

# Power Smart for Business

Building Optimization | Custom Measures | HVAC | Insulation | Lighting | Parking Lot Controllers | Refrigeration | Windows

# Power Smart Design Standards

**For New & Renovated Buildings**



 **Manitoba  
Hydro**  
**POWER SMART\***

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## About the Design Standards

This publication specifies the design standards that new or renovated buildings must meet or exceed to be considered Power Smart.

The standards take the form of Power Smart mandatory requirements, prescriptive measures by building type, eligible products and systems, and recommended good practice.

They were prepared to help owners and engineering/architectural teams develop building designs that qualify their proposed new or renovated buildings for designation as Power Smart.

## Province Of Manitoba Green Building Policy

As of April 1, 2007, all new (and some renovated) building projects that are funded either in whole or in part by the Government of Manitoba must comply with the *Green Building Policy for Government of Manitoba Funded Projects*. A full copy of the Policy, detailing the scope and technical requirements, is available at: [http://www.gov.mb.ca/est/energy/pdf/green\\_bldg\\_policy.pdf](http://www.gov.mb.ca/est/energy/pdf/green_bldg_policy.pdf)

This policy applies to all Government of Manitoba departments, crown corporations and agencies as well as other entities that are either provincially funded or receive a direct capital contribution for a building or renovation project, with the exception of organizations receiving project funding solely from either the Power Smart Program operated by Manitoba Hydro or the Designated Heritage Building Grants Program operated by the Historic Resources Branch of Manitoba Culture, Heritage and Tourism.

# Power Smart Design Standards for New and Renovated Buildings

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# General introduction: obtaining a Power Smart building designation

Manitoba Hydro supports energy efficiency in new and renovated construction. It recommends that the Model National Energy Code of Canada for Buildings (MNECB) 1997 serve as the minimum guideline for the design and construction of all buildings.

## Benefits of a Power Smart building

- a Power Smart building will use a minimum of 25% less energy than conventionally-built designs.
- reduced operating cost
- lower maintenance cost
- reduction in greenhouse gas emissions
- more comfortable indoor environment
- higher resale value
- demonstrates commitment to energy efficient design and environmental leadership

## Achieving a Power Smart building designation

To be designated as Power Smart, a new or renovated building:

- must meet or exceed all mandatory provisions in the MNECB 1997
- must meet or exceed all Power Smart mandatory requirements listed in Section 1. (If the Power Smart mandatory requirements are more stringent than the provisions of the MNECB 1997, the provisions of the Power Smart mandatory requirements will prevail)
- must have an energy performance that is at least 25 per cent more efficient than a building built to the minimum MNECB 1997 requirements.

To demonstrate compliance with the Power Smart Design Standards, the architectural/engineering design team:

- must select and comply with one of two design options – the Performance option or the Prescriptive option.
- must submit, on behalf of the owner, a signed letter of commitment to Manitoba Hydro upon completion of the detailed design phase. (See sample letters located at the end of this section.)

- must submit a second signed letter of certification, upon completion of the facility, to affirm that all requirements and measures outlined in the letter of commitment have been included in the actual construction,

## Design options

Two design options are available to demonstrate compliance with the Power Smart Design Standards for new and renovated buildings: the performance option and the prescriptive option.

### i. Performance option

Under the performance option, designers are required to model the energy performance of the proposed design.

This option applies to buildings with 4650 m<sup>2</sup> (50 000 ft<sup>2</sup>) or more of conditioned floor space and to smaller buildings where the prescriptive option is not appropriate.

## Signed letter of commitment

To designate a building as Power Smart under the performance option, Manitoba Hydro must be provided with a signed letter of commitment from the engineer/architect design team stating that, to the best of the team's knowledge, the building:

- will meet or exceed all mandatory provisions in the MNECB 1997,  
**and**
- will meet or exceed the Power Smart mandatory requirements, which are listed in Section 1,  
**and**
- will have an energy performance 25 per cent more efficient than a building built to the minimum MNECB 1997 requirements.

The signed letter must include a brief listing of the energy saving measures incorporated in the proposed design to achieve the minimum 25 per cent improvement in energy efficiency. Manitoba Hydro reserves the option to evaluate the proposed design using EE4 software program or other methods to confirm that the proposed building design meets our Power Smart designation.

Please see Sample performance option – letter of commitment at the end of this section.

**When construction of the building is essentially complete and /or commissioned, a second signed letter of certification is required to affirm that all requirements and measures outlined in the letter of commitment were included in the actual construction. Any changes from the original plan should be qualified as to their effect on performance. Manitoba Hydro reserves the right to inspect the building and equipment and to request verification of building performance prior to issuing Power Smart certificate.**

## Software tools

To help the architectural/engineering design teams confirm that their proposed designs meet Power Smart Design Standards, Manitoba Hydro suggests the use of the energy performance simulation software tool called EE4 software program or other computer software that conforms to specifications detailed in "Performance Compliance for Buildings, Specifications for Calculation Procedures for Demonstrating Compliance to the Model National Energy Code for Buildings Using Whole Building Performance," published by the Canadian Commission on Building and Fire Codes.

The EE4 software estimates annual energy costs for the building as designed, and for the same building constructed to the MNECB 1997 standard.

This and other software tools are supported by Natural Resources Canada's (NRCan) and are available on the NRCan website at: [http://www.sbc.nrcan.gc.ca/software\\_and\\_tools/ee4\\_e.asp](http://www.sbc.nrcan.gc.ca/software_and_tools/ee4_e.asp)

## ii. Prescriptive option

Under the prescriptive option, designers select a set from the Power Smart prescriptive measures by building type (Section 2) that best suits their building.

This option normally applies to buildings with less than 4650 m<sup>2</sup> (50 000 ft<sup>2</sup>) of conditioned floor space.

There are at least two sets of prescriptive measures for each of the building types. Choose the set that is appropriate for your building.

Each set comprises various combinations of measures that surpass MNECB 1997 requirements for envelope construction, lighting, controls, HVAC and service water heating.

Each set applies proven technologies that, in combination, results in the minimum additional 25 per cent energy savings required for Power Smart designation.

## Signed letter of commitment

To designate a building as Power Smart under the prescriptive option, Manitoba Hydro must be provided with a signed letter of commitment from the engineering/architectural design team stating that, to the best of the team's knowledge, the building:

- will meet or exceed all mandatory and prescriptive provisions of the MNECB 1997

**and**

- will meet or exceed the Power Smart mandatory requirements listed in Section 1.

**and**

- will include at least one set of Power Smart prescriptive measures by building type listed in Section 2.

The letter must also specify which set of Power Smart prescriptive measures by building type the team selected. Note that following the prescriptive option does not preclude the necessity to apply good design and engineering practices in the proper selection and application of energy efficiency measures.

Please see Sample prescriptive option – letter of commitment at the end of this section.

**When construction of the building is essentially complete and /or commissioned, a second signed letter of certification is required to affirm that all requirements and measures outlined in the letter of commitment were included in the actual construction. Any changes from the original plan should be qualified as to their effect on performance. Manitoba Hydro reserves the right to inspect the building and equipment and to request verification of building performance prior to issuing Power Smart certificate.**

## Aspects not addressed by prescriptive measures

Those aspects of the building envelope; lighting system; heating, ventilating, and air conditioning systems (HVAC); electrical power equipment; and

service hot water system not addressed by a set of Power Smart prescriptive measures by building type are to be in accordance with MNECB 1997 mandatory and prescriptive requirements and the Power Smart mandatory requirements (Section 1).

## Requirements for Power Smart designation summary

| Requirements for Power Smart designation |   |   |   |
|--|---|---|---|
| Design path                              | Building size   | Mandatory provisions/requirements   | Recommended provisions/requirements   |
| Performance option                       | <ul style="list-style-type: none"> <li>greater than or equal to 4650 m<sup>2</sup> (50 000 ft<sup>2</sup>) of conditioned floor space</li> <li>smaller buildings that cannot use the prescriptive option</li> </ul> | <ul style="list-style-type: none"> <li>meet or exceed Power Smart mandatory requirements</li> <li>meet or exceed all mandatory provisions of MNECB 1997</li> <li>25% more efficient than minimum MNECB 1997 requirements</li> <li>signed letter of commitment</li> <li>signed letter of certification</li> </ul>              | <ul style="list-style-type: none"> <li>Power Smart prescriptive measures by building type (one set)</li> <li>Power Smart eligible products and systems</li> <li>Power Smart recommended good practices</li> </ul> |
| Prescriptive option                      | <ul style="list-style-type: none"> <li>less than 4650 m<sup>2</sup> (50 000 ft<sup>2</sup>) of conditioned floor space</li> </ul>   | <ul style="list-style-type: none"> <li>meet or exceed Power Smart mandatory requirements</li> <li>meet or exceed all mandatory provisions of MNECB 1997</li> <li>include Power Smart prescriptive measures by building type (one set)</li> <li>signed letter of commitment</li> <li>signed letter of certification</li> </ul> | <ul style="list-style-type: none"> <li>Power Smart eligible products and systems</li> <li>Power smart recommended good practice</li> </ul>  |

## Sample performance option – letter of commitment

Date

Manitoba Hydro's Representative's name  
Address

Dear Manitoba Hydro's Representative:

RE: Name of Building – Power Smart letter of commitment

On behalf of the Owner and in accordance with Manitoba Hydro's Power Smart Design Standards requirements, we confirm that, to the best of our knowledge, the above building:

- will meet or exceed all mandatory provisions in the MNECB 1997
- will meet or exceed Section 1: Power Smart mandatory requirements, Power Smart Design Standards (Third Edition October 2007)
- will have an energy performance of 25% more efficient than a building built to the minimum MNECB requirements.

The project exceeds 50,000 ft<sup>2</sup> of conditioned space and was designed under the Performance option of the Power Smart Design Standards (Third Edition October 2007). The EE4 energy performance simulation modeling predicts the energy performance of the building to be approximately xx% better than the same building constructed to the MNECB and will be achieved through:

- the incorporation of a closed loop ground source heat pump;
- refrigeration and ventilation heat recovery;
- higher levels of insulation in the walls and roof;
- energy efficient shower heads;
- high efficiency pumps and motors;
- improved air barrier systems;
- energy efficient windows;
- parking lot controllers.

Enclosed you will find letters of commitment from xxxx, our mechanical consultant and xxx, the electrical consultant.

Sincerely,

## Sample prescriptive option - letter of commitment

Date

Manitoba Hydro's Representative's name  
Address

Dear Manitoba Hydro's Representative:

RE: Name of Building – Power Smart letter of commitment

On behalf of the Owner and in accordance with Manitoba Hydro's Power Smart Design Standards requirements, we confirm that, to the best of our knowledge, the above building:

- will meet or exceed all mandatory provisions in the MNECB 1997
- will meet or exceed Section 1: Power Smart mandatory requirements, Power Smart Design Standards (Third Edition October 2007)
- will include the prescriptive energy efficiency measures listed under Energy efficiency measure set C for Small health care facilities, Power Smart Design Standards (Third Edition October 2007).

Enclosed you will find letters of commitment from xxxx, our mechanical consultant and xxx, the electrical consultant.

Sincerely,



# Section 1: Power Smart mandatory requirements

To be declared Power Smart, all new or renovated buildings must meet the following Power Smart mandatory requirements.

Financial assistance in the form of Power Smart incentives is available for electrical or natural gas heated construction projects that meet or exceed the minimum requirements of Manitoba Hydro's Power Smart programs. See Manitoba Hydro's website at [http://www.hydro.mb.ca/your\\_business/savings\\_commercial.shtml](http://www.hydro.mb.ca/your_business/savings_commercial.shtml) for more details.

If these Power Smart mandatory requirements are more stringent than the standards of the MNECB 1997, the provisions of the Power Smart mandatory requirements will prevail.

## Envelope insulation

### A. Building envelope

#### 1. Envelope insulation

1.1 Effective insulation values are the minimum acceptable values for all heating energy sources including electricity, geothermal, natural gas, fuel oil and propane. See table below.

**Only renovation projects that use electricity or natural gas for heat are eligible for Power Smart insulation incentives. See Power Smart eligible products and systems in section 3 for details.**

| Component   | Description  | Effective RSI (R) south of 53rd                    | Effective RSI (R) north of 53rd                    |
|---|--|--|--|
| <b>Roofs</b>  | Flat or sloped – no attic space.<br>Sloped – with attic space.   | RSI 4.4 (R-25)<br>RSI 7.0 (R-40)                   | RSI 4.9 (R-28)<br>RSI 8.8 (R-50)                   |
| <b>Exterior walls</b>   | Above and below grade.<br>Behind electric recessed heaters.  | RSI 3.0 (R-17)<br>RSI 3.5 (R-20)                   | RSI 4.4 (R-25)<br>RSI 4.9 (R-28)                   |
| <b>Floor edges, Above grade</b>                                 | All types of construction. Insulate edge to full height.   | RSI 1.8 (R-10)                                     | RSI 2.6 (R-15)                                     |
| <b>Floors, on grade And below-grade</b>                         | With in-floor heat. Insulate under full floor and install a 0.6 m (2 ft) exterior skirt just above floor level and sloped away at 15%*.  | RSI 1.8 (R-10))                                    | RSI 2.6 (R-15)                                     |
| <b>Floors, on grade &amp; 0.6 m (2 ft) or less below-grade</b>  | Without in-floor heat. Insulation must be installed under the first 1.2 m (4 ft) of the floor (from the perimeter). Install a 0.6 m (2 ft) exterior skirt sloped away at 15%*. | RSI 1.8 (R-10))                                    | RSI 2.6 (R-15)                                     |
| <b>Floors, greater than 0.6m (2 ft) below-grade</b>             | Without in-floor heat. Install a 0.6 m (2 ft) exterior skirt sloped away at 15%*.  | RSI 1.8 (R-10)                                     | RSI 2.6 (R-15)                                     |
| <b>Grade beams</b>  | No part of the beam shall be uninsulated.  | RSI 1.8 (R-10)                                     | RSI 2.6 (R-15)                                     |
| <b>Floors, overhanging (undersides exposed to the elements)</b> | parallel chord-trusses; area less than or equal to 10m <sup>2</sup> and joist-type floors; area greater than 10m <sup>2</sup> .<br>All other types.                            | RSI 5.3 (R-30)<br>RSI 7.0 (R-40)<br>RSI 3.7 (R-21) | RSI 5.3 (R-30)<br>RSI 7.0 (R-40)<br>RSI 3.7 (R-21) |

\* The exterior skirt must be installed just above floor level for below-grade floors and at the bottom edge of the edge insulation for thickened edge slabs on grade floors.

#### Notes:

1. Effective RSI is the overall average RSI value of a building section, including that of air films on both faces, taking into account variations in thermal conductivity and thermal bridging due to construction components other than insulation.
2. Effective versus nominal RSI values are given in Appendix B, "Thermal Characteristics of Common Building Assemblies" of the Model National Energy Code of Canada for Buildings (MNECB) 1997, pp. 131-174. They can also be calculated by applying the procedures described in Appendix C of the MNECB1997, "Method for Calculating the Thermal Properties of Building Assemblies," pp. 175-191.
3. To convert RSI value to Imperial R value, multiply the RSI value by 5.678.

## 2. Windows/skylights

2.1 Windows and skylights used in construction projects south of the 53rd parallel, must have a U-value of 1.7 W/m<sup>2</sup> •°C or less for new construction and 2.0 W/m<sup>2</sup> •°C or less for existing or renovation projects. Projects north of the 53rd parallel must have U-values of 1.7 W/m<sup>2</sup> •°C or less for new construction and 1.8 W/ m<sup>2</sup> •°C or less for existing or renovation projects. For fenestration/wall ratios higher than 0.4 refer to the tables below. U-value must be determined in accordance with CSA A440.2.

### New construction projects

| Fenestration to wall ratio | Maximum U-values (W/m <sup>2</sup> •°C) for windows |               |
|----------------------------|---|---------------|
|                            | South of 53rd                                       | North of 53rd |
| Less than or equal to 0.4  | 1.7   | 1.7           |
| Greater than 0.4 to 0.5    | 1.7   | 1.7           |
| Greater than 0.5 to 0.6    | 1.7   | 1.6           |
| Greater than 0.6 to 0.7    | 1.6   | 1.5           |
| Greater than 0.7 to 0.8    | 1.5   | 1.5           |
| Greater than 0.8 to 0.9    | 1.4   | 1.4           |
| Greater than 0.9           | 1.4   | 1.4           |

### Existing or Renovation projects

| Fenestration to wall ratio | Maximum U-values (W/m <sup>2</sup> •°C) for windows |               |
|----------------------------|---|---------------|
|                            | South of 53rd                                       | North of 53rd |
| Less than or equal to 0.4  | 2.0   | 1.8           |
| Greater than 0.4 to 0.5    | 1.9   | 1.7           |
| Greater than 0.5 to 0.6    | 1.7   | 1.6           |
| Greater than 0.6 to 0.7    | 1.6   | 1.5           |
| Greater than 0.7 to 0.8    | 1.5   | 1.5           |
| Greater than 0.8 to 0.9    | 1.4   | 1.4           |
| Greater than 0.9           | 1.4   | 1.4           |

**A Power Smart incentive is available for energy efficient window systems which have a U-value of 1.7 W/m<sup>2</sup> •°C or less in new construction and 2.0 W/m<sup>2</sup> •°C or less in renovation projects. See Power Smart eligible products and systems in section 3 for details.**

## 3. Doors

3.1 All doors must be appropriately weather-stripped on all four edges, and have an automatic closing device.

3.2 Glass doors must use a minimum of double glazing with 13mm air space.

3.3 All solid doors must be metal, foam insulated doors. Uninsulated doors must not be used.

## 4. Air barrier systems

The air barrier system must be installed by trained, experienced applicators. The installation must be monitored, tested, and inspected by a qualified, independent authority for proper adhesion and air tightness prior to the application of the cladding.

