

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

Final Report

Prepared for: Natural Resources Canada
Buildings Division, Office of Energy Efficiency
930 Carling Avenue, Building 3
Ottawa, ON
K1A 0E4

Att: Kristina Edwards

Prepared by: Caneta Research Inc.
7145 West Credit Ave.
Suite 102, Building 2
Mississauga, Ontario
L5N 6J7

January 31, 2012
Revised February 16, 2012

Introduction and Discussion

This study was undertaken to determine the energy savings of the NECB-2011 compared to ASHRAE 90.1-2010 for various building types in locations across Canada. The prescriptive requirements of each code were applied to DOE 2.1E models of the eight archetype buildings described in Table 1. The locations evaluated in this study were Toronto, Montreal, Halifax, Vancouver, Winnipeg, Calgary, Regina, Saint John, St. John's, Charlottetown, Iqaluit, Whitehorse, and Yellowknife.

For the Toronto, Montreal, Halifax, Vancouver, Winnipeg, Calgary, Regina, and Saint John locations, all eight archetype buildings were analyzed, as each archetype is fully represented in those regions. For the St. John's, Charlottetown, Iqaluit, Whitehorse, and Yellowknife locations, five of the eight archetype buildings were analyzed (low rise MURB, small office, retail without anchor store, primary school, and warehouse). The high rise MURB, high rise office, and retail with anchor store were not modelled, as they are not typical for these locations.

A summary of the energy results from the DOE simulations, for each location and building type, along with the energy savings of NECB compared to ASHRAE are provided in Table 2. In addition to Table 2, Figures 1 to 13 present results graphically for each location. Detailed simulation results for each code, building type, and location are provided in Appendices A through H.

A summary of the modelling inputs and assumptions for each code, building type, and location analyzed are provided in Appendix I. The utility rates used for the analysis, which are summarized in Appendix J, are current as of January 2012.

In addition to the assumptions and inputs listed in the appendices, the notes listed below are considered particularly noteworthy.

1. Several locations and building types invoked the prescriptive heat recovery requirements of either the NECB or ASHRAE codes. The NECB prescribes heat recovery with an effectiveness of 50%, whenever the sensible heat content of the exhaust air is greater than 150 kW. ASHRAE prescribes heat recovery with an effectiveness of 50%, based on the region and percentage outdoor air supplied.
2. The NECB 2011 prescribes a maximum fenestration to wall ratio (FWR), as a function of heating degree days (HDD) as shown in Table 3. ASHRAE prescribes a single maximum of 40%, independent of region. Whenever the window to wall ratio of the archetype building exceeded that allowed by either code, the total building energy use was not allowed to exceed that of a building having the maximum allowable window to wall ratio. In other words, if the archetype exceeded the maximum NECB FWR it would be limited to the max FWR shown in Table 3 of this report. If the archetype exceeded the maximum ASHRAE FWR it was limited to 40%.
3. The fuel source for each location was based on that typically used in the region. Natural gas was used in Toronto, Montreal, Vancouver, Calgary, and Regina. Oil was used in Halifax, St John's, Saint John, Charlottetown, Iqaluit, Whitehorse, and Yellowknife.
4. Both codes have the envelope air infiltration requirements set to 0.25 L/s/m² (taken from Part 8 of the NECB).

5. For both the NECB and ASHRAE codes, the plug load inputs were based on the defaults listed in the NECB.

For the **high rise office** and **high rise MURB** building types, the NECB savings compared to ASHRAE are similar for Toronto, Montreal, Winnipeg, Calgary, Regina, and Saint John. The overall energy savings for these locations range from a low of 9.1% to a high of 13.6%. The majority of the overall energy savings results from a reduction in heating energy use. The NECB has significantly more stringent envelope requirements, and prescribes modulating boilers compared to single stage boilers prescribed in ASHRAE. This results in heating energy savings between 20% and 30% depending on the location. For the Halifax and Vancouver locations the overall energy use tends to be lower. Halifax and Vancouver show lower savings because they are milder climates, resulting in less potential for heating savings associated with the improved envelope and modulating boilers prescribed by NECB. Also, colder climates have larger heating savings, because the NECB prescribes a reduced maximum percentage glazing as a function of heating degree days (see Table 3), compared to ASHRAE which is capped at 40% for all locations.

