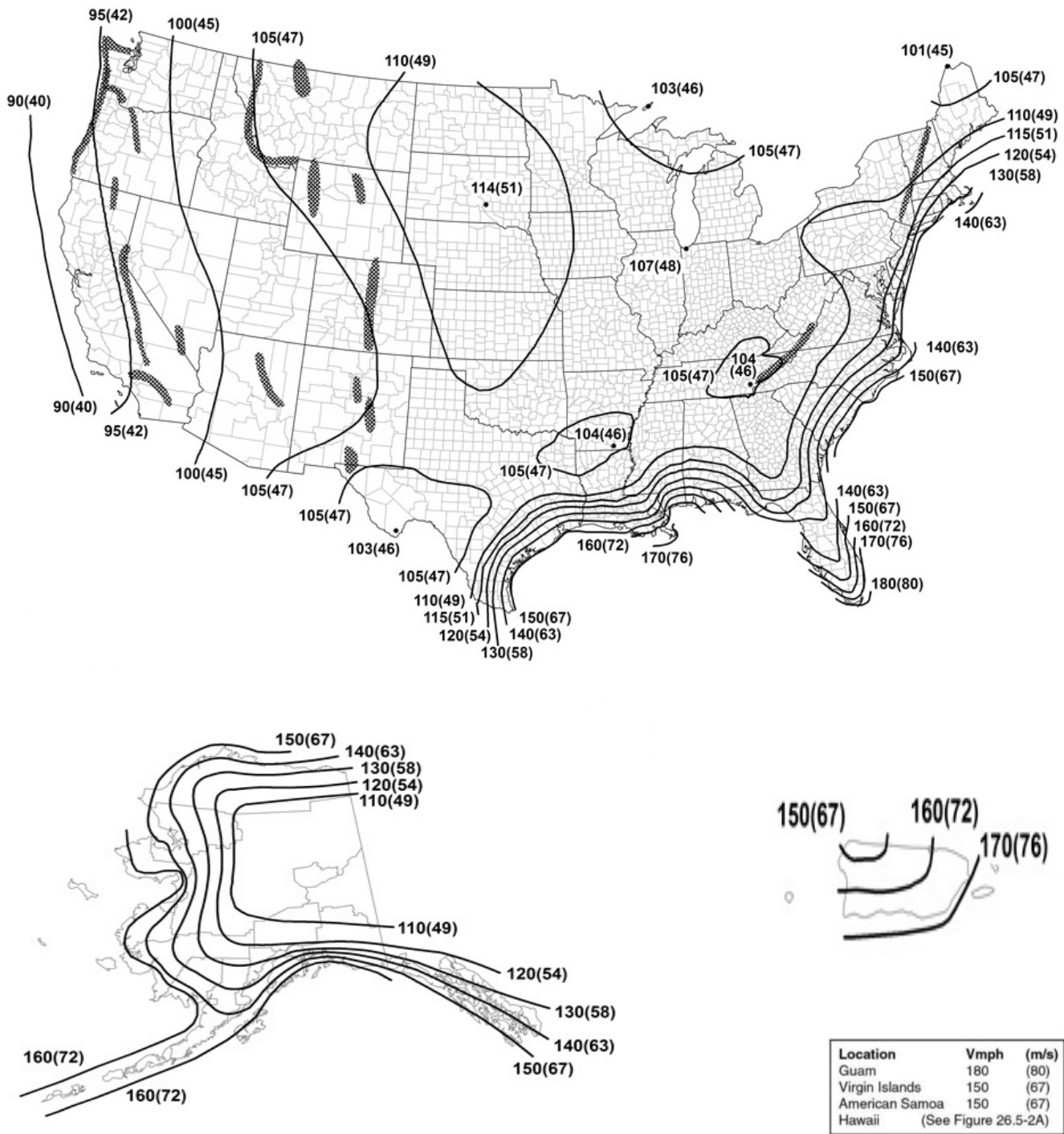
NOTE: This is an abbreviated version of the 2015 International Building Code (IBC) Table 1604.5. Please, check with your local building code official(s) for current requirements in your area.

Design Factors		
Category	Non-Hurricane prone regions and Hurricane prone regions with V = 85/100 mph and Alaska	Hurricane prone regions with V greater than 100 mph
I	0.87	0.77
II	1.00	1.00
III	1.15	1.15
IV	1.15	1.15

Wind Speed Map - ASCE 7-16

NOTES: Basic Wind Speeds for Occupancy Category II Buildings and Other Structures.

- Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33ft (10m) above ground for Exposure C category.
- Linear interpolation between contours is permitted.
- Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.
- Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.
- Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (Annual Exceedance Probability = 0.00143, MRI = 700 Years).



Altitude Guidance

Marvin provides Capillary Tube Usage Guidelines for all products, available upon request. Capillary tubes are also recommended in smaller lites or ADL units where one side of glass is less than 12" (305) in length at elevations of 3,000 feet or more above sea level. Partners who serve high altitude markets are expected to consult the Capillary Tube Usage Guidelines and make appropriate selections based on product size, installed altitude, and highest transportation altitude.