**No incentive is available for this option.**

## B. Lighting systems

### 1. Fluorescents

1.1 Linear fluorescent systems must have T8 electronic ballasts, unless a lack of product or unsuitability of current products prevails. Suitable alternative sources can be as follows:

- T5 Fluorescents
- Compact Fluorescents
- High Intensity Discharge (HID).

1.2 Linear fluorescents can also be used in conjunction with high performance luminaires or dimming systems to extend energy savings.

1.3 Approved T8 ballasts and lamps must be used.

**A Power Smart incentive is available for T8 fluorescents. See Power Smart eligible products and systems in section 3 for details.**

### 2. Incandescents

2.1 Standard incandescent sources must not be used, except in very infrequently used areas, such as crawlspaces, storage areas, cold temperature areas, or applications of a special nature.

2.2 Notwithstanding Section 2.1, tungsten halogen technology must be used wherever normal hours of usage are expected, provided that the system is on dimming control.

2.3 Tungsten halogen technology can be applied as a secondary system for relatively short operating intervals in conjunction with a primary system of acceptable efficient technology such as T8 and HID. These two systems must be positively interlocked or controlled such that only one system can operate at one time. The tungsten halogen lighting load must be less than the primary system load.

No incentives are available for incandescent lamps.

### 3. Compact Fluorescents (CF)

3.1 Compact Fluorescent (CF) sources must be applied where traditionally incandescent sources were used, such as in architectural settings. Dimming of CF or multi-level manual control is acceptable. Approved ballasts must be used to be eligible for the incentive.

**A Power Smart incentive is available for CF. See Power Smart eligible products and systems in section 3 for details.**

3.2 CF is acceptable for low temperature applications provided that suitable approved ballasts and lamps are used.

### 4. LED exit signs

4.1 Exit signs must use Light Emitting Diode (LED) technology. Sign wattage must not exceed four watts.

**No incentive is available for LED signs in new construction. See Power Smart eligible products and systems in section 3 for details.**

### 5. Metal Halide (MH)

5.1 Where a metal halide source is required, preference shall be given to new pulse start systems, using fixtures approved by Manitoba Hydro.

**Contact the Lighting Program Engineer for more information.**

5.2 **All MH fixtures must be totally enclosed for safety.** MH fixtures for interior applications shall be used with only base-up or base down lamp operating positions. Clear lamps are to be used as much as possible.

5.3 Integral standby quartz halogen lamps shall not be used in MH fixtures. Where necessary, individual quartz fixtures may be used with an approved control methodology.

**A Power Smart incentive is available for pulse start (quartz and ceramic) MH fixtures. See Power Smart eligible products and systems in section 3 for details.**

### 6. Occupancy sensors

6.1 Individual offices, smaller conference rooms, photocopying rooms or coffee rooms that remain unoccupied for longer than 15 minutes at a time should have Power Smart approved wall or ceiling mounted occupancy sensors.

**A Power Smart incentive is available for occupancy sensors. See Power Smart eligible products and systems in section 3 for details.**

### 7. General lighting

7.1 Combinations of technologies for individual areas are acceptable.

7.2 For additional energy savings, High Performance Luminaires (HPL) for fluorescent and HID sources can be factored into lighting design.

**A Power Smart incentive is available. See Power Smart eligible products and systems in section 3 for details.**

7.3 All exterior lighting must have a minimum source efficacy of 60 lumens/watt.

7.4 Exterior sign lighting must use either LED's or fluorescent lamps.

7.5 All products must be new and fully CSA approved or equivalent.

7.6 All ballasts (T8, CF and HID) must be of the High Power Factor (HPF) type.

### 8. Lighting levels

8.1 For specialized areas or visually stringent tasks, installing supplemental task lighting is preferable to increasing general lighting levels throughout a space. Task lighting sources must conform to the mandatory requirements of the MNECB and the requirements for lighting systems listed above.

8.2 For all spaces, interior and exterior, lighting levels must conform to the standards of Illuminating Engineering Society (IES).

## C. Heating, ventilating and air conditioning

### 1. Rooftop packaged and split system air conditioners

1.1 All cooling systems rated less than 19 kW (65 000 Btu/hr) must meet or exceed Energy Star qualifications and all cooling systems rated above 19 kW (65 000 Btu/hr) must meet or exceed the minimum performance standards listed in the most recent version of CSA Standards C746-06.

**Power Smart incentives are no longer available for roof top or split system AC units. See Power Smart eligible products and systems in section 3 for details.**

### 2. Packaged water chillers

2.1 Packaged water chillers, which have ARI certified Integrated Part Load Value (IPLV) performance ratings less than or equal to the maximum Power Smart IPLV (kW/ton) values listed below, shall be eligible for incentives.

| Chiller capacity (tons) | Power smart chiller maximum IPLV (kW/ton) |
|-------------------------|---|
| Less than 150           | 0.620                                     |
| 150-299                 | 0.550                                     |
| 300-2000                | 0.460                                     |

**A Power Smart incentive is available for packaged water chillers and those retrofitted with variable speed drives (VSD). See Power Smart eligible products and systems in section 3 for details.**

### 3. Natural gas fired boilers

3.1 Commercial boilers with input ratings less than 300 000 Btu/h must meet the following requirements:

- Canadian Gas Association Standard CGA P.2-1991 (Gas Fired Boilers)
- Minimum efficiency of 85 per cent (near-condensing) or 90 per cent (condensing) AFUE (Annual Fuel Utilization Efficiency) in accordance with Energy Star requirements for energy efficiency
- Electronic ignition (No standing pilot)
- Induced draft fan or power vent
- Condensing boiler must be designed to withstand continuous operation with a return water temperature not exceeding 49°C (120°F)

3.2 Commercial boilers with input ratings of greater than or equal to 300 000 Btu/h must meet the following requirements:

- Minimum combustion efficiency of 85 per cent (near-condensing) or 90 per cent (condensing) as per ANSI Z21.13/CSA 4.9 standards.
- Electronic ignition (no standing pilot)
- Induced draft fan **OR** power vent

3.3 Condensing boiler must be designed to withstand continuous operation with a return water temperature not exceeding 49°C (120°F)

**A Power Smart incentive is available for high efficiency condensing boilers that are used primarily for space heat in new and renovation projects.**

**A Power Smart incentive is available for near condensing boilers that are used primarily for space heat in renovation projects only.**

### 4. Hot water boiler system controls

4.1 An indoor/outdoor (outdoor reset) control shall automatically adjust the supply water temperature of the system in relation to outdoor air temperature.

### 5. Natural gas furnaces

5.1 CSA approved high efficiency condensing Energy Star qualified natural gas furnaces only.

5.2 Minimum efficiency of 90 per cent AFUE in accordance with Energy Star specifications for energy efficiency

**A Power Smart incentive is available for high efficiency Energy Star qualified furnaces that are used primarily for space heat.**

### 6. Geothermal heat pump system

6.1 Forced air (water-to-air) geothermal heat pump units must be certified by CSA or ARI/ISO 13256-1. Fluid-to-fluid geothermal heat pumps must be rated by the manufacturer in accordance with ARI/ISO 13256-2.

6.2 All systems must be designed and installed in accordance with the current edition of CSA 448.1 (Design and Installation of Earth Energy Systems for Commercial and Institutional Buildings)

6.3 Products, equipment and their applications and installations, must be new and meet or exceed energy efficient regulatory requirements in Manitoba.

**A Power Smart incentive is available for geothermal heat pumps. See Power Smart eligible products and systems in section 3 for details.**

## 7. Thermostatic controls

7.1 The supply of heating energy to each heating zone shall be individually controlled by thermostatic controls responding directly to the temperature within each zone.

7.2 Heating systems shall be controlled by a thermostat which also controls the cooling (air conditioning) system to prevent or minimize simultaneous heating and cooling.

## D. Domestic/service water

### 1. Electric water heaters

1.1 Storage tanks and tank type water heaters must be insulated to a nominal minimum of RSI 2.8.

1.2 Separate remote heaters or booster heaters are required when less than half of the total design flow has a discharge temperature requirement of greater than 60°C (140° F).

1.3 Minimum storage capacity of 20 L per kW of installed element capacity is required.

### 2. Natural gas water heaters

2.1 Commercial gas fired storage water heaters must conform to standard CSA 4.3-2004 "Gas Water Heaters".

2.2 Utilize an electronic ignition system (no standing pilot).

2.3 The water heater venting system must have an automatic flue damper, induced draft fan or a forced draft fan.

## E. Electrical power

### 1. General

1.1 All three phase motors must be high efficiency types. This includes any three phase motors in packaged equipment. Motors from which the heat losses can be shown to be useful during the heating season need not be considered if they can be shown to be uneconomic.

1.2 Power factor must be corrected to a minimum of 0.92 at time of building peak demand.

1.3 Ramp and sidewalk heating cables and pipe heat tracing must be thermostatically, time clock, or otherwise automatically controlled to minimize unnecessary operation.

### 2. Parking lot electrical service

2.1 Receptacles provided for vehicle block heater and interior warmer service shall be automatically controlled to reduce energy consumption during milder weather.

2.2 The amount of energy delivered must vary with outside air temperature.

2.3 Full power (100 per cent) shall be delivered continuously when the outside air temperature is below a set temperature as describe in 2.4 below.

2.4 Maximum temperature for full power is -20°C (-4°F), and between -20°C (-4°F) and -30°C (-22°F) is recommended. The set point should be adjustable for easy modification after installation.

**A Power Smart incentive is available for parking lot controllers. See Power Smart eligible products and systems in section 3 for details.**

## F. Power Smart commercial refrigeration

To be declared Power Smart, all new or renovated buildings that include commercial refrigeration equipment, must implement at least 50 per cent of the listed measures that are appropriate for the refrigeration equipment in the building. Refrigeration equipment that has a listed measure as a standard feature is deemed to have the measure implemented and can be counted towards the 50 per cent requirement. A list of all selected measures must accompany the signed letter of commitment from the engineer/architect design team.

**A Power Smart incentive is available for all approved refrigeration measures.**

## **G. Refrigerated display cases**

### **1. Glass / acrylic doors or night covers**

1.1 The case should be equipped with glass / acrylic doors.

or

1.2 The case manufacturer must have no objections to the use of such front night covers. It is recommended that film type covers have small, perforated holes to decrease moisture buildup.

### **2. Anti-sweat heater controls or no-sweat doors**

2.1 Install a device that reduces the operation of the anti-sweat heaters by at least 50 per cent (from 100 per cent) for the glass door and door frame. Technologies that reduce or turn off anti-sweat heaters based on simple timing or by sensing humidity or condensation qualify. Timer must not be equipped with a "hold-on" feature.

or

2.2 Install special no-sweat doors, the type that eliminates glass heating. Doors must have either heat reflective treated glass, be gas filled, or both. Doors must have three (3) or more panes.

### **3. Auto-closers for doors**

3.1 Door closers must firmly close doors that are within one inch of full closure.

### **4. High efficiency evaporator fan motors**

4.1 Electronically commutated motors (ECM) must be used as the evaporator fan motors in lieu of standard efficiency motors such as shaded pole or permanent split capacitor (PSC).

### **5. T8 lighting with premium electronic ballast**

5.1 The ballast, lamp, and fixture must be rated to match the case temperature or lower. Lamps shall be approved by Manitoba Hydro. Ballasts shall be dedicated only for T8 systems. Premium ballast power factor shall be a minimum of 0.98 (lead or lag). Total Harmonic Distortion (THD) limits for premium ballasts shall not exceed 10 per cent at 90 to 106 per cent of nominal primary voltage. For retrofitting of rapid start wired fixtures, where existing lamp holders are in good condition, it is mandatory that the two conductors from each lamp holder be of equal length and be connected together before

connection to the appropriate single lamp lead on an instant start ballast. This requirement is for safe and optimum performance of T8 lamps, per NEMA # LSD 2-1998. Ballasts shall be infrared (IR) conflict free. Lamp shall operate outside the IR range 31 350 to 42 000 Hz and 53 960 to 59 640 to avoid potential infrared equipment incompatibility problems. Refer to Manitoba Hydro's web site [http://www.hydro.mb.ca/your\\_business/lighting/pdf/light\\_t8\\_premium.pdf](http://www.hydro.mb.ca/your_business/lighting/pdf/light_t8_premium.pdf) to view the Product Eligibility Lists for T8 Fluorescent Systems – Premium Ballasts.

## **H. Refrigerated walk-in boxes**

### **1. Strip curtains**

1.1 Install new strip curtains on inside doorways of walk-ins.

### **2. Auto-closers for doors**

2.1 Door closers must firmly close doors that are within one inch of full closure.

### **3. High efficiency evaporator fan motors**

3.1 Electronically commutated motors (ECM) must be used as the evaporator fan motors in lieu of standard efficiency motors such as shaded pole or permanent split capacitor (PSC).

### **4. Energy efficient lighting**

4.1 The ballast, lamp, and fixture must be rated to match the case temperature or lower. Lamps shall be approved by Manitoba Hydro. Ballasts shall be dedicated only for T8 systems. Premium ballast power factor shall be a minimum of 0.98 (lead or lag). THD limits for premium ballasts shall not exceed 10 per cent at 90 to 106 per cent of nominal primary voltage. For retrofitting of rapid start wired fixtures, where existing lamp holders are in good condition, it is mandatory that the two conductors from each lamp holder be of equal length and be connected together before connection to the appropriate single lamp lead on an instant start ballast. This requirement is for safe and optimum performance of T8 lamps, per NEMA # LSD 2-1998. Ballasts shall be IR conflict free. Lamp shall operate outside the IR range 31 350 to 42 000 Hz and 53 960 to 59 640 to avoid potential infrared equipment incompatibility problems. Refer to Manitoba Hydro's web site [http://www.hydro.mb.ca/your\\_business/lighting/pdf/light\\_t8\\_premium.pdf](http://www.hydro.mb.ca/your_business/lighting/pdf/light_t8_premium.pdf) to view the Product Eligibility Lists for T8 Fluorescent Systems – Premium Ballasts.

or

4.2 Hardwired electronically ballasted CF lamp fixture must be rated to match the case temperature or lower. Lamps shall be approved by Manitoba Hydro. Input current total harmonic distortion limits for electronic ballasts are 19 per cent THD with power factor above 0.98, for a voltage variation of 90 to 104 per cent of nominal primary voltage. Permanent or “hardwired” types of luminaries shall be complete with an integral replaceable electronic ballast-thermally protected, high power factor. Where multiple lamps are used, ballasts may be the multi-lamp type. Retrofit kits for the conversion of existing incandescent luminaries shall have permanent mounting features, with thermally protected high power factor electronic ballasts. All attachments shall be mechanical means and not dependent upon tape or adhesives. All displaced incandescent lamp sockets shall be permanently removed. Major hardware shall identify this kit as a retrofit type, with make/model number and nominal lamp rating. Kit components are not to be modified in a manner so as to invalidate CSA approval for the intended function. Refer to Manitoba Hydro’s web site [http://www.hydro.mb.ca/your\\_business/lighting/pdf/light\\_cfl\\_hardwired.pdf](http://www.hydro.mb.ca/your_business/lighting/pdf/light_cfl_hardwired.pdf) to view the Product Eligibility Lists for CF Systems – Hardwired Ballasts.

## 5. Door gaskets

5.1 Install new gasket on the doors of walk-ins. Gaskets must meet the manufacturer’s specifications regarding dimensions, materials, attachment method, style, compression and magnetism.

## 6. Evaporator fan controllers

6.1 Install evaporator fan controllers to reduce air flow of evaporator fans in medium temperature walk-ins when there is no refrigerant flow through the evaporator (i.e., when the compressor is in an off-cycle). Must control a minimum fan load of 1/20 hp where the fan(s) are currently running continuously, and must reduce fan motor power consumption by at least 75 per cent during the compressor off-cycle.

## I. Mechanical room

### 1. High efficiency refrigeration compressors

1.1 Install compressors that have energy efficiency ratings (EER) of 5.2 or better. The EER rating is based on the following conditions: Saturated Suction Temperature (SST) =  $-32^{\circ}\text{C}$  ( $-25^{\circ}\text{F}$ ); Saturated Condensing Temperature (SCT) =  $41^{\circ}\text{C}$  ( $105^{\circ}\text{F}$ ); Maximum Suction Return Gas Temperature =  $18^{\circ}\text{C}$  ( $65^{\circ}\text{F}$ ); Zero degrees of sub cooling.

### 2. Insulated refrigeration suction lines

2.1 Insulate refrigeration suction lines (the larger diameter lines that run from the evaporator to the compressor). Medium temperature lines must be insulated with  $\frac{3}{4}$ -inch insulation, and low temperature lines must be insulated with 1-inch insulation. Insulation material must be flexible closed-cell nitrile rubber, or equivalent. Insulation exposed to outside weather must be jacketed (such as with a medium-gauge aluminum jacket) or adequately protected from the weather.



## Section 2: Power Smart prescriptive measures by building type

The following Power Smart prescriptive measures have been grouped into sets for various building types. They are based on “energy efficiency measure sets” that were originally created by NRCan to satisfy the requirements of the former Commercial Building Incentive Program (CBIP) but have been modified by Manitoba Hydro to reflect new technologies and the differences between Power Smart mandatory requirements and the MNECB 1997.

Please note that:

- Window U-values must be 1.7 W/m<sup>2</sup>•°C or less for all new construction in Manitoba. Window U-values for existing or renovation projects must be 2.0 for less for buildings south of the

53rd parallel and 1.8 W/ m<sup>2</sup> •°C or less than for buildings north of the 53rd parallel.

- Wall insulation improvement values refer to the Power Smart mandatory requirements. They do not refer to the MNECB 1997.

