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1.0 GENERAL TECHNICAL SPECIFICATIONS

1.1 General requirements

1.1.1 All products must 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. Lamps shall only be used and installed in accordance with manufacturer instructions.

1.1.2 All eligible products must be represented by an authorized North American representative or distributor, including after-sales service.

1.1.3 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 may result in disqualification of the product from the Commercial Lighting Program (CLP).

1.1.4 A -3% tolerance for Power Factor (PF) values will be accepted.

1.1.5 A +5% tolerance for Total Harmonic Distortion (THD) values will be accepted.

1.2 Electrical re-certification

All retrofitted luminaires must 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.

1.3 Installation and application

1.3.1 Products intended for exterior application must be rated for satisfactory operation from -40°C to +40°C (-40°F to +104°F).

1.3.2 It is recommended that the average lighting levels comply with the Illuminating Engineering Society’s (IES) recommended 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 satisfy all approving authorities that have jurisdiction for specific applications.

1.3.3 In the event of abnormally high product failure rates within the first year of operation (in excess of 10 per cent) Manitoba Hydro may reject specific products or series of products from the program. Re-application for product qualification will be required. For customers who request products that exceed program specifications, additional product testing may be required (at a cost to the customer).

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

1.4 Construction specifications

1.4.1 All products must 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.

1.4.2 No socket adaptor or extensions are acceptable.

1.4.3 Only T12 to T8 fluorescent conversion kits are acceptable, except for metric systems.

1.4.4 For linear fluorescent systems, the ballast must be attached to the body of the fixture.

1.4.5 Fixtures shall have passive cooling systems only. Active cooling is allowed for LED lamps only.

1.4.6 Product marking/labelling must include at minimum: manufacturer name/logo, part number, safety certification agency marking, and electrical rating (wattage, voltage, power factor or current, and frequency).

1.4.7 To be eligible for a financial incentive, lighting fixtures have to be permanently installed in the facility.

1.5 Warranty

Minimum product warranty must meet Manitoba Hydro requirements which is specified in the pertinent sub-section of this document for each product technology.
2.0 T8 FLUORESCENT LIGHTING SYSTEMS

2.1 T8 Fluorescent standard fixtures

2.1.1 General requirements

2.1.1.1 Must be CSA-approved and complete with ballast disconnect device.

2.1.1.2 Photometric testing results, based on IES testing procedure and report format, should be prepared by an independent recognized testing laboratory and made available by the manufacturer. Manitoba Hydro will review photometric data prepared by manufacturers.

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

2.1.1.4 When retrofitting 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. This connection method is recommended for new installations, where rapid start operation maybe required in the future (e.g. use of occupancy sensors).

2.1.2 Construction specifications (standard fixtures)

2.1.2.1 Strip luminaires

channels must be 4 1/8 inches wide

Approximate equal length

Wiring diagram for a typical two-lamp instant start ballast

2.1.2.2 Strip luminaires complete with reflector

channels must be 4 1/8 inches wide and reflectors must have a minimum 9 3/8 inches opening

2.1.2.3 Wrap luminaires

lens must hinge from either side
2.1.2.4 **Recessed luminaires**

2.1.2.4.1 flat lensed and louvered must have hinged optics

2.1.2.4.2 acrylic lenses must be 0.125 inches nominal thickness

2.1.2.4.3 centre of lamp to ceiling plane spacing must be a minimum of two inches

2.1.2.5 **Cross blade luminaires**

louvers must be of interlocking, mitered construction

2.1.2.6 **Parabolics**

louvers must be of interlocking, mitered minimum three-inch construction

2.1.2.7 **Reflectored individual lamp/lensed luminaires**

recessed luminaire with each lamp having a reflector and a prismatic acrylic lens redirecting light to the workspace
2.1.2.8  **Vapourtight luminaires**

2.1.2.8.1 polycarbonate housing

2.1.2.8.2 minimum six polycarbonate or stainless steel latches

2.1.2.8.3 continuous gasketing and stainless steel mounting brackets with high impact lens

2.1.2.8.4 IP65 rated

---

2.1.3 **Warranty**

All standard fixtures must have a minimum one-year warranty.
2.2 T8 Fluorescent premium fixtures

2.2.1 General requirements

2.2.1.1 Must be CSA-approved and complete with a ballast disconnect device.

2.2.1.2 Photometric testing results, based on IES testing procedure and report format, should be prepared by an independent recognized testing laboratory and made available by the manufacturer. Manitoba Hydro will review photometric data prepared by manufacturers.

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

2.2.1.4 When retrofitting 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 they are connected 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. This connection method is recommended for new installations, where rapid-start operation may be required in the future (e.g. use of occupancy sensors).

2.2.2 Construction specifications (premium fixtures)

2.2.2.1 Must have all channels, housings, and reflectors die-formed embossed manufacture – minimum 20 gauge (22 gauge on recessed luminaires) – riveted or screwed (welded seams on surface box luminaires).

2.2.2.2 All metal surfaces must be painted, after manufacture, with a multi-stage polyester powder coat finish with a reflectance of greater than 90 per cent.

