Notice to all Heating, Ventilation and Air Conditioning (HVAC) designers

On Jan 12, 2015, the Ontario Building Code adopted Canadian Standards Association (CSA) F280-12. Substantial changes to the method and delivery of Heating, Ventilation and Air Conditioning (HVAC) design has resulted. The Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI) has also required an "updater" requirement (course and exam) to ensure that the designers understand the recent changes.

As a result of this requirement all designs must conform to this standard. Updates to qualifications must also be completed by the end of the 2015 calendar year. Designs submitted that are not completed to this standard will not be accepted. Designs submitted by designers after Dec 31, 2015, who do not have qualification updates will also not be accepted. The Building Code Identification Number (BCIN) qualifications have not changed.

Please see attached the updated heat loss/gain forms available on the Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI) website. These forms will be required for submissions; however, we will accept company created forms provided all the information required on the HRAI form is included.

Thanks,

Paul Nixon CET CBCO CMM111
Chief Building Official

HRAI Residential Heat Loss and Heat Gain Calculations		Page 1.
HRAI SKILLTECH ACADEMY	**BUILDING LOCATION**	
	Model	Site
	Address	Lot
	City and Province	Postal Code

SUBMITTED FOR		**DESIGNED/SUBMITTED BY:**	
Name		Name	
Company		Company	
Address		Address	
City and Province	Postal Code	City and Province	Postal Code
Telephone		Telephone	
E-mail		E-mail	

FOR DESIGNER'S USE:			
Signature:	Date Prepared (MM/DD/YY)	HRAI #	Other Certification # (e.g. BCIN)

SECTION A	**BUILDING CONSTRUCTION DETAILS**		
Plan & Drawing No:			
Attachment:		Front facing:	Assumed ☐ Yes ☐ No
No. of Stories:		Air tightness:	Assumed ☐ Yes ☐ No
Weather location:	Ventilated ☐ Yes ☐ No	Wind Exposure:	
HRV Model	☐ N/A	Internal Shading:	Occupants:
		Units: ☐ Imperial	☐ Metric

Building Envelope Assemblies

Above Grade Walls		**Windows**	
Structure:		Structure:	
Structure:		Structure:	
Structure:		Structure:	
Structure:		Structure:	

Below Grade Walls		**Skylights**	
Structure:		Structure:	
Structure:		Structure:	

Ceilings		**Floors on Soil**	
Structure:		Structure:	
Structure:		Structure:	

Doors		**Exposed Floors**	
Structure:		Structure:	
Structure:		Structure:	

SECTION B DESIGN CONDITIONS

HEAT LOSS		HEAT GAIN	
Outdoor Design Temperature Heating(ODT)	____ °F / °C	Outdoor Design Temperature Cooling (ODT)	____ °F / °C
Indoor Design Temperature (IDT)	____ °F / °C	Indoor Design Temperature (IDT)	____ °F / °C
Mean Soil Temperature	____ °F / °C	North Latitude	____ °
		Summer Mean Daily Temperature Range	____ °F / °C
Building Volume (Vb)	ft³ / m³	Building Conditioned Area	ft² / m²

HRV Apparent Sensible Effectiveness = (insert N/A if no HRV/ERV installed)

Ventilation System:

☐ Case #1: Exhaust Only System ☐ Case #2: Direct Ducted System ☐ Case #3: Central Forced Air System

SECTION C ROOM HEAT LOSS / HEAT GAIN SUMMARY

Level	Room Name	Total Heat Loss Calculated Section 16 Btuh/W	Total Heat Gain Calculated Section 17 Btuh/W	Level	Room Name	Total Heat Loss Calculated Section 16 Btuh/W	Total Heat Gain Calculated Section 17 Btuh/W
				SUB TOTAL		Section 18	Section 21

SECTION D BUILDING HEAT LOSS SUMMARY

Building Sub Total Heat Loss	(Section 18)	____ Btuh/W	
Central Forced Air Ventilation Heat Loss*	(Section 19)	____ Btuh/W	*Only applicable for ventilation case #3
Total Building Heat Loss	(Section 20)	____ Btuh/W	