Energy savings achieved with these energy efficiency measure sets are equal to or greater than 25 per cent when compared to a similar building built to MNECB 1997 requirements. The sets have been tailored for climate zone 4 (south of the 53rd parallel in Manitoba) and climate zone 6 (north of the 53rd parallel in Manitoba). Consideration has been given to variations in fuel availability and cost, construction cost, and climate.

### Small retail stores and big box retail stores

#### (South of the 53rd parallel in Manitoba)

##### Energy efficiency measure set A

- wall insulated to an increase of RSI 0.9 above Power Smart mandatory requirements
- sloped roofs with an attic space insulated to an increase of RSI 0.9 above Power Smart mandatory requirements
- lighting power density less than 15 W/m<sup>2</sup>
- mid-efficiency rooftop units
- Heat Recovery Ventilators (HRV)

Note: If propane or oil is the principal heating source, the U-value of fixed windows must be less than 1.6 W/m<sup>2</sup>•°C.

##### Energy efficiency measure set B

- wall insulated to an increase of RSI 1.7 above Power Smart mandatory requirements
- sloped roof with an attic space insulated to an increase of RSI 1.7 above Power Smart mandatory requirements
- flat or sloped roofs with no attic space insulated to an increase of RSI 0.8 above Power Smart mandatory requirements
- lighting power density less than 15 W/m<sup>2</sup>
- mid-efficiency rooftop units

#### (North of the 53rd parallel in Manitoba)

##### Energy efficiency measure set A

- wall insulated to an increase of RSI 0.1 above Power Smart mandatory requirements
- sloped roofs with an attic space insulated to an increase of RSI 0.5 above Power Smart mandatory requirements
- window U-value less than 1.6 W/m<sup>2</sup>•°C. (See note below.)
- lighting power density less than 15 W/m<sup>2</sup>
- mid-efficiency rooftop units
- Heat Recovery Ventilators (HRV)

Note: If the fenestration-to-wall ratio is greater than 0.6, then the U-value of fixed glazing shall not exceed the Power Smart mandatory requirements value.

Note: If propane or oil is the main heating source, the U-value of fixed windows must be less than 1.6 W/m<sup>2</sup>•°C.

## Strip mall retail stores

### South of the 53rd parallel in Manitoba)

#### Energy efficiency measure set A

- wall insulated to an increase of RSI 0.9 above Power Smart mandatory requirements
- sloped roofs with an attic space insulated to an increase of RSI 0.9 above Power Smart mandatory requirements
- lighting power density less than 18 W/m<sup>2</sup>
- mid-efficiency rooftop units
- Heat Recovery Ventilators (HRV)

Note: If propane or oil is the principal heating source, the U-value of fixed windows must be less than 1.6 W/m<sup>2</sup> •°C.

#### Energy efficiency measure set B

- wall insulated to an increase of RSI 1.7 above Power Smart mandatory requirements
- sloped roofs with an attic space insulated to an increase of RSI 1.7 above Power Smart mandatory requirements
- flat or sloped roofs with no attic space insulated to an increase of RSI 0.8 above Power Smart mandatory requirements
- lighting power density less than 18 W/m<sup>2</sup>
- mid-efficiency rooftop units

Note: If propane or oil is the principal heating source, the U-value of fixed windows must be less than 1.6 W/m<sup>2</sup> •°C.

### (North of the 53rd parallel in Manitoba)

#### Energy efficiency measure set A

- wall insulated to an increase of RSI 0.1 above Power Smart mandatory requirements
- sloped roofs with an attic space insulated to an increase of RSI 0.5 above Power Smart mandatory requirements
- window U-value less than 1.6 W/m<sup>2</sup>•°C. (See note below.)
- lighting power density less than 18 W/m<sup>2</sup>
- mid-efficiency rooftop units
- Heat Recovery Ventilators (HRV)

Note: If the fenestration-to-wall ratio is greater than 0.6, then the U-value of fixed glazing shall not exceed the Power Smart mandatory requirements value.

## Small offices

### (South of the 53rd parallel in Manitoba)

#### Energy efficiency measure set A

- lighting power density of 11.5 W/m<sup>2</sup>
- overall fenestration U-value of 1.48 W/m<sup>2</sup>•°C or less
- condensing boiler or condensing furnace with a minimum efficiency of 90 per cent AFUE

#### Energy efficiency measure set B

- wall insulated to an increase of RSI 1.7 above Power Smart mandatory requirements
- overall fenestration U-value of 1.37 W/m<sup>2</sup>•°C or less
- lighting power density of 11.5 W/m<sup>2</sup>
- upgrade rooftop unit (inlet vane control, low-leakage damper, optimum start)

#### Energy efficiency measure set C

- lighting power density of 11.5 W/m<sup>2</sup>
- overall fenestration U-value of 1.48 W/m<sup>2</sup>•°C or less
- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness

#### Energy efficiency measure set D

- lighting power density of 11.5 W/m<sup>2</sup>
- overall fenestration U-value of 1.48 W/m<sup>2</sup>•°C or less
- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness
- perimeter daylighting with light dimming
- water-loop heat pump system with condensing boiler and cooling tower

#### Energy efficiency measure set E

- wall insulated to an increase of RSI 2.8 above Power Smart mandatory requirements
- lighting power density of 11.5 W/m<sup>2</sup>
- overall fenestration U-value of 1.48 W/m<sup>2</sup>•°C or less
- active solar shading
- radiant ceiling heating/cooling, displacement ventilation with heat recovery, water economizer, condensing boiler and chiller

#### Energy efficiency measure set F

- lighting power density of 10.8 W/m<sup>2</sup>
- wall insulated to an increase of RSI 0.9 above Power Smart mandatory requirements
- overall fenestration U-value of 1.37 W/m<sup>2</sup>•°C or less
- two-pipe ground source heat pump system [Energy Efficiency Ratio (EER) = 15.5, Coefficient of Performance (COP) = 3.4]

### (North of the 53rd parallel in Manitoba)

#### Energy efficiency measure set A

- lighting power density of 14.5 W/m<sup>2</sup>
- overall fenestration U-value of 1.48 W/m<sup>2</sup>•°C or less
- condensing boiler or condensing furnace with a minimum efficiency of 90 per cent AFUE

#### Energy efficiency measure set B

- wall insulated to an increase of RSI 0.9 above Power Smart mandatory requirements
- overall fenestration U-value of 1.37 W/m<sup>2</sup>•°C or less
- lighting power density of 14.5 W/m<sup>2</sup>
- upgrade rooftop unit (inlet vane control, low-leakage damper, optimum start)

#### Energy efficiency measure set C

- lighting power density of 14.5 W/m<sup>2</sup>
- overall fenestration U-value of 1.48 W/m<sup>2</sup>•°C or less
- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness

#### Energy efficiency measure set D

- lighting power density of 14.5 W/m<sup>2</sup>
- overall fenestration U-value of 1.48 W/m<sup>2</sup>•°C or less
- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness
- perimeter daylighting with light dimming
- water-loop heat pump system with condensing boiler and cooling tower

#### Energy efficiency measure set E

- wall insulated to an increase of RSI 2.0 above Power Smart mandatory requirements
- lighting power density of 14.5 W/m<sup>2</sup>
- overall fenestration U-value of 1.48 W/m<sup>2</sup>•°C or less
- active solar shading
- radiant ceiling heating/cooling, displacement ventilation with heat recovery, water economizer, condensing boiler and chiller

#### Energy efficiency measure set F

- lighting power density of 10.8 W/m<sup>2</sup>
- wall insulated to an increase of RSI 0.1 above Power Smart mandatory requirements
- overall fenestration U-value of 1.37 W/m<sup>2</sup>•°C or less
- two-pipe ground source heat pump system [Energy Efficiency Ratio (EER) = 15.5, Coefficient of Performance (COP) = 3.4]

## Small hotels/motels

### (South of the 53rd parallel in Manitoba)

#### Energy efficiency measure set A

- overall fenestration U-value of  $1.48 \text{ W/m}^2\cdot\text{°C}$  or less
- energy-efficient showerheads and auto-off faucets
- occupancy sensors for guest room lights and exhaust system
- automatic control on guest room temperatures and outdoor air when room not occupied
- no incandescent lighting in building

#### Energy efficiency measure set B

- energy-efficient showerhead and tap fixtures
- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness

#### Energy efficiency measure set C

- condensing service hot water (SHW) boiler with a minimum efficiency of 90 per cent AFUE
- condensing natural gas-fired furnace with a minimum efficiency of 90 per cent AFUE for make-up air
- corridor lighting power density less than  $1.9 \text{ W/m}^2$
- energy-efficient showerhead and tap fixtures
- air to air heat recovery of fresh air with a minimum 60 per cent annual effectiveness
- high-efficiency packaged terminal air conditioners (PTAC) in guest rooms with an EER = 10.6
- overall fenestration U-value of  $1.37 \text{ W/m}^2\cdot\text{°C}$  or less
- wall insulated to an increase of RSI 0.9 above Power Smart mandatory requirements

#### Energy efficiency measure set D

- wall insulated to an increase of RSI 0.9 above Power Smart mandatory requirements
- sloped roofs with an attic space insulated to an increase of RSI 0.9 above Power Smart mandatory requirements
- overall fenestration U-value of  $1.48 \text{ W/m}^2\cdot\text{°C}$  or less
- high-efficiency SHW boiler with a minimum efficiency of 90 per cent AFUE, auto-off faucets
- occupancy sensors for guest room lights and exhaust system
- automatic control on guest room temperatures and outdoor air when room not occupied
- no incandescent lighting in building
- high-efficiency central chiller (COP = 4.4), condensing lead boiler with a minimum efficiency of 90 per cent AFUE and fan-coils
- central ventilation with air-to-air heat recovery and individual guest room dampers controlled according to occupancy with a minimum of 60 per cent annual effectiveness

### (North of the 53rd parallel in Manitoba)

#### Energy efficiency measure set A

- overall fenestration U-value of  $1.48 \text{ W/m}^2\cdot\text{°C}$  or less
- energy-efficient showerheads and auto-off faucets
- occupancy sensors for guest room lights and exhaust system
- automatic control on guest room temperatures and outdoor air when room not occupied
- no incandescent lighting in building

#### Energy efficiency measure set B

- energy-efficient showerhead and tap fixtures
- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness

#### Energy efficiency measure set C

- condensing service hot water (SHW) boiler with a minimum efficiency of 90 per cent AFUE
- condensing natural gas-fired furnace with a minimum efficiency of 90 per cent AFUE for make-up air
- corridor lighting power density less than  $1.9 \text{ W/m}^2$
- energy-efficient showerhead and tap fixtures
- air-to-air heat recovery of fresh air with a minimum 60 per cent annual effectiveness
- high-efficiency packaged terminal air conditioner (PTAC) in guest rooms with an EER = 10.6
- overall fenestration U-value of  $1.37 \text{ W/m}^2\cdot\text{°C}$  or less
- wall insulated to an increase of RSI 0.1 above Power Smart mandatory requirements

#### Energy efficiency measure set D

- wall and roof insulated to an increase of RSI 0.1 above Power Smart mandatory requirements
- overall fenestration U-value of  $1.48 \text{ W/m}^2\cdot\text{°C}$  or less
- high-efficiency service hot water (SHW) boiler with a minimum efficiency of 90 per cent AFUE, auto-off faucets
- occupancy sensors for guest room lights and exhaust system
- automatic control on guest room temperatures and outdoor air when room not occupied
- sloped roofs with an attic space insulated to an increase of RSI 0.5 above Power Smart mandatory requirements
- no incandescent lighting in building
- high-efficiency central chiller (COP = 4.4), condensing lead boiler with a minimum efficiency of 90 per cent AFUE and fan-coils
- central ventilation with air-to-air heat recovery and individual guest room dampers controlled according to occupancy with a minimum of 60 per cent annual effectiveness

## Small health care facilities

### (South of the 53rd parallel in Manitoba)

#### Energy efficiency measure set A

- wall insulated to an increase of RSI 1.2 above Power Smart mandatory requirements
- sloped roof with an attic space insulated to an increase of RSI 1.8 above Power Smart mandatory requirements
- flat or sloped roofs with no attic space insulated to an increase of RSI 0.9 above Power Smart mandatory requirements
- lighting power density less than or equal to 16.6 W/m<sup>2</sup>
- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness

#### Energy efficiency measure set B

- wall insulated to an increase of RSI 1.2 above Power Smart mandatory requirements
- sloped roof with an attic space insulated to an increase of RSI 1.8 above Power Smart mandatory requirements
- flat or sloped roofs with no attic space insulated to an increase of RSI 0.9 above Power Smart mandatory requirements
- lighting power density less than or equal to 12.9 W/m<sup>2</sup>
- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness
- high-efficiency cooling (IPLV greater than or equal to 12). An IPLV is an Integrated Part-Load Value

#### Energy efficiency measure set C

- wall insulated to an increase of RSI 1.2 above Power Smart mandatory requirements
- sloped roof with an attic space insulated to an increase of RSI 1.8 above Power Smart mandatory requirements
- flat or sloped roofs with no attic space insulated to an increase of RSI 0.9 above Power Smart mandatory requirements
- lighting power density less than or equal to 12.9 W/m<sup>2</sup>
- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness
- variable speed drives on Variable Air Volume (VAV) system fans
- boiler temperature reset

### North of the 53rd parallel in Manitoba)

#### Energy efficiency measure set A

- lighting power density less than or equal to 6.6 W/m<sup>2</sup>
- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness
- minimum boiler efficiency greater than or equal to 90 per cent AFUE
- minimum service water heating efficiency greater than or equal to 90 per cent AFUE

#### Energy efficiency measure set B

- wall insulated to an increase of RSI 0.9 above Power Smart mandatory requirements
- lighting power density less than or equal to 16.6 W/m<sup>2</sup>
- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness
- minimum boiler efficiency greater than or equal to 90 per cent AFUE
- minimum service water heating efficiency greater than or equal to 90 per cent AFUE

#### Energy efficiency measure set C

- wall insulated to an increase of RSI 0.1 above Power Smart mandatory requirements
- lighting power density less than or equal to 16.6 W/m<sup>2</sup>
- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness

#### Energy efficiency measure set D

- lighting power density less than or equal to 16.6 W/m<sup>2</sup>
- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness
- boiler temperature reset
- wall insulated to an increase of RSI 0.9 above Power Smart mandatory requirements

## Small health care facilities continued

(South of the 53rd parallel in Manitoba)

Cont'd

### Energy efficiency measure set D

- wall insulated to an increase of RSI 1.2 above Power Smart mandatory requirements
- sloped roof with an attic space insulated to an increase of RSI 1.8 above Power Smart mandatory requirements
- flat or sloped roofs with no attic space insulated to an increase of RSI 0.9 above Power Smart mandatory requirements
- lighting power density less than or equal to 12.9 W/m<sup>2</sup>
- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness
- minimum boiler efficiency greater than or equal to 90 per cent AFUE
- minimum service water heating efficiency greater than or equal to 90 per cent AFUE
- variable speed drives on VAV system fans

### Energy efficiency measure set E

- wall insulated to an increase of RSI 1.2 above Power Smart mandatory requirements
- sloped roof with an attic space insulated to an increase of RSI 1.8 above Power Smart mandatory requirements
- flat or sloped roofs with no attic space insulated to an increase of RSI 0.9 above Power Smart mandatory requirements
- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness
- lighting occupancy controls applied to 45 per cent of floor area
- lighting power density less than or equal to 10.8 W/m<sup>2</sup>
- boiler temperature reset

## Small schools

### (South of the 53rd parallel in Manitoba)

#### Energy efficiency measure set A

- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness
- classroom and office lighting power density less than 11.5 W/m<sup>2</sup>
- energy-efficient showerheads, tap fixtures and auto-off faucets

#### Energy efficiency measure set B

- overall fenestration U-value less than 1.37 W/m<sup>2</sup>•°C
- classroom and office lighting power density less than 11.5 W/m<sup>2</sup>
- high efficiency condensing boiler system with a minimum efficiency of 90 per cent AFUE

#### Energy efficiency measure set C

- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness
- overall fenestration U-value less than 1.37 W/m<sup>2</sup>•°C

#### Energy efficiency measure set D

- two-pipe ground-source heat pump system (EER=15.5, COP = 3.4)

### (North of the 53rd parallel in Manitoba)

#### Energy efficiency measure set A

- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness

#### Energy efficiency measure set B

- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness
- classroom and office lighting power density less than 11.5 W/m<sup>2</sup>

#### Energy efficiency measure set C

- high efficiency condensing boiler system with a minimum efficiency of 90 per cent AFUE
- overall fenestration U-value less than 1.37 W/m<sup>2</sup>•°C
- wall insulated to an increase of RSI 0.1 above Power Smart mandatory requirements
- sloped roofs with an attic space insulated to an increase of RSI 0.5 above Power Smart mandatory requirements
- classroom and office lighting power density less than 11.5 W/m<sup>2</sup>
- energy-efficient showerheads, tap fixtures, and auto-off faucets
- condensing boiler for SHW with a minimum efficiency of 90 per cent AFUE

## Small Multi-Unit Residential Buildings (MURBS)

### South of the 53rd parallel in Manitoba)

#### Energy efficiency measure set A

- high-efficiency boiler for space heating must have a minimum efficiency of 90 per cent AFUE
- condensing boiler for service hot water must have a minimum efficiency of 90 per cent AFUE
- wall insulated to an increase of RSI 0.9 above Power Smart mandatory requirements
- sloped roofs with an attic space insulated to an increase of RSI 0.9 above Power Smart mandatory requirements
- energy-efficient showerheads and tap fixtures
- overall fenestration U-value less than  $1.37 \text{ W/m}^2\cdot\text{°C}$