2.2.2.3 Photometric data will be available from independent test laboratories based on IES photometry standards.

2.2.2.4 Strip luminaires

channels must be 4 1/8 inches wide

2.2.2.5 Strip luminaires complete with reflector

channels must be 4 1/8 inches wide and reflectors must have a minimum 13 inches opening

---

Approximate equal length

Wiring diagram for a typical two-lamp instant start ballast
2.2.2.6  **Wrap luminaires**  
2.2.2.6.1 lens must hinge from either side  
2.2.2.6.2 lens must have concealed spring loaded pin retention

2.2.2.7  **Recessed luminaires**  
2.2.2.7.1 flat lensed and louvered must have hinged optics  
2.2.2.7.2 acrylic lenses must be 0.125 inches nominal thickness  
2.2.2.7.3 centre of the lamp to ceiling plane spacing must be a minimum of two inches

2.2.2.8  **Cross blade luminaires**  
lovers must be of interlocking, mitered construction

2.2.2.9  **Parabolics**  
2.2.2.9.1 louvers must be of interlocking, mitered three inches construction  
2.2.2.9.2 parabolic luminaires must have room-side ballast capability
2.2.2.10 Reflectored individual lamp/lensed luminaires

2.2.2.10.1 recessed luminaire with each lamp having a reflector and a prismatic acrylic lens redirecting light to the workspace

2.2.2.10.2 reflectored individual lamp/lensed luminaires must have room-side ballast capability

2.2.2.11 Vapourtight luminaires

2.2.2.11.1 polycarbonate housing

2.2.2.11.2 minimum six polycarbonate or stainless steel latches

2.2.2.11.3 continuous gasketing and stainless steel mounting brackets with high impact lenses

2.2.2.11.4 IP65 rated

2.2.2.11.5 lamp spacing (centre to centre) must be a minimum two inches

2.2.3 Warranty

All standard fixtures must have a minimum one-year warranty.
2.3 T8 Fluorescent ballasts

2.3.1 General requirements

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

2.3.1.2 Any existing PCB ballasts (T12) must be removed from the site and not abandoned within the luminaire that is being retrofitted. It is the owner’s responsibility to cover the cost of this work.

2.3.1.3 For qualifying information on dimming ballasts and controls, contact Manitoba Hydro.

2.3.2 Power quality

2.3.2.1 TABLE 1: VOLTAGE TEST RANGE

<table>
<thead>
<tr>
<th>Nominal (v)</th>
<th>Standard category (SH)</th>
<th>Premium category (LH)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum (v)</td>
<td>Maximum (v)</td>
</tr>
<tr>
<td>120</td>
<td>108</td>
<td>125</td>
</tr>
<tr>
<td>208</td>
<td>190</td>
<td>216</td>
</tr>
<tr>
<td>240</td>
<td>216</td>
<td>250</td>
</tr>
<tr>
<td>277</td>
<td>250</td>
<td>288</td>
</tr>
<tr>
<td>347</td>
<td>312</td>
<td>360</td>
</tr>
</tbody>
</table>

2.3.2.2 Power regulation: Ballast wattage regulation must not exceed ± 10 per cent when operated at voltage variation as per Table 1 at 60 Hz with ambient temperature of 25°C ± 2°C (77°F ± 3.6°F).

2.3.2.3 Power Factor (PF): Ballast power factor must 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.

2.3.2.4 Total Harmonic Distortion (THD): Limits for standard T8 electronic ballasts must not exceed 20 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 that are subject to change without notice.

2.3.2.5 Infrared (IR): Ballasts must be IR conflict free. Lamps must 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.

2.3.3 Warranty

All ballasts must have a minimum five-year warranty.
2.4 T8 Fluorescent energy efficient (EE) lamps

2.4.1 Performance

2.4.1.1 Measure applies to four-foot (48 inches) replacement T8 fluorescent lamps.

2.4.1.2 Performance parameters are listed below in Table 2 below.

TABLE 2: FLUORESCENT T8 LAMPS PERFORMANCE PARAMETERS

<table>
<thead>
<tr>
<th>Power (W)</th>
<th>Reference Length (inches)</th>
<th>Minimum light output</th>
<th>Minimum average life (at 3 hours per start)</th>
<th>Minimum CRI (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>48</td>
<td>2,800</td>
<td>2,700</td>
<td>24,000</td>
</tr>
<tr>
<td>28</td>
<td>48</td>
<td>2,650</td>
<td>2,500</td>
<td>24,000</td>
</tr>
<tr>
<td>25</td>
<td>48</td>
<td>2,400</td>
<td>2,250</td>
<td>24,000</td>
</tr>
</tbody>
</table>

Note: CRI Colour Rendering Index

2.4.2 Warranty

All lamps must have a minimum one-year warranty.
3.0 T5 FLUORESCENT LIGHTING SYSTEMS

3.1 T5 Fluorescent fixtures

3.1.1 General requirements

3.1.1.1 Must be CSA-approved complete with ballast disconnect device.

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

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

3.1.1.4 Life ratings of lamps must be at least 20,000 hours at three hours per start.

3.1.1.5 Fixture optics must be fully enclosed.

3.2 T5 Fluorescent ballasts

3.2.1 General requirements

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

3.2.1.2 All ballasts must be dedicated only to T5 fluorescent systems. Multi-lamp ballasts will be eligible.

3.2.1.3 All ballasts must be approved by Manitoba Hydro and submitted for product testing or independent laboratory test results.

3.2.1.4 For qualifying information on dimming ballasts and controls, contact Manitoba Hydro.

3.2.2 Power quality

3.2.2.1 Power regulation: Ballast wattage regulation must not exceed ± 10 per cent when operated at voltage variation as per Table 1 at 60 Hz with ambient temperature of 25°C ± 2°C (77°F ± 3.6°F).

3.2.2.2 Power Factor (PF): Ballast PF must be a minimum of 0.95 for Standard Harmonics (SH) category ballasts and 0.98 for Low Harmonics (LH) category ballasts (lead or lag) at voltage variation as per Table 1.

3.2.2.3 Total Harmonic Distortion (THD): Input current THD limits for electronic ballasts are 20 per cent, 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, for a voltage variation see the Premium category in Table 1 listed as the LH category. Manitoba Hydro uses other parameters to differentiate between these two classes of ballasts which are subject to change without notice.

3.2.2.4 Infrared (IR): Ballasts must be IR conflict free. Lamps must 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.

