



## **Consultation Document for Energy Efficiency in the Manitoba Building Code**

On October 16, 2010, the province introduced its first set of energy and water efficiency regulations, meeting its 2010 deadline for introducing energy efficiency into the Building Code, as required under Section 9(1) of Bill 19 *The Climate Change and Emissions Reduction Act*.

In creating the Regulation, the following steps were undertaken by the Office of the Fire Commissioner (OFC):

- A province-wide, public consultation that outlined energy and water objectives was undertaken in 2008. The result of the consultation was that the majority of respondents wanted to see energy and water efficiency as a priority in the building and plumbing codes. A province-wide, in-person consultation was also undertaken at the same time.
- A report on the consultation was provided to all who submitted comments and also posted on the OFC website.
- Once the report was accepted by the Minister of Labour and Immigration, The Building Standards Board (the Board) was tasked with bringing forth recommendations to the Minister on how to implement these ideas.
- The Board then created a sub-committee to look at energy and water efficiency in the Codes. It was comprised of energy experts from Manitoba Hydro, mechanical contractors, engineers, consulting designers, design builders, building officials, and interior designers. During the course of a year and a half of meetings, the group also consulted with other large contractors, members from ASHRAE working groups, members from the National Energy Code of Buildings working groups, the OFC's plumbing expert, boiler experts, the Heating and Refrigeration and Air Conditioning Institute (HRAI), window manufacturers, local suppliers of plumbing products, sustainability architects, and local lighting suppliers. Members were also asked to consult with their local associations for input into the group's discussions.

**The following are the recommendations that were accepted by the Minister of Labour and Immigration for incorporation in Part 3 of the Manitoba Building Code. After the consultation closes on January 4, 2011, the recommendations plus associated comments, will proceed through the regulation development process.**

Comments can be submitted via email to [firecomm@gov.mb.ca](mailto:firecomm@gov.mb.ca) or via mail to:  
Office of the Fire Commissioner  
508-401 York Ave  
Winnipeg MB R3C 0P8

## Section 1 – Lighting

- (1) Lighting Energy Consumption - All interior and exterior lighting levels are to be designed in accordance with power densities in ASHRAE Standard 90.1-2007 Energy Standard for Buildings Except Low-Rise Residential Buildings including the exceptions listed in 9.2.2.3. As guidance, users will be referenced to design light output/illumination levels in accordance with the Illumination Engineering Society, Lighting Handbook – 9<sup>th</sup> Edition Reference and Application in the Appendix.
- (2) Occupancy Sensors - All interior lighting (except service rooms) shall be designed according to lighting levels described under Lighting Energy Consumption (Recommendation 1) and are to be controlled by occupant sensors in order to turn lights off when the space is not occupied. ASHRAE Standard 90.1-2007 Energy Standard for Buildings except Low-Rise Residential Buildings is to be referenced for the design, use and application of these sensors.

In lieu of occupancy sensors in new construction for hotels, motels, student residences, *suites* and guestrooms, a card or sensor activated master switch may be installed. Each dwelling type shall be provided with one or more master switches at the main entry door to each guest room or *suite*, or each room within a *suite*, to turn on and off all permanently wired light fixtures and switched receptacles, except those located in bathrooms. Sensors and overrides are to be designed to ASHRAE Standard 90.1-2007.

- (3) Internally illuminated exit signs shall not exceed 5.0 watts per side Canadian Standards Association (CSA) CAN/CSA-C860-07.
- (4) Probe-start fixtures shall not be used in any buildings.

## Section 2 – HVAC

- (5) Use similar wording as per Part 5 of the Model National Energy Code for Buildings (MNECB) 1997 as a baseline for the new HVAC standards, as well as update the MNECB Table 5.2.13.1 with current HVAC performance standards from Canada's Energy Efficiency Act.

