

# The Impact of Fenestration on the Building Envelope: A Window of Opportunity

Date: January 18<sup>th</sup>, 2017

Presented to: **CHBA Webinar**



## JELD-WEN

- Who we are?
- What we do?

## How we got here?

- From Super E to Net Zero
- CHBA & Building Knowledge

## The Study

- The Theory
- Window Optimization
- The Modeling

## The Results

- Impact of Fenestration on Building Envelope
- The Tool
- Choosing the right glass package
- Cost optimization – initial and operational



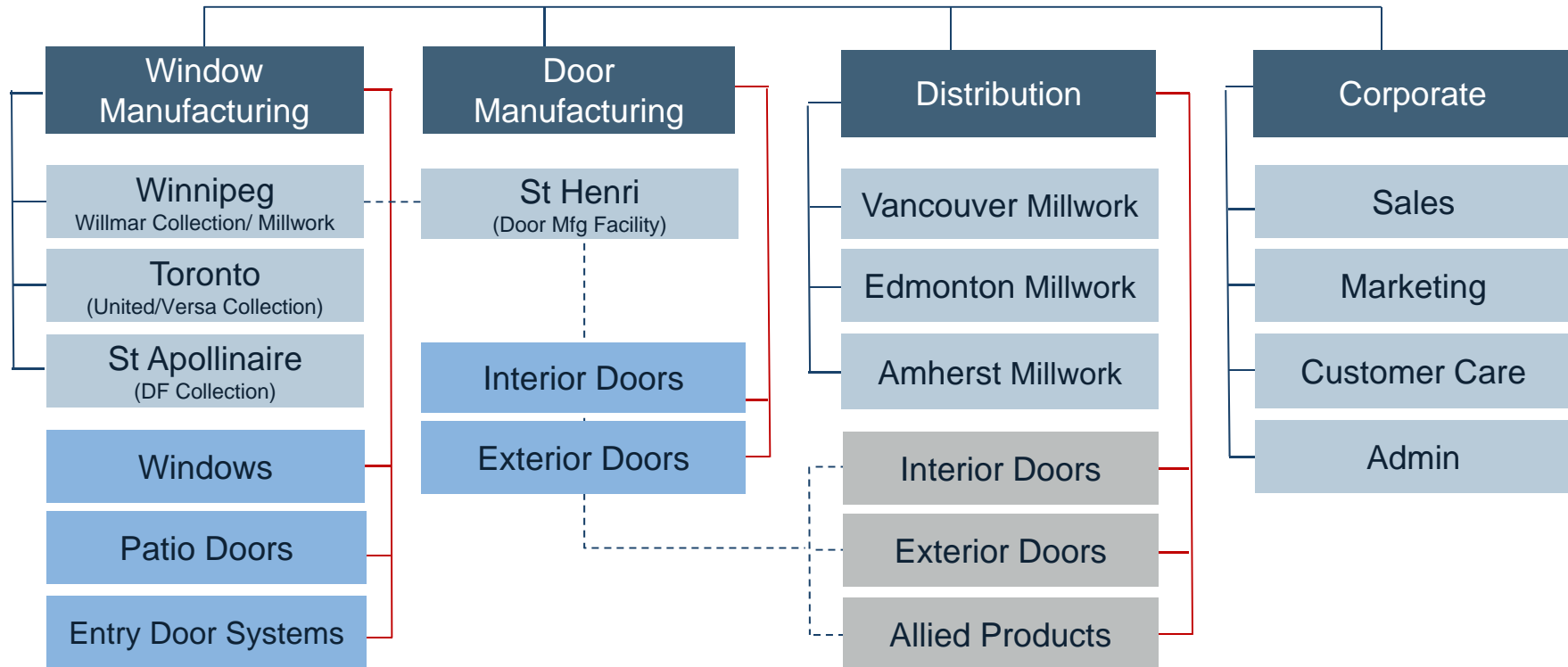
## Top 10 “Must Have” Home Features Overall

1. Walk-in closets
2. Energy efficient appliances
3. Overall energy efficient home
4. High-efficiency windows
5. Kitchen islands
6. Linen closets
7. Open concept kitchens
8. Large windows
9. 2-Car garage
10. Walk-in pantry











## Super E Housing program – early 2000's



Canada

CONTACT

Super E.com

est une nouvelle norme d'habitation  
des naturelles Canada (RNCan) qui a ses  
mes à très grand succès : la Norme R—  
de maisons performantes. Il utilise la  
construction qui favorise la conservation  
ion respectueuse de l'environnement, et

adiens à base scientifique, Ressources  
priété canadienne d'hypothèques et de  
anal de recherches Canada travaillent avec  
r d'habitation pour accélérer la recherche

Please choose your country



English - United Kingdom

Super E® is a Registered Trade Mark of Her Majesty the Queen in Right of Canada





## 2007 –CMHC Equilibrium Sustainable Housing



CMHC Equilibrium™ Sustainable Housing Demonstration Initiative: Project Profile—ÉcoTerra™

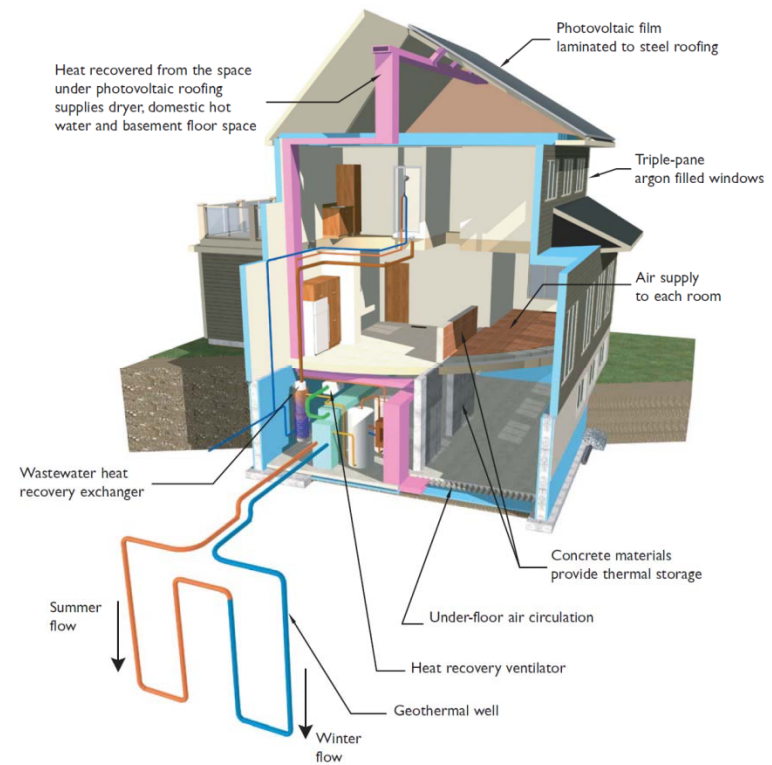


Figure 6—Cross-section of ÉcoTerra™, showing space and water heating technology





6<sup>th</sup> over all (19 teams)



## NRCan - Owens Corning EcoEnergy Innovation Initiative





**FOR IMMEDIATE RELEASE**  
 December 11, 2014

## CHBA ANNOUNCES MEMBERS OF NET ZERO ENERGY HOUSING COUNCIL

**An Action Plan for Net Zero Energy Housing in Canada Moves Forward**

**Ottawa, ON** – On December 9, 2014 the CHBA Board Executive Committee approved the 2015 members of the Association's Net Zero Energy Housing Council (NZC). The NZC supports innovation in our industry with the goal of creating a market advantage for builder and renovator members pursuing Net Zero Energy performance. The Council's work will help to meet the housing aspirations of Canadians, and renew Canadian leadership in high performance housing.