#### Energy efficiency measure set B

- air-to-air heat recovery on fresh air with a minimum of 60 per cent annual effectiveness
- air-to-air heat recovery on garage ventilation air
- corridor and stairwell LPD not to exceed  $4 \text{ W/m}^2$
- lobby and laundry LPD not to exceed  $8.1 \text{ W/m}^2$
- parking garage LPD not to exceed  $2.2 \text{ W/m}^2$

#### Energy efficiency measure set C

- air-to-air heat recovery on fresh air with a minimum of 70 per cent annual effectiveness
- energy-efficient showerheads and tap fixtures
- corridor and stairwell LPD not to exceed  $4 \text{ W/m}^2$
- lobby and laundry LPD not to exceed  $8.1 \text{ W/m}^2$
- wall insulated to an increase of RSI 0.9 above Power Smart mandatory requirements
- sloped roofs with an attic space insulated to an increase of RSI 0.9 above Power Smart mandatory requirements

#### Energy efficiency measure set D

- overall fenestration U-value less than  $1.37 \text{ W/m}^2\cdot\text{°C}$
- wall insulated to an increase of RSI 0.9 above Power Smart mandatory requirements
- sloped roofs with an attic space insulated to an increase of RSI 0.9 above Power Smart mandatory requirements
- air-to-air heat recovery on fresh air with 60 per cent annual effectiveness

LPD = lighting power density

### (North of the 53rd parallel in Manitoba)

#### Energy efficiency measure set A

- air-to-air heat recovery on fresh air with a minimum of 70 per cent annual effectiveness
- high-efficiency boiler for space heating must have a minimum efficiency of 90 per cent AFUE
- condensing boiler for SHW must have a minimum efficiency of 90 per cent AFUE
- energy-efficient showerheads and tap fixtures
- overall fenestration U-value less than  $1.37 \text{ W/m}^2\cdot\text{°C}$
- corridor and stairwell LPD not to exceed  $4 \text{ W/m}^2$
- lobby and laundry LPD not to exceed  $8.1 \text{ W/m}^2$
- wall and insulated to an increase of RSI 0.1 above Power Smart mandatory requirements
- sloped roofs with an attic space insulated to an increase of RSI 0.5 above Power Smart mandatory requirements

#### Energy efficiency measure set B

- overall fenestration U-value less than  $1.37 \text{ W/m}^2\cdot\text{°C}$
- air-to-air heat recovery on fresh air with a minimum of 70 per cent annual effectiveness
- garage air heat recovery
- corridor and stairwell LPD not to exceed  $4 \text{ W/m}^2$
- lobby and laundry LPD not to exceed  $8.1 \text{ W/m}^2$
- parking garage LPD not to exceed  $2.2 \text{ W/m}^2$

#### Energy efficiency measure set C

- air-to-air heat recovery on fresh air with a minimum of 70 per cent annual effectiveness
- energy-efficient showerheads and tap fixtures
- corridor and stairwell LPD not to exceed  $4 \text{ W/m}^2$
- lobby and laundry LPD not to exceed  $8.1 \text{ W/m}^2$
- wall insulated to an increase RSI 0.1 above Power Smart mandatory requirements
- sloped roofs with an attic space insulated to an increase of RSI 0.5 above Power Smart mandatory requirements
- overall fenestration U-value less than  $1.37 \text{ W/m}^2\cdot\text{°C}$
- garage air heat recovery

## Section 3: Power Smart eligible products and systems

### Envelope insulation

#### 1. General

- 1.1 Only renovation projects that use electricity or natural gas for space heating are eligible for the Commercial Insulation Program.
- 1.2 Foundation walls are not eligible for incentives under the Commercial Insulation Program
- 1.3 For partial installations, a minimum of 100 square metres (1076 square feet) of roof and/or wall insulations shall be installed per incentive application. If the total qualifying area is less than the minimum amount the insulation must cover the entire area.
- 1.4 Facilities with an indoor set temperature of 10°C (50°F) or less **do not qualify** for the full Commercial Insulation incentive, and **will be adjusted** according to a pro-rated fraction of full energy savings for buildings with an in-door temperature of 21°C (69°)
- 1.5 All products shall be new, of current manufacture, and meet applicable standards.
- 1.6 Minimum product warranty shall be one year from date of installation.
- 1.7 Products intended for exterior application shall be rated for satisfactory operation from -40°C (-40°F) to +40°C (+104°F).
- 1.8 Product components shall not consist of or contain hazardous components (such as PCBs, CFCs, and asbestos).
- 1.9 Manitoba Hydro reserves the right to request or obtain product samples for technical evaluation and quality control. The manufacturer and/or designated agent will be advised of product details which are not to the satisfaction of Manitoba Hydro. During the program, randomly selected production samples will be evaluated for the same purposes. Any significant reduction in product quality and performance can result in the delisting of the product from the program.
- 1.10 See Application Guide for more details

### Energy efficient window systems

#### 1. General

- 1.1 Reference Standards – All materials and installation procedures within this specification are subject to all applicable provisions of the current edition of the National Building Code of Canada and materials standards referenced in this publication.

#### 2. Materials

- 2.1 Proof of the energy performance (total window U-value) must accompany the application, which in all cases must relate to the window unit(s) being submitted for Incentive. A test report by an independent technical source, tested to CSA A440.2 (1998 to current) is required.

Alternatively, windows listed with current NFRC Certified Products Listing are also acceptable.

- 2.2 Windows shall conform to the requirements of A440, including test ratings for air tightness, water tightness, and wind load resistance. We recommend the user guidelines provided in A440.1 be followed for your building.

- 2.3 Manitoba Hydro may review an unlisted product to determine whether the product meets the Commercial Window Program requirements and the resulting incentive in accordance with the Incentive Processing section.

**Note:** A440 is CSA Standard A440, and acceptable versions include 1998 to current harmonized North American version published in 2005.

#### 3. Installation

- 3.1 An energy efficient window should be accompanied by an energy efficient installation that also assures the durability of window and wall. The importance of installation cannot be overstated. Shoddy installation may nullify any benefit in choosing an energy efficient window assembly.
- 3.2 Good practice guidelines for installation can be found in A440.4, and in publications from the Energy Efficient Building Association (EEBA) Builder's Guides, Canada Mortgage and Housing Corporation (CMHC) publications, and other building association publications. All products shall be installed in accordance with all applicable federal, provincial, or local codes, and all industry and manufacturer's recommendations and specifications.

3.3 Limited technical assistance may be available from Manitoba Hydro. Technical assistance may include savings and payback estimates. In some instances, Manitoba Hydro may supply a more detailed calculation of energy savings.

3.4 See Application Guide for more details

## **Air barrier system**

### **1. General**

1.1 Reference Standards – All materials and installation procedures within this specification are subject to all applicable provisions of the current edition of the National Building Code of Canada, the Canadian Electrical Code, and materials standards referenced in this publication.

### **2. Installation**

2.1 The air barrier system must be installed by trained, experienced applicators. The installation must be monitored, tested, and inspected by a qualified, independent authority for proper adhesion and air tightness prior to the application of the cladding

## **Lighting systems**

### **1. General specifications for all eligible products**

1.1 All products shall be new, of current manufacture and Canadian Standards Association (CSA) approved or certified by an accredited independent organization to conform to CSA standards for the intended application.

1.2 Minimum product warranty must be three years from date of installation, unless otherwise stated.

1.3 Products intended for exterior application shall be rated for satisfactory operation from  $-40^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$  ( $-40^{\circ}\text{F}$  to  $+104^{\circ}\text{F}$ ).

1.4 Manitoba Hydro reserves the right to request specific product samples and/or independent laboratory test results for the purposes of technical evaluation, safety and quality control. The manufacturer and/or designated agent will

be advised of product details that are not to the satisfaction of Manitoba Hydro. During the course of the program, production samples will be evaluated for the same purposes. Any significant reduction in product quality and performance can result in disqualification of the product from the Commercial Lighting Program (CLP).

1.5 Average lighting levels shall comply with the Illuminating Engineering Society (IES) recommended practices. All measurements of average lighting levels must be generally in accordance with IES measurement practices. Manitoba Hydro will not monitor lighting levels but reserves the right to occasionally check levels and design quality. Lighting levels must meet the requirements of the end user and be to the satisfaction of all approving authorities having jurisdiction for specific applications.

1.6 All retrofitted luminaires shall be suitably identified with approved labelling, listing the re-rated parameters to the satisfaction of Manitoba Electrical Inspections and Code officials. Contact Manitoba Hydro for more details.

1.7 In any installation, in the event of abnormally high product failure rates within the first year of operation (in excess of 10 per cent) Manitoba Hydro can exercise the right to reject specific products or series of products from the Program. Re-application for product qualification will then be necessary. For customers requesting products exceeding Power Smart specifications, additional product testing may be required at a cost to the customer.

1.8 No specifications on product audible noise level apply in this Program. It shall be the responsibility of the supplier, installer and end user to establish acceptable noise levels for specific applications.

1.9 All products shall be constructed of individually replaceable compatible lighting components, such as ballasts, starters, capacitors, sockets and lamps so as not to invalidate any of these component warranties.

1.10 All eligible products shall be represented by an authorized local representative or distributor, including after-sales service.

1.11 Product approval is valid for three years. All products need to be retested in the fourth year or eligibility will expire at the end of the calendar year.

## 2. T8 fluorescent lighting systems

2.1 The manufacturer shall make available photometric test results, based on IES testing procedure and report format, prepared by an independent recognized testing laboratory. Photometric data prepared by manufacturers will be reviewed by Manitoba Hydro.

2.2 It is the responsibility of the customer and/or installing contractor to ensure that the luminaires are CSA-approved for the specific application, and in full compliance with the building codes.

2.3 Colour Rendering Index (CRI) shall be 75 at a minimum. There is no restriction on lamp colour temperature. Optional lamps with higher CRI ratings are preferred.

2.4 Ballasts shall be electronic and dedicated only for T8 systems. Ballasts with low, normal and high ballast power factors are eligible but must be approved by Manitoba Hydro.

2.5 Ballast power factor shall be a minimum of 0.95 for standard ballasts and 0.98 for premium ballasts (lead or lag) at voltage variation as per Table 1.

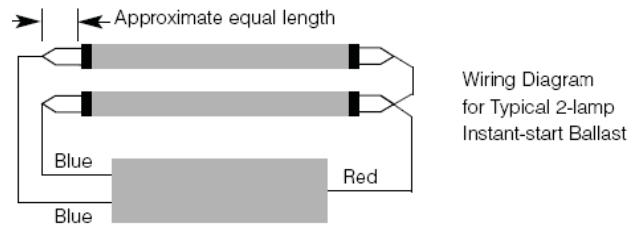
**TABLE 1: VOLTAGE TEST RANGE**

| Nominal (v) | Standard category |             | Premium category |             |
|-------------|-------------------|-------------|------------------|-------------|
|             | Minimum (v)       | Maximum (v) | Minimum (v)      | Maximum (v) |
| 120         | 108               | 125         | 104              | 127         |
| 208         | 190               | 216         | 187              | 220         |
| 240         | 216               | 250         | 208              | 254         |
| 277         | 250               | 288         | 240              | 293         |
| 347         | 312               | 360         | 300              | 367         |

2.6 Total Harmonic Distortion (THD) limits for standard T8 electronic ballasts shall not exceed 19 per cent at voltage variation as per Table 1. Premium T8 electronic ballasts must have THD below 10 per cent at voltage variation as per Table 1. Manitoba Hydro uses other parameters to differentiate between these two classes of ballasts, which are subject to change without notice.

2.7 For retrofitting of rapid start wired fixtures, where existing lamp holders are in good condition, it is **mandatory** that the two conductors from each lamp holder be of equal length and be connected together **before** connection to the appropriate single lamp lead on an instant start ballast.

This requirement is for the safe and optimum performance of T8 lamps, per NEMA # LSD 2-1998. For new installations, where rapid start operation may be required in the future (e.g. use of occupancy sensors) the use of this connection method is recommended.



2.8 Any existing PCB ballasts (T12) shall be removed from the site and not be abandoned within the luminaire, which is being retrofitted. The cost of this work is to be the responsibility of the owner.

2.9 Ballasts shall be infrared (IR) conflict free. Lamps shall operate outside the IR range 31 350 to 42 000 Hz and 53 960 to 59 640 Hz to avoid potential IR equipment incompatibility problems.

2.10 For dimming ballasts and controls, refer to Manitoba Hydro for qualifying details.

## 3. T5 fluorescent lighting systems

3.1 This measure will apply to T5 fluorescent systems with lamps rated 14 to 80 watts inclusive, using electronic ballasts, in new luminaires.

3.2 All ballasts must be dedicated only for T5 fluorescent systems. Multi-lamp ballasts will be eligible.

3.3 All ballasts must be approved by Manitoba Hydro by submission of ballasts for product testing or independent laboratory test results.

3.4 Input current THD limits for T5 ballasts are 19 per cent with power factor above 0.95, for a voltage variation see the Standard category in Table 1 listed as the Standard Harmonics (SH) category. Input current THD for ballasts are less than 10 per cent with power factor above 0.98, for a voltage variation see the Premium category in Table 1 listed as the Low Harmonics (LH) category.

3.5 For dimming ballasts and controls, refer to Manitoba Hydro for qualifying details.

#### 4. Hard-wired Compact Fluorescent (CF) lighting systems

- 4.1 This measure applies to common Compact Fluorescent (CF) lamp wattages with single or multiple lamps per luminaire.
- 4.2 Life rating of lamps shall be 10 000 hours minimum at three hours per start, and 15 000 hours minimum at continuous operation on electronic ballasts.
- 4.3 Lamps shall start and operate reliably at temperatures down to +10°C (+50°F) throughout their rated lives. Low temperature ballasts to be suitably rated for cool temperature applications.
- 4.4 There is no restriction on the lamp colour temperature, but the CRI shall be 75 at a minimum.
- 4.5 Input current THD limits for electronic ballasts are 19 per cent with power factor above 0.95, for a voltage variation see the Standard category in Table 1 listed as the SH category. Input current THD for ballasts are less than 10 per cent with power factor above 0.98, for a voltage variation see the Premium category in Table 1 listed as the LH category.
- 4.6 Permanent or “hard-wired” types of luminaires shall be complete with integral replaceable electronic ballast [thermally protected, High Power Factor (HPF)]. Where multiple lamps are used, ballasts may be the multi-lamp type. It shall be possible to reconnect multiple ballasts individually to achieve multi-level switching within individual fixtures, or use dimming ballasts.
- 4.7 Retrofit kits for the conversion of existing incandescent luminaires shall have permanent mounting features, with thermally protected HPF electronic ballasts. All attachments shall be mechanical means, and not dependent upon tape or adhesives. All displaced incandescent lamp sockets shall be permanently removed. Major hardware shall identify this kit as a retrofit type, with make/model number and nominal lamp rating. Kit components are not to be modified in a manner so as to invalidate CSA approval for the intended function.
- 4.8 For dimming ballasts and controls, refer to Manitoba Hydro for qualifying details.

#### 5. Screw-in Compact Fluorescent (CF) lamps

- 5.1 Lamp to be “one-piece” construction, with integral electronic ballast circuitry, enclosed in a non-metallic housing. Base to be a standard medium (E26) base.
- 5.2 Rated lamp wattage to be **within**  $\pm 10$  per cent of rated value at nominal 120 volt 60 Hz input, base-up orientation and ambient temperature of  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$  ( $77^{\circ}\text{F} \pm 3.6^{\circ}\text{F}$ ).
- 5.3 Lamp wattage regulation not to exceed  $\pm 10$  per cent of rated value (120 volt) when operated at standard voltage variations of 110 volts (-10 per cent) and 125 volts (+4 per cent) 60 Hz with base-up orientation and ambient temperature of  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$  ( $77^{\circ}\text{F} \pm 3.6^{\circ}\text{F}$ ).
- 5.4 Power factor to be over 95 per cent (lead or lag) at nominal 120 volt input.
- 5.5 Lamp input current harmonic distortion to be 25 per cent maximum (RMS harmonic current as a percentage of the fundamental current value) with lamp at steady state operating condition at nominal 120 volt 60 Hz input, base-up and  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$  ( $77^{\circ}\text{F} \pm 3.6^{\circ}\text{F}$ ) ambient temperature. Input voltage distortion allowance to be 0 to 3 per cent.
- 5.6 Lamp life to be a minimum of 7 500 hours at three hours per start, with a minimum one-year lamp warranty.
- 5.7 Lamps to be available in colour temperature range of 2 700°K to 3 500°K, with a minimum CRI of 80 per cent.
- 5.8 Light loss factor (lumen depreciation) is to be less than 30 per cent at end of life or a minimum output of 70 per cent at end of life.
- 5.9 Lamp must start within one second. Lamp warm-up time is to be one minute, with a minimum of 85 per cent of full light output.
- 5.10 Lamps to have universal operating positions (base-up, base-down or horizontal).
- 5.11 For dimming ballasts and controls, refer to Manitoba Hydro for qualifying details.

## 6. Light emitting diode (LED) exit signs

6.1 Measure applies to replacement of existing exit luminaires with incandescent lamps (25 or 15 watts) with new luminaires which have Light Emitting Diode (LED) arrays. CF sources are not eligible.

6.2 Retrofit hard-wired LED products may be considered only under special circumstances. Contact Manitoba Hydro for details.

6.3 All attachments shall be by mechanical means and not dependent upon tape or adhesives. All LED products used must have a minimum five-year warranty.

6.4 LED assembly must be conveniently replaceable within the sign.

6.5 All new luminaires, as well as retrofitted units shall be to the satisfaction of inspectors and the approving authorities having jurisdiction. Must be CSA approved and conform to CSA standard C860-01, "Performance of Internally Lighted Exit Signs".