**Updated - Table 5.2.13.1.**  
 Heating, Ventilation and Air-Conditioning Equipment Performance Standards  
 Forming Part of Sentence 5.2.13.1.(1)

Component	Cooling Capacity	Standard	Rating Conditions		Minimum Performance
Split-system	≤ 19 kW	CAN/CSA C656-05	In Standard		In Standard
Single package	≤ 19 kW	CAN/CSA C656-05			
All Phases	> 19 and < 73 kW	CAN/CSA-C746-06			
Air-conditioners, all phases	73 – 222.7 kW (250 000 – 760 000 Btu/h)	AHRI 340/360-07	In Standard		EER = 8.5 <sup>(1)</sup> IPLV = 7.5 <sup>(2)</sup>
	> 222.7 kW (760 000 Btu/h)				EER = 8.2 <sup>(1)</sup> IPLV = 7.5 <sup>(2)</sup>
Heat Pumps	73 – 222.7 kW (250 000 – 760 000 Btu/h)	AHRI 340/360-07	Cooling Mode		EER = 8.5 <sup>(1)</sup> IPLV = 7.5 <sup>(2)</sup>
			Heating Mode	47°F (8.3°C)	COP = 2.9 <sup>(3)</sup>
	17°F (-8.3°C)			COP = 2.0 <sup>(3)</sup>	
	> 222.7 kW (760 000 Btu/h)		Cooling Mode		EER = 8.7 <sup>(1)</sup> IPLV = 7.5 <sup>(2)</sup>
Heating Mode		47°F (8.3°C)	COP = 2.9 <sup>(3)</sup>		
	17°F (-8.3°C)	COP = 2.0 <sup>(3)</sup>			
<b>Evaporatively cooled and Water/Evaporatively cooled Unitary Air-conditioners and Heat Pumps – Electrically operated (Except Packaged Terminal Air-Conditioners and Room Air-conditioners)</b>					
Evaporatively cooled	≤ 19 kW (65 000 Btu/h)	AHRI 210/240-08, CTI 201-09	Indoor Air	80°F db/67°F wb (26.7°C db/19.4°C wb)	In standard
			Outdoor Air	95°F db/75°F wb (35.0°C db/23.9°C wb)	
Evaporatively cooled, water/evaporatively cooled	> 19 and < 73 kW	CAN/CSA-C746-06	In standard		In Standard
Water/evaporatively cooled air-conditioners	≥ 73 kW	AHRI 340/360-07, CTI 201-09	In standard		EER = 11.0 <sup>(1)</sup>
<b>Condensing Units</b>					
Air-cooled and water/evaporatively cooled	> 19 and < 73 kW	CAN/CSA-C746-06	In Standard		In Standard

Air-cooled	> 73 kW	AHRI 365-02	In Standard		In Standard
Water/evaporatively cooled		AHRI 365-02, CTI 201-09			In Standard
<b>Water-cooled Unitary Air-Conditioners and Heat Pumps – Electronically operated</b>					
Ground/water-source heat pumps	< 35 kW	C13256-1-01 (R2005), C13256-2-01 (R2005)	In Standard		In Standard
Internal water-loop heat pumps	< 40 kW	CAN/CSA-C655-M			
Water-cooled air-conditioners	< 19 kW	ARI 210/240-08, CTI 201-09	Indoor Air	80°F db/67°F wb (26.7°C db/19.4°C wb)	In Standard
			Entering Water	85°F (29.4°C)	
	19 – 39.5 kW		Entering Water	75°F (23.9°C)	In Standard
	Indoor Air		80°F db/67°F wb (26.7°C db/19.4°C wb)	In Standard	
Entering Water	85°F (29.4°C)				
<b>Direct-expansion Ground-source Heat Pumps – Electrically operated</b>					
Direct-expansion ground-source heat pumps	≤ 21 kW	CSA C748-94 (R2005)	In Standard		13.0 EER (cooling) 3.1 COP (heating)
<b>Packaged Terminal Air-conditioners and Heat Pumps</b>					
Packaged terminal AC and heat pumps, air-cooled, electronically operated		CSA C744-04 ARI 310/380-04	In Standard		In Standard
<b>Room Air-conditioners and Room Air-conditioners/Heat Pumps</b>					
Without reverse cycle	< 10.55 kW	CAN/CSA-C368.1- M90 (R2007)	In Standard		In Standard
With reverse cycle with louvered sides without louvered sides		CAN/CSA-C368-M90 (R2007)			In Standard
<b>Packaged Water Chillers</b>					
Vapour compression, air or water-cooled, electrically operated	< 5600 kW	CAN/CSA C743-02 (R2007)	In Standard		In Standard
Absorption, single or double-effect, indirect or direct-fired					