3.2.3 Warranty

All ballasts must have a minimum five-year warranty.
3.3 T5 Fluorescent energy efficient (EE) lamps

3.3.1 Performance

3.3.1.1 Measure applies to four-foot (46 inches) replacement T5 fluorescent lamps.

3.3.1.2 Performance parameters are listed below in Table 3.

TABLE 3: FLUORESCENT T5 LAMPS PERFORMANCE PARAMETERS

<table>
<thead>
<tr>
<th>Power (W)</th>
<th>Reference length (inches)</th>
<th>Minimum light output</th>
<th>Minimum average life (at 3 hours per start) (hours)</th>
<th>Minimum CRI (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>46</td>
<td>4,700</td>
<td>4,400</td>
<td>24,000</td>
</tr>
<tr>
<td>44</td>
<td>46</td>
<td>4,200</td>
<td>4,000</td>
<td>24,000</td>
</tr>
<tr>
<td>49</td>
<td>46</td>
<td>4,700</td>
<td>4,500</td>
<td>24,000</td>
</tr>
<tr>
<td>47</td>
<td>46</td>
<td>4,300</td>
<td>4,100</td>
<td>24,000</td>
</tr>
</tbody>
</table>

Note: CRI Colour Rendering Index

3.3.2 Warranty

All lamps must have a minimum one-year warranty.
3.4  Induction fluorescent fixtures

3.4.1  General requirements

3.4.1.1  Must be CSA-approved and complete with ballast disconnect device.

3.4.1.2  Photometric testing results, based on IES testing procedure and report format, should be prepared by an independent recognized testing laboratory and made available by the manufacturer. Manitoba Hydro will review photometric data prepared by manufacturers.

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

3.4.1.3  Outdoor induction fixtures must be fully enclosed with minimum IP rating of 44. Induction optical systems must be gasketted (enclosed) to minimize light dirt depreciation.

3.4.2  Supplemental markings

3.4.2.1  Ballast marking: USE ONLY WITH [lamp manufacturer] [lamp catalogue number] LAMP.

3.4.2.2  Lamp marking: USE ONLY WITH [luminaire manufacturer] [luminaire catalogue number] LUMINAIRE, as applicable.

REPLACE ONLY WITH [lamp manufacturer] [lamp catalogue number] LAMP, as applicable.

3.4.2.2.1  Marking must be on label affixed to luminaire and visible during component replacement. For fixtures with separate ballast and lamp/ reflector compartments, one label must be affixed in proximity to the lamp and the second label affixed in proximity of the electrical connection between the lamp and ballast compartments.

3.4.2.2.2  Minimum font size is 1.6 mm (0.062 inches).

3.4.3  Power quality

3.4.3.1  Power regulation: Ballast wattage regulation must not exceed ± 10 per cent when operated at voltage variation as per Table 1 at 60 Hz with ambient temperature of 25°C ± 2°C (77°F ± 3.6°F).

3.4.3.2  Power Factor (PF): Ballast PF must be a minimum of 0.95 for Standard Harmonics (SH) category ballasts and 0.98 for Low Harmonics (LH) category ballasts (lead or lag) at voltage variation as per Table 1.

3.4.3.3  Total Harmonic Distortion (THD): Input current THD limits for electronic ballasts are 20 per cent, 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, for a voltage variation see the Premium category in Table 1 listed as the LH category. Manitoba Hydro uses other parameters to differentiate between these two classes of ballasts which are subject to change without notice.

3.4.4  Warranty

All induction fixtures must have a minimum five-year warranty.
4.0 COMPACT FLUORESCENT (CF) LIGHTING SYSTEMS

4.1 Hard-wired CF fixtures

4.1.1 General requirements

4.1.1.1 This measure applies to CF fixtures with single or multiple lamps per luminaire.

4.1.1.2 For qualifying information on dimming ballasts and controls, contact Manitoba Hydro.

4.1.1.3 Life rating of lamps must be 10,000 hours minimum at three hours per start and 15,000 hours minimum at continuous operation on electronic ballasts.

4.1.1.4 Lamps must start and operate reliably at temperatures down to +10°C (+50°F) throughout their rated lives. Low temperature ballasts must be suitably rated for cool temperature applications.

4.1.1.5 Permanent or “hard-wired” luminaires must be complete with integral replaceable electronic ballasts (thermally protected). Where multiple lamps are used, ballasts may be the multi-lamp type. It should be possible to reconnect multiple ballasts individually to achieve multi-level switching, within individual fixtures or use dimming ballasts.

4.1.1.6 Retrofit kits, for the conversion of existing incandescent luminaires, must have permanent mounting features with thermally protected HPF electronic ballasts. All attachments must be mechanical and not dependent upon tape or adhesives. All displaced incandescent lamp sockets must be permanently removed. Major hardware must 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.

4.1.1.7 There is no restriction on the lamp colour temperature, but the CRI must be a minimum of 75.

4.1.2 Power quality

4.1.2.1 Power regulation: Ballast wattage regulation must not exceed ± 10 per cent when operated at voltage variation as per Table 1 at 60 Hz with ambient temperature of 25°C ± 2°C (77°F ± 3.6°F).

4.1.2.2 Power Factor (PF): Ballast PF must be a minimum of 0.95 for Standard Harmonics (SH) category ballasts and 0.98 for Low Harmonics (LH) category ballasts (lead or lag) at voltage variation as per Table 1.

4.1.2.3 Total Harmonic Distortion (THD): Input current THD limits for electronic ballasts are 20 per cent, 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, for a voltage variation see the Premium category in Table 1 listed as the LH category. Manitoba Hydro uses other parameters to differentiate between these two classes of ballasts which are subject to change without notice.

4.1.2.4 Infrared (IR): Ballasts must be IR conflict free. Lamps must 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.

4.1.3 Warranty

All ballasts must have a minimum five-year warranty.
4.2 Screw-in Compact Fluorescent Lamps (CFLs)

4.2.1 General requirements

4.2.1.1 Life rating of lamps must be a minimum of 7,500 hours at three hours per start.

4.2.1.2 Light loss factor (lumen depreciation) must be less than 30 per cent at end of life or a minimum output of 70 per cent at end of life.

