

Ministry of Energy, Mines and Petroleum Resources

Energy Efficiency for Windows and Glazing: Evaluating BC's **Market Transformation Approach BC Building Envelope Council** Sept 22, 2010 Andrew Pape-Salmon, P Eng, MRM **Director – Energy Efficiency Branch** Canada's Pacific Gateway



Overview

- Market Transformation
- BC's Regulations
- Typical technical characteristics
- Window Manufacturer and Building Inspector Surveys
- Savings for a Typical MURB
- Conclusions



Background

- Climate Action Plan (-33% emissions)
- Energy Efficient Building Strategy (-20% energy use per household, -9% ICI)
- Clean Energy Act (-66% electricity growth)
- Three areas of focus: windows (2005-2009), doors (2008-2009), glazing assemblies (2008-2010)





Market Transformation Measures

- NRCan ENERGY STAR program
- BC Hydro Power Smart DSM program
- FortisBC PowerSense program
- Capacity Building Coordinator
- Lab testing assistance



Market Transformation Measures cont...

- Wood door thermal performance project
- Former Provincial Sales Tax exemption
- LiveSmart BC: Efficiency Incentive Program – house labelling & retrofit
- Greening the BC Building Code (ASHRAE 90.1-2004)
- Energy Efficiency Act standards



Energy Efficiency Act Regulations: Low-Rise Buildings

Product	Maximum U-Value W/(m²·K) BTU/(hr·ft²·K)		Effective Date	
Vinyl and fibreglass windows and sliding doors	2.0	0.35	March 1, 2009	
Wood windows and sliding glass doors	2.0	0.35	January 1, 2011	
Metal windows and sliding glass doors	2.57 2.0	0.45 0.35	June 1, 2009 January 1, 2011	
Skylights (for low-rise and high-rise)	3.1	0.54	March 1, 2009	

- Tested with CSA A440.2-04 or NFRC 100-2004
- Third party testing (SCC or NFRC accredited labs)
- Permanent certification label, temporary U-value label
- Exempts heritage buildings





EE Act Regulations: High-Rise Buildings

Product	Maximum U-Value W/(m²·K) BTU/(hr·ft²·K)		Effective Date
Metal framed curtain wall, window wall and storefront products	2.57	0.45	January 1, 2011
Windows with framing materials other than metal, with or without metal reinforcing or cladding	2.0	0.35	January 1, 2011

- Exempts products installed in buildings that are compliant with ASHRAE 90.1 (04 or 07)
- Option for U-value "certificate" in lieu of labels
- Flexibility provided for structural windows



Technical Options

- Double and triple glazing
- Low-emissivity coating (soft & hard coat)
- Alternative framing materials
- Quality IGU manufacturing
- Argon fill with compatible edge sealant
- Spacer bars other than aluminum box
- Reduction of thermal bridging



"Please rate the relative impact of government and utility policies and programs on motivating you to design, develop, certify and sell new energy efficient product lines" (17 respondents, 19% of manufacturers invited)



Manufacturer Survey cont...

ENERGY STAR was most impactful

- Foundation of all measures for windows
- Credibility as independent standard
- Marketing tool for manufacturers and mechanism for accessing programs and tax breaks
- Enables differentiation for early adopters and higher price point to reinvest in research & innovation



Manufacturer Survey cont...

- 60% ENERGY STAR market share in 2009 (11 respondents); 20-30% in 2006
- 1 respondent: 95% of sales in BC were ENERGY STAR, 70% across Canada
- 60-100% of product lines qualify for ENERGY STAR (7 respondents)
- 14% were U ≤ 1.6 (0.28)
- 47% of products were U 1.6-1.8 (0.315)



Manufacturer Survey cont...

- Market readiness for regulation
 - Survey illustrates robust readiness among manufacturers
 - Manufacturing costs increased by at least 5% and for some, over 15%
 - Disproportionate impact on small manufacturers for testing and certification
 - Lab testing assistance partly defrayed the up-front certification costs



Building Inspector Survey

- 28 respondents, focus on ASHRAE 90.1
 Commented on compliance rate for various building types, compliance path and degree of market transformation
- Reliance on site inspections and Letters of Assurance to confirm compliance
- Majority felt U-value label is useful



Savings for a Typical MURB (Source: RDH MURB Study)

Case	Performance Standard (effective values)	Overall Product Performance Characteristics	Total Heating [kWh/m ²]	Total Bldg Energy [kWh/m ²]	% Total Savings
Baseline	Average Existing Building: Wall R-3.6, Roof R-12.7, Glazing percentage: 46%	U-0.70 (Btu/(h·ft²·°F)), SHGC-0.67	83.2	187.1	0.0%
Changes to	o Sample Building				
Window	ASHRAE 90.1-2004	U-0.57, SHGC-0.4	83.3	187.2	-0.1%
	ASHRAE 90.1-2007	U-0.55, SHGC-0.4	82.7	186.6	0.3%
	ASHRAE 189.1-2009	U-0.45, SHGC-0.4	79.1	183.0	2.2%
	BC EEA metal frame	U-0.45, SHGC-0.4	79.1	183.0	2.2%
	BC EEA non-metal frame	U-0.35, SHGC-0.4	75.0	178.8	4.4%
	Non metal frame, low-e, argon fill, triple glazed	U-0.17, SHGC-0.3	67.6	171.5	8.4%
Lighting	ASHRAE 90.1-2007	7.53 W/m^2	83.7	185.5	0.9%
	ASHRAE 189.1-2009	6.78 W/m ²	84.1	184.4	1.4%



Conclusions for Low-Rise

- Market transformation appears complete for windows
- Reasonable level of compliance with Energy Efficiency Act regulations
- Wide level of awareness, availability, accessibility, acceptance, affordability
- Disproportionate financial impact on small manufacturers



Conclusions for Mid- and High-Rise

- Pre-inspection compliance rate under ASHRAE is less than ideal
- Market transformation underway
- Increased reliance of building inspectors on Letters of Assurance anticipated, complementing site inspections and review of U-value labels
- Energy savings of 2.2% for typical MURB



Future Research

 Paper at ASHRAE 2011 Winter **Conference – focus on building inspector** survey and MURB impacts Extend research on glazing assemblies to the design of super-efficient, zeroemission buildings Survey of developers and builders on effectiveness of measures



Questions and Comments?

- Andrew Pape-Salmon, P.Eng, MRM
- Director, Energy Efficiency Branch
- BC Ministry of Energy, Mines and Petroleum Resources
- Tel: 250-952-0819
- Andrew.PapeSalmon@gov.bc.ca