<b>Boilers</b>				
Gas-fired boilers, <sup>(4)</sup> ≤88 kW		CSA P 2-07	In Standard	In Standard
Gas-fired boilers, >88 kW		ANSI Z21.13, HI Heating Boiler Standard, ANSI/ASME PTC 4.1 UL 795	Max. rated capacity, steady state	E <sub>C</sub> = 80% <sup>(5)</sup>
			Min. rated capacity, steady state	E <sub>C</sub> = 80% <sup>(5)</sup>
Oil-fired boilers, ≤ 88 kW		CSA B212-00	In Standard	In Standard
Oil-fired boilers (residual), > 88 kW		HI Heating Boiler Standard, ANSI/ASME PTC 4.1-08	Max. rated capacity, steady state	E <sub>C</sub> = 83% <sup>(5)</sup>
			Min. rated capacity, steady state	E <sub>C</sub> = 83% <sup>(5)</sup>
Oil-fired boilers (other), 88 kW		ANSI/UL 726-95, HI Heating Boiler Standard, ANSI/ASME PTC 4.1	Max. rated capacity, steady state	E <sub>C</sub> = 83% <sup>(5)</sup>
			Min. rated capacity, steady state	E <sub>C</sub> = 83% <sup>(5)</sup>
<b>Warm-air Furnaces, Combination Warm-air Furnaces/Air-conditioning Units, Duct Furnaces and Unit Heaters</b>				
Gas-fired warm-air furnaces <sup>(4)</sup> ≤66 kW		CAN/CSA P.2-2007	In Standard	In Standard
Gas-fired warm-air furnaces, >66 kW		CAN/CSA 2.3-2006*	Max. rated capacity, steady state	In Standard
			Min. rated capacity, steady state	In Standard
Gas-fired duct furnaces, <sup>(4)</sup> ≤ 117.23 kW		CGA 2.8-M	In Standard	In Standard
Gas-fired unit heaters, <sup>(4)</sup> ≤ 117.23 kW		CAN/CGA-2.6-M-06		
Oil-fired warm-air furnaces, ≤ 66 kW		CSA B212 -00 (R2005)	In Standard	Tier 1: 83% AFUE Tier 2: 85% AFUE
Oil-fired warm-air furnaces, > 66 kW		UL 727	In Standard	E <sub>C</sub> = 81%
Oil-fired duct furnaces and unit heaters		UL 731	In Standard	E <sub>C</sub> = 80%

Notes :

- 1) EER is the *energy efficiency ratio* in Btu/(h-W) (no metric equivalent)
- 2) IPLV is the *integrated part-load value* (no units)
- 3) COP is the *coefficient of performance* in W/W
- 4) Includes propane

5) E<sub>C</sub> is the combustion efficiency (%)

6) E<sub>T</sub> is the thermal efficiency (%)

- (6) Include a clause for Chilled and Hot Water Temperature Reset Controls - Chilled and hot-water systems with a design capacity exceeding 88 kW supplying chilled or heated water (or both) to comfort conditioning systems shall include controls that automatically reset supply water temperatures by representative building loads (including return water temperature) or by outdoor air temperature.