SECTION E BUILDING HEAT GAIN SUMMARY

Building Sub Total Heat Gain	(Section 21)	____ Btuh/W	
Central Forced Air Ventilation Heat Gain*	(Section 22)	____ Btuh/W	*Only applicable for ventilation case #3
Total Building Heat Gain	(Section 23)	____ Btuh/W	

Notes:

HRAI Residential Heat Loss and Heat Gain Calculations										Page 3.
HL ΔT =		HG ΔT =								
COMPONENTS	STRUCTURE	EFFECTIVE R-VALUE Col 1	HLΔT / R Col 2	SC Col 3	(HGΔT+SC) / R Col 4		P_E		LVL	
							H		RM	
							A_F Area		HEAT LOSS	HEAT GAIN
1.GROSS EXPOSED WALLS										
2.WINDOWS, GLASS DOORS AND SKYLIGHT					THGM					
					THGM					
					THGM					
					THGM					
					THGM					
					THGM					
3.EXPOSED DOORS										
4.NET EXPOSED WALLS										
5.HEADER AREAS										
6.EXPOSED CEILINGS										
7.EXPOSED FLOORS										
8.OTHER										

9.FOUNDATION CONDUCTIVE HEAT LOSS	☐ BASEMENT ☐ SLAB ON GRADE							
		LVL 1	LVL 2	LVL 3	LVL 4			
10. TOTAL CONDUCTIVE	TOTAL HEAT LOSS							
	TOTAL HEAT GAIN							
11. AIR LEAKAGE	HEAT LOSS MULTIPLIER							
	HEAT GAIN MULTIPLIER							
12a. VENTILATION: EXHAUST ONLY	HEAT LOSS MULTIPLIER							
	HEAT GAIN MULTIPLIER							
12b. VENTILATION: DIRECT DUCTED SYSTEM	HEAT LOSS MULTIPLIER					Qvr		
	HEAT GAIN MULTIPLIER							
13. INTERNAL HEAT GAIN (PEOPLE, LIGHTS, APPLIANCES, PLUG LOADS)								
14. NET LOADS	ADD SECTIONS (10 + 11 + 12 + 13)							
15. DUCT / PIPE HEAT LOSS/GAIN THROUGH UNCONDITIONED SPACES						LOSS		
						GAIN		
16. TOTAL HEAT LOSS FOR EACH ROOM	ADD SECTIONS (14 + 15)					LOSS		
17. TOTAL HEAT GAIN FOR EACH ROOM	ADD SECTIONS (14 + 15) × 1.3					GAIN		

18. SUB TOTAL HEAT LOSS (SUM OF SECTION 16)		20. TOTAL HEAT LOSS ADD SECTIONS (18 + 19)	
19. CENTRAL FORCED AIR VENTILATION HEAT LOSS			
21. SUB TOTAL HEAT GAIN (SUM OF SECTION 17)		23. TOTAL HEAT GAIN ADD SECTIONS (21 + 22)	
22. CENTRAL FORCED AIR VENTILATION HEAT GAIN			

HRAI Residential Heat Loss and Heat Gain Calculations											Page
COMPONENTS	STRUCTURE	P_E		LVL		P_E		LVL		P_E		LVL	
		H		RM		H		RM		H		RM	
		A_F	Area	HEAT LOSS	HEAT GAIN	A_F	Area	HEAT LOSS	HEAT GAIN	A_F	Area	HEAT LOSS	HEAT GAIN
1.GROSS EXPOSED WALLS													
2.WINDOWS, GLASS DOORS AND SKYLIGHT													
3.EXPOSED DOORS													
4.NET EXPOSED WALLS													
5.HEADER AREAS													
6.EXPOSED CEILINGS													
7.EXPOSED FLOORS													
8.OTHER													
9.FOUNDATION HL													
10. TOTAL CONDUCTIVE													
11. AIR LEAKAGE													
12a. VENTILATION: EXHAUST ONLY													
12b. VENTILATION:		Qvr				Qvr				Qvr			
DIRECT DUCTED SYSTEM													
13. INTERNAL HEAT GAIN													
14. NET LOADS													
15. DUCT / PIPE HEAT		LOSS				LOSS				LOSS			
LOSS / GAIN		GAIN				GAIN				GAIN			
16. TOTAL HL (ROOM)		LOSS				LOSS				LOSS			
17. TOTAL HG (ROOM)		GAIN				GAIN				GAIN			