For the **retail with Anchor store** building type, the largest NECB savings are seen in Toronto, Montreal, and Halifax, corresponding to 9.7%, 7.2%, and 5.3%, respectively. The majority of the overall energy savings, results from a reduction in heating energy use. The NECB prescribes gas fired furnace with AFUEs of 92.4% for the majority of the air handling units, while ASHRAE prescribes 80% thermal efficiencies. The overall energy savings for this building type is generally lower than other building types evaluated, because ASHRAE prescribes air-to-air heat recovery on several systems while NECB does not. This reduces the energy savings potential in heating. For Winnipeg, Regina, Calgary, and Saint John, the NECB energy savings are lower; ranging from a low of -0.9% to a high of 2.7%. For these 4 locations, ASHRAE prescribes additional systems to have heat recovery, further reducing the energy savings for the NECB. In addition, the NECB prescribes more furnaces with 81.0% thermal efficiency instead of 92.4% AFUE, for many air handling units in these 4 locations due to their increased capacity. Vancouver has significantly higher energy savings (15.2%), because ASHRAE does not prescribe air-to-air heat recovery for any air handling units for this climate.

For the **low rise office** building type, the NECB savings compared to ASHRAE are similar for Toronto, Montreal, Winnipeg, Regina, Saint John, St John's, and Charlottetown. The overall energy savings for these locations range from a low of 8.6% to a high of 11.4%. The majority of the overall energy savings, results from a reduction in heating energy use. The NECB has significantly more stringent envelope requirements, and prescribes more efficient gas fired furnace in air handling units than does ASHRAE. NECB prescribes 92.4% AFUE for gas-fired furnaces, while ASHRAE prescribes 80% thermal efficiency. Halifax and Calgary show slightly less energy savings, 6.6% and 6.7% respectively. Vancouver shows a negative savings resulting from reduced heating savings because of its mild climate, and a higher cooling energy use than ASHRAE, due to increased window gains. Significantly higher overall energy savings are evident in Iqaluit (31.3%), Whitehorse (19.9%), and Yellowknife (28.7%). This increased energy savings is a result of the NECB code prescribing air-to-air heat recovery, while ASHRAE does not.

For the **low rise MURB**, the NECB savings relative to ASHRAE are relatively consistent for all locations. The overall energy savings for all locations range from a low of 9.5% to a high of 14.5%.

For the **education** building type, the NECB savings relative to ASHRAE are similar for Montreal, Halifax, Winnipeg, Regina, Saint John, St. John's, Charlottetown, Iqaluit, Whitehorse, and Yellowknife. The overall energy savings for these locations range from a low of 18.1% to a high of 22.8%. The majority of the overall energy savings results from a reduction in heating energy use. For the above locations NECB prescribes modulating boilers, while ASHRAE prescribes single stage boilers. The NECB also has significantly more stringent envelope requirements. The Toronto, Vancouver, and Calgary locations show lower savings at 13.2%, 11.1%, and 14.8% respectively. For these locations the NECB prescribes two stage boilers instead of modulating boiler, resulting in reduced savings relative to ASHRAE. The Vancouver results show savings more in line with the Toronto and Calgary for this building type, because both the ASHRAE and NECB codes do not call for heat recovery in Vancouver. For all other locations heat recovery is required by both codes. For Vancouver having heat recovery results in more heating load transferred to the boiler loop, and results in more heating savings. Overall, this building type shows high energy saving for NECB because heating is the dominate energy use.

For the **retail without Anchor store (strip mall)**, the NECB savings compared to ASHRAE are similar for Toronto, Montreal, Vancouver, Winnipeg, Calgary, and Regina. The overall energy savings for these locations ranges from a low of 14.5% to a high of 18.9%. For Saint John and St. John's the energy savings are lower, at 7.5% and 8.0% respectively. Saint John and St. John's show lower savings because ASHRAE prescribes heat recovery on 1 of the 6 systems in the building, and NECB does not. For Halifax, Charlottetown, and Iqaluit the NECB savings range from 3.8% to 5.1%. These locations show lower overall energy savings, because ASHRAE requires air-to-air heat recovery on 2 of the 6 systems, and NECB does not. For Whitehorse and Yellowknife the energy savings for the NECB are negative. For these locations, ASHRAE prescribes air-to-air heat recovery on 4 of the 6 systems in the building, and NECB does not. In addition, Saint John, St. John's, Halifax, Charlottetown, Iqaluit, Whitehorse and Yellowknife use oil as the heating source, which does not require condensing technology under NECB, as it does for natural gas.