4.2.1.3 Lamp must start within one second. Lamp warm-up time must be one minute, with a minimum of 85 per cent of full light output.

4.2.1.4 For qualifying information on dimming ballasts and controls, contact Manitoba Hydro.

4.2.1.5 Lamps must have universal operating positions (base-up, base-down, or horizontal).

4.2.1.6 Lamps must be available in colour temperature range of 2,700°K to 3,500°K, with a minimum CRI of 80 per cent.

4.2.2 Power quality

4.2.2.1 Power Input: Rated lamp wattage must be within ±10 per cent of rated value at nominal 120 volt 60 Hz input, base-up orientation and ambient temperature of 25°C ± 2°C (77°F ± 3.6°F).

4.2.2.2 Power regulation: Lamp wattage regulation must not exceed ±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°C ± 2°C (77°F ± 3.6°F).

4.2.2.3 Power Factor: Must be over 95 per cent (lead or lag) at nominal 120 volt input.

4.2.2.4 Total Harmonic Distortion (THD): Lamp input current harmonic distortion must be 33 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°C ± 2°C (77°F ± 3.6°F) ambient temperature. Input voltage distortion allowance must be zero to three per cent.

4.2.3 Construction specifications

Lamp must be “one-piece” construction, with integral electronic ballast circuitry, enclosed in a non-metallic housing. Base to be a standard medium (E26) base.

4.2.4 Warranty

All screw-in CF products must have a minimum one-year warranty.
5.0 LIGHT Emitting Diode (LED) TECHNOLOGIES

5.1 LED emergency exit signs

5.1.1 General requirements

5.1.1.1 Measure applies to replacement of existing exit luminaires with incandescent lamps (25 or 15 watts) with new luminaires that have LED arrays. CF sources are not eligible.

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

5.1.2 CSA compliance

5.1.2.1 For signs with “EXIT”: All new luminaires and retrofitted units must satisfy the inspectors and the approving authorities who have jurisdiction. All signs must be CSA-approved and conform to CSA standard C22.2-C860-01, “Performance of Internally Lighted Exit Signs”.

5.1.2.2 For signs with “running man”: All new luminaires and retrofitted units must satisfy the inspectors and the approving authorities who have jurisdiction. All signs must be CSA-approved and conform to CSA standard C22.2-141-10, “Emergency Lighting Equipment”.

5.1.3 Construction specifications

5.1.3.1 All attachments must be made mechanically. Reliance on tape, adhesive, or other non-permanent means to secure parts will disqualify the product for incentive.

5.1.3.2 LED assembly must be conveniently replaceable within the sign.

5.1.4 Warranty

All LED products must have a minimum five-year warranty.

5.2 LED backlit signage

5.2.1 General requirements

5.2.1.1 This measure applies to replacement of neon, fluorescent, or incandescent backlit signs with new luminaires which have LED arrays.

5.2.1.2 All new signage and retrofitted units must be CSA-approved or satisfy the inspectors and the approving authorities who have jurisdiction.

5.2.1.3 Manitoba Hydro must approve all LED luminaires through submission of technical specifications. Submission of samples and/or independent laboratory test results may be required.

5.2.2 Construction specifications

LED assembly must be conveniently replaceable within the sign.

5.2.3 Warranty

All LED products must have a minimum five-year warranty.
5.3 Line voltage hard-wired LED retrofit

5.3.1 General requirements

5.3.1.1 Measure applies to LED retrofit kits, which are designed for 120-347 volts. The LED driver must be listed in the provided technical specification. Self-ballasted LED lamps intended to replace T8 and T5 fluorescent lamps are not eligible.

5.3.1.2 All new retrofit kits must be CSA-approved or satisfy the inspectors and the approving authorities who have jurisdiction.

5.3.2 Lamp rating

5.3.2.1 Total luminous flux (lumens) must be measured as per IES LM-79-08.

5.3.2.2 Projected lifetime must be reported as per IES-TM-21 calculations and based on IES-LM-80-08 measurements. Lamp lifetime should be 36,000 hours at minimum.

5.3.2.3 Retrofitted replacement LEDs for linear fluorescent lamps must meet or exceed all performance criteria listed in Table 4. Refrigeration units are exempt from the performance criteria listed below in Table 4. The LED lamp must have a nominal voltage rating equal to or less than 24 volts AC (VAC) or 48 volts DC (VDC).

TABLE 4: LIGHT OUTPUT PERFORMANCE PARAMETERS

<table>
<thead>
<tr>
<th>Lamp length (feet)</th>
<th>Initial lumens/watt</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>80</td>
</tr>
<tr>
<td>3</td>
<td>85</td>
</tr>
<tr>
<td>4</td>
<td>90</td>
</tr>
<tr>
<td>8</td>
<td>100</td>
</tr>
</tbody>
</table>

5.3.3 Power quality

5.3.3.1 Performance parameters are listed below in Table 5.

TABLE 5: POWER QUALITY PERFORMANCE PARAMETERS

<table>
<thead>
<tr>
<th>Power (W)</th>
<th>Maximum Total Harmonic Distortion (THD)</th>
<th>Minimum Power Factor (PF)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard Harmonic (SH) (%)</td>
<td>Low Harmonic (LH) (%)</td>
</tr>
<tr>
<td>P≤20</td>
<td>60</td>
<td>26</td>
</tr>
<tr>
<td>20&lt;P≤100</td>
<td>33</td>
<td>20</td>
</tr>
<tr>
<td>100&lt;P</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>

5.3.3.2 Power regulation: Lamp wattage regulation must not exceed ± 10 per cent when operated at voltage variation as per Table 1 at 60 Hz with ambient temperature of 25°C ± 2°C (77°F ± 3.6°F).