The CHBA is proud to recognize the Founding Members of the Net Zero Energy Housing Council:

**Management Committee Members**

Avalon Master Builder  
 Building Knowledge Canada  
 Coleman-Dias' Construction Inc.  
 Denim Homes Inc.  
 Habitat Studio  
 Insightful Healthy Homes Inc.  
 Landmark Group of Builders  
 Minto Group  
 RDC Fine Homes Inc.  
 Wrighthaven Homes Ltd.

**Sponsor Members**

Owens Corning Canada  
 All Weather Windows  
 Dettson Industries  
 Enbridge Gas Distribution  
 JELD-WEN of Canada

**General Members**

BASF Canada

BC Hydro  
 Canadian Wood Council  
 City of Calgary  
 Canadian Manufactured Housing Institute  
 Cosella-Dorken  
 Council of ICF Industries  
 EnerQuality  
 Icymene Inc.  
 Lafarge Eastern Canada  
 NAIMA Canada  
 Rheem Canada  
 Union Gas Limited  
 VELUX Canada Inc.

**Builder/Renovator Members**

Brookfield Residential  
 Corvinelli Homes Ltd.  
 Doug Tarry Homes  
 Effect Home Builders Ltd.  
 Naikoon Contracting Ltd.

North Ridge Development  
 Quiniscoe Homes Ltd.  
 Sean  
 Sloot Construction Ltd.  
 Sonbuilt Custom Homes Ltd.  
 Steve Snider Construction Inc.

**Academia Members**

Nova Scotia Community College  
 SAIT Polytechnic GBT Access Centre

**Ex-Officio Members**

CMHC  
 NRCan CanmetENERGY  
 NRCan OEE  
 CHBA Board/Executive Committee  
 CHBA Manufacturers' Council  
 CHBA Technical Research Committee  
 CHBA Canadian Renovators' Council  
 CHBA Professional Development Committee  
 CHBA National Marketing Committee

Consistent with the CHBA Strategic Priority to Advance Innovation, the mandate of this self-funding Council is to deliver services that will support members' voluntary adoption of Net Zero Energy (NZE) housing. Members were selected for their demonstrated competence and experience in NZE or R-2000 Housing as well as their knowledge or capability in specialized areas important to the advancement of NZE Housing.

**ABOUT**

Since 1943, the Canadian Home Builders' Association has been "the voice of Canada's residential construction industry"—one of the most vital and enterprising industries in Canada. Representing more than 8,500 member firms across Canada, CHBA members represent every part of Canada's housing industry - home builders, renovators, land developers, trade contractors, product and material manufacturers, building product suppliers, lending institutions, insurance providers, service professionals and others.

**CONTACT**

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###





**BRITISH COLUMBIA  
BUILDING ENVELOPE COUNCIL**



Home > **2011 BCBEC Conference & AGM**

## 2011 BCBEC Conference & AGM

### Building the Enclosure - Innovation and Transformation

**Wednesday, September 21st, 2011**  
**Fairmont Waterfront Hotel**  
**900 Canada Place Way**  
**Vancouver, BC**

This one-day conference by the BC Building Envelope Council will focus on emerging trends in building enclosure design, integrated energy efficient solutions, thermal performance and regulatory issues. National and local experts will share lessons learned on themes such as building enclosure impacts on the energy performance of new and retrofit buildings, design considerations for wood-frame buildings, air barrier testing and commissioning of large buildings, and reserve fund case studies.

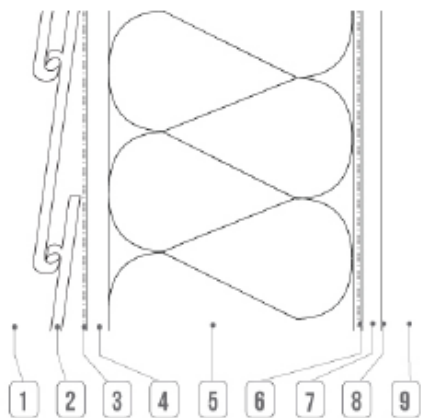
**2011 BCBEC Conference & AGM Information:**   
*(Updated August 16, 2011)*

**Conference Presentations:**

Energy Efficiency and the Future of Building Science	<b>John Straube</b> University of Waterloo, Building Science Corporation
Monitoring Results from 4 Equilibrium™ Projects - Lessons Learned to Date	<b>Allan Dobie</b> Canada Mortgage and Housing Corporation
Energy Impacts of Envelope Upgrades to Existing Houses Through LiveSmart BC	<b>Andrew Pape Salmon and Rylan Nowell</b> BC Ministry of Energy and Mines, Energy Efficiency Branch

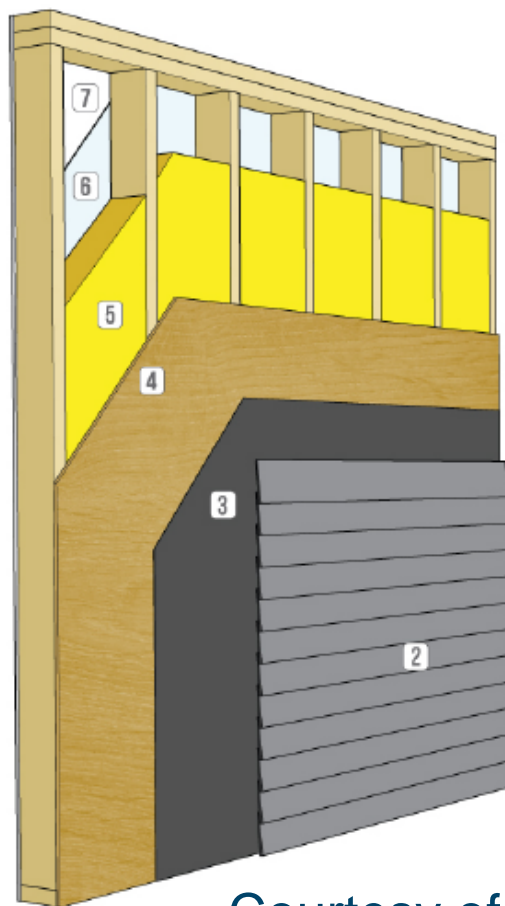
- Home
- Membership
- BCBEC Foundation
- Building Research Committee
- Seminars
- 2011 BCBEC Conference & AGM**
- Directors
- Links
- Contact Us





WALL ASSEMBLY COMPONENTS <sup>1</sup>		RSI	R
1	exterior air film	0.03	0.17
2	vinyl siding (no air space)	0.11	0.62
3	asphalt impregnated paper <sup>2</sup>	0.00	0.00
4	7/16" (11.1mm) OSB sheathing	0.11	0.62
5	2x6 framing filled with R22 batt @ 8" o.c.	2.44	13.85
6	polyethylene	0.00	0.00
7	1/2" (12.7mm) gypsum board	0.08	0.45
8	finish: 1 coat latex primer and latex paint	0.00	0.00
9	interior air film	0.12	0.68
Effective RSI / R Value of Entire Assembly		2.89	16.39
Centre of Cavity RSI / R Value		4.32	24.54
Installed Insulation RSI / R Value (nominal)		3.87	22.00
Effective RSI / R Value of Assembly with Advanced Framing (advanced framing as defined by NBC 9.36.2.4.(1))		3.00	17.02

Note: Values are for generic insulation products. Where a specific insulation product is used in the assembly, the thermal resistance value, or long term thermal resistance value, where applicable, of that product is permitted to be used as reported by the Canadian Construction Materials Centre (CCMC) in the evaluation of such a product. Sheathing membrane material must comply with CAN/CGSB-51.32, "Sheathing Membrane Breather Type."