Exceptions:

- a. Where the supply temperature reset controls cannot be implemented without causing improper operation of heating, cooling, humidifying, or dehumidifying systems.
  - b. Hydronic systems that use variable flow to reduce pumping energy.
- (7) Include a clause for Energy Recovery – Exhaust Air Energy Recovery - Individual fan systems that have both a design supply air capacity of 2400 L/s or greater and have a minimum *outdoor air* supply of 70% or greater of the design supply air quantity shall have an energy recovery system with at least 50% recovery effectiveness and shall be used to decrease the amount of energy to condition the outside air of the fan system. Fifty percent energy recovery effectiveness shall mean a change in the enthalpy of the *outdoor air* supply equal to 50% of the difference between the *outdoor air* and return air at design conditions. Provision shall be made to bypass or control the heat recovery system to permit air economizer operation as required by Section 5.3.2.2.

Exceptions:

- a. Laboratories where control of fume hood exhaust systems would be deemed unsafe or affect their proper operations,
  - b. Systems serving spaces that are not cooled and that are heated to less than 16°C,
  - c. Systems exhausting toxic, flammable, paint, or corrosive fumes or dust,
  - d. Commercial kitchen hoods used for collecting and removing grease vapors and smoke,
  - e. Where more than 60% of the *outdoor air* heating energy is provided from site-recovered or site-solar energy,
  - f. Cooling systems in climate zones 7a, 7b and 8,
  - g. Where the largest exhaust source is less than 75% of the design outdoor airflow, and
  - h. Systems requiring dehumidification that employ energy recovery in series with the cooling coil.
- (8) Natural Gas, Propane and Oil-Fired Boilers (>88 kW - 3,663 kW) - no atmospheric burners with draft hoods and standing pilot lights shall be installed in any new building and/or major addition built to the *Manitoba Building Code*.

### Section 3 – Building Envelope

(9) Building Envelope Recommendations – see Table below:

Component	Description	Maximum Overall Thermal Transmittance (U-value) W/m <sup>2</sup> .°C	
		South <sup>1</sup>	North <sup>1</sup>
Roofs	Without attic space	0.23	0.20
	With attic space	0.14	0.11
Exterior Walls	Above Ground	0.33	0.23
Foundation Walls and Slab Edges <sup>2</sup>	Above Ground	0.33	0.23
	In contact with the ground <sup>3</sup>	0.48	0.39
Floors	less than 1.2m below grade (1.2m around perimeter)	0.56	0.39
	greater than 1.2m below grade	---	---
	with in-floor heat	0.56	0.39
	exposed above grade	0.27	0.23
Entryways <sup>4</sup>	Vestibule or Revolving Door	---	---

Notes:

1. To reduce the effects of thermal bridging, thermal transmittance must not exceed 4 times the value of the assembly thermal transmittance at all structural components and assembly transitions.
2. Must comply with frost protected foundation requirements.
3. Insulation to the bottom of structure; minimum 600mm below grade.
4. Vestibules are not required for exterior doors where the door is: a revolving door, used primarily to facilitate vehicular movement or material handling, intended to be used as a service or emergency *exit* door only, opens directly from a dwelling unit, or opens directly from a retail space less than 200m<sup>2</sup> in area or from a space less than 150m<sup>2</sup> for other uses.

Furthermore, an Appendix Note should be added: Consideration shall be given to the adaptive reuse of existing buildings, especially those with cultural or historic value, to capture the embodied energy and other resources that these buildings contain. It is hoped that when a building such as this is retrofitted, the exterior building façade will be preserved and the interior of the building envelope will be upgraded to current thermal transmittance levels. Where it isn't feasible to reuse an existing non-designated building, the deconstruction and reuse of the building materials rather than demolition should be explored.