5.3.4 Construction specifications

5.3.4.1 Luminaires must be hard-wired. Some exceptions may apply, contact Manitoba Hydro for details.

5.3.4.2 Luminaires must be clearly marked with manufacturer name, model number, electrical rating, and agency approval (CSA, UL, etc.).

5.3.4.3 The LED lamps must be hard-wired with remote ballast.

5.3.5 Warranty

All LED products must have a minimum five-year warranty.

5.3.6 Inspection/fixture safety recertification

When fixture or electrical connections are modified, fixture may be subject of safety recertification. Recertification is acceptable from Labour Department, CSA (or equivalent).
5.4 Line voltage LED light fixtures

5.4.1 General requirements

5.4.1.1 Measure applies to LED light fixtures, which are designed for 120-347 volts. The LED driver must be listed in the provided technical specification.

5.4.1.2 All new LED product must be CSA-approved or satisfy the inspectors and the approving authorities who have jurisdiction.

5.4.1.3 Projected lifetime must be reported as per IES-TM-21 calculations and based on IES-LM-80-08 measurements. Lamp lifetime should be 36,000 hours at minimum.

5.4.1.4 Total luminous flux (lumens) must be measured as per IES-LM-79-08.

5.4.2 Power quality

5.4.2.1 Performance parameters are listed below in Table 6.

5.4.2.2 Power regulation: Lamp wattage regulation must not exceed ± 10 per cent when operated at voltage variation as per Table 1 at 60 Hz with ambient temperature of 25°C ± 2°C (77°F ± 3.6°F).

5.4.3 Construction specifications

5.4.3.1 Outdoor LED fixtures must be fully enclosed with minimum IP rating of 44. LED optical system must be gasketted (enclosed) to minimize light dirt depreciation.

5.4.3.2 Luminaires must be clearly marked with manufacturer name, model number, electrical rating, and agency approval (CSA, UL, etc.).

5.4.4 Warranty

All LED products must have a minimum five-year warranty.
5.5 Line voltage LED lamps

5.5.1 General requirements

5.5.1.1 Measure applies to LED screw-in or plug-in replacement lamps, which are designed for 120 volts and have self-contained drivers. Only 120V Type B LED lamps intended to replace T8 and T5 fluorescent lamps are eligible. Lamp type definition as per standard CSA C22.2 No. 1993-12 (UL 1993).

5.5.1.2 All new LED lamps must be CSA-approved or satisfy the inspectors and the approving authorities who have jurisdiction.

5.5.1.3 Projected lifetime must be reported as per IES-TM-21 calculations and based on IES-LM-80-08 measurements. Lamp lifetime should be 15,000 hours at minimum for medium base (E26) lamps, and 25,000 hours at minimum for all other line voltage lamps.

5.5.1.4 Total luminous flux (lumens) must be measured as per IES-LM-79-08.

5.5.2 Power quality

5.5.2.1 Performance parameters are listed below in Table 7.

<table>
<thead>
<tr>
<th>Power (W)</th>
<th>Maximum Total Harmonic Distortion (THD)</th>
<th>Minimum Power Factor (PF)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard Harmonic (SH) (%)</td>
<td>Low Harmonic (LH) (%)</td>
</tr>
<tr>
<td>P≤10</td>
<td>80</td>
<td>33</td>
</tr>
<tr>
<td>10&lt;P≤20</td>
<td>60</td>
<td>26</td>
</tr>
<tr>
<td>20&lt;P</td>
<td>33</td>
<td>20</td>
</tr>
</tbody>
</table>

Note: Medium base (E26) LED lamps excluded.

5.5.2.2 Power regulation: Lamp wattage regulation must not exceed ± 10 per cent when operated at voltage variation as per Table 1 at 60 Hz with ambient temperature of 25°C ± 2°C (77°F ± 3.6°F).

5.5.3 Construction specifications

5.5.3.1 Lamps with screw-in or plug-in bases are eligible.

5.5.3.2 Lamps must be permanently marked by molded imprint or ink with manufacturer name, model number, electrical rating, and approval agency (CSA, UL, etc.).

5.5.4 Warranty

LED lamps with a minimum 15,000 hour rated life must have a minimum three-year warranty.

LED lamps with a minimum 25,000 hour rated life must have a minimum five-year warranty.
5.6 Low voltage LED lamps

5.6.1 General requirements

5.6.1.1 Measure applies to LED screw-in or plug-in replacement lamps, which are designed for 12–24 volts.

5.6.1.2 Projected lifetime must be reported as per IES-TM-21 calculations and based on IES-LM-80-08 measurements. Lamp lifetime should be 15,000 hours at minimum.

5.6.1.3 Total luminous flux (lumens) must be measured as per IES-LM-79-08.

5.6.2 Construction specifications

5.6.2.1 Lamps with screw-in or plug-in bases are eligible.

5.6.2.2 Lamps must be permanently marked by molded imprint or ink with manufacturer name.

5.7.3 Warranty

All LED products must have a minimum one-year warranty.

5.7 LED lamps for linear fluorescent lamp replacement (LED specialty lamps)

5.7.1 General requirements

5.7.1.1 Measure applies to LED lamps designed to replace linear fluorescent lamps (T5, T8). Lamps must be Type A (compatible with existing ballast without additional modifications of fluorescent lamp circuit). Type B (with integral LED driver for 120V) and Type C (with remote driver) lamps are not eligible. Lamp type definition as per standard CSA C22.2 No. 1993-12 (UL 1993).

5.7.1.2 Self-ballasted Type B line voltage lamps are excluded.

5.7.1.3 Type A lamps shall only be used with electronic ballasts specified by manufacturer.

5.7.1.4 Lamps must be CSA-approved or satisfy the inspectors and the approving authorities who have jurisdiction.

5.7.2 Lamp rating

5.7.2.1 Total luminous flux (lumens) must be measured as per IES LM-79-08.

5.7.2.2 Minimum efficacy levels must meet or exceed performance criteria listed in Table 4.

5.7.2.3 Projected lifetime must be reported as per IES-TM-21 calculations and based on IES-LM-80-08 measurements. Lamp lifetime should be 36,000 hours at minimum.