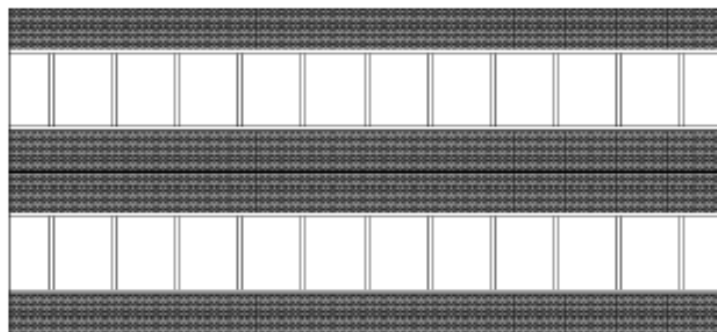


Courtesy of  
CWC

Reff = 16  
R nominal insulation is  
22



Reff = 3.8



**50% fenestration (R2)**

**50% wall (R20)**

**R3.6**

**Window:**

**R2**

**Wall:**

**R40**



**R<sub>eff</sub>:**

**R3.8**

**Window:**

**R4**

**Wall:**

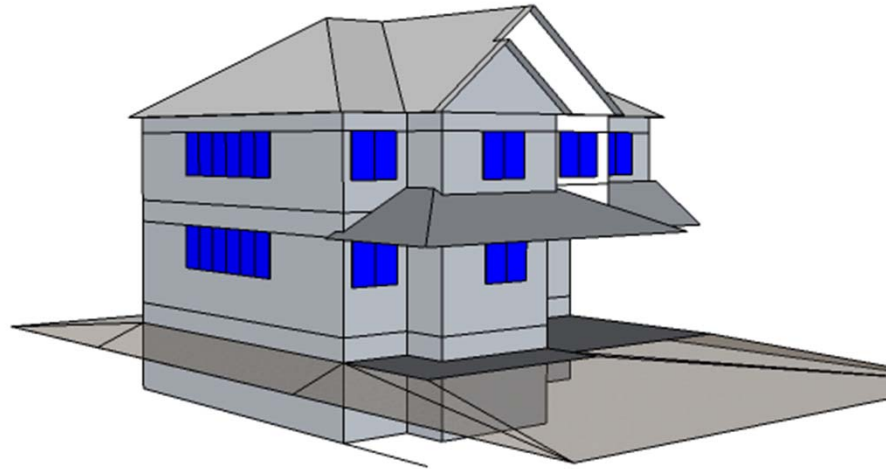
**R20**



**R<sub>eff</sub>:**

**R6.7**

Courtesy of CLEB



House as a system approach

1. How the WWR impacts overall total wall effective R Values  
(glazing plus opaque assemblies)
2. Builder benefits
3. Homeowner benefits



1. Occupant Satisfaction: Comfort,  
Health (Relative Humidity --  
Condensation ) Peace....
2. Energy Efficiency: New Codes,  
Net Zero and beyond
3. Cost: First Cost & Total Cost

1. Air Temperature(Ambient)
2. Surrounding Surface Temperature(MRT)
3. Humidity
4. Air movement-Drafts(Air Speed)
5. Occupant Activity AND Sensitivity(Metabolic Rate and Clothing )

ASHRAE 55....”Mean Radiant Temperature”

<http://comfort.cbe.berkeley.edu/>





## Zone 6-7:

1m from glass, patio door

“Acceptable” room side glass threshold temp= 57F or 14C

Single, metal frame:

- Winter: 3000+ hrs of discomfort
- Summer: 300+ hrs of discomfort

Double , insulated

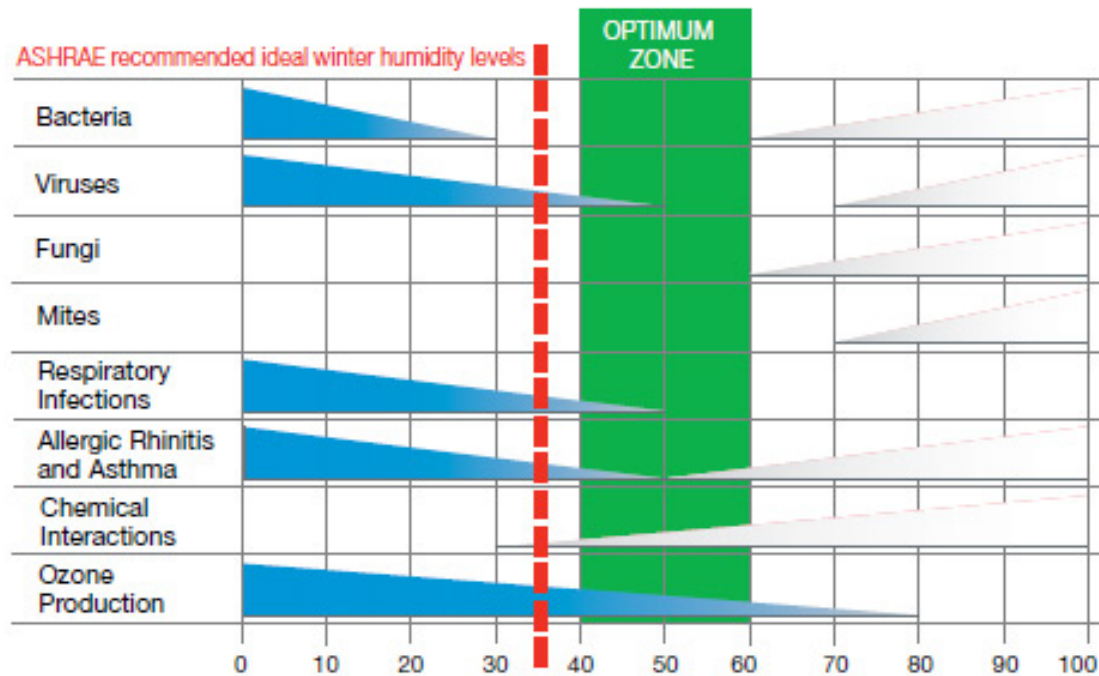
- Winter: 500+ hrs of discomfort
- Summer: 75+ hrs of discomfort

Triple: Low Solar:

- Winter: 0 hrs of discomfort
- Summer: 0hrs of discomfort



- Humidity Control is a critical element of EE homes and buildings.
- We spend more time indoors and produce more moisture with our current lifestyles
- One of the leading warranty calls dealt with by builders across N. America
- Optimum Relative Humidity levels are critical in homes and buildings