6.6 All LED luminaires shall be approved by Manitoba Hydro through submission of technical specifications. Submission of samples and/or independent laboratory test results may be necessary.

## 7. High Intensity Discharge (HID) lighting systems

7.1 This measure applies to both interior and exterior lighting systems where new, as well as retrofitted luminaires, are eligible for new construction or renovation application.

7.2 All High Intensity Discharge (HID) luminaries must have a minimum one-year warranty.

7.3 Metal Halide (MH) and High Pressure Sodium (HPS) are eligible sources for displacement of incandescent, quartz, Mercury Vapour (MV) and T12 fluorescent for the calculated incentive option. Sources must be of current commercial production.

7.4 Any variations or "specials" to the listed lamps will be reviewed by Manitoba Hydro.

7.5 All HID ballasts shall have a ballast factor of 0.95 minimum and a HPF of 0.90 at a minimum. Low or normal power factor ballasts will be acceptable only for 35 and 50 watts inclusive HPS.

7.6 All MH fixtures must be totally enclosed for safety.

7.7 Ballasts of suitable low noise level characteristics shall be used where required. Remote mounting of ballasts with suitable interwiring will be accepted. Ballast ambient temperature rating must be suitable for the intended applications.

**Caution:** Consult manufacturer on the maximum remote mounting distances for HPS and pulse start MH. With the starter at the remote ballast, starting pulse may be attenuated below minimum starting values.

7.8 Any necessary emergency lighting requirements are not part of this program. The use of quartz standby or emergency lamps within HID luminaires will impact negatively on the calculated incentive amount since there will be an overlap of quartz and HID lamp loading. The additional quartz lamp loading will be factored into the energy and demand usage unless it can be shown that luminaire maximum demand will not exceed the nominal HID input wattage. Otherwise, demand savings will be reduced accordingly.

7.9 On delta systems, suitably rated isolated winding type ballasts must be used. Check with ballast manufacturer on product warranties.

7.10 Manitoba Hydro reserves the right to reject HID luminaires of relatively small reflector diameters with respect to lamp wattage. Luminaires are evaluated on the combination of efficiency, Coefficients of Utilization (CU) and direct luminaire glare. **As a guideline**, the following reflector minimum **optic diameter** and lamp wattage correlation applies as per Table 2.

TABLE 2: OPTIC DIAMETERS AND LAMP WATTAGES

| Optic diameter (inches) | Lamp wattage |                |        |
|-------------------------|--------------|----------------|--------|
|                         | HPS (W)      | Ceramic MH (W) | MH (W) |
| 14                      | 150          | 150            | 250    |
| 16                      | 250          | 250            | 400    |
| 17                      | 400          | 400            | -      |
| 20                      | 1 000        | 1 000          | 1 000  |

Notes:

**HPS** - High Pressure Sodium      **MH** - Metal Halide

*Optic diameter refers to the maximum reflector diameter, **excluding** any additional "lip" needed for door assemblies. If questions arise, consult Manitoba Hydro for clarification.*

## 8. High performance luminaires (HPL)

### 8.1 Fluorescent

8.1.1 This measure is based either upon a reduced number of fluorescent lamps within a conventional luminaire body, such as two-foot by four-foot, two-lamp recessed unit or upon superior optical systems. T8 fluorescent lamps must be used.

8.1.2 Luminaires in this measure can also utilize high reflectance finishes and/or parabolic reflectors. Photometric data shall be available from independent test laboratories based on IES photometry standards to support performance gain.

8.1.3 Gains in performance shall be calculated relative to a standard T12 fluorescent luminaire, such as a four-lamp recessed troffer or a four-lamp surface unit. Photometric data of these standard "reference" luminaires must be included with the calculations. Manitoba Hydro reserves the right to establish standard "reference" photometric data, which is dependent upon the unit selected as well as application. Refer to the HPL technology sheet for incentive amount. If the fixture is not listed, then a custom calculation must be performed by Manitoba Hydro.

8.1.4 This measure is acceptable for renovations and new construction.

8.1.5 Performance gains shall be assessed only with standard T12 fluorescent lamps and not using high performing lamps or lamp/ballast combinations. The incorporation of an electronic ballast in this luminaire will be treated as a separate measure.

8.1.6 Reflectance of interior luminaire surfaces shall be 87 per cent at a minimum.

### 8.2 HID

8.2.1 This measure is based upon increased luminaire efficiencies, without sacrificing good glare control. Normal parameters would be higher reflectance surfaces, superior reflector design and larger reflecting surfaces. Glare control must be acceptable for the intended applications.

8.2.2 This measure is acceptable for renovations and new construction.

8.2.3 Gains in performance shall be calculated relative to a standard luminaire which would normally be acceptable to this program for the displacement of incandescent, MV or T12 fluorescent sources.

8.2.4 High performing lamps or non-standard lamp/ballast combinations are not to be used to enhance performance.

## 9. Light Emitting Diode (LED) technologies

### 9.1 LED backlit signage

9.1.1 Measure applies to replacement of neon, fluorescent or incandescent backlit signs with new luminaires which have LED arrays.

9.1.2 All attachments shall be by mechanical means and not dependent upon tape or adhesives. All LED products used must have a minimum five-year warranty.

9.1.3 LED assembly must be conveniently replaceable within the sign.

9.1.4 All new signage, as well as retrofitted units shall be to the satisfaction of inspectors and the approving authorities having jurisdiction.

9.1.5 All LED luminaires shall be approved by Manitoba Hydro through submission of technical specifications. Submission of samples and/or independent laboratory test results may be necessary.

### 9.2 LED screw-in lamps

9.2.1 Measure applies to replacement lamps with LED arrays.

9.2.2 Lamps with screw-in or plug-in bases are eligible. Average rated lamp life to be a minimum of 50 000 hours, with a minimum five-year warranty.

9.2.3 Light loss factor (lumen depreciation) is to be less than 30 per cent at end of life. In other words, a minimum output of 70 per cent at end of life.

9.2.4 All new signage, as well as retrofitted units shall be approved by the CSA or to the satisfaction of inspectors and the approving authorities having jurisdiction.

9.2.5 All LED luminaires shall be approved by Manitoba Hydro through submission of technical specifications. Submission of samples and/or independent laboratory test results may be necessary.

## 10. Occupancy sensors

10.1 Principle of operation shall be on the basis of passive IR energy, ultrasonic energy response or a combination of both, and be of commercial quality only.

10.2 All occupancy sensors must have a minimum one-year warranty.

10.3 Switch format to be either a wall-mounted type for the replacement of conventional wall switches, or a ceiling-mounted version. Switch contacts to be suitable for application on fluorescent and HID lighting systems. Sensor switches to be used in conjunction with approved low voltage systems will also be permitted. Switch to have no minimum loading requirement to stay activated.

10.4 Sensor switches shall have "off-automatic" selector modes with no "on" position conveniently located on the faceplate.

10.5 Sensor switches can have an optional ambient light sensing feature with an adjustment range to result in a lighting system not being turned "on" during occupancy with generous daylight contribution. Adjustable time delay to apply to this feature.

10.6 An adjustable "on" time feature shall be provided with a minimum continuous range of one to 15 minutes. Occupancy "scan" frequency shall be at least once every two seconds, with automatic timing function reset. LED indicator to show activity detection.

10.7 All sensors shall have a sensitivity adjustment feature to "tune in" for proper operation for a variation of room or area geometrics.

10.8 This measure accepts the use of two or more sensor switches suitably interconnected as a system for situations such as highly irregular areas, partitioned work station areas, very large areas, etc.

10.9 Qualifying sensors, through submission for approval to Manitoba Hydro shall be used.

10.10 Occupancy sensor layout and arrangement is to be in accordance with individual manufacturer's recommendations. All necessary adjustments shall be suitably identified on the sensor for convenience, without the necessity of referring to an instruction manual.

10.11 For operation in adverse conditions or in low temperatures, contact Manitoba Hydro.

10.12 For situations where an "off" option is required during room occupancy where ceiling-type sensors are used, a wall switch is suggested to electrically switch off the occupancy sensor.

10.13 Switch to have humidity-resistant circuitry and components.

10.14 It is important that the sensor have adequate inrush current capability for the subjected application, particularly electronic ballasts.

10.15 Occupancy sensors to have a "reset" not exceeding two seconds. The "reset" interval is defined as the time when the sensor shuts off a load during which an occupancy condition occurs, to the time when the sensor turns this load back on. Potentially occupants can be momentarily "in the dark".

## 11. Specialty lamps

### 11.1 Fluorescent

11.1.1 Measure applies to four-foot replacement T8 lamps.

11.1.2 Performance parameters are listed below in Table 3.

**TABLE 3: FLUORESCENT LAMPS PERFORMANCE PARAMETERS**

| Power (W) | Length (inches) | Minimum light output |               | Minimum average life (at three hours per start) (hours) | Minimum CRI (%) |
|-----------|-----------------|----------------------|---------------|---|-----------------|
|           |                 | Initial (lumens)     | Mean (lumens) |   |                 |
| 30        | 48              | 2 800                | 2 700         | 24 000  | 80              |
| 28        | 48              | 2 650                | 2 500         | 24 000  | 80              |
| 25        | 48              | 2 400                | 2 250         | 24 000  | 80              |

**Note:** CRI - Colour Rendering Index

## 11.2 MH

11.2.1. Measure applies to 360-watt replacement MH lamps rated for 400-watt ballast.

11.2.2. Performance parameters are listed below in Table 4.

**TABLE 4: MH LAMPS PERFORMANCE PARAMETERS**

| Power (W) | Type (-)    | Orientation              | Minimum light output |               | Minimum average life (hours) |
|-----------|-------------|--------------------------|----------------------|---------------|------------------------------|
|           |             | (vertical or horizontal) | Initial (lumens)     | Mean (lumens) |                              |
| 360       | BT37 CLEAR  | Vertical                 | 35 000               | 23 500        | 20 000                       |
|           |             | Horizontal               | 30 000               | 19 000        | 15 000                       |
| 360       | BT37 COATED | Vertical                 | 35 000               | 22 500        | 20 000                       |
|           |             | Horizontal               | 30 000               | 19 000        | 15 000                       |
| 360       | ED28 CLEAR  | Vertical                 | 35 000               | 23 000        | 20 000                       |
| 360       | ED28 COATED | Vertical                 | 34 000               | 22 000        | 20 000                       |

## Higher efficiency rooftop and split system air conditioners

### 1. General

1.1 Units shall have ARI-certified cooling capacities and efficiencies based on the results of physical tests of units at standard ARI rating conditions.

1.2 Standard ARI rating conditions are: 35°C (95°F) drybulb ambient air on the condenser coil; and 27°C (80°F) drybulb, 19°C (67°F) wetbulb indoor air on the evaporator coil.

1.3 Seasonal Energy Efficiency Ratio (SEER) ratings shall be used for units of 64.9 MBH (1000's of Btu/h) net cooling capacity and less.

1.4 Energy Efficiency Ratio (EER) ratings shall be used for units with net cooling capacities over 65.0 MBH and less than 240.0 MBH.

All participating rooftop package units and air handler/split systems shall be equipped with fully modulating economizers enabling them to utilize 100 per cent outside air for free cooling whenever the outside air temperature is below 14°C (58°F).

### 2. Standards

2.1 Standards published jointly by the Air-Conditioning and Refrigeration Institute (ARI) and the American National Standard Institute (ANSI) are as follows:

- ANSI/ARI Standard 210/240-2003 Unitary Air-Conditioning and Air Source Heat Pump Equipment, which covers units with less than 135 MBH cooling capacity.
- ANSI/ARI Standard 365/2003 Commercial and Industrial Unitary Air-Conditioning Condensing Units, which covers units over 135 MBH cooling capacity.

2.2 CAN/CSA Standards are as follows:

- CAN/CSA – C273.3-M91 (R2001) which covers split systems with less than 135 MBH of cooling capacity.
- CAN/CSA – C656-M93 (R1998) which covers single package units with over 135 MBH of cooling capacity.

## Packaged water chillers

### 1. General

1.1 Packaged water chillers eligible for incentives shall have ARI-Certified cooling capacities and efficiencies based on the results of physical tests, of the units at standard ARI rating conditions, by an independent testing company such as ARI or CSA. Vendors retrofitting existing packaged water chillers, with energy efficient components, shall provide documentation of ARI-Certified ratings at standard ARI rating conditions for the upgraded chillers.

1.2 Eligibility is limited to the cost of equipment only. Labour and material costs associated with equipment installation are not allowed in any incremental cost calculations.

1.3 ARI Standard 550/590 Certified Ratings are comprised of the following criteria for both full and part loads at standard rating conditions:

1.3.1 Capacities, in tons

1.3.2 Energy efficiency, as applicable – Power inputs per ton, kW/ton- Energy Efficiency Ratio (EER), Btu/Wh- Coefficient of Performance (COP)

1.3.3 Water Pressure Drops, psi or feet of water

1.3.4 Integrated Part Load Values (IPLV's) and

1.3.5 Non-Standard Part Load Values (NPLV's)

1.4 Integrated Part Load Values (IPLV's) ratings shall be used in the incentive calculations.

1.5 Centrifugal and screw chillers rated greater than 2000 tons cooling and reciprocating chillers greater than 1500 tons cooling are not eligible for the prescriptive program.

1.6 Chiller Components normally sold as part of a Packaged Water Chiller, such as control panels, control programming and drives, that increase the efficiency of and existing chiller, are eligible for the program.

## 2. Standards

2.1 Standards published by the ARI are as follows:

- ARI Standard 550/590, Water Chilling Packages Using the Vapour Compression Cycle, which covers units up to 2000 Tons.
- CAN/CSA Standards C743, Performance Standard for Rating Packaged Water Chillers.

2.2 Standards published by the American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) are as follows:

- ANSI/ASHRAE 90.1, Energy standard for Buildings Except Low-Rise Residential Buildings.
- ANSI/ASHRAE 15, Safety Code for Mechanical Refrigeration.

## Condensing boilers

### 1. General

1.1 Condensing boilers must meet the following requirements:

- minimum combustion efficiency of 90 per cent as per ANSI Z21.13/CSA 4.9 standards for boilers greater than or equal to 300,000Btu/h

- Energy Star qualified with AFUE (Annual Fuel Utilization Efficiency) greater than or equal to 90 per cent for boilers less than 300,000Btu/h
- electronic ignition (no standing pilot)
- Induced or forced draft fan or power vent
- designed to withstand continuous operation with a return water temperature not exceeding 49°C (120°F)
- must be a natural gas fired boiler used primarily for space heat
- application form must be accompanied by technical data sheets showing catalogue performance data and efficiency rating certification
- incentives may be limited by existing system input and/or building heating and ventilation requirements. Heat loss calculations may be required.

## Near-Condensing boilers

### 1. General

1.1 Near-Condensing boilers must meet the following requirements:

- minimum combustion efficiency of 85 per cent as per ANSI Z21.13/CSA 4.9 standards for boilers greater than or equal to 300,000 Btu/h
- Energy Star qualified with AFUE (Annual Fuel Utilization Efficiency) greater than or equal to 85 per cent for boilers less than 300,000 Btu/h
- electronic ignition (no standing pilot)
- Induced or forced draft fan or power vent
- must be a natural gas fired boiler used primarily for space heat
- application form must be accompanied by technical data sheets showing catalogue performance data and efficiency rating certification
- incentives may be limited by existing system input and/or building heating and ventilation requirements. Heat loss calculations may be required.

## High Efficiency Furnaces

### 1. General

- all furnaces must be Energy Star qualified with AFUE (Annual Fuel Utilization Efficiency) greater than or equal to 90 per cent
- must be a natural gas fired boiler used primarily for space heat

## Parking lot controllers

### 1. General

1.1 All materials and installation procedures in this specification are subject to all applicable provisions of the current edition of the National Building Code of Canada, the Canadian Electrical Code, materials Standards referenced herein and authorities having jurisdiction.

### 2. Systems and products

2.1 Parking Lot Control Systems must automatically vary the amount of energy delivered to the parking lot electrical outlets depending on the outside air temperature and/or wind chill. This is typically accomplished by shutting off the power supply to the outlet for a portion of a "time cycle period".

2.2 The "time cycle period" shall be between four and 15 minutes.

2.3 The energy must be delivered in varying quantities when the temperature varies between 0°C (32°F) and -30°C (-22°F). For step controlled systems, a minimum of five different power delivery levels are required. Example: 0 per cent (off), 25 per cent, 50 per cent, 75 per cent and 100 per cent (full power). Variably controlled systems should adjust power levels linearly with outside temperature within the full temperature range.

2.4 Full power (100 per cent) shall be delivered continuously when the outside air temperature is below a set temperature. The maximum temperature for full power is -20°C (-4°F). Between -20°C (-4°F) and -30°C (-22°F), depending on the customer's preference is recommended. The set point should be adjustable for easy modification after installation.

2.5 Contactors or other devices used to vary the power delivered to the parking lot outlets shall be rated to deliver a minimum of one million full load operations and to last a minimum of 15 years at the designed time cycle period.

2.6 With central controllers the contactors or other devices shall be controlled (rotated) in such a way that in 25 per cent, 50 per cent and 75 per cent cycle modes, 25 per cent, 50 per cent and 75 per cent respectively of the contactors are closed while the balance are open. This will allow electrical peak demand savings in milder weather. The contactor rotation schedule should also be designed to minimize the number of contactor operations in one year.

2.7 The contactors or other devices used to cycle the power supply to the vehicle receptacles shall be controlled by:

- Packaged Parking Lot Controller(s) (PPLC's)
- Building Energy Management Systems (BEMS's)
- Energy Management Control Systems (EMCS's)
- Programmable Logic Controller(s) (PLC's).

2.8 Where parking lots are expected to be completely unoccupied for eight hours or more per day, time clocks should be considered to shut off power to the receptacles and reduce the number of contactor operations per year.