For the **warehouse**, the NECB savings relative to ASHRAE are relatively similar for all locations, with the exception of Vancouver. The overall energy savings for all locations, excluding Vancouver, range from a low of 16.7% to a high of 20.1%. The majority of the overall energy savings results from a reduction in heating energy use. The NECB has significantly more stringent envelope requirements, and prescribes more efficient gas fired furnaces in the air handling units than does ASHRAE. NECB prescribes 92.4% AFUE for gas-fired furnaces, while ASHRE prescribes 80% thermal efficiency. Vancouver has less overall savings (11.7%) because its milder climate reduces the potential for heating savings. The warehouse building type shows larger overall energy savings than most building types because the warehouse has heating as its predominant energy end-use.

Table 1: Description of Benchmark Building Models Selected for Analysis

| Building Type | Building Description |
|--------------------------|--|
| High Rise Office | The high rise office archetype represents a square 144,000 ft ² (13,380 m ²), 10-storey building with a wall-to-roof area ratio of 4.3. The maximum window-to-wall area ratio is 40% (varies by location). The zoning includes 5 zones per floor, with a 1,570ft ² (146 m ²) perimeter zone on each of the four major orientations and a core zone that accounts for 57% of the floor space. The HVAC system includes six built-up variable air volume (VAV) systems. A single natural gas boiler provides heating. A water-cooled electric compression chiller and cooling tower provide cooling. Walls are 75% curtain wall and 25% concrete block with brick veneer and interior insulation. |
| High Rise MURB | The high rise MURB archetype represents a square 146,450 ft ² (13,611 m ²), 20-storey building with a wall-to-roof area ratio of 8.1. The maximum window-to-wall area ratio is 40% (varies by location). The zoning includes 6 apartments and 1 core zone per floor. A two-pipe fan coil system serves the suites, and a make-up air unit with hot and cold water coils provides fresh air to the core zones. Fresh air infiltrates into the suites from the core zone via undercuts in the doors. The fan coils are served by a single natural gas boiler and a single water-cooled chiller. Walls are comprised of 75% curtain wall and 25% concrete block with brick veneer and interior insulation. |
| Retail with Anchor Store | The retail archetype represents a 1-storey building with a total floor area of 17,662 m ² (190,123 ft ²) and consists of several small retail outlets attached to one large anchor store. The floor area of each individual retail outlet ranges from 56 m ² (600 ft ²) to 223 m ² (2,400 ft ²). The anchor store has a floor area of 8,279 m ² (89,115 ft ²). The wall-to-roof area ratio is 0.42. The window-to-wall area ratio is 18.2%. The building has insulated cavity walls with a brick veneer. Separate packaged constant volume systems serve each retail outlet. Several packaged constant volume systems serve the sales area in the anchor store. These packaged systems each contain a natural gas furnace and a DX cooling section. No zone reheat is provided by these systems. A packaged VAV system with DX cooling and electric reheat serves the administrative area of the anchor store. |
| Low Rise Office | The low rise office archetype represents a square 32,000 ft ² (2,974 m ²), 2-storey building with a wall-to-roof area ratio of 1.85. The maximum window-to-wall area ratio is 33% (varies by location). The zoning includes 5 zones per floor, with two 200 m ² (2,175 ft ²) perimeter zones, two 118 m ² (1,275 ft ²) perimeter zones, and a core zone that accounts for 57% of the floor space. The entire building is served by a single packaged variable air volume (PVAV) system. Heating and cooling for the PVAV are provided by a natural gas furnace and a DX cooling coil. There is a single natural gas boiler that provides reheat to the zones. The walls are masonry with interior insulation and drywall. Windows are strip windows set into the concrete block walls. |

