A photograph of a modern interior space, likely a lounge or office, featuring large, dark-framed windows that offer a view of a lush, green forest. The room has a wooden ceiling and walls, and is furnished with two brown leather chairs and a small table. The text "WINDOWS – CLEARLY A PANE..." is overlaid in the top left corner.

WINDOWS – CLEARLY A PANE...

# WINDOWS RESEARCH PRESENTATION

PRESENTED BY STEVEN DELUCA  
MARCH  
2015

FOR **WADE ENGINEERING LTD.**

# Window Frame Materials

Wood Windows	Aluminum Windows
<ul style="list-style-type: none"><li>▪ <b>Pros</b><ul style="list-style-type: none"><li>• Warm, Traditional and Aesthetically pleasing</li><li>• Good insulators</li><li>• Metal clad options</li></ul></li><li>▪ <b>Cons</b><ul style="list-style-type: none"><li>• Prone to rot</li><li>• Frequent paint cycles, touch-ups &amp; refurbishments</li></ul></li></ul>	<ul style="list-style-type: none"><li>▪ <b>Pros</b><ul style="list-style-type: none"><li>• Strong &amp; Durable</li><li>• Little to no maintenance/Will not rust</li><li>• Thermal-break for energy-efficiency (single and double available)</li></ul></li><li>▪ <b>Cons</b><ul style="list-style-type: none"><li>• Readily conducts heat &amp; cold (with no thermal break)</li><li>• Pricy</li></ul></li></ul>
PVC (uPVC) windows	Fibreglass Windows
<ul style="list-style-type: none"><li>▪ <b>Pros</b><ul style="list-style-type: none"><li>• Economical</li><li>• Excellent weathering resistance</li><li>• Looks new for years</li><li>• Aluminum clad options</li></ul></li><li>▪ <b>Cons</b><ul style="list-style-type: none"><li>• Differences in quality from one manufacturer to the other</li><li>• Only 2 color options</li></ul></li></ul>	<ul style="list-style-type: none"><li>▪ <b>Pros</b><ul style="list-style-type: none"><li>• Impervious to water, cold, heat, insects, salt air &amp; ultraviolet rays (better R-value)</li><li>• Won't crack from dryness</li><li>• Won't swell, peel or warp</li><li>• Can be painted and veneer finish can be added</li><li>• Different color options</li></ul></li><li>▪ <b>Cons</b><ul style="list-style-type: none"><li>• Pricy</li></ul></li></ul>

# Window: Types

Some of the commonly-used windows are:

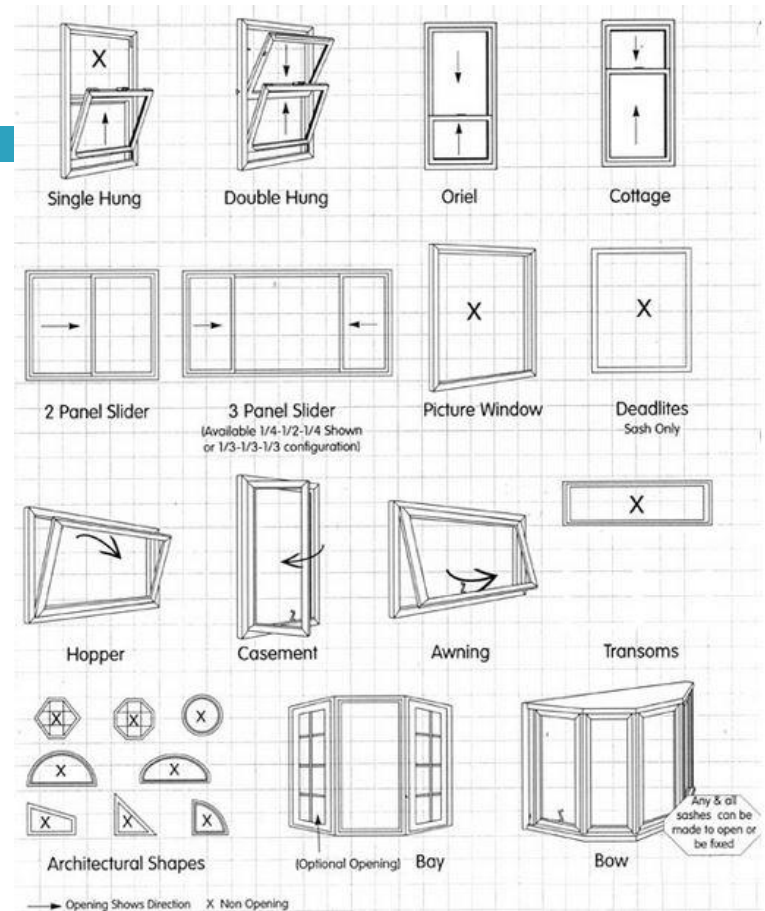
Slider – Horizontal and Vertical

Hopper

Awning

Bay w/ Optional opening

Single & Double Hung



# Types of Glass

- Float Glass
- Laminated Glass
- Wired Glass
- Polished Wired Glass
- Low- E Coated Glass
- Surface Treated Glass
- Tempered Glass
- Heat-Strengthened Glass
- Enameled & Silk screen printed
- Bent Glass
- Mirror Glass
- Insulating Glass
- Spandrel Glass

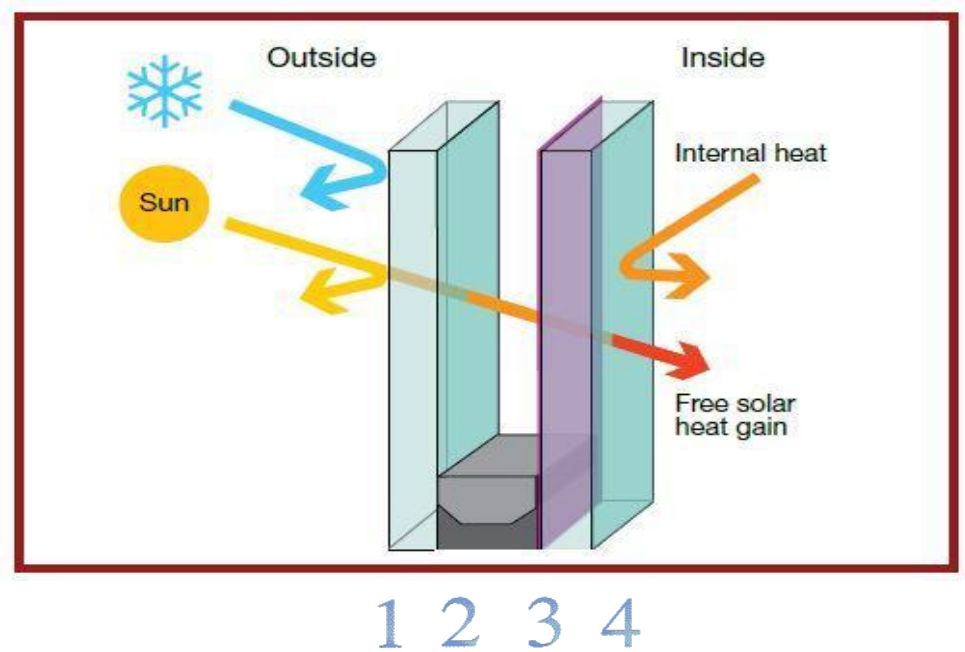
<b>Base Products</b>	Float glass (Annealed) – Patterned glass – Wired glass – Polished wired glass
<b>Processed Products</b>	Primary Processing Low-e coated glass – Surface treated glass (etched, sandblasted, etc.)
	Secondary Processing Tempered glass – Heat-strengthened glass – Laminated glass – Enameled and silk-screen printed glass – Bent glass – Mirror glass – Insulating glass – Spandrel glass

## Insulating Glass Unit (IGU)

Type	R-/value	SHGC
Single	1.0	.87
Double	2.0	.78
Double Low- E	2.9	.75
Double, Low-E, Gas Filled	3.7	.75
Triple	3.1	.70
Triple, Low-E, Gas Filled	6.0	.50