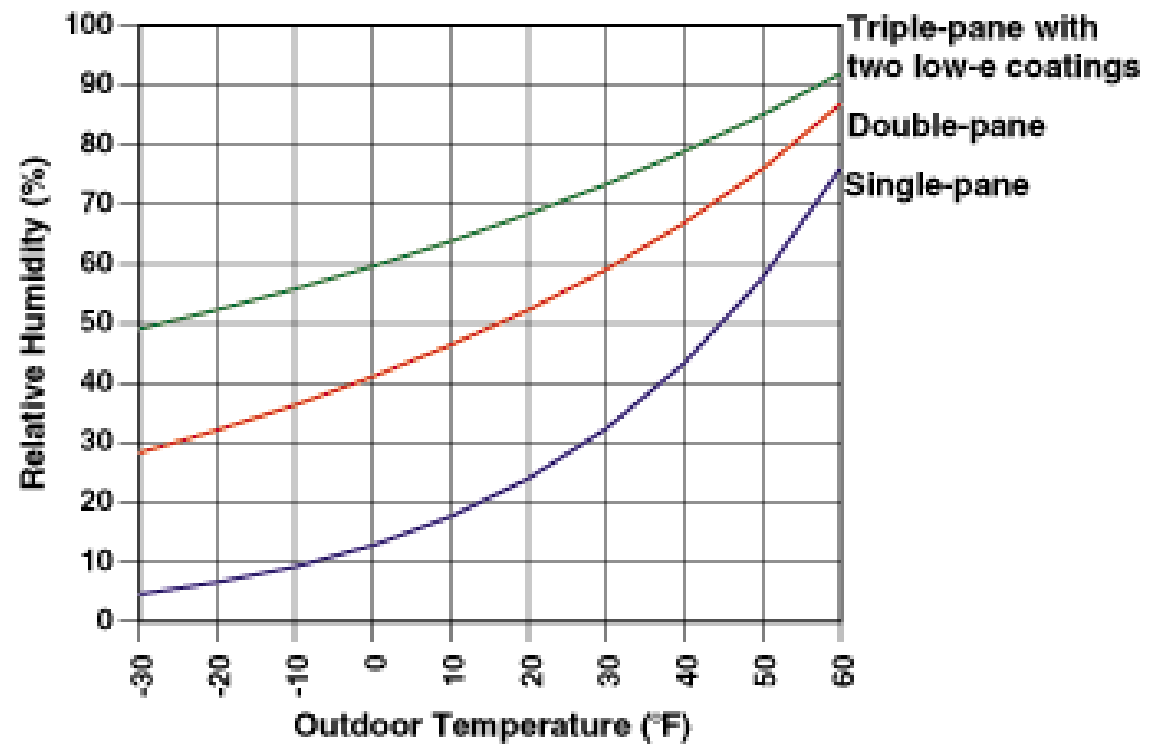


\* American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)

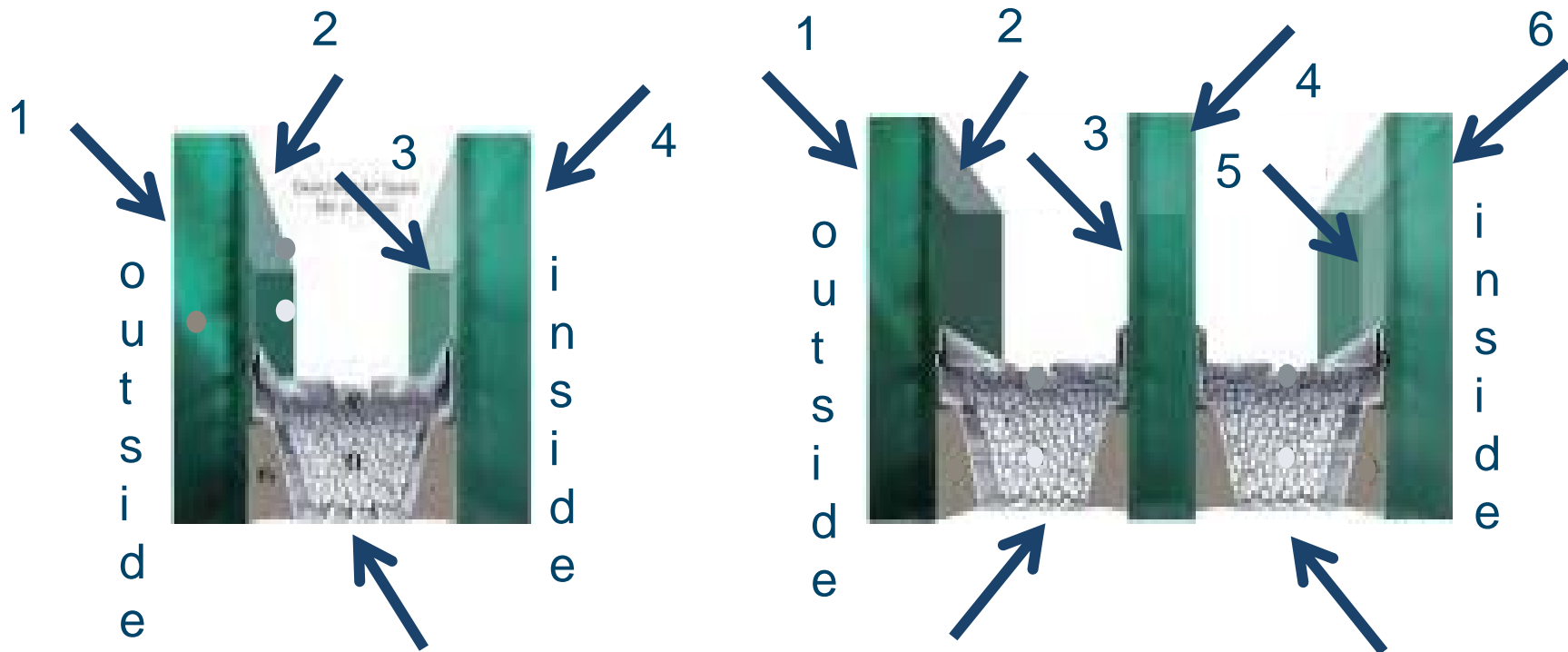




### Conditions For Window Condensation



## Anatomy of an IG



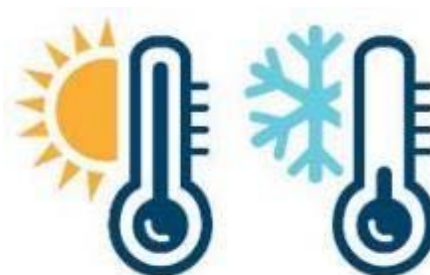
### LOW-E

- Low-E is glass that has been coated with a low-emittance material
- Multiple Low-E types each having unique characteristics
- Increases thermal performance
- Reduces UV rays
- Reduces fading
- Reduces heating / cooling costs
- Low-E 180 & Low-E 366 standard options



LOW-E 180

Designed for **passive solar gain** applications



LOW-E 366

Designed for the highest level of **low solar control** applications

## U Values measure

- Thermal conductance
- Does not take into consideration SHGC or air infiltration/exfiltration
- The lower the number, the better
- Measures total product
- Resistance (R) is the reciprocal of Conductance (U)
  - i.e. U- Value =  $0.97 \text{ w/m}^2 = 0.17 \text{ btu/ft}^2 \cdot \text{F}$
  - $R = 1/0.17 = 6.88$