HRAI Residential Heat Loss and Heat Gain Calculations
Formula Sheet (For Air Leakage / Ventilation Calculation)

BUILDING AIR LEAKAGE HEAT LOSS

B (M) = 0.33
B (I) = 0.018

$HL_{leak} = B \times LR_{airh} \times Vb \times HL\Delta T$

= _____ x _____ x _____ x _____ = [ ]

BUILDING AIR LEAKAGE HEAT GAIN

B (M) = 0.33
B (I) = 0.018

$HG_{leak} = B \times LR_{airc} \times Vb \times HG\Delta T$

= _____ x _____ x _____ x _____ = [ ]

AIR LEAKAGE HEAT LOSS/GAIN MULTIPLIER TABLE (SECTION 11)

Level	Level Factor (LF)	Building Air Leakage Heat Loss (HL_{leak})	Level Conductive Heat Loss: see Section 10 (HL_{clevel})	Air Leakage Heat Loss Multiplier ($LF \times HL_{leak} \div HL_{clevel}$)
1				
2				
3				
4				

Air Leakage Heat Gain Multiplier = $\frac{HG_{leak}}{\text{Building Conductive Heat Gain}}$ = _____ = [ ]

VENTILATION HEAT LOSS

C (M) = 1.2
C (I) = 1.08

$HL_{bvent} = C \times PVC \times HL\Delta T \times (1 - E)$

= _____ x _____ x _____ x _____ = [ ]

VENTILATION HEAT GAIN

C (M) = 1.2
C (I) = 1.08

$HG_{bvent} = C \times PVC \times HG\Delta T$

= _____ x _____ x _____ = [ ]

Case #1: Exhaust Only System (Section 12a)

Multiplier = Level Factor x HL_{bvent} ÷ Level Cond. Heat Loss

Level	LF	HL_{bvent}	LVL Cond. HL	Multiplier
1				
2				
3				
4				

HL_{rvent} = Multiplier x Room Conductive Heat Loss

Case #1: Exhaust Only System (Section 12a)

Multiplier = $\frac{HG_{bvent}}{\text{Building Conductive Heat Gain}}$

= [ ]

HG_{rvent} = Multiplier x Room Conductive Heat Gain

Case #2: Direct Ducted System (Section 12b)

C (M) = 1.2
C (I) = 1.08

Multiplier = $C \times HL\Delta T \times (1 - E)$

Multiplier = _____ x _____ x _____ = [ ]

Q_{vr} = Room Ventilation Rate
HL_{rvent} = Multiplier x Q_{vr}

Case #2: Direct Ducted System (Section 12b)

C (M) = 1.2
C (I) = 1.08

Multiplier = $C \times HG\Delta T$

Multiplier = _____ x _____ = [ ]

Q_{vr} = Room Ventilation Rate
HG_{rvent} = Multiplier x Q_{vr}

Case #3: Central Forced Air System (Section 19)

Enter HL_{bvent} in Section 19

Case #3: Central Forced Air System (Section 22)

HG_{bvent} x 1.3 = [ ] x 1.3 = [ ]

(enter in Section 22)