5.7.3 Construction specifications

Measure applies to lamps with bi-pin (G5 for T5 fluorescent tubes and G13 for T8 fluorescent tubes).

5.7.4 Warranty

Lamps shall carry a minimum five-year warranty.

5.8 LED lamps for hardwired CFL lamp replacement (LED specialty lamps)

5.8.1 General requirements

5.8.1.1 Measure applies to LED lamps designed to replace compact fluorescent lamps with external electronic ballast and PL plug-in bases.

5.8.1.2 Lamps shall only be used in accordance with manufacturer instructions.

5.8.1.3 Lamps must be CSA-approved or satisfy the inspectors and the approving authorities who have jurisdiction.

5.8.2 Lamp rating

5.8.2.1 Total luminous flux (lumens) must be measured as per IES LM-79-08.

5.8.2.2 Minimum initial efficacy of 70 lumens per watt.

5.8.2.3 Projected lifetime must be reported as per IES-TM-21 calculations and based on IES-LM-80-08 measurements. Lamp lifetime should be 25,000 hours at minimum.
5.8.3 Construction specifications
Measure applies to lamps with 4 pin G24q/GX24q base.
Lamps must have the hardware key feature implemented in the base of the lamp.
Lamps with two-pin base working with magnetic ballast are not eligible.

5.8.4 Warranty
Lamps shall carry a minimum five-year warranty.

5.9 LED lamps for MH HID lamp replacement (LED specialty lamps)

5.9.1 General requirements
5.9.1.1 Measure applies to LED lamps designed to replace HID probe and/or pulse start metal halide lamps with E26 (medium) base or E39 (mogul) base and magnetic ballast.
5.9.1.2 Lamps shall only be used and installed in accordance with manufacturer instructions.
5.9.1.3 Lamps must be CSA-approved to CSA 22.2 1993-12 or satisfy the inspectors and the approving authorities who have jurisdiction.

5.9.2 Lamp rating
5.9.2.1 Total luminous flux (lumens) must measured as per IES LM-79-08.
5.9.2.2 Minimum initial efficacy of 80 lumens per watt.
5.9.2.3 Projected lifetime must be reported as per IES-TM-21 calculations and based on IES-LM-80-08 measurements. Lamp lifetime should be 45,000 hours at minimum.

5.9.3 Construction
Lamps with E39 base shall be supplied with a cable or chain to allow securing to the luminaire.

5.9.4 Warranty
Lamps shall carry a minimum five-year warranty.
6.0 HIGH INTENSITY DISCHARGE (HID) LIGHTING SYSTEM

6.1 HID fixtures

6.1.1 General requirements

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

6.1.1.2 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.

6.1.1.3 Manitoba Hydro will review any variations or “specials” to the listed lamps.

6.1.1.4 Ballasts with suitable low noise level characteristics must 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.

6.1.1.5 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.

6.1.1.6 Any necessary emergency lighting requirements are not part of this program. The use of quartz standby or emergency lamps within HID lighting systems will have a negative impact 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.

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

6.1.2 Power quality

6.1.2.1 HID fixtures with magnetic ballasts

6.1.2.1.1 Power Factor (PF): All HID magnetic ballasts must have a ballast factor of 0.95 minimum and a HPF of 0.90 at a minimum. Low or normal PF ballasts will be acceptable only for 35 and 50 watts inclusive HPS.

6.1.2.2 HID fixtures with electronic ballasts

6.1.2.2.1 Power regulation: Electronic ballast wattage regulation must not exceed ± 10 per cent when operated at voltage variation as per Table 1 at 60 Hz with ambient temperature of 25°C ± 2°C (77°F ± 3.6°F).

6.1.2.2.2 Power Factor (PF): Electronic ballast PF must be a minimum of 0.95 for Standard Harmonics (SH) category ballasts and 0.98 Low Harmonics (LH) category ballasts (lead or lag) at voltage variation as per Table 1.

6.1.2.2.3 Total Harmonic Distortion (THD): Input current THD limits for electronic ballasts are 20 per cent, 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, for a voltage variation see the Premium category in Table 1 listed as the LH category. Manitoba Hydro uses other parameters to differentiate between these two classes of ballasts which are subject to change without notice.

6.1.3 Construction specifications

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 8.

All MH fixtures must be totally enclosed for safety.
TABLE 8: OPTIC DIAMETERS AND LAMP WATTAGES

<table>
<thead>
<tr>
<th>Optic diameter (inches)</th>
<th>Lamp wattage</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HPS (W)</td>
<td>Ceramic MH (W)</td>
<td>MH (W)</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>150</td>
<td>150</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>250</td>
<td>250</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>400</td>
<td>400</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>1,000</td>
<td>1,000</td>
<td>1,000</td>
<td></td>
</tr>
</tbody>
</table>

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.

6.1.4 Warranty

All HID luminaries must have a minimum one-year warranty.
6.2 HID ballasts

6.2.1 General requirements

6.2.1.1 This measure applies to both interior and exterior lighting systems, where new and retrofitted luminaires with electronic ballasts are eligible for new construction or renovation application.

6.2.1.2 MH and HPS are eligible sources for displacement of incandescent, quartz, MV, and T12 fluorescent for the calculated incentive option. Sources must be of current commercial production.

6.2.1.3 Manitoba Hydro will review any variations or "specials" to the listed lamps.

6.2.1.4 Ballasts of suitable low noise level characteristics must 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.

6.2.1.5 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.

6.2.1.6 Any necessary emergency lighting requirements are not included in this program. The use of quartz standby or emergency lamps within HID lighting systems will have a negative impact 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.