Table 1: Description of Benchmark Building Models Selected for Analysis – Cont'd

| Building Type | Building Description |
|--|--|
| Low Rise MURB | The low rise MURB archetype represents a square 42,000ft ² (3,900 m ²), 3-storey building with a wall-to-roof area ratio of 1.1. The maximum window-to-wall area ratio is 29% (varies by location). There are 15 apartments and 1 core zone per floor. The HVAC system consists of package air conditioners (PACs) and hydronic baseboards serving each apartment. There is a single make-up air unit (MAU), equipped with a hot water coil and DX cooling, providing fresh air to the core zones. Fresh air infiltrates into the suites from the core zone via undercuts in the doors. A single gas boiler provides heating. Walls are concrete block with brick veneer and interior insulation. |
| Education | The education archetype represents a 69,697 ft ² (6,475 m ²), 2-storey building with a wall-to-roof area ratio of 0.71. The window-to wall area ratio is 16.3%. The building has insulated cavity walls with a brick veneer. The HVAC system includes two packaged VAV systems serving the classrooms, one packaged VAV system serving the administration area, and one packaged single zone system serving the gymnasium. All systems have hydronic heating and DX cooling. A single gas boiler provides heating. Reheat in the zones is hydronic. |
| Retail without Anchor Store (Strip Mall) | The retail without anchor store (strip mall) archetype consists of a number of retail outlets with a total ground floor area of 3,993 m ² (42,980ft ²). Each retail area ranges from 56 m ² (600 ft ²) to 223 m ² (2,400 ft ²). The window-to-wall area ratio is 20%, and the wall-to-roof area ratio is 0.95. Walls are brick faced with insulation applied over 12 inch concrete block. The HVAC system in each store is a roof-top packaged constant volume system. The packaged systems have natural gas furnace sections and DX cooling sections. No zone re-heat is provided. |
| Warehouse | The warehouse archetype represents a 3,891 m ² (41,883 ft ²), 1-storey building. The building contains an office area that is 10% of the total area of the building. The building has a wall-to-roof area ratio of 0.72. The window-to-wall area ratio is 3.5%. Walls are metal “sandwich panels” containing rigid insulation. The office area is served by a packaged constant volume system with a natural gas furnace and DX cooling section. The warehouse area contains natural gas-fired unit heaters and no cooling. |