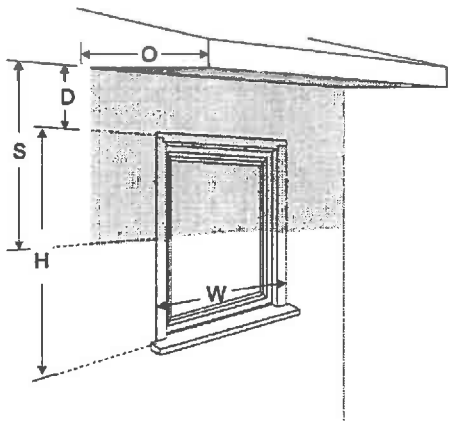
HRAI WINDOW SHADING WORKSHEET

Latitude = °

Level							
Room Name							
Direction Window Faces							
W (ft / m) Width of Window							
H (ft / m) Height of Window							
A (ft² / m²) Total Window Area							
O (ft / m) Width of Overhang							
F (see Table below) F-Shade Factor							
S (ft / m) S = F x O Shade Line							
D (ft / m) Drop							
SA (ft² / m²) SA = (S-D) x W Shaded Area							
UA (ft² / m²) UA = A - SA Unshaded Area							

NOTES:

1. Shaded area SA will be marked on the HRAI Worksheets as "north"
2. Unshaded area (UA) will be marked on the HRAI Worksheets as the direction the window actually faces
3. Shading calculations are not required for north, northeast and northwest facing windows.
4. If the shaded area (SA) is greater than the window area, then the entire window area (A) is shaded.
5. If shaded area (SA) is negative use a value of zero.



F Shade Factor							
Direction Window Faces	**North Latitude, Degrees**						
	40	**42.5**	**45**	**47.5**	**50**	**52.5**	**55**
East/West	0.8						
Southeast/Southwest	1.3	1.2	1.1	1.1	1.0	1.0	0.9
South	2.6	2.3	2.0	1.9	1.7	1.6	1.4

TRANSPARENT ASSEMBLY HEAT GAIN MULTIPLIER (THGM) WORKSHEET

Transparent Assembly Heat Gain Multiplier (THGM)

$$THGM = \frac{HG\Delta T}{R} + SHGC \times SOLAR \times ISF$$

THGM Calculation Table							
		Facing Direction					
		North & Shaded	South	East / West	Northeast / Northwest	Southeast / Southwest	Horizontal
North Latitude		°					
HGΔT		°F / °C					
Effective R-value							
#1	$\frac{HG\Delta T}{R}$						
#2	SHGC						
#3	SOLAR						
#4	ISF						
#5	(#2) × (#3) × (#4)						
#6	THGM=(#1) + (#5)						

SOLAR = Estimated Solar Radiation												
Latitude	North & Shaded		South		East / West		Northeast / Northwest		Southeast / Southwest		Horizontal	
	Imperial Btu/h/ft²	Metric W/m²	Imperial Btu/h/ft²	Metric W/m²	Imperial Btu/h/ft²	Metric W/m²	Imperial Btu/h/ft²	Metric W/m²	Imperial Btu/h/ft²	Metric W/m²	Imperial Btu/h/ft²	Metric W/m²
40	29	93	51	160	90	285	62	194	80	252	169	534
41	29	93	53	166	90	285	62	194	83	261	169	534
42	29	93	55	172	90	285	62	194	86	271	169	534
43	29	93	56	178	90	285	62	194	89	280	169	534
44	29	93	58	184	90	285	62	194	92	290	169	534
45	29	93	60	190	90	285	62	194	95	299	169	534
46	29	93	62	196	90	285	62	194	98	309	169	534
47	29	93	64	202	90	285	62	194	101	318	169	534
48 to 82	29	93	66	208	90	285	62	194	104	328	169	534

ISF = Internal Shading Factors				
Type of interior shading	Type of glazing systems			
	Single	Double	Triple	Heat Mirror
No interior shades	1	1	1	1
Interior blinds, curtains, and etc.	0.50	0.55	0.57	0.60
Interior reflective metallic blinds or screens	0.35	0.37	0.40	0.44