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

6.2.2 Power quality

6.2.2.1 HID magnetic ballasts

6.2.2.1.1 Power Factor (PF): All HID magnetic ballasts must have a ballast factor of 0.95 minimum and a HPF of 0.90 at a minimum. Low or normal PF ballasts will be acceptable only for 35 and 50 watts inclusive HPS.

6.2.2.2 HID electronic ballasts

6.2.2.2.1 Power regulation: Electronic ballast wattage regulation must not exceed ± 10 per cent when operated at voltage variation as per Table 1 at 60 Hz with ambient temperature of 25°C ± 2°C (77°F ± 3.6°F).

6.2.2.2.2 Power Factor (PF): Electronic ballast PF must be a minimum of 0.95 for Standard Harmonics (SH) category ballasts and 0.98 for Low Harmonics (LH) category ballasts (lead or lag) at voltage variation as per Table 1.

6.2.2.2.3 Total Harmonic Distortion (THD): Input current THD limits for electronic ballasts are 20 per cent, 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, for a voltage variation see the Premium category in Table 1 listed as the LH category. Manitoba Hydro uses other parameters to differentiate between these two classes of ballasts which are subject to change without notice.

6.2.3 Warranty

All HIDs must have a minimum one-year warranty.
6.3 Metal Halide (MH) energy efficient (EE) lamps

Measure applies to replacement of MH lamps rated as per Table 9 below.

### TABLE 9: MH LAMPS PERFORMANCE PARAMETERS

<table>
<thead>
<tr>
<th>Power (W)</th>
<th>Type (-)</th>
<th>Orientation (universal, vertical or horizontal)</th>
<th>Minimum light output</th>
<th>Minimum average life (hours)</th>
<th>Compatible with ballasts</th>
<th>Replacement for MH lamps (watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>145</td>
<td>ED17 CLEAR</td>
<td>Universal</td>
<td>13,000</td>
<td>10,000</td>
<td>20,000</td>
<td>M57 (175W MH)</td>
</tr>
<tr>
<td></td>
<td>ED17 COATED</td>
<td>Universal</td>
<td>12,000</td>
<td>9,000</td>
<td>20,000</td>
<td>M152 (175W MH PS)</td>
</tr>
<tr>
<td>145</td>
<td>ED28 CLEAR</td>
<td>Universal</td>
<td>13,000</td>
<td>10,000</td>
<td>20,000</td>
<td>M57 (175W MH)</td>
</tr>
<tr>
<td></td>
<td>ED28 COATED</td>
<td>Universal</td>
<td>12,000</td>
<td>9,000</td>
<td>20,000</td>
<td>M152 (175W MH PS)</td>
</tr>
<tr>
<td>205</td>
<td>ED28 CLEAR</td>
<td>Universal</td>
<td>20,000</td>
<td>15,000</td>
<td>20,000</td>
<td>M58 (250W MH)</td>
</tr>
<tr>
<td></td>
<td>ED28 COATED</td>
<td>Universal</td>
<td>18,000</td>
<td>14,000</td>
<td>20,000</td>
<td>M138 (250W MH PS)</td>
</tr>
<tr>
<td>320</td>
<td>BT28 CLEAR</td>
<td>Vertical</td>
<td>28,000</td>
<td>19,000</td>
<td>20,000</td>
<td>M59 (400W MH)</td>
</tr>
<tr>
<td></td>
<td>BT28 COATED</td>
<td>Vertical</td>
<td>28,000</td>
<td>19,000</td>
<td>15,000</td>
<td>M165 (400W MH)</td>
</tr>
<tr>
<td></td>
<td>BT28 COATED</td>
<td>Horizontal</td>
<td>28,000</td>
<td>19,000</td>
<td>15,000</td>
<td>M128 (400W MH PS)</td>
</tr>
<tr>
<td></td>
<td>ED37 CLEAR</td>
<td>Universal</td>
<td>31,000</td>
<td>22,000</td>
<td>20,000</td>
<td>M135 (400W MH PS)</td>
</tr>
<tr>
<td></td>
<td>ED37 COATED</td>
<td>Universal</td>
<td>30,000</td>
<td>21,000</td>
<td>20,000</td>
<td>M155 (400W MH PS)</td>
</tr>
<tr>
<td></td>
<td>ED37 COATED</td>
<td>Horizontal</td>
<td>27,000</td>
<td>18,000</td>
<td>20,000</td>
<td>M172 (400W MH PS)</td>
</tr>
<tr>
<td>350</td>
<td>BT37 CLEAR</td>
<td>Vertical</td>
<td>32,000</td>
<td>23,000</td>
<td>20,000</td>
<td>M59 (400W MH)</td>
</tr>
<tr>
<td></td>
<td>BT37 COATED</td>
<td>Vertical</td>
<td>31,000</td>
<td>22,000</td>
<td>20,000</td>
<td>M165 (400W MH)</td>
</tr>
<tr>
<td>360</td>
<td>ED/BT37 CLEAR</td>
<td>Vertical</td>
<td>35,000</td>
<td>23,000</td>
<td>20,000</td>
<td>M59 (400W MH)</td>
</tr>
<tr>
<td></td>
<td>ED/BT37 COATED</td>
<td>Vertical</td>
<td>30,000</td>
<td>19,000</td>
<td>15,000</td>
<td>M165 (400W MH)</td>
</tr>
<tr>
<td></td>
<td>ED/BT37 COATED</td>
<td>Horizontal</td>
<td>35,000</td>
<td>22,000</td>
<td>20,000</td>
<td>M172 (400W MH PS)</td>
</tr>
<tr>
<td></td>
<td>ED28 CLEAR</td>
<td>Vertical</td>
<td>35,000</td>
<td>23,000</td>
<td>20,000</td>
<td>M59 (400W MH)</td>
</tr>
<tr>
<td></td>
<td>ED28 COATED</td>
<td>Vertical</td>
<td>34,000</td>
<td>22,000</td>
<td>20,000</td>
<td>M59 (400W MH)</td>
</tr>
<tr>
<td>830</td>
<td>BT56</td>
<td>Vertical</td>
<td>80,000</td>
<td>69,000</td>
<td>15,000</td>
<td>M47 (1,000W MH)</td>
</tr>
</tbody>
</table>

#### 6.3.1 Performance

Performance parameters are listed below in Table 9.