**Certified for area indicated.**  
**Certifié pour les régions indiquées.**

ENERGY STAR

ER/RE: 43

Zones = 1 2 3 8977

**JELD-WEN**  
WINDOWS & DOORS  
VF - DF3103H Hybrid Fixed  
Casement/-Cl-arg-180  
HK1-FIN NRCan-RNCan  
NR5759-10316541-ES  
NFRJEL-N-826-00321-00001

National Fenestration Rating Council®  
**CERTIFIED**

**ENERGY PERFORMANCE RATINGS**  
**ÉVALUATION DES PROPRIÉTÉS ÉNERGÉTIQUES**

U-FACTOR FACTEUR-U	SOLAR HEAT GAIN COEFFICIENT COEFFICIENT DE GAIN DE CHALEUR SOLAIRE
<b>0.17 (U.S./I-P)   0.97 (Metric/SI)</b>	<b>0.43</b>

**ADDITIONAL PERFORMANCE RATINGS**  
**ÉVALUATION SUPPLÉMENTAIRE DES PROPRIÉTÉS**

VISIBLE TRANSMITTANCE TRANSMISSION VISIBLE	AIR LEAKAGE INFILTRATION D'AIR
<b>0.54</b>	<b>0.10 (U.S./I-P)   0.5 (Metric/SI)</b>

Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult literature for other product performance information.  
t, ces cotes sont conformes aux procédures applicables du NFRC servant à établir le rendement global du produit. Les cotes du NFRC sont établies selon des environnementales et des dimensions de produit spécifiques. NFRC ne recommande aucun produit et ne garantit pas la pertinence d'aucun produit pour aucune tique. Consultez la littérature du fabricant pour de l'information sur le rendement de tout autre produit.

[www.nfrc.org](http://www.nfrc.org)

CPD #	U-factor	SHGC	VT	Condensation Resistance	Air Leakage
JEL-N-826-00321-00001	0.17	0.43	0.54	77	



Group ID	Manufacturer Product Code	Frame/Sash Type	Glazing Layers	Low-E	Gap Widths	Spacer	Gap Fill	Grid	Divider	Tint
1	180-arg-Cl-arg-180	AV/AV	3	0.068(2),0.068(5)	0.462,0.462	SS-D	Fill 1: ARG/AIR (90/10), Fill 2: ARG/AIR (90/10)	N	-	CL

## SHGC – Solar Heat Gain Coefficient


- Ability for glass to absorb energy from the sun
- High solar gain helps in heating dominated climates
  - Helps reduce energy consumption
  - Can lead to overheating
- Low solar gain helps in cooling dominated climates
  - Helps reduce cooling loads
  - Blocks out more visible light = darker

**Certified for area indicated.**  
**Certifié pour les régions indiquées.**

ER/RE: 43

Zones = 1 2 3 8977



National Fenestration Rating Council®

**CERTIFIED**

**JELD-WEN**  
 WINDOWS & DOORS  
 VF - DF3103H Hybrid Fixed  
 Casement/Cl-arg-180  
 HK1-FIN NRCan-RNCan  
 NR5759-10316541-ES  
 NFRC JEL-N-826-00321-00001

ENERGY PERFORMANCE RATINGS ÉVALUATION DES PROPRIÉTÉS ÉNERGÉTIQUES	
U-FACTOR FACTEUR-U	SOLAR HEAT GAIN COEFFICIENT COEFFICIENT DE GAIN DE CHALEUR SOLAIRE
0.17 (U.S./I-P)   0.97 (Metric/SI)	0.43
ADDITIONAL PERFORMANCE RATINGS ÉVALUATION SUPPLÉMENTAIRE DES PROPRIÉTÉS	
VISIBLE TRANSMITTANCE TRANSMISSION VISIBLE	AIR LEAKAGE INFILTRATION D'AIR
0.54	0.10 (U.S./I-P)   0.5 (Metric/SI)

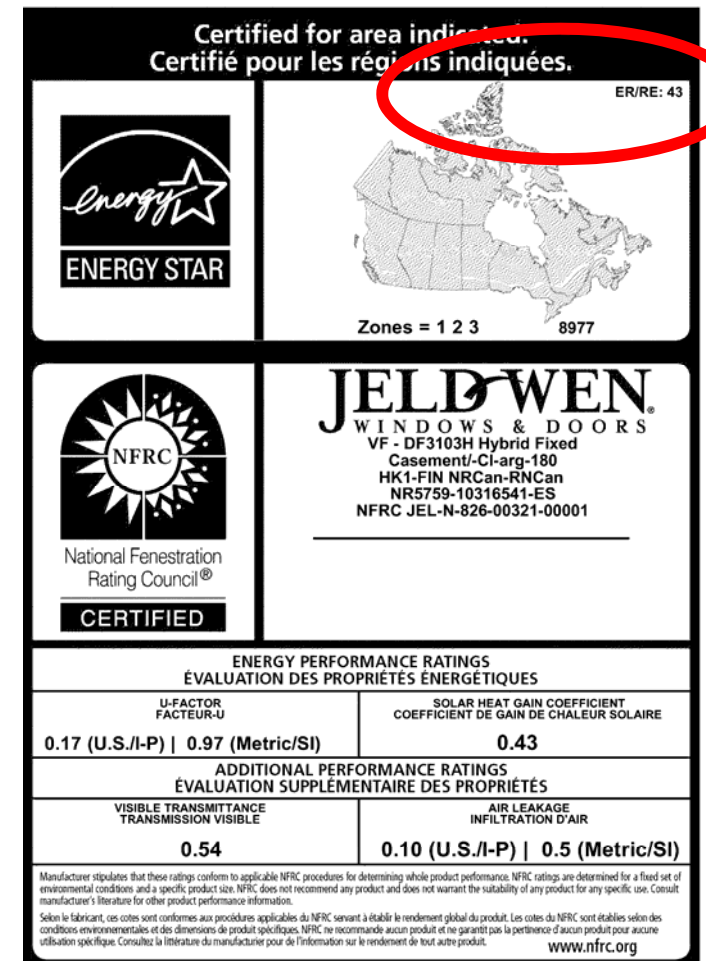
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 Selon le fabricant, ces cotes sont conformes aux procédures applicables du NFRC servant à établir le rendement global du produit. Les cotes du NFRC sont établies selon des conditions environnementales et des dimensions de produit spécifiques. NFRC ne recommande aucun produit et ne garantit pas la pertinence d'un produit pour aucune utilisation spécifique. Consultez la littérature du fabricant pour de l'information sur le rendement de tout autre produit.

[www.nfrc.org](http://www.nfrc.org)



## ER

- Energy Rating which considers U-Value, SHGC and air infiltration/exfiltration
- Considers that windows absorb heat and help diminish energy costs during heating season
- Initially meant to compare how much energy a window used versus another
- Always meant for smaller WWR (< 18%)
- Can lead to overheating in southern or western exposure with higher WWR and no shading
- Leads to the lowest energy consumption in GJ
- Not meant for MURBS



## CONDENSATION RESISTANCE FACTOR

- CR measures how well a window resists the formation of condensation on the inside surface.
- CR is expressed as a number between 1 and 100.
- The rating value is based on interior surface temperatures at 30%, 50%, and 70% indoor relative humidity for a given outside air temperature of 0° Fahrenheit under 15 mph wind conditions.
- The **higher the number, the better** a product is able to resist condensation
- CR is meant to compare products and their potential for condensation formation.
- CR is an **optional** rating on the NFRC label.