### 3. Installation

3.1 Contactors opening and closing can generate a significant level of audible noise. Indoor mounted contactor panels should not be located close to occupied dwellings or work spaces.

## Commercial Earth Power Program

### 1. Introduction

The Commercial Earth Power Program's primary goal is to reduce general service electricity rate customers' electrical usage through the use of geothermal heat pump systems. In line with this primary goal, in order for commercial customers to be eligible for Feasibility Study Assistance and/or a System Installation Incentive, they must meet/adhere to the following general eligibility criteria:

### 2. Feasibility Study Assistance Eligibility Criteria

2.1 Only studies conducted by engineers or architects registered to practice in Manitoba will be considered for funding.

2.2 Manitoba Hydro reserves the right to reject proposals to study geothermal heat pump installations which would not produce predictable, sustainable savings or would not meet Manitoba's Hydro's Power Smart objectives.

2.3 Studies for projects that achieve savings by switching to other energy sources, and studies or projects initiated prior to the approval of this Application are not eligible under this program.

2.4 Customers receiving financial assistance from other government sources to become more energy efficient must disclose this funding and may not be eligible for Feasibility Study Assistance at Manitoba Hydro's discretion.

### **3. Commercial Earth Power Program Eligibility Criteria**

3.1 Program applicants must be a Manitoba Hydro Customer eligible for the General Service Electricity Rate excluding residential dwellings.

3.2 Payment of Program Feasibility Study Assistance or a System Installation Incentive is conditional upon the Customer remaining a customer of Manitoba Hydro for a minimum period of 36 months from the date of payment of the applicable incentive. In the event that the Customer ceases to be a Manitoba Hydro customer prior to the expiry of the said 36 month period, the Customer shall forthwith repay to Manitoba Hydro a pro rata proportion of the incentive equivalent to 1/36th of the total incentive, multiplied by the number of months or partial months remaining in the 36 month period.

3.3 The Program only applies to new construction, renovation and retrofit projects in the commercial, industrial and general service agricultural sector.

3.4 Incentives are not available for projects in progress or already completed.

3.5 Only applications that offer potential to reduce Manitoba Hydro's peak electrical load and improve electrical energy efficiency on the Manitoba Hydro power system are eligible for the Program.

3.6 Existing buildings currently heated by natural gas are not eligible for Feasibility Study Assistance or System Installation Incentives.

3.7 Electrically heated buildings constructed in areas served by natural gas will be eligible for the Program.

3.8 One System Installation Incentive will be allowed for each eligible project.

3.9 Installed forced air (water-to-air) geothermal heat pump units must be certified by CSA or ARI/ISO 13256-1. Installed Fluid-to-Fluid geothermal heat pumps must be manufacturer rated in accordance with ARI/ISO 13256-2.

3.10 All systems must be designed and installed in accordance with the current edition of CSA 448.1 (Design and Installation of Earth Energy Systems for Commercial and Institutional Buildings)

3.11 Direct Expansion (DX), standing-column well, air source, internal source or other heat pump systems that are not covered by CSA 448 are not eligible for participation in the Program.

3.12 Participating buildings must be heated for the entire heating season (September – May) and use the installed geothermal heat pump system as the buildings primary heating source.

3.13 A geothermal heat pump system sized to provide up to 100% of the base building transmission and infiltration heating loads will be eligible for an equipment incentive. Additional installed system capacity to handle ventilation or water heating loads are not applicable in calculating the incentive.

3.14 Products, equipment and their applications and installations, must be new and meet or exceed energy efficient regulatory requirements in Manitoba.

3.15 Products and equipment which have received financial assistance under any other federal, provincial or Manitoba Hydro energy conservation program must be disclosed and may not be eligible for this Program.

3.16 Manitoba Hydro must be notified in writing of any changes to the building design that affects the original application before the purchase and installation of any energy efficient equipment in order for the changes to be eligible for incentives.

3.17 Payment of any incentive is limited to 100% of incremental product costs.

3.18 Manitoba Hydro decisions relating to product or customer eligibility, energy savings potential of the proposed projects, amount of incentives, or other related issues will be final and binding on all parties.

3.19 The following organizations can provide a list of certified/accredited geothermal heat pump installers in the Manitoba area. However, these organizations do not inspect, endorse or guarantee any installer's work or performance.

Manitoba Geothermal Energy Alliance (MGEA)  
1980-B Main St.  
Winnipeg, MB R2B 2V6  
Phone: (204) 470-6447  
Email: mm@mgea.ca or inez@mgea.ca  
Website: www.mgea.ca or www.mgea.ca/  
contractors.aspx

Canadian GeoExchange Coalition (CGC)  
934, St. Catherine St, Office 220  
Montreal, QC H2L 2E9  
Phone: (514) 807-7559 ext. 34  
Email: info@geo-exchange.ca  
Website: www.geo-exchange.ca

## Custom electric incentive measure eligibility

### 1. General eligibility

1.1 The proposed product or system must produce predictable and sustainable electrical savings in at least one of the following categories:

1.2 Reduction of Manitoba Hydro's Winter System Peak (measured in kW). Calculated as the average kW load of customer's equipment over the on peak hours of 6 a.m. thru 10 p.m. Monday through Saturday at winter design temperatures occurring in the months of December, January or February.

1.3 Reduction of Manitoba Hydro's Summer System Peak (measured in kW). Calculated as the average kW load of customer's equipment over the on peak hours of 6 a.m. thru 10 p.m. Monday through Saturday at summer design temperatures occurring in the months of June, July or August.

1.4 Reduction in annual electrical energy consumption in kilowatt-hours (kWh).

Manitoba Hydro reserves the right to assess any special situations or integrated requirements on an individual basis.

### 2. Eligible measures

2.1 Minimum project electrical energy savings of 25 000 kWh per year or 10 kW winter or 10 kW summer Hydro system peak demand reductions as estimated by a Registered Professional Engineer or Architect as reviewed, adjusted and approved by a Manitoba Hydro Program Engineer.

2.2 Utilize proven technology with a minimum expected equipment operating life of 10 years.

2.3 Savings shall be calculated in comparison to an Engineer or Architect defined and Manitoba Hydro approved "Base Case System". The Base Case System is defined as the system which would normally be installed in the absence of Power Smart incentive programs. Manitoba Hydro's decisions with respect to the Base Case System definition shall be final.

### 3. Measures not eligible

3.1 Measures which are eligible for all other Prescriptive Power Smart Programs including but not limited to:

- Commercial Lighting Program
- Commercial Building Envelope Program
- Commercial Parking Lot Controller Program
- Commercial HVAC program
- Commercial Earth Power program

3.2 Measures which are eligible for "Calculated Incentives" under the Commercial Lighting Program.

3.3 Demand Control systems – systems which modify a customer's load shape by shifting loads within Manitoba Hydro's winter or summer on-peak period of 6 a.m. to 10 p.m. Monday through Saturday.

3.4 Power Factor Correction systems

3.5 Technologies that were formerly part of a Manitoba Hydro incentive program but are now considered base case, including but not limited to:

- High efficiency motors.

3.6 Fuel Switching Measures – measures that achieve electrical energy or demand savings by switching to other energy sources such as fuel oil, propane, natural gas, coal, or wood.

### 4. Measures individually considered for eligibility

4.1 Energy storage systems – Energy storage systems which result in a net reduction of electrical energy consumption throughout Manitoba Hydro's Winter or Summer on-peak periods may be considered by Manitoba Hydro Program Engineers on an individual basis. Please contact Manitoba Hydro to discuss concept eligibility, before proceeding with an application.

4.2 Renewable Energy Sources – Adoption or integration of renewable energy sources such as solar, wind or sustainable biomass may be considered by Manitoba Hydro on a case by case basis if they can be shown to be economically attractive and technically feasible. Please contact Manitoba Hydro to discuss concept eligibility, before proceeding with an application.

## Section 4: Power Smart recommended good practices

These efficiency recommendations are good building practice for most construction projects. Owners are asked to consider them for all end-use categories.

### General

#### 1. Total building commissioning

1.1 Total building commissioning typically includes thorough documentation of the designer's intent, multistage performance testing, and maintenance manuals developed for the specific building.

1.2 Commissioning is more commonly performed by an independent third party commissioning/engineering firm but can also be performed by the building designers. Benefits of a formalized commissioning process include:

- sustainable energy savings from energy conservation measures
- improved occupant comfort
- improved indoor environmental conditions
- improved system and equipment function
- improved building operation and better trained operators
- reduced building maintenance costs

1.3 The Commissioning Process (CxP) and its components are best understood through referencing ASHRAE Guideline 0 - The Commissioning Process

1.4 Total building commissioning carries a cost. Sources in the industry advise costs of 0.5 to 1.5 per cent of total building cost. Commissioning of the mechanical and electrical systems and building envelope systems is typically included.

#### 2. Design documentation

2.1 A statement of design intent and operation recommendations which would enable the systems in the building to be operated efficiently must be included in an Operations and Maintenance Manual for the building. The statement must include at least the following:

2.2 Descriptive information about each system, detailing its function, design capability, performance characteristics, and distribution arrangement.

2.3 Schematic and control diagrams and sequences of operation; and start/stop and adjustment procedures.

2.4 Changeover, and start-up and shut down sequences.

### Lighting systems

#### 1. Power densities

1.1 Although lighting power densities for the various building types and space functions are to conform to the appropriate MNECB 1997 table, trade-offs in power densities between various spaces are acceptable provided that:

- overall building power density conforms to MNECB 1997 Table 4.3.2.1.
- minimum technology performance requirements are met.

### Heating, ventilating and air conditioning

Ventilation systems should conform to ASHRAE Standard 62-2001 "Ventilation for Acceptable Indoor Air Quality"

#### 1. Control systems

1.1 Automatic controls should be provided. The controls should be capable of reducing energy use when the building is unoccupied. Night setback of more than 2°C to 3°C (36°F to 37°F) in electrically heated buildings which will be billed on a demand rate must be carefully considered because of the risk that the electric heat could add to the building's peak demand during the morning warm-up period.

1.2 Manitoba Hydro supports and encourages the use of "interoperable" control systems that allow owners to contract maintenance as well as purchase control equipment from multiple control companies (vendors).

This should reduce maintenance and upgrade costs. Flexible control systems are key to the efficient control and operation of building systems and energy management systems. Interoperable control systems include Direct Digital Control (DDC) systems that use BACnet or Lonworks communication protocols.

1.3 Some recommended methods of reducing energy use during unoccupied periods include:

- operating the air distribution fan on demand for heating or cooling only
- reducing or shutting off of outdoor air during heating or cooling operation when the space is unoccupied

- utilizing economizer(s) for free cooling when available (night flush)

1.4 Consideration should be given to using demand controlled ventilation during occupied periods. Controls should be in compliance with the latest version of ASHRAE Standard 62 – Ventilation for Acceptable Indoor Air Quality and local standards.

## 2. Commissioning of HVAC systems

2.1 All HVAC systems should be commissioned as per the latest version of ASHRAE Guideline 1 – Guideline for Commissioning of HVAC Systems.

This guideline provides procedures and methods for documenting and verifying the performance of HVAC systems so that systems operate in conformity with the design intent.

## 3. Air distribution systems

3.1 Supply and exhaust ductwork should be constructed and sealed to minimize air leakage.

3.2 Supply and exhaust ductwork should be tested and adjusted (air balanced) by a qualified independent contractor.

3.3 Ducts run outdoors should be insulated to a minimum of RSI 3.5 (R-20).

3.4 Zones with special ventilation or temperature requirements should be served by separate air distribution for either heating or cooling systems.

## 4. Piping for hydronic heating and cooling systems

4.1 All heating and cooling piping systems should be designed and constructed so that water flows can be tested and adjusted (balanced).

4.2 Pipes designed to carry fluids warmer than 40°C (104°F) and cooler than 13°C (55°F) should be insulated as per Table 5.2.4.3 from the Model National Energy Code for Buildings (MNECB) 1997.

4.3 Pipes run outdoors should be insulated to the levels required for pipes carrying 177°C (351°F) water.

Table 5.2.4.A.

| Minimum Pipe Insulation Thickness (mm)                                    |                              |                            |                                  |             |              |              |             |
|---|------------------------------|----------------------------|----------------------------------|-------------|--------------|--------------|-------------|
| Fluid Design Temperature (°C)   | Insulation Conductivity      |                            | Nominal Pipe Diameter (in.)      |             |              |              |             |
|   | Conductivity Range, W/m x °C | Mean Rating Temperature °C | Runouts <sup>1</sup> up to 2 in. | 1" and less | 1 1/4" to 2" | 2 1/2" to 4" | 5" & larger |
| <b>Heating Systems (Steam, Steam Condensate and Hot Water)</b>            |                              |                            |                                  |             |              |              |             |
| Above 176   | 0.046-0.049                  | 121                        | 38.1                             | 63.5        | 63.5         | 76.2         | 88.9        |
| 122 to 176  | 0.042-0.045                  | 93                         | 38.1                             | 50.8        | 63.5         | 63.5         | 88.9        |
| 94 to 121   | 0.039-0.043                  | 65                         | 25.4                             | 38.1        | 38.1         | 50.8         | 50.8        |
| 61 to 93  | 0.036-0.042                  | 52                         | 25.4                             | 25.4        | 25.4         | 38.1         | 38.1        |
| 41 to 60  | 0.035-0.040                  | 38                         | 25.4                             | 25.4        | 25.4         | 25.4         | 38.1        |
| <b>Cooling Systems (Chilled Water, Brine and Refrigerant)<sup>2</sup></b> |                              |                            |                                  |             |              |              |             |
| 5 to 13   | 0.033-0.039                  | 24                         | 25.4                             | 25.4        | 25.4         | 25.4         | 25.4        |
| Below 5   | 0.033-0.039                  | 24                         | 25.4                             | 25.4        | 38.1         | 38.1         | 38.1        |

### Notes for Table 5.2.4.A.:

- (1) Runouts to individual terminal units not exceeding 3.7 m.
- (2) The required minimum thicknesses do not consider water vapour transmission and condensation. Additional insulation, vapour barriers or both may be required to limit water vapour transmission and condensation.

4.4 Pumping systems that serve control valves designed to modulate or to open and close in steps as a function of load shall be designed for variable fluid flow and shall be capable of reducing system flow to 50 per cent of design flow or less. Exceptions:

- Systems where a minimum flow greater than 50 per cent of the design flow is required for the proper operation of primary equipment serving the system, such as chillers and boilers
- Systems with a control valve
- Systems that include controls to reset the fluid supply temperature based on either outdoor temperature or system loads

## Domestic/service water

### 1. Showers and basins

1.1 Maximum shower flow rate should be 9.5 L/min @ 550 kPa (80 psi).

1.2 Pressure or temperature balance type shower control valves must be used to prevent sudden shower water temperature fluctuations.

1.3 Maximum public lavatory flow rate should be 8.3 L/ min @ 415 kPa (60 psi).

1.4 Public washroom lavatory faucets must automatically shut off when not in use.

Storage tanks and tank type water heaters should be insulated to a nominal minimum of RSI 2.8 (R-16).

1.5 All domestic or service hot water piping in circulating systems, non-recirculating systems without heat traps and non-circulating systems with electric heating elements along the pipes to maintain temperature should be insulated as per the following Table 6.2.3.1. From the MNECB 1997:

### 2. Commercial Spray Valves

2.1 Valves shall be certified to CSA B125.1-05 / AMSE A112.18.1-2005 standards or equivalent, subject to technical review.

2.2 Maximum flow rate of 6.1 litre/minute (1.6 US/ GPM) tested at 415 kPa (60 psi). A removable flow restrictor may not be used to achieve the required flow rate.

2.3 High velocity, "knife edge" spray pattern.

2.4 Minimum water pressure of 40 psi.

Table 6.2.3.A.

| Minimum Pipe Insulation Thickness (mm) |                              |                            |                                  |             |              |              |             |
|--|------------------------------|----------------------------|----------------------------------|-------------|--------------|--------------|-------------|
| Fluid Design                           | Insulation Conductivity      |                            | Nominal Pipe Diameter (in.)      |             |              |              |             |
| Piping Location                        | Conductivity Range, W/m x °C | Mean Rating Temperature °C | Runouts <sup>1</sup> up to 2 in. | 1" and less | 1 1/4" to 2" | 2 1/2" to 4" | 5" & larger |
| Conditioned Space                      | 0.035-0.040                  | 38                         | 12.7                             | 25.4        | 25.4         | 38.1         | 38.1        |
| Non-conditioned space or outside       | 0.046-0.049                  | 121                        | 38.1                             | 63.5        | 63.5         | 76.2         | 88.9        |

#### Notes for Table 6.2.3.A.:

- (1) Applies to recirculating sections of service or domestic hot water systems and the first 2.4 m from storage tank for non-recirculating systems.

1.6 Electric Water Heaters should comply with the following standards:

| <b>Input (kW)</b>           | <b>Storage Capacity (L)</b>  | <b>Standard</b>                          |
|-----------------------------|------------------------------|--|
| Less than or equal to 12 kW | <b>And</b> 50 to 454 L       | CAN/CSA-C745- 95                         |
| Greater than 12 kW          | <b>Or</b> greater than 454 L | ANSI Z21.10.3-1990 and ASHRAE 90.1b-1992 |

# Section 5: Green building policy and LEED requirements for projects that are funded either in whole or in part by the Government of Manitoba

## Green Building Policy for Government of Manitoba Funded Projects

As of April 1, 2007, all new (and some renovated) building projects that are funded either in whole or in part by the Government of Manitoba must comply with the *Green Building Policy for Government of Manitoba Funded Projects*. This policy applies to all Government of Manitoba departments, crown corporations and agencies as well as other entities that are either provincially funded or receive a direct capital contribution for a building or renovation project, with the exception of organizations receiving project funding solely from either the Power Smart Program operated by Manitoba Hydro or the Designated Heritage Building Grants Program operated by the Historic Resources Branch of Manitoba Culture, Heritage and Tourism.