#### 6.3.2 Warranty

All lamp products must have a minimum one-year warranty.
6.4 Ceramic Metal Halide (CMH) screw-in lamps

6.4.1 General requirements

6.4.1.1 Measure applies to CMH screw-in or plug-in replacement lamps with integrated ballast designed for 120-347 volts.

6.4.1.2 All new CMH lamps must be CSA-approved or satisfy the inspectors and the approving authorities who have jurisdiction.

6.4.1.3 Light loss factor (lumen depreciation) must be less than 30 per cent or have a minimum output of 70 per cent at end of life. The L70 rated life of the LED lamp to be provided by an independent lab test as per IES LM-51-00.

6.4.2 Power quality

6.4.2.1 Power regulation: Lamp wattage regulation must not exceed ± 10 per cent when operated at voltage variation as per Table 1 at 60 Hz with ambient temperature of 25°C ± 2°C (77°F ± 3.6°F).

6.4.2.2 Power Factor: Must be over 90 per cent (lead or lag) at nominal 120 volt input.

6.4.2.3 Total Harmonic Distortion (THD): Input current THD limits for lamps are 20 per cent, for a voltage variation see the Standard category in Table 1 listed as the SH category. Input current THD for lamps are less than 10 per cent, for a voltage variation see the Premium category in Table 1 listed as the LH category. Manitoba Hydro uses other parameters to differentiate between these two classes of ballasts which are subject to change without notice.

6.4.3 Construction specifications

Lamps with screw-in or plug-in bases are eligible.

6.4.4 Warranty

All CMH products must have a minimum one-year warranty.
7.0 OCCUPANCY SENSORS

7.1 General requirements

7.1.1 Principle of operation (Passive IR, ultrasonic, microwave, etc.) must not be in conflict with other building systems including lighting systems.

7.1.2 Only commercial quality sensors must be used.

7.1.3 Occupancy sensor layout and arrangement must be in accordance with individual manufacturer’s recommendations. To avoid having to refer to an instruction manual, identify all necessary adjustments on the sensor.

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

7.1.5 For situations where an “off” option is required during room occupancy where ceiling-mounted sensors are used, a wall switch is suggested to electronically switch off the occupancy sensor.

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

7.2 Construction specifications

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

7.2.2 Switch format can be a wall-mounted type for the replacement of conventional wall switches, a fixture-mounted version or a ceiling-mounted version. Switch must be compatible with the lighting load. Sensor switches used in conjunction with approved low voltage systems will also be permitted. Switch must have no minimum loading requirement to stay activated.

7.2.3 Sensor switches must have “off-automatic” selector modes with no “on” position and be conveniently located on the faceplate.

7.2.4 Sensor switches can have an optional ambient light-sensing feature with an adjustable range that results in a lighting system not being turned “on” during occupancy with generous daylight contribution. This feature must have an adjustable time delay.

7.2.5 Occupancy “scan” frequency must be controlled automatically with built-in electronics.

7.2.6 All sensors must have a sensitivity adjustment feature to “tune in” for proper operation for a variation of room or area geometrics.

7.2.7 Switch to have humidity-resistant circuitry and components.

7.3 Warranty

All occupancy sensors products must have a minimum one-year warranty.
DEFINITIONS AND ABBREVIATIONS

Definitions

Base case lighting system:
The lighting system that would be installed if the Commercial Lighting Program did not exist.

Customer:
The purchaser/end user of the energy efficient lighting system.

Pre-installation walk-through and post-installation walk-through:
Inspections conducted by an assigned Manitoba Hydro energy services advisor (ESA) or sales representative to verify the existing lighting system and the newly installed lighting system. These inspections are separate from the electrical inspections required under the Manitoba Electrical Code and are only conducted with the intent to verify quantities, products, and model numbers.

Total lighting equipment cost:
The total cost to the customer (end user of the equipment) of all light fixtures to be installed including taxes. This does not include the costs for labour, design, any wiring or auxiliary material costs.

Trade ally:
Any contractor, installer, engineer, lighting consultant, distributor, vendor, supplier, manufacturer, or agent who provides the customer with their services/product as they relate to the lighting upgrade or installation. Manitoba Hydro refers to these individuals or firms as trade allies.

Written authorization:
The authorization granted to the customer after the existing lighting system and the proposed system have been verified by a Manitoba Hydro ESA or sales representative. Approval of the application is contingent upon the proposed products and quantities being installed and supported by invoicing. Any changes to the installed system compared to the system originally proposed may affect the incentive.

Abbreviations

CF – Compact Fluorescent
CFL – Compact Fluorescent Lamp
CLP – Commercial Lighting Program
CRI – Colour Rendering Index
CSA – Canadian Standards Association
CU – Coefficient of Utilization
EE – Energy Efficient
ESA – Energy Services Advisor
GS – General Service
HID – High Intensity Discharge
HO – High Output
HPF – High Power Factor
HPS – High Pressure Sodium
IES – Illuminating Engineering Society
IR – Infrared
LED – Light Emitting Diode
LH – Low Harmonic
MH – Metal Halide
MV – Mercury Vapour
NPF – Normal Power Factor
PF – Power Factor
SH – Standard Harmonic
SHO – Super High Output
THD – Total Harmonic Distortion
VHO – Very High Output
For more information contact your Manitoba Hydro account representative or:

Call 204-360-3676 (Winnipeg) or 1-888-624-9376
Email: clp@hydro.mb.ca
Visit: hydro.mb.ca

Available in accessible formats upon request.

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