 <b>World's Best Window Co.</b> Series "2000" Casement Vinyl Clad Wood Frame Double Glazing • Argon Fill • Low E ABC-X-1-00001-00001	
ENERGY PERFORMANCE RATINGS	
U-Factor (U.S. / I-P)	Solar Heat Gain Coefficient
<b>0.35</b>	<b>0.32</b>
ADDITIONAL PERFORMANCE RATINGS	
Visible Transmittance	Air Leakage (U.S. / I-P)
<b>0.51</b>	<b>0.2</b>
Condensation Resistance	
<b>51</b>	<b>—</b>
<small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product, and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. <a href="http://www.nfrc.org">www.nfrc.org</a></small>	

## JELD-WEN Windows & Doors

### Willmar Collection - Vinyl Casement Window

	U cg W/m2C	U edge W/m2C	U frame W/m2C	U total W/m2C	Frame Height mm	SHGC cg	SHGC total	ER Assuming No Air Leakage	CR Condensation Resistance
Cl-air-Cl	2.72	2.72	1.34	2.27	76	0.76	0.49	19	46
180-arg-Cl	1.47	1.47	1.53	1.49	76	0.64	0.43	32	60
180-arg-i89	1.19	1.19	1.46	1.28	76	0.62	0.42	36	47
366-arg-Cl	1.36	1.36	1.55	1.42	73	0.27	0.19	20	61
366-arg-i89	1.12	1.12	1.44	1.22	73	0.27	0.18	24	48
180-arg-Cl-arg-180	0.77	0.77	1.43	0.99	76	0.56	0.38	40	77
366-arg-Cl-arg-366	0.69	0.69	1.47	0.94	73	0.24	0.16	29	78
LE180-arg-LE180-arg-i89	0.67	0.67	1.48	0.94	76	0.53	0.36	40	62
LE366-arg-LE180-arg-i89	0.61	0.61	1.53	0.90	72	0.24	0.17	30	63



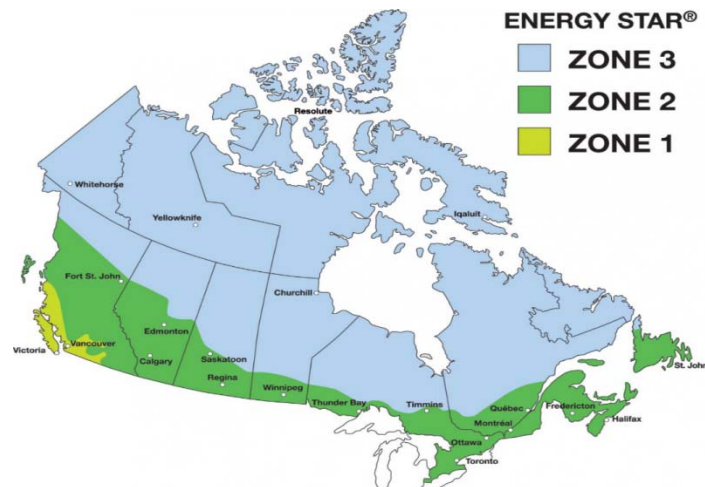
- Double Pane , surface 4 LowE.
- Ask for Condensation resistance number
- Products work fine when used in the correct climate zone e.g. Zone 4<



## Be careful of reliance on simple ratings with higher efficiency homes

- The lower the U the better,
- Consider appropriate SHGC to avoid over heating

Zone 1: <3500 HDDs  
Zone 2: 3500 to <6000 HDDs  
Zone 3: ≥6000 HDDs



**ENERGY STAR® Certified in Highlighted Regions**  
**Certifié ENERGY STAR dans les régions en surbrillance**

**Canada**

energystar.gc.ca

**DO NOT REMOVE UNTIL FINAL INSPECTION/NE PAS RETIRER AVANT L'INSPECTION FINALE**

**Energy Performance Ratings**  
**Évaluation des propriétés énergétiques**

U-Factor Facteur U	U-Factor (both coefficients) Coefficient de gain de chaleur total
<b>1.10</b> W/m²·K	<b>0.35</b>
Energy Rating Rendement énergétique	Visual Transmittance Transparence visuelle
<b>36</b>	<b>0.53</b>

**Window Company Ltd.**  
Triple X Operable Casement  
Vinyl frame, triple glaze, Low-e coating (E-322, 53, 55)  
Krypton/air filled (both cavities), Gills <= 13mm  
N10000-000000-05

**CSA**

Energy performance and visual transmittance ratings certified to CSA 4440.2-14. Ratings are determined for a fixed set of environmental conditions and a specific product. Certification agency does not recommend or warrant product for any specific use.  
Les taux de performance énergétique et de transparence visuelle sont certifiés CSA 4440.2-14. Les taux sont déterminés selon une série de conditions environnementales fixes et une série de produit particulières. L'agence de certification ne recommande ni ne garantit le produit aux fins d'utilisation particulières.





## Amount of Glass in New Homes : More or Less?

**2000 or before: 8 to 10%...**

**2010 to 2016: 12% to 17%....**

**2016 New product showing: 17% to 25%+**



## Air Conditioning

- Fastest growing peak load
- Most costly electrical use in most Canadian homes
- Heat Gain Load determined primarily by windows(40 to 50% of cooling load in glass!)
- Duct size is determined by cooling load (not heating load) in most new EE homes



## Base

- 2x6 w/ R22
- Dual Glazed Low-e

## Program

- Hot2000 10.51
- 1400+ simulations

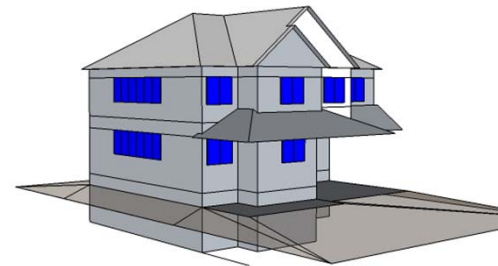
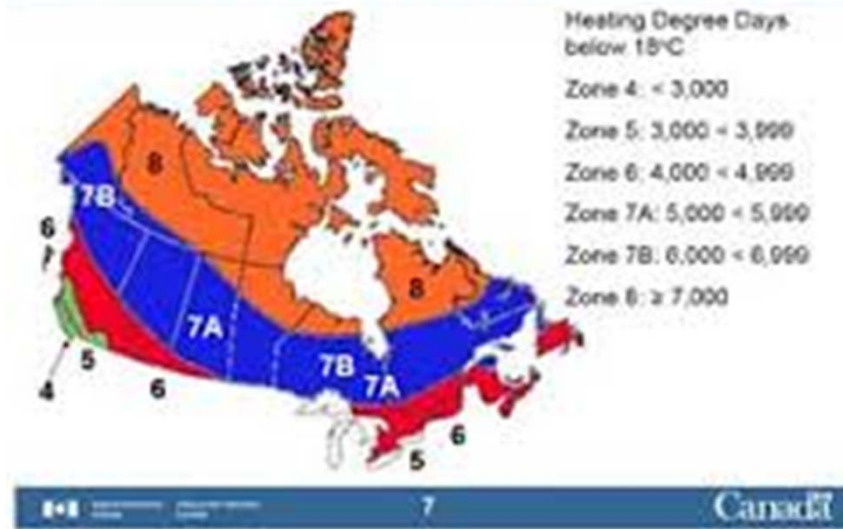
## Costs:

- Local utility costs

## Climate:

- Zone 5,6,7a

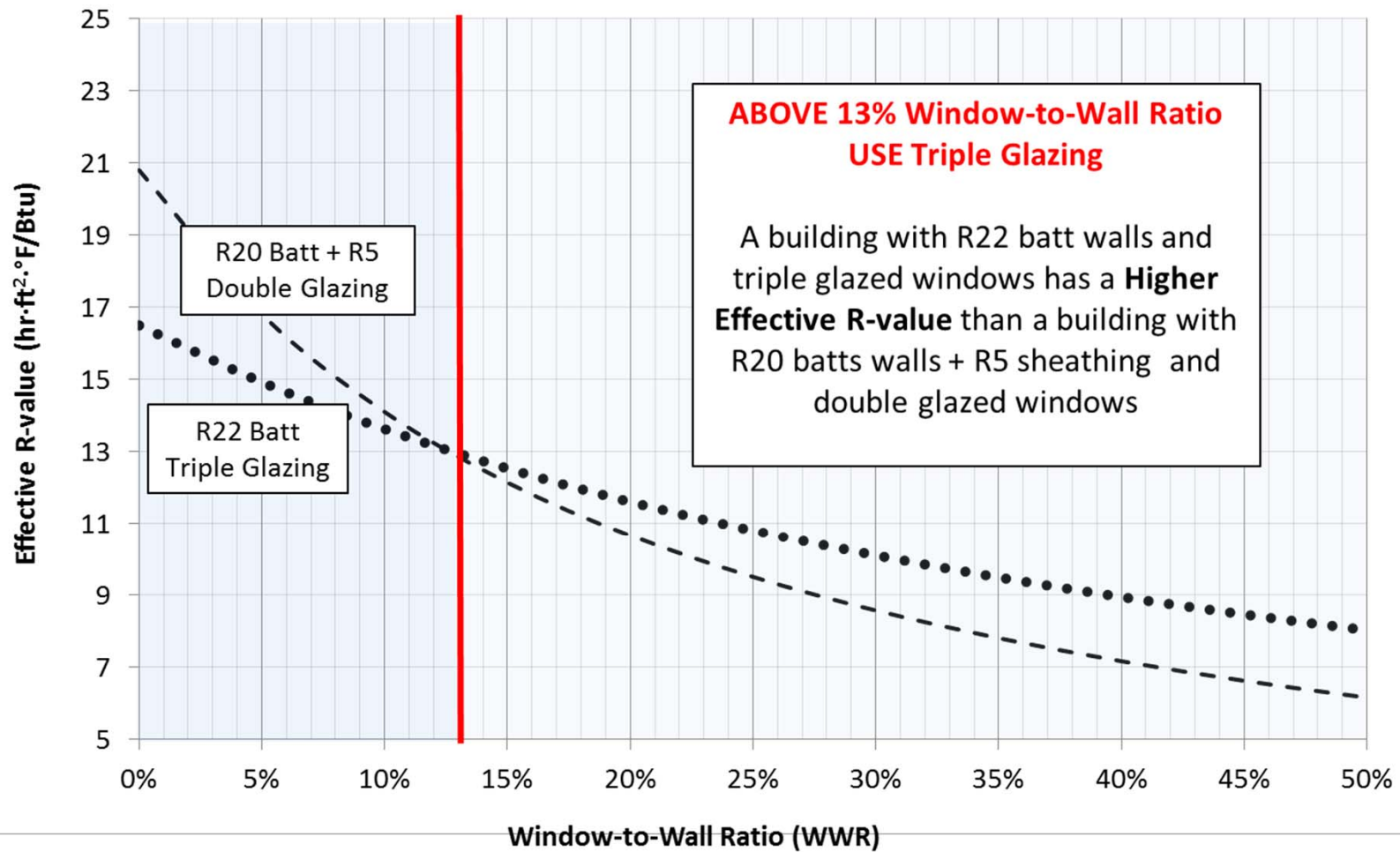
### ASHRAE Climate Zones for NECB 2011





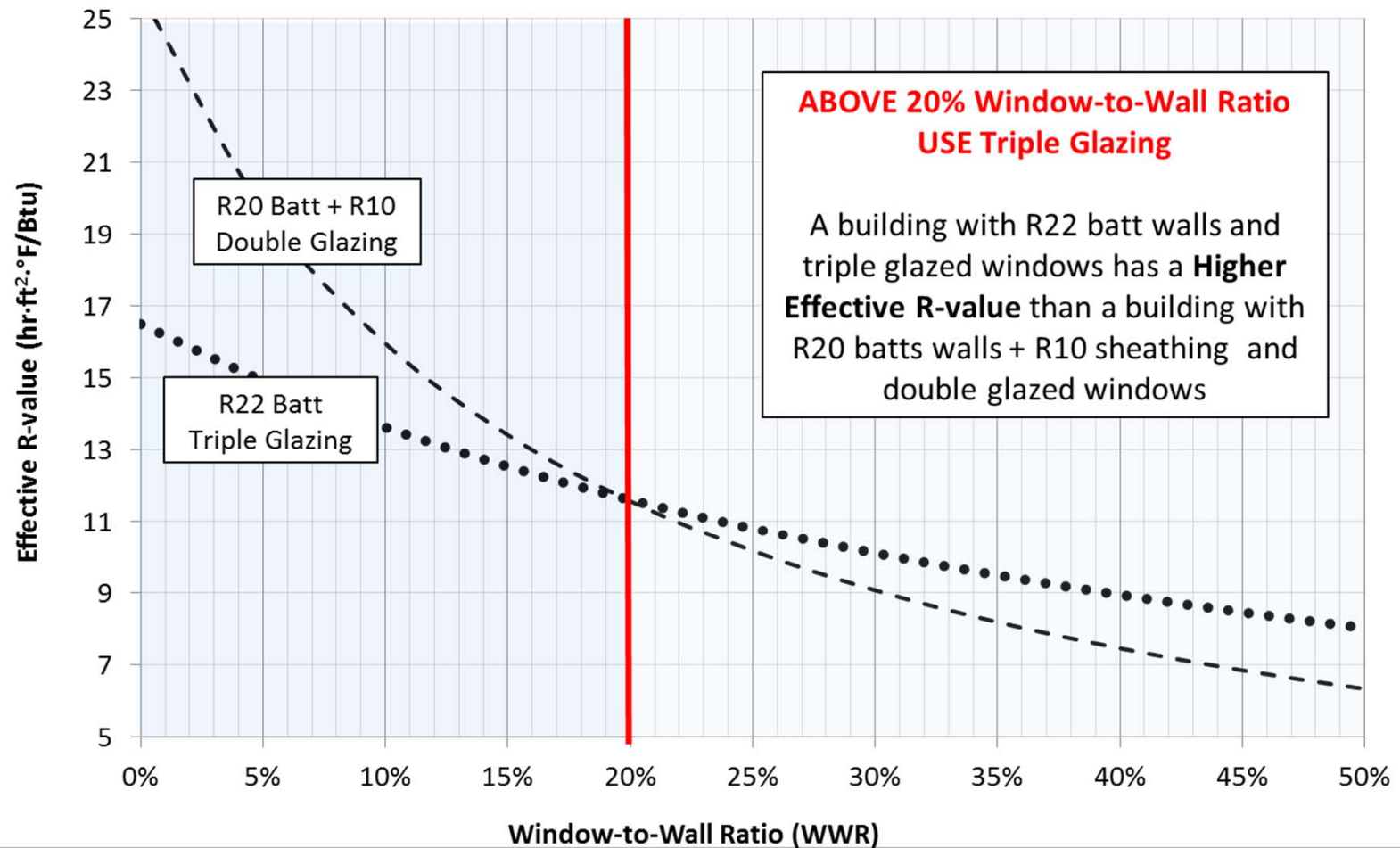


## Effective R-value Triple Glazing vs. R5 Sheathing





## Effective R-value Triple Glazing vs. R10 Sheathing



1. The greater the WWR, the more important choosing the right window becomes for a builder.
2. In all homes (Zone 5-6) with **WWR above 12.5%** - Tripane windows improve the effective R value of AG walls more than 2 x 6 wall with **R 20 + R5** exterior insulation
3. In all homes (Zone 5-6) with **WWR above 20%** - Tripane windows improve the effective R value of AG walls more than 2 x 6 wall with **R 20 + R10** exterior insulation
4. Low Solar Glass (366) can reduce Air Conditioning loads by up to 50%+ / 1 to 1.5Tons +
5. Tripanes improve the effective R Value of envelope by
  - At 15% WWR – Improvement of 16%
  - At 20% WWR- Improvement of 22%
  - At 25% WWR- Improvement of 24%

Aug. 5<sup>th</sup> 2015

## Large Volume Canadian Production Builders



## Feedback:

- Facing aggressive Building Codes, new Volunteer program targets and optional incentive programs.
- Had heard windows were becoming more important...But couldn't find any clear direction Or examples from anyone.
- Found report useful. Liked seeing “Key Conclusions”
- Found pricing estimates in line and accurate
- Recommend starting with comparisons to 1” and 2”of foam. This is the critical decision point as builders assess the new building codes(9.36) and Energy Star program
- Noted Triple Pane units were “Less” than expected....
- Air Conditioning becoming “Normal” inclusion. Specifically on Multifamily product
  - AC loads are increasing each year. Clearly showing builders and occupants the option of decreasing AC equipment costs and operating costs through optimized SHGC .

## Opportunities Checklist

- 1.Homeowner expectations are rising
- 2.Energy codes are advancing
- 3.TOTAL Cost is a better metric than FIRST Cost
- 4.Window areas are increasing
- 5.AC is now normal in most new homes
- 6.Humidity Levels need to be maintained for  
occupant health, comfort
- 7.Select knowledgeable manufacturer partners.



Translating knowledge into value!

- Value for our staff
- Value for our builders
- Value for our homeowners






The screenshot shows the 'Jeld-Wen Menu - JELD-WEN Windows' application window. The interface includes a menu on the left with options like 'Location', 'Archetype Homes', 'Fenestration Ratio', 'Wall Construction', 'Window Selection', and 'Jeld-Wen Study Data'. The main area displays a table with the following data:

ID	Location	Zone	City	HeatingDegreeDays_Low	HeatingDegreeDays_High	HeatingDesignTempCelsius	CoolingDesignTemp