- (10) A building/wall trade-off mechanism should be allowed in the Manitoba Building Code for designers in a small few instances where a wall may not be able to meet the prescribed thermal transmittance requirements listed in #10. The mechanism shall be written similar to the tradeoffs mechanism in MNECB Article 3.4.2.1.(1) where the sum of all wall areas multiplied by their respective thermal transmittance values for the proposed building shall not exceed the sum of the wall areas multiplied by thermal transmittance as calculated in accordance with #10.
- (11) Windows Recommendation - all fixed windows shall have a U-value ( $W/m^2 \cdot ^\circ C$ ) of not greater than 2.0 and all operable windows shall have a U-value not greater than 2.2.
- (12) Doors
- A. Follow Manitoba Hydro's prescriptive requirements for commercial doors. These recommendations include:
- Exterior non-glass man-doors must have a closure, be insulated, appropriately weather-stripped on all four edges, and have an automatic closing device.
  - Exterior glass man-doors must have a closure, use a minimum of double glazing with a minimum 13mm air space, be appropriately weather-stripped on all four edges, and have an automatic closing device.
  - There are no recommendations for fabric roll-away doors, overhead doors, revolving glass doors and sliding glass doors.
- B. Building envelope penetrations for doors that do not exceed 2% of the door to building envelope ratio, the prescriptive requirements for doors need not apply providing the doors are not required for life safety requirements.

#### **Section 4 – Service Water Heating**

- (13) Use similar wording as per Part 6 of the MNECB 1997 as a baseline for the new Service Water Heating Standards, as well as update Table 6.2.2.1 (see next page) with current Service Water Heating standards from Canada's Energy Efficiency Act.
- (14) Showers and Lavatories ensure that any amendments to a shower or lavatory meets the new Manitoba Plumbing Regulation 143/2010 for Maximum Flow Rates at 6.6Lpm (1.75gpm US) when tested according to CSA Standard B125-M, "Plumbing Fittings" (see Appendix E) and 5.7Lpm (1.50gpm US) when tested according to CSA Standard B125-M, "Plumbing Fittings" respectively.



Updated - Table 6.2.2.1.

Service Water Heating Equipment Performance Standards

Component	Input	Capacity, L	V <sub>t</sub> , US gal. (L)	Input/V <sub>t</sub> , Btuh/US gal. (W/L)	Standard	Rating Conditions	Performance Requirement	
<b>Storage-type and Non-storage (Instantaneous) Service Water Heaters</b>								
Electric	≤ 12 kW	50-270			CSA C191	In Standard	35 + 0.20 V SL (Top Inlet) 40 + 0.20 V SL (Bottom Inlet)	
		>270 and ≤ 454					In Standard	(0.472V)-38.5 W SL (Top Inlet) (0.472V)-33.5 W SL (Bottom Inlet)
	> 12 kW				CSA 4.3-2004 ANSI Z21.10.3 <sup>(1)</sup>	In Standard	In Standard	
		> 454			CSA 4.3-2004 ANSI Z21.10.3 <sup>(1)</sup>	In Standard	In Standard	
Heat pump water heaters	≤ 24 A and ≤ 250 V				CSA-C745 2009	In Standard	0.93 - 0.000349 V EF	
Gas-fired <sup>(4)</sup>	< 22 kW	≥76 and ≤ 380 L			CSA P.3	In Standard	0.67 - 0.0005 V EF	
	22-45 kW				CSA 4.3-2004 ANSI Z21.10.3	In Standard	E <sub>t</sub> ≥ 78% SL ≤ 1.3 + 114/V <sub>t</sub>	
	> 45 kW			< 4000 (310)			In Standard	E <sub>t</sub> ≥ 78% <sup>(5)</sup> SL ≤ 1.3 + 95/V <sub>t</sub> <sup>(2)(3)</sup>
				< 10 gallons (37.8L)	≥ 4000 (310)	CSA-4.3 - 2004, ANSI Z21.10.3		E <sub>t</sub> ≥ 80% <sup>(5)</sup>
				≥ 10 U.S.gal (37.8L)	≥ 4000 (310)		In Standard	E <sub>t</sub> ≥ 77% <sup>(5)</sup> SL ≤ 2.3 + 67/V <sub>t</sub> <sup>(2)(3)</sup>
Oil-fired, instantaneous	≤ 61.5 kW NAECA-covered <sup>(6)</sup>				DOE test procedures, US Code of Federal Regulations, 10 CFR, Part 430, Subpart B, Appendix E		EF ≥ 0.59 – 0.0005 V <sup>(7)(8)</sup>	