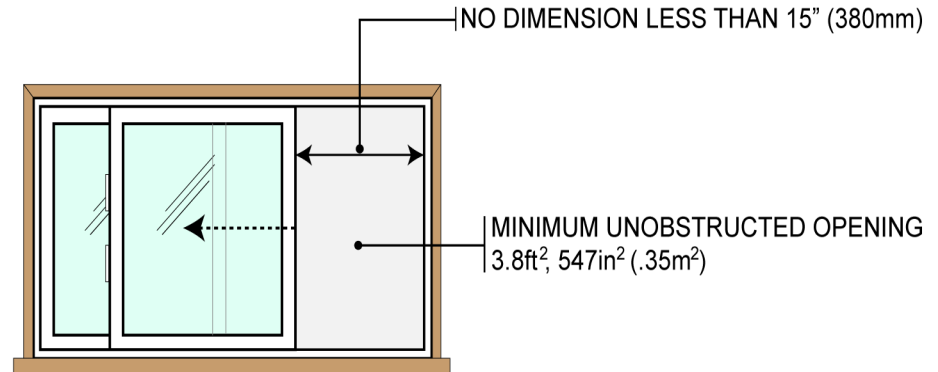
# Low-E Coatings

- Thin metal coating applied directly to the glass.
- Hard-coat
  - ▣ Applied during float line
- Soft-coat
  - ▣ Film applied to pre-cut glass
- Cold climates
  - ▣ Surface 3
- Hot climates
  - ▣ Surface 2



# Window: Emergency Egress

- Window referred to above shall provide unobstructed openings with areas not less than  $0.35 \text{ m}^2$  ( $3.8 \text{ ft}^2$ ), with no dimension less than 380 mm (15 in.).
- If the window referred above is provided with security bars, the security bars shall be installed so they may be opened from the inside without the use of any tools or special knowledge
- For buildings that are greater than 3 storeys, windows on the bottom floors do not need to meet egress but there must be at least two fire escapes via stairwells that are fire protected.



Windows that can be ACCEPTABLE	Windows that are generally UNACCEPTABLE
In-swing Awning	Hopper
Casement	Out-swing Awning
Horizontal or Vertical Slider	

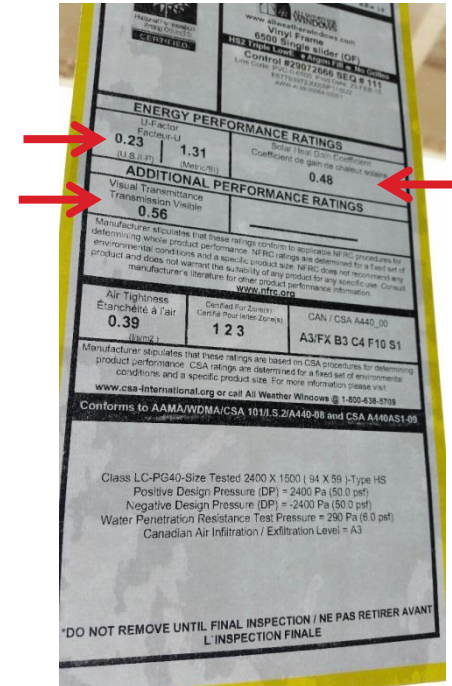
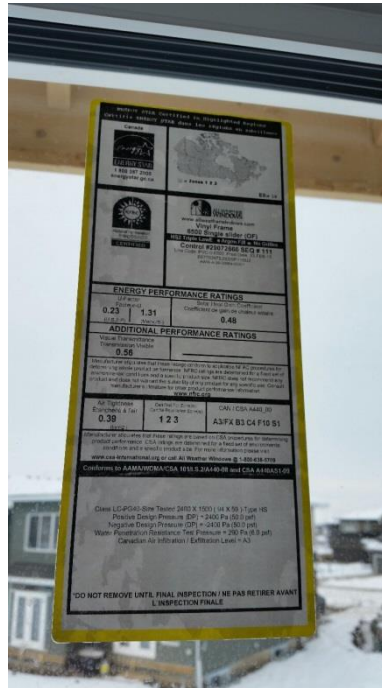
# Window: Energy Ratings