This section contains an abbreviated version of the Green Building Policy. For a full and updated copy of the Policy, detailing the scope and all technical requirements, contact the Green Building Coordination Team at [gbmanitoba@gov.mb.ca](mailto:gbmanitoba@gov.mb.ca) or visit the web site at: [http://www.gov.mb.ca/est/energy/green\\_bldg\\_html](http://www.gov.mb.ca/est/energy/green_bldg_html).

### 1. Vision, purpose and goals

The vision of this policy is to create a significant improvement in how new and renovated buildings that are funded by the Government of Manitoba perform over their entire life cycle from an environmental, energy and economic perspective.

“Green building” is a term used to describe projects that are sited to promote livable communities; protect sensitive lands and preserve natural resources; are energy efficient and/or use renewable energy; incorporate environmentally-friendly building materials and practices; and promote occupant health and well-being.

The general purpose of this policy document is to provide the green building principles and practices that are to be used for projects that are funded either in whole or in part by the Government of Manitoba. Specific goals are to:

- Reduce overall expenditures through improved building performance, full cost accounting and a life-cycle approach to costing.
- Reduce Manitoba’s exposure to the price volatility and long-term supply concerns associated with the use of non-renewable fossil fuel imported from outside the province (i.e. natural gas, fuel oil and propane).
- Create a common and consistent framework for green building standards across provincial government departments, crown corporations and agencies as well as other levels of government (i.e. municipalities, local government

districts) or entities that receive provincial government funding for building projects.

- Minimize the negative environmental impacts associated with building site selection, construction, renovation, operation, maintenance, repair and demolition or deconstruction without impairing the intended use or function of the building.
- Lower greenhouse emissions from Manitoba’s building sector by improving energy efficiency and expanding the use of clean renewable energy.
- Capitalize on other benefits often achieved by green buildings such as healthier, more productive indoor environments and improved asset value.
- Create economic opportunities for Manitoba businesses by stimulating the demand for green building products and services.

### 2. Background

The buildings sector is a significant contributor to depletion of natural resources and is a major cause of greenhouse gas emissions, air and water pollution, solid waste, deforestation, toxic waste, health hazards and other negative consequences.

However, green buildings have demonstrated that they significantly reduce these impacts and achieve many other benefits when compared to conventional building practice. For a building owner or operator, these potential benefits include:

- Avoided capital costs (e.g. reduced infrastructure costs, reduced material use, savings in construction waste disposal, downsized mechanical equipment, financial incentives and tax credits, etc.)
- Reduced operating costs (e.g. lower energy costs, lower water and sewage charges, greater durability and fewer repairs, reduced cleaning and maintenance, reduced cost to reconfigure office space and relocate workers, reduced waste generation, etc.)
- Other economic benefits (e.g. increased property value, easier employee recruiting, reduced employee turnover, reduced liability risk, positive public image, generation of new economic development opportunities etc.)

### 3. Scope

#### 3.1 Building Projects Covered by this Policy

– This policy applies to the site selection, design, construction and renovation of non-residential buildings (excluding industrial and farm buildings). Unless otherwise permitted under Sub-Sections 3.2 and 5.3, all new buildings and additions to existing buildings with a building area of 600 sq. m (6 500 sq. ft.) or more as well as renovations of existing buildings where the economics of new construction apply, shall meet or exceed the design, environmental and energy requirements described in Section 4.

3.2 Organizations Affected by this Policy – This policy applies to all Government of Manitoba departments, crown corporations and agencies as well as other entities that are either provincially funded or receive a direct capital contribution for a building or renovation project, described in Sub-Section 3.1 with the exception of organizations receiving project funding solely from either the:

- Power Smart Program operated by Manitoba Hydro
- or**
- Designated Heritage Building Grants Program operated by the Historic Resources Branch of Manitoba Culture, Heritage and Tourism.

3.3 Transition Period and Effective Date – This policy shall affect all building or major renovation projects and organizations noted in Sub-Sections 3.1 and 3.2 in two phases:

- Phase One (Transition Period): Compliance shall be voluntary for all projects that receive funding approval between April 1, 2006 and March 31, 2007.

- Phase Two (Effective Date): Compliance shall be mandatory after April 1, 2007 for all projects.

### 4. Design, environmental and energy requirements

4.1 Integrated Design Process (IDP) – Projects covered by this policy shall use an integrated design process.

The design process itself is the most important contributor to the realization of high performance buildings. An integrated design process (IDP) is a holistic, collaborative and comprehensive design process that brings together all design professionals and specialty consultants, along with the building owner, the occupant(s), and other direct stakeholders to design the building as a team. It is not a series of meetings where responsibilities and tasks are assigned, but instead a process whereby people work together to design the building.

An IDP for a specific project often begins with a series of intensive one-day to three-day long design charrettes. Team formation and goal setting are critical early stage components. For more information about the Integrated Design Process, see:

- C2000 Integrated Design Process (Natural Resources Canada) [http://www.sbc.nrcan.gc.ca/buildings/idp\\_e.asp](http://www.sbc.nrcan.gc.ca/buildings/idp_e.asp)
- Integrated Design Process Guide (Canada Mortgage and Housing Corporation) [http://www.cmhcschl.gc.ca/en/inpr/bude/himu/coedar/upload/Integrated\\_Design\\_GuideENG.pdf](http://www.cmhcschl.gc.ca/en/inpr/bude/himu/coedar/upload/Integrated_Design_GuideENG.pdf)

4.2 Environmental Requirements – All building projects covered by this policy shall achieve a minimum of Silver certification under the Canada Green Building Council's "LEED® Canada NC Version 1.0 Green Building Rating System for New Construction and Major Renovations". (See table at end of this section for more information)

4.3 Energy Mandatory requirements – In addition to the environmental requirements described in Sub-Section 4.2, all building projects covered by this policy must also:

- achieve at least 3 points under the Optimize Energy Performance of the LEED® rating system;
- comply with the requirements to achieve designation as a Power Smart Building in accordance with Manitoba Hydro's Power Smart Design Standards for New and Renovated Buildings.

For information about the standards and programs noted above, please see the following links:

- Leadership in Energy and Environmental Design (Canada Green Building Council)  
<http://www.cagbc.org/>
- Model National Energy Code of Canada for Buildings 1997  
[http://www.nationalcodes.ca/mnecb/index\\_e.shtml](http://www.nationalcodes.ca/mnecb/index_e.shtml)

For information about the energy efficiency standards and programs noted above, please see the following links:

- Model National Energy Code of Canada for Buildings 1997  
[http://www.nationalcodes.ca/mnecb/index\\_e.shtml](http://www.nationalcodes.ca/mnecb/index_e.shtml)
- Power Smart Design Standards (Manitoba Hydro)  
[http://www.hydro.mb.ca/your\\_business/design\\_standards/index.shtml](http://www.hydro.mb.ca/your_business/design_standards/index.shtml)

4.4 Low or zero carbon renewable energy sources – Except for temporary, back-up or emergency power, all new buildings covered by this policy shall give preference to renewable low or zero carbon energy sources and systems (e.g. ground source heat pumps, passive solar, thermal solar, photovoltaics, wind, biomass, etc.) for space heating, domestic water heating, ventilation, lighting and other major building loads, unless it can be shown they are not cost-effective on a life-cycle cost basis.

4.5 Adaptive reuse and deconstruction of existing buildings – Consideration shall be given to the adaptive reuse of existing buildings, especially those of significant cultural or historic value, to capture the embodied energy and other resources that these buildings contain. 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.

## 5. Policy administration and support

5.1 Green Building Coordination Team – A Green Building Coordination Team shall administer and support this policy. Duties of this unit include:

- Development and distribution of an implementation guide and web site for the effective communication and application of this policy.

Outreach and education for organizations that will be impacted by this policy.

- Collaborating with organizations and building partnerships to ensure that the necessary skills, tools and awareness are developed to ensure that the policy is effectively implemented.
- Providing interpretations about the application of this policy and issuing revisions or clarifications.
- Monitoring the impact and outcomes generated by this policy.
- Drafting a future expansion of the policy to cover residential buildings, leased accommodations, residential buildings and issues related to minimizing environmental impacts from building operation, maintenance, repair and demolition.
- Coordinating the Interdepartmental Green Building Policy Working Group.

5.2 Independent verification – Independent, third-party verification shall be used to confirm that the design, environmental and energy requirements described in Section 4 have been met. All building projects covered by this policy must:

- Be certified by the Canada Green Building Council for the LEED® requirement;
- seek validation of the projected energy performance of the proposed building design against the Model National Energy Code of Canada for Buildings 1997 (if eligible) through Natural Resources Canada's *ecoENERGY for Buildings and Houses Initiative*, or through an equivalent service as defined by the Canada Green Building Council; and
- obtain a letter from Manitoba Hydro indicating the utility has accepted a signed letter of commitment from the project architect or engineer that the proposed building design will meet or exceed the *Power Smart Design Standards for New and Renovated Buildings* (Third Edition).

For more information about validation of projected energy performance please see:

- Natural Resources Canada Validation of New Building Models with Respect to the Model National Energy Code for Buildings (MNECB)  
<http://oee.nrcan.gc.ca/commercial/newbuildings/validation.cfm?attr=20>

5.3 Equivalencies, reduced requirements or exemptions – project proponents may suggest alternatives to the requirements of this policy at the schematic design and cost estimating stage. This request should be directed to the Green Building Coordination Unit identified in Sub-Section 5.1 and demonstrate that:

- the intent of the policy will still be met;
- the energy and performance of the building project will still meet or exceed the specific standards described in Section 4; and
- the life-cycle cost of the building project will be the same or less.

5.4 Support and Policy Interpretation – For support and assistance with interpreting the application of this policy, or to submit a request for an equivalency, exemption, or reduction in the required level of environmental or energy performance, contact the Green Building Coordination Team at [gbmanitoba@gov.mb.ca](mailto:gbmanitoba@gov.mb.ca).

## 6. Budgeting and financial implications

Based on green building experience in Manitoba and other jurisdictions, it is expected that any increase in capital cost needed to satisfy this policy will be modest and should be more than offset by lower operating costs, improved productivity and enhanced asset value. To minimize any financial impacts, the use of financial incentives and in-kind technical support from the Federal Government and Manitoba Hydro should be maximized.

However, it is recognized that some adjustments may be needed to the normal design fees and capital construction cost guidelines used by government departments, crown corporations and agencies.

Lifecycle cost analysis conducted for projects covered by this policy shall use a uniform set of key assumptions provided in the Green Building Policy Implementation Guide. Examples of these factors include:

- the discount rate;
- annual escalation rate for electricity costs;
- annual escalation rate for natural gas, propane, and fuel oil costs;
- annual escalation rate for building operating costs (excluding energy);
- the reduction in staffing costs due to improved productivity; and
- a cost per tonne for greenhouse gas emissions.

## 7. Reporting and evaluation

7.1 Monitoring and review – The impacts of this policy will be assessed on an ongoing basis by Green Building Coordination Team and adjusted when necessary after consultation with the Interdepartmental Green Building Policy Working Group. An interim review of the policy will be completed by March 31, 2008 and a more in-depth review by March 31, 2009.

7.2 Pre-construction and post-occupancy surveys – To enable the impact of this policy to be effectively monitored, organizations identified in 3.2 shall complete the following forms for each building project that falls within the scope of this policy and submit these forms to the Green Building Coordination Unit:

- Pre-Construction Green Building Survey at the schematic design phase and cost estimating phase (see Appendix C)
- Post-Occupancy Green Building Survey within six months of project completion and occupancy (see Appendix D)

7.3 Project contact person – For each building project affected by this policy, organizations identified in 3.2 shall appoint a contact person who will be deemed to be responsible for ensuring compliance with this policy.

## LEED requirements

This section provides a brief overview of the LEED requirements for the *Green Building Policy for Government of Manitoba Funded Projects*.

LEED® (Leadership in Energy and Environmental Design) is a consensus-based rating system that provides third-party verification of green buildings. It awards points for meeting specific performance criteria, which are organized into six categories: Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources, Indoor Environmental Quality, and Innovation & Design Process. Green building projects using LEED® are certified with a rating - Certified, Silver, Gold, or Platinum – that is determined by the total number of points attained (See table below for more information).

For details on project registration, program costs, training programs and details on the rating system please contact Leadership in Energy and Environmental Design (Canada Green Building Council) or visit their web site at <http://www.cagbc.org/>

## 1. Silver certification

1.1 All building projects covered by the Green Building Policy shall achieve a minimum of a Silver certification (33 to 38 LEED points) under the Canada Green Building Council's "LEED® Canada NC Version 1.0 Green Building Rating System for New Construction and Major Renovations".

## 2. Energy performance

2.1 In addition to a LEED® certification of Silver or better, all building projects covered by this policy must also achieve at least 3 LEED® points for increased levels of energy performance above the prerequisite standard. Compliance shall be demonstrated by using whole building energy simulation.

## 3. LEED points table

The following table outlines the categories and points available to calculate a LEED rating.

| LEED Canada-NC 1.0 Project Point List  |  |                 |
|--|--|-----------------|
| Certified 26-32 points   Silver 33-38 points   Gold 39-51 points   Platinum 52-70 points |  |                 |
| Sustainable Sites  |  |                 |
| Prereq 1   | <b>Erosion &amp; Sedimentation Control</b>                           | <b>Required</b> |
| Credit 1   | <b>Site Selection</b>  | 1               |
| Credit 2   | <b>Development Density</b>   | 1               |
| Credit 3   | <b>Redevelopment of Contaminated Site</b>                            | 1               |
| Credit 4.1   | <b>Alternative Transportation</b> , Public Transportation Access     | 1               |
| Credit 4.2   | <b>Alternative Transportation</b> , Bicycle Storage & Changing Rooms | 1               |
| Credit 4.3   | <b>Alternative Transportation</b> , Alternative Fuel Vehicles        | 1               |
| Credit 4.4   | <b>Alternative Transportation</b> , Parking Capacity                 | 1               |
| Credit 5.1   | <b>Reduced Site Disturbance</b> , Protect or Restore Open Space      | 1               |
| Credit 5.2   | <b>Reduced Site Disturbance</b> , Development Footprint              | 1               |
| Credit 6.1   | <b>Storm water Management</b> , Rate and Quantity                    | 1               |
| Credit 6.2   | <b>Storm water Management</b> , Treatment                            | 1               |
| Credit 7.1   | <b>Heat Island Effect</b> , Non-Roof                                 | 1               |
| Credit 7.2   | <b>Heat Island Effect</b> , Roof                                     | 1               |
| Credit 8   | <b>Light Pollution Reduction</b>                                     | 1               |
| <b>Total Possible Points for Sustainable Sites</b>                                       |  | <b>14</b>       |

| <b>Water Efficiency</b>                           |  |          |
|---|--|----------|
| Credit 1.1  | <b>Water Efficient Landscaping</b> , Reduce by 50%                   | 1        |
| Credit 1.2  | <b>Water Efficient Landscaping</b> , No Potable Use or No Irrigation | 1        |
| Credit 2  | <b>Innovative Wastewater Technologies</b>                            | 1        |
| Credit 3.1  | <b>Water Use Reduction</b> , 20% Reduction                           | 1        |
| Credit 3.2  | <b>Water Use Reduction</b> , 30% Reduction                           | 1        |
| <b>Total Possible Points for Water Efficiency</b> |  | <b>5</b> |

| <b>Energy &amp; Atmosphere</b>                           |   |                 |
|--|---|-----------------|
| Prereq 1   | <b>Fundamental Building Systems Commissioning</b> | <b>Required</b> |
| Prereq 2   | <b>Minimum Energy Performance</b>                 | <b>Required</b> |
| Prereq 3   | <b>CFC Reduction in HVAC&amp;R Equipment</b>      | <b>Required</b> |
| Credit 1   | <b>Optimize Energy Performance</b>                | 1 to 10         |
| Credit 2.1   | <b>Renewable Energy</b> , 5%                      | 1               |
| Credit 2.2   | <b>Renewable Energy</b> , 10%                     | 1               |
| Credit 2.3   | <b>Renewable Energy</b> , 20%                     | 1               |
| Credit 3   | <b>Best Practice Commissioning</b>                | 1               |
| Credit 4   | <b>Ozone Protection</b>                           | 1               |
| Credit 5   | <b>Measurement &amp; Verification</b>             | 1               |
| Credit 6   | <b>Green Power</b>                                | 1               |
| <b>Total Possible Points for Energy &amp; Atmosphere</b> |   | <b>17</b>       |

| <b>Materials &amp; Resources</b>                           |  |                 |
|--|--|-----------------|
| Prereq 1   | <b>Storage &amp; Collection of Recyclables</b>                           | <b>Required</b> |
| Credit 1.1   | <b>Building Reuse</b> : Maintain 75% of Existing Walls, Floors, and Roof | 1               |
| Credit 1.2   | <b>Building Reuse</b> : Maintain 95% of Existing Walls, Floors, and Roof | 1               |
| Credit 1.3   | <b>Building Reuse</b> : Maintain 50% of Interior Non-Structural Elements | 1               |
| Credit 2.1   | <b>Construction Waste Management</b> : Divert 50% from Landfill          | 1               |
| Credit 2.2   | <b>Construction Waste Management</b> : Divert 75% from Landfill          | 1               |
| Credit 3.1   | <b>Resource Reuse</b> : 5%   | 1               |
| Credit 3.2   | <b>Resource Reuse</b> : 10%  | 1               |
| Credit 4.1   | <b>Recycled Content</b> : 7.5% (post-consumer + ½ post-industrial)       | 1               |
| Credit 4.2   | <b>Recycled Content</b> : 15% (post-consumer + ½ post-industrial)        | 1               |
| Credit 5.1   | <b>Regional Materials</b> : 10% Extracted and Manufactured Regionally    | 1               |
| Credit 5.2   | <b>Regional Materials</b> : 20% Extracted and Manufactured Regionally    | 1               |
| Credit 6   | <b>Rapidly Renewable Materials</b>                                       | 1               |
| Credit 7   | <b>Certified Wood</b>  | 1               |
| Credit 8   | <b>Durable Building</b>  | 1               |
| <b>Total Possible Points for Materials &amp; Resources</b> |  | <b>14</b>       |