	> 61.5 kW			< 4000 (310)		In Standard	$E_t \geq 78\%$ <sup>(5)</sup> $SL \leq 1.3 + 95/V_t$ <sup>(2)(3)</sup>
			< 10 (37.8L)	$\geq 4000$ (310)	CSA 4.3-2004 ANSI Z21.10.3 <sup>(9)</sup>		$E_t \geq 80\%$ <sup>(5)</sup>
			$\geq 10$ (37.8L)	$\geq 4000$ (310)		In Standard	$E_t \geq 77\%$ <sup>(5)</sup> $SL \leq 2.3 + 67/V_t$ <sup>(2)(3)</sup>
Oil-fired, storage-type	$\leq 30.5$ kW	< 190			CSA-B211		$EF \geq 0.59 - 0.0005 V$
	$\leq 30.5$ kW	> 190			DOE test procedures, US Code of Federal Regulations, 10 CFR, Part 430, Subpart B, Appendix E		$EF \geq 0.59 - 0.0019 V$ <sup>(7)(8)</sup> $E_t \geq 78\%$
	> 30.5 kW	> 190		< 4000 (310)		$\Delta t = 90^\circ\text{F}$ (50°C)	$E_t \geq 78\%$ <sup>(5)</sup> $SL \leq 1.3 + 95/V_t$ <sup>(2)(3)</sup>
			< 10 (37.8)	$\geq 4000$ (310)	CSA 4.3-2004 ANSI Z21.10.3 <sup>(9)</sup>		$E_t \geq 80\%$ <sup>(5)</sup>
			$\geq 10$ (37.8)	$\geq 4000$ (310)		$\Delta t = 90^\circ\text{F}$ (50°C)	$E_t \geq 77\%$ <sup>(5)</sup> $SL \leq 2.3 + 67/V_t$ <sup>(2)(3)</sup>
<b>Pool Heaters</b>							
Gas-fired <sup>(4)</sup>	< 117.2 kW				CSA 4.7		$E_t \geq 78\%$ <sup>(5)</sup>
Oil-fired					ANSI Z21.56		$E_t \geq 78\%$ <sup>(5)</sup>

Notes1.:

- (1) When testing an electric *storage-type service water heater* for *standby loss* using the test procedure of Section 2.9. of the referenced standard, the electrical supply voltage shall be maintained within  $\pm 1\%$  of the centre of the voltage range specified on the water heater nameplate. Also, when needed for calculations, the *thermal efficiency* ( $E_t$ ) shall be 98%.
- (2)  $V_t$  is the storage volume in US gallons as measured according to the referenced standard.
- (3) SL is the *standby loss* (%/h).
- (4) Includes propane
- (5)  $E_t$  is the thermal efficiency with 70°F (38.9°C) water temperature difference.
- (6) Consistent with the U.S. National Appliance Energy Conservation Act of 1987.
- (7) EF is the *energy factor* (%/h).
- (8) V is the storage volume in US gallons as specified by the manufacturer.
- (9) When testing an oil-fired water heater using the test procedures of Section 2.8 and 2.9. of the referenced standard, the following modifications shall be made:
  - A vertical length of flue pipe of sufficient height to establish the minimum draft specified in the manufacturers installation instructions shall be connected to the flue gas outlet.
  - All measurements of oil consumption shall be taken by instruments with an accuracy of  $\pm 1\%$  or better.
  - The burner rate shall be adjusted to achieve an hourly Btu input rate within  $\pm 2\%$  of the manufacturers specified input rate, with the carbon dioxide (CO<sub>2</sub>) reading as specified by the manufacturer, with smoke number no greater than 1 and the fuel pump pressure within  $\pm 1\%$  of the manufacturers specification.