Ratings that must be displayed:

- **U- Value**
- **Visible Transmittance**
- **Solar Heat Gain Coefficient**

Optional (can be requested):

- Air Leakage
- Condensation Resistance
- Water Infiltration
- Structural Performance Ratings
- Acoustical Performance Ratings
- Security Performance Ratings



# Window: Performance & Selection

## LOCATION

Location	Column A		Column B	Column C		Column D
	Driven Rain Wind Pressure (DRWP), Pa, 1/5	Driven Rain Wind Pressure (DRWP), Pa, 1/10	Hourly Wind Pressure (HWP), kPa, 1/50	Snow Load, kPa, 1/50		January Design Temp. (JDT), °C, 2.5%
				Ground Snow Load, S <sub>s</sub>	Associated Rain Load, S <sub>r</sub>	
Edmonton	160	180	0.45	1.7	0.1	-32
Fort McMurray	60	80	0.35	1.4	0.1	-39
Grande Prairie	120	140	0.47	2.2	0.1	-36

Canadian Standard Association (CSA) A440 - 2009

### Performance Classes

**R:** commonly used in one- and two- family dwellings.

**LC:** commonly used in low-rise and mid-rise multi-family dwellings and other buildings where larger sizes and higher loading requirements are expected

**CW:** commonly used in low-rise and mid-rise buildings where larger sizes, higher loading requirements, limits on deflection, and heavy use are expected.

**AW:** commonly used in high-rise and mid-rise buildings to meet increased loading requirements and limits on deflection and in buildings where frequent and extreme use of fenestration product is expected.

Minimum performance grades (PG), design pressures (DP), uniform load structural test pressure (STP), and water penetration resistance test pressures for the four classes are listed beside the table →

Product Performance Class	Minimum Performance Grade (PG)	Minimum Design Pressure (DP), Pa (psf)	Minimum Structural Pressure (STP), Pa (psf)	Minimum Water Resistance Test Pressure, Pa (psf)
Windows and Doors				
R	15	720 (15.0)	1080 (22.5)	140 (2.90)
LC	25	1200 (25.0)	1800 (37.5)	180 (3.75)
CW	30	1440 (30.0)	2160 (45.0)	220 (4.50)
AW	40	1920 (40.0)	2880 (60.0)	390 (8.00)
Unit Skylights, Tubular Daylighting Devices and Roof Windows				
R	15	720 (15.0)	1440 (30.0)	140 (2.90)
CW	30	1440 (30.0)	2880 (60.0)	220 (4.5)

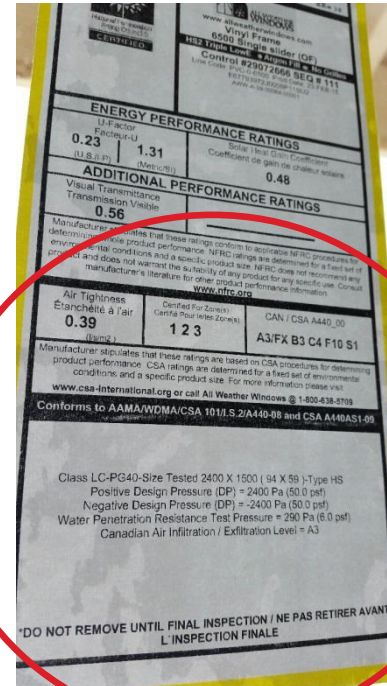
## PERFORMANCE GRADES





# Window: Performance & Selection

(continued)



# Window: Common Failure Points

- ❑ Faulty window hardware
- ❑ Drafty windows
  - ▣ Worn down weather-stripping
- ❑ Foggy Glass
  - ▣ Broken seal
  - ▣ Insufficient ventilation
  - ▣ High moisture levels
- ❑ Broken screen



# QUESTIONS AND DISCUSSION