1	Toronto Met.	5	Toronto Met. Res., ON	3000	3999	-22.0	
2	Ottawa	6	Ottawa, ON	4000	4999	-27.0	
3	Calgary	7A	Calgary, AB	5000	5999	-33.0	

The taskbar at the bottom shows the 'Mode Formulaire' window and several open applications including 'Boîte de r...', 'FW: WRLA...', 'WWR', 'Thermal I...', and multiple instances of 'JELD-WE...'.

		
Jeld-Wen Study Data Compare		
	137	131
Archetype Home	Single Detached Two Storey	Single Detached Two Storey
Fenestration Ratio (%)	15.0%	15.00%
Model	Standard	Standard
Zone	6	6
Wall Code	W1	W1
Wall Description	2x6 @ 16" R22	2x6 @ 16" R22
ModelLine	Donat Flamand	Donat Flamand
Glazing	366-arg-CL-arg-366	CL-arg-180
Effective R-Value	12.4	10.4
Calculated Energy Cost	\$3 109	\$3 370
GHG Emissions (tonnes/yr)	11.212	11.983
Des Heat Loss (Btu/h)	42 532.33	46 439.23
Des Heat Gain (Btu/h)	18 196.94	27 477.96
Energy Consumed (GJ)	140	143
Total Operating Cost (\$)	\$3 109	\$3 370

Zone:6  
 Natural Gas (0.2975 \$/m3 x m3 ) + ( 12 mnth x 20 \$/mnth)  
 Electricity (0.17 \$/kWh x kWh ) + ( 12 mnth x 10.46 \$/mnth)

Tripane

Minimum Code Window

Better Effective R Value

Lower Energy Costs

Lower GHG emissions

9281 BTU drop > ½ TON

Better  
Window



Better  
Wall

### Jeld-Wen Study Data Compare

ID	327	324
Archetype Home	Single Detached Two Storey	Single Detached Two Storey
Fenestration Ratio (%)	20.0%	20.00%
Model	Standard	Standard
Zone	7A	7A
Wall Code	W1	W3
Wall Description	2x6 @ 16" R22	2x6 @ 16" R20+R10
Modelline	Willmar	Willmar
Glazing	366-arg-CL-arg-366	180-arg-CL
Effective R-Value	11.9	11.4
Calculated Energy Cost	\$2 648	\$2 914
GHG Emissions (tonnes/yr)	11.441	12.34
Des Heat Loss (Btu/h)	48 445.56	50 097.04
Des Heat Gain (Btu/h)	14 167.21	27 621.27
Energy Consumed (GJ)	145	144
Total Operating Cost (\$)	\$2 648	\$2 914

Better Effective R Value

Lower Energy Costs

Lower GHG emissions

13 000 BTU drop = 1 TON

Zone:7A

Natural Gas (0.2024 \$/m3 x m3 ) + ( 12 mnth x 36.72 \$/mnth)

Electricity (0.1227 \$/kWh x kWh ) + ( 12 mnth x 19.7 \$/mnth)



### Better windows

- A PO change – No learning curve
- Reduced Callbacks= \$\$\$ savings
  - Reduced risk of condensation
  - Increased comfort
- Quieter
- Reduced mechanical size = \$\$\$ savings

### Better walls

- Learning curve – additional labour – thicker foundations = +\$\$\$
- Bigger mechanical systems = +\$\$\$ and consumer discomfort
- Increased Callbacks from condensation and discomfort = +\$\$\$

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1.If you haven't looked at triples lately, as a builder, you need to!

2. If you need help on how to improve your

- customers comfort levels
- reduce your callback's

Let's have the conservation



# Questions?

# Providing Solutions for Builders Thank you!

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