| <b>Indoor Environmental Quality</b>                           |  |                 |
|---|--|-----------------|
| Prereq 1  | <b>Minimum IAQ Performance</b>                                       | <b>Required</b> |
| Prereq 2  | <b>Environmental Tobacco Smoke (ETS) Control</b>                     | <b>Required</b> |
| Credit 1  | <b>Carbon Dioxide (CO<sub>2</sub>) Monitoring</b>                    | 1               |
| Credit 2  | <b>Ventilation Effectiveness</b>                                     | 1               |
| Credit 3.1  | <b>Construction IAQ Management Plan: During Construction</b>         | 1               |
| Credit 3.2  | <b>Construction IAQ Management Plan: Testing Before Occupancy</b>    | 1               |
| Credit 4.1  | <b>Low-Emitting Materials: Adhesives &amp; Sealants</b>              | 1               |
| Credit 4.2  | <b>Low-Emitting Materials: Paints and Coating</b>                    | 1               |
| Credit 4.3  | <b>Low-Emitting Materials: Carpet</b>                                | 1               |
| Credit 4.4  | <b>Low-Emitting Materials: Composite Wood and Laminate Adhesives</b> | 1               |
| Credit 5  | <b>Indoor Chemical &amp; Pollutant Source Control</b>                | 1               |
| Credit 6.1  | <b>Controllability of Systems: Perimeter Spaces</b>                  | 1               |
| Credit 6.2  | <b>Controllability of Systems: Non-Perimeter Spaces</b>              | 1               |
| Credit 7.1  | <b>Thermal Comfort: Compliance</b>                                   | 1               |
| Credit 7.2  | <b>Thermal Comfort: Monitoring</b>                                   | 1               |
| Credit 8.1  | <b>Daylight &amp; Views: Daylight 75% of Spaces</b>                  | 1               |
| Credit 8.2  | <b>Daylight &amp; Views: Views 90% of Spaces</b>                     | 1               |
| <b>Total Possible Points for Indoor Environmental Quality</b> |  | <b>15</b>       |

| <b>Innovation &amp; Design Process</b>                           |                                      |          |
|--|--------------------------------------|----------|
| Credit 1.1   | <b>Innovation in Design</b>          | 1        |
| Credit 1.2   | <b>Innovation in Design</b>          | 1        |
| Credit 1.3   | <b>Innovation in Design</b>          | 1        |
| Credit 1.4   | <b>Innovation in Design</b>          | 1        |
| Credit 2   | <b>LEED® Accredited Professional</b> | 1        |
| <b>Total Possible Points for Innovation &amp; Design Process</b> |                                      | <b>5</b> |

|  |           |
|--|-----------|
| <b>Total Possible Project Points (pre-certification estimates)</b> | <b>70</b> |
|--|-----------|



## Appendix: Glossary of terms

**Annual Fuel Utilization Efficiency (AFUE)** – Seasonal efficiency of a boiler or furnace. Takes into account seasonal and non-seasonal losses.

**Air barrier** – A system of components to prevent the uncontrolled flow of air through the building envelope.

**Air changes** – A method of expressing the amount of air flow into or out of a building or room in terms of the number of building volumes or room volumes of air exchanged per hour.

**Air-to-air Heat Recovery** – See HRV.

**Ambient temperature** – Temperature (usually of the air) surrounding operating equipment.

**Ampere (A)** – The unit of measurement of electric current.

**ANSI** – American National Standards Institute.

**ARI** – Air-Conditioning and Refrigeration Institute.

**ASHRAE** – American Society of Heating, Refrigerating, and Air Conditioning Engineers.

**ASME** – American Society of Mechanical Engineers

**Atmospheric pressure** – Pressure exerted because air has weight. Under normal conditions this pressure is 14.7 lb./sq. In. (101.2 kPa).

**BACnet** – A data communication protocol for building automation and control networks. A data communication protocol is a set of rules governing the exchange of data over a computer network. The rules take the form of a specification that spells out what is required to conform to the protocol.

**British Thermal Unit (Btu)** – Amount of heat energy required to raise the temperature of one pound of water one degree Fahrenheit. It is approximately the amount of heat generated by burning a common match.

**British thermal unit per hour (Btu/h)** – See definition for Btu. Air conditioners are rated in Btu/h capacity.

**Building envelope** – The building exterior—including walls, roof, windows, doors, foundation, floor, Insulation, vapour retarder, and air barrier—that act as a unit to provide shelter and an indoor space.

**Burner** – A device that introduces the fuel and air into a furnace at the desired velocities and turbulence to maintain proper combustion.

**Calorie** – The amount of heat energy required to raise the temperature of one gram of water through a change of one degree Celsius. (8604 kilo calories = 1 kW/h).

**Capacitor** – Functions primarily to accumulate and store electrical charges. Used for power factor correction.

**Commercial Building Incentive Program (CBIP)** – A former program of Natural Resources Canada that provided funding to help design new buildings that are at least 25 per cent more efficient than the MNECB 1997.

**Celsius** – The temperature measuring scale (formerly Centigrade) in which the freezing point of water is taken at 0°C and the vaporization point at 100°C. Absolute zero on this scale is -273.15°C.

**Chlorofluorocarbons (CFC's)** – A group of chemicals used in refrigeration equipment also known as Freon gas.

**Coefficient of Performance (COP)** – The total heat in Btu's produced by the system divided by the total energy in Btu's consumed by the system. See Seasonal Coefficient of Performance.

**Colour Rendering Index (CRI)** – A measure of how well a light source renders colour as compared to daylight. Can only be used to compare light sources with the same colour temperatures. A CRI of 100 would indicate the light renders the same as daylight at the same colour temperature. A CRI in the upper 90s is considered the best assurance that the light source will render all colours properly.

**Compact Fluorescent (CF)** – Compact fluorescent lamps generally consist of phosphor-coated tubes that are "folded" or curled to increase the surface area. Quad tube lamps have two U-bent sections. New triple tube models have three tube sections to give higher light output from a shorter lamp. Compact fluorescent lamps are typically 4 times more efficient than incandescent lamps and last about 10 000 hours.

**Compressor** – A device that takes a refrigerant vapour at a low temperature and pressure and raises it to higher temperature and pressure.

**Conduction** – A method by which heat energy is transferred by actual collision of the molecules.

**CSA** – Canadian Standards Association

**CxP** – Commissioning process as defined in ASHRAE Guideline 0 – The Commissioning Process.

**Direct Digital Control (DDC)** – A computerized control system for operating building control systems.

**Demand** – The rate at which electric energy is delivered to a load. It is expressed in either kilowatts (kW) or kilovolt-amperes (kVA). Demand is the peak amount of power drawn through the meter during a specific billing period.

**EE4** – An energy performance simulation software tool that was originally used to confirm compliance with the former NRCan program called CBIP. This software estimates annual energy use of a building as designed, and compares it to a reference building constructed to meet the MNECB 1997 standard.

**EMS** – Energy Management System

**Energy Efficiency Ratio (EER)** – An indication of the efficiency of a unit such as an air conditioner. The higher the EER, the more energy efficient the unit. EER is equal to the cooling output in Btu/hr divided by the energy input in watts

**Evaporation** – The process by which a liquid changes into a vapour as a result of absorbing heat.

**Evaporator** – Device in the low-pressure side of a refrigeration system through which the unwanted heat flows and absorbs the heat into the system in order to be moved or transferred to the condenser.

**Fenestration** – The glazing, framing and in some cases shading devices and insect screens. The glazing may be single or multiple and be either glass or plastic.

**Footcandle** – A unit of measurement of usable light (illumination) that reaches any given surface. It is defined as 1 lumen spread over an area of 1 square foot.

**Gas Appliance Manufacturers Association (GAMA)** – A national trade association whose members manufacture appliances, components, and related products that are used in connection with space heating, water heating and commercial food service.

**Gauge pressure** – Pressure above or below atmospheric pressure.

**Geothermal Heat Pump (GHP)** – A ground source heat pump, also called a geothermal heat pump. Similar to an air conditioner or refrigerator in that it moves heat from one place to another. In the summer, a geothermal heat pump that operates in a cooling mode lowers indoor temperatures by transferring heat to the ground. Unlike an air conditioner, this process can be reversed. In the

winter, a geothermal heat pump extracts heat from the ground and transfers it inside. The energy value of the heat moved is typically more than three times the electricity used in the transfer process.

**High Intensity Discharge (HID)** – A category of lamps that operate with an electric arc passing through a gas-filled tube. They are more efficient than either incandescent or fluorescent lights. Mercury vapour, metal halide, low-pressure sodium, and high-pressure sodium lamps are all HID lamps.

**High-Pressure Sodium (HPS)** – The second most efficient HID light. HPS produces a golden-white light that is most commonly used for large interior areas, exterior areas, and roadway lighting.

**Heat Recovery Ventilator (HRV)** – An air-to-air heat recovery unit that removes heat from warm, stale air that is exhausted from a building and uses it to heat incoming cold, fresh air. The recovery of heat saves energy by reducing the load on the heating system.

**Heating Ventilation Air-Conditioning (HVAC)** – A system to control the temperature, humidity, and ventilation in a building.

**Illuminating Engineering Society of North America (IESNA)** – The recognized technical authority on illumination. It communicates information on all aspects of good lighting practice.

**Incandescent** – Any light whose operation is based on heating a wire filament until it glows. The least efficient form of electric light. Household bulbs and quartz-halogen lights are both incandescent.

**Integrated Part-Load Value (IPLV)** – The average power input based upon a chiller operating at part loads through the cooling season.

**Kilovolt (kV)** – The unit of electrical pressure, or force, equivalent to 1000 volts (V).

**Kilowatt (kW)** – The unit of electrical power equivalent to 1000 watts (W).

**Kilowatt-hour (kWh)** – The unit by which electrical energy is measured. For example, 10, 100-watt light bulbs switched on for one hour would use one kilowatt-hour (1000 watts for one hour).

**Light Emitting Diode (LED)** – A solid state device that produces light by electroluminescence when a low-voltage direct current is applied to it. LEDs are used for signals, indicators, signs, and displays.

**LONWORKS® Network** – A communications protocol developed by Echelon® Corporation. The protocol is recognized internationally as a standard for open, interoperable control networks.

**Low Pressure Sodium (LPS)** – The most efficient HID light. LPS Produces a monochromatic yellow light. Most commonly used for exterior areas such as parking lots and some roadway lighting.

**Linear fluorescent** – A straight fluorescent tube typically 1.5 inches in diameter (T12) or 1 inch in diameter (T8). When a specific voltage is applied to the ends of the tube, ultra-violet radiation is generated and in turn, strikes the phosphor coating, emitting light. The composition of the phosphor coating determines the colour of the light.

**Lumen** – A unit of measurement of light emitted by a lamp at the light source. A unit of luminous flux.

**Lux** – A unit of measurement of usable light (illumination) that reaches any given surface. It is defined as one lumen spread upon an area of one square metre.

**MBH** – 1000 British thermal units per hour. A unit of power normally used for heating equipment.

**Megawatt (MW)** – The unit of electrical power equal to one million watts or 1000 kilowatts.

**Model National Energy Code of Canada for Buildings (MNECB) 1997** – Serves as the minimum guideline for the design and construction of all buildings in Canada.

**Modified bitumen membrane** – Thin asphalt based product that can be adhered to a wall or a roof to provide an excellent air and vapour barrier.

**Metal Halide (MH)** – An improved form of MV fixture that is more efficient and produces a blue-white light. Comes in both probe-start and the newer pulse-start models.

**Mercury Vapour (MV)** – The least efficient HID fixture. Produces a bluish light.

**National Electrical Manufacturers Association (NEMA)** – A forum for the standardization of electrical equipment.

**Natural Resources Canada (nrcan)** – The department of the federal government that specializes in the sustainable development and use of natural resources, energy, minerals and metals, forests and earth sciences.

**Packaged Air Conditioner (PAC)** – Assembly of equipment that controls the temperature, relative humidity purity and movement of the air flowing through it. The compressor, condenser, evaporator and expansion device are all included in one piece of equipment. A rooftop unit is an example of a packaged air conditioner.

**Polychlorinated Biphenyl (PCB)** – Synthetic liquid chemical compounds of chlorine, carbon, and hydrogen that were once popular for use because of their fire-resistant, insulating, and chemically stable properties.

**Peak Load** – Record of maximum amount of electricity used in a given time period.

**PLC** – Programmable Logic Controller.

**Polyolefin** – An air barrier material that is airproof but allows vapour to move through it. This air barrier material is wrapped over the exterior sheathing. It goes by such trade names as Tyvek, Typar, or Air-Gard.

**Power** – The rate of using electrical energy, usually measured in watts, kilowatts, or megawatts.

**Power factor** – The ratio of real usable power measured in kilowatts to the total power (real and reactive power) measured in kilovolt-amperes.

**PTAC** – Packaged terminal air conditioner.

**Refrigerant** – Substance which is circulated in a refrigeration system to transfer heat.

**R-value** – A measure of resistance to heat flow. A higher value indicates a better heat-insulating property. In traditional units R-value is measured in Btu's of energy conducted multiplied by inches of thickness per hour of time per square foot of area per Fahrenheit degree of temperature difference between the two sides of the material (hr·ft<sup>2</sup> °F/Btu). R-1 is equivalent to RSI 0.17612.

**RSI value** – A measure of resistance to heat flow in SI units: square meter Kelvin per watt (m<sup>2</sup> K/W). RSI 1 is equivalent to R-5.678.

**Seasonal Coefficient of Performance (SCOP)** – The total heat in Btu's produced by the system during the heating season divided by the total energy in Btu's consumed by the system. The SCOP of geothermal heat pumps typically vary from 2.5 to 3.5. For reference, the SCOP of an electric baseboard heater is 1.

**Seasonal Energy Efficiency Ratio (SEER)** – Ratio of the total cooling provided during the season in Btu's divided by the total energy used by the system in watt-hours. The higher the SEER, the more energy efficient the unit. Also the EER of a unit averaged out over the heating or cooling season.

**SHW** – Service Hot Water.

**Split system air conditioner** – An air conditioning system consisting of an outdoor mounted condensing unit (condenser and compressor) and a separate evaporator coil mounted in a furnace, a fan unit, air handler, or a make-up air unit. Also called air cooled as the condenser is typically cooled by outdoor air.

**T5** – A straight fluorescent tube with a diameter of 5/8 inches and available only in metric lengths and mini bipin bases. These lamps are used in shallower luminaires than T8 lamps, and are more efficient over all than luminaires for T8 lamps. T5s can be found providing lighting from coves, under cabinet fixtures, indirect pendants, recessed indirects, architectural niches, and display cases. T5 lamps provide a higher source brightness than T8 lamps and better optical control. Their unique lengths, special lampholder, and electronic ballast requirements make them unsuitable for most retrofit applications. Compact fluorescents also use the T5 tube.

**T8** – A straight fluorescent tube that provides excellent colour quality with substantial energy savings. The replacement for standard T12s, T8 lamps measure 1 inch in diameter, are available in lengths from 2 feet to 8 feet, and use fixtures equipped with electronic ballasts.

**THD** – Total Harmonic Distortion.

**Tungsten halogen** – Term used to describe an incandescent lamp or bulb that offers a substantially increased life compared to a standard incandescent. Also described as quartz-tungsten-halogen. Source in which an electrical current passes through a filament and uses an inert gas to recycle fragments of burnt off tungsten back to filament.

**U-value** – A measure of heat transmission. It indicates the rate of heat flow through a building assembly, in units of heat flow per unit area per degree of temperature difference between indoor and outdoor air temperature. Units are  $W/m^2 \cdot ^\circ C$ . The lower the "U" value, the greater the insulating value. In North America the building assembly most often described by U-value is the window.

**Vapour retarder** – Commonly referred to as the vapour barrier. Reduces the movement of water vapour through the building envelope.

**Variable Air Volume (VAV)** – A means of controlling the temperature in a conditioned space by varying the amount of air provided to the controlled zone instead of the air temperature.

**VHO** – Very High Output florescent lamps

**Volt (V)** – The unit of measurement of electrical pressure or force, which causes electric current to flow.

**Volt-amp** – Unit used to measure apparent power. 1000-Volt Amps = 1 kVA.

**Volt-amp Resistance** – Unit used to measure reactive power. 1000-VAR = 1 kVAR.

**Watt** – Unit used to measure real or useable power. 1000-watts = 1kW.

**W/m<sup>2</sup>/°C** – Watts per square metre per degree Celsius – A measure of the heat flow through a substance.

**W/m<sup>2</sup>** – Watts per square metre – A measure of lighting density.



First edition: September 2002  
Second edition: April 2003  
Third edition: October 2007

For more information on Power Smart programs,  
contact your local Manitoba Hydro Energy Services Advisor, or:

**Telephone: (204) 474-3676 in Winnipeg**  
**Toll-Free: 1 888 MB HYDRO (1-888-624-9376)**  
**E-mail: [powersmartforbusiness@hydro.mb.ca](mailto:powersmartforbusiness@hydro.mb.ca)**  
**[www.hydro.mb.ca/psfb](http://www.hydro.mb.ca/psfb)**