Table 2: NECB-2011 and ASHRAE90.1-2010 Energy Use Comparison Summary

| Location | Building Type | Total Energy Use (GJ) | | NECB Savings (%) Relative to ASHRAE 90.1-2010 |
|-----------|-----------------------------|-----------------------|-----------------|---|
| | | NECB-2011 | ASHRAE90.1-2010 | |
| Toronto | High Rise Office | 8,617 | 9,504 | 9.3 |
| | High Rise MURB | 9,117 | 10,100 | 9.7 |
| | Retail with Anchor Store | 11,104 | 12,297 | 9.7 |
| | Low Rise Office | 2,632 | 2,932 | 10.2 |
| | Low Rise MURB | 3,112 | 3,487 | 10.8 |
| | Education | 4,362 | 5,025 | 13.2 |
| | Retail without Anchor Store | 3,479 | 4,291 | 18.9 |
| | Warehouse | 2,326 | 2,791 | 16.7 |
| Montreal | High Rise Office | 9,326 | 10,350 | 9.9 |
| | High Rise MURB | 9,718 | 11,048 | 12.0 |
| | Retail with Anchor Store | 12,433 | 13,397 | 7.2 |
| | Low Rise Office | 2,865 | 3,185 | 10.0 |
| | Low Rise MURB | 3,281 | 3,772 | 13.0 |
| | Education | 4,518 | 5,615 | 19.5 |
| | Retail without Anchor Store | 3,951 | 4,623 | 14.5 |
| | Warehouse | 2,593 | 3,144 | 17.5 |
| Halifax | High Rise Office | 8,214 | 8,884 | 7.5 |
| | High Rise MURB | 8,696 | 9,671 | 10.1 |
| | Retail with Anchor Store | 11,449 | 12,087 | 5.3 |
| | Low Rise Office | 2,593 | 2,775 | 6.6 |
| | Low Rise MURB | 3,022 | 3,436 | 12.0 |
| | Education | 3,969 | 4,904 | 19.1 |
| | Retail without Anchor Store | 3,627 | 3,779 | 4.0 |
| | Warehouse | 2,384 | 2,869 | 16.9 |
| Vancouver | High Rise Office | 7,642 | 7,838 | 2.5 |
| | High Rise MURB | 7,681 | 8,081 | 5.0 |
| | Retail with Anchor Store | 9,048 | 10,675 | 15.2 |
| | Low Rise Office | 2,473 | 2,443 | -1.2 |
| | Low Rise MURB | 2,541 | 2,806 | 9.5 |
| | Education | 3,922 | 4,413 | 11.1 |
| | Retail without Anchor Store | 2,815 | 3,298 | 14.6 |
| | Warehouse | 1,948 | 2,205 | 11.7 |
| Winnipeg | High Rise Office | 9,888 | 11,430 | 13.5 |
| | High Rise MURB | 10,462 | 11,793 | 11.3 |
| | Retail with Anchor Store | 14,117 | 13,988 | -0.9 |
| | Low Rise Office | 3,037 | 3,426 | 11.4 |
| | Low Rise MURB | 3,625 | 4,083 | 11.2 |
| | Education | 4,932 | 6,024 | 18.1 |
| | Retail without Anchor Store | 4,417 | 5,300 | 16.7 |
| | Warehouse | 2,898 | 3,515 | 17.6 |
| Calgary | High Rise Office | 8,523 | 9,517 | 10.4 |
| | High Rise MURB | 8,951 | 9,851 | 9.1 |
| | Retail with Anchor Store | 11,330 | 11,642 | 2.7 |
| | Low Rise Office | 2,736 | 2,934 | 6.7 |
| | Low Rise MURB | 3,137 | 3,487 | 10.1 |
| | Education | 4,284 | 5,027 | 14.8 |
| | Retail without Anchor Store | 3,651 | 4,443 | 17.8 |
| | Warehouse | 2,489 | 3,039 | 18.1 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

Table 2: NECB-2011 and ASHRAE90.1-2010 Energy Use Comparison Summary – Cont'd

| Location | Building Type | Total Energy Use (GJ) | | NECB Savings (%) Relative to: |
|---------------|-----------------------------|-----------------------|-----------------|-------------------------------|
| | | NECB-2011 | ASHRAE90.1-2010 | ASHRAE 90.1-2010 |
| Regina | High Rise Office | 9,462 | 10,954 | 13.6 |
| | High Rise MURB | 10,161 | 11,410 | 10.9 |
| | Retail with Anchor Store | 13,303 | 13,252 | -0.4 |
| | Low Rise Office | 2,947 | 3,308 | 10.9 |
| | Low Rise MURB | 3,503 | 3,948 | 11.3 |
| | Education | 4,654 | 5,695 | 18.3 |
| | Retail without Anchor Store | 4,203 | 5,087 | 17.4 |
| | Warehouse | 2,786 | 3,391 | 17.8 |
| Saint John | High Rise Office | 8,493 | 9,546 | 11.0 |
| | High Rise MURB | 9,128 | 10,423 | 12.4 |
| | Retail with Anchor Store | 12,128 | 12,230 | 0.8 |
| | Low Rise Office | 2,709 | 2,965 | 8.6 |
| | Low Rise MURB | 3,218 | 3,677 | 12.5 |
| | Education | 4,135 | 5,170 | 20.0 |
| | Retail without Anchor Store | 3,840 | 4,151 | 7.5 |
| | Warehouse | 2,598 | 3,133 | 17.1 |
| St. Johns | Low Rise Office | 2,630 | 2,938 | 10.5 |
| | Low Rise MURB | 3,396 | 3,914 | 13.2 |
| | Education | 4,227 | 5,327 | 20.6 |
| | Retail without Anchor Store | 3,947 | 4,292 | 8.0 |
| | Warehouse | 2,706 | 3,282 | 17.6 |
| Charlottetown | Low Rise Office | 2,680 | 2,983 | 10.2 |
| | Low Rise MURB | 3,254 | 3,754 | 13.3 |
| | Education | 4,261 | 5,270 | 19.2 |
| | Retail without Anchor Store | 3,984 | 4,140 | 3.8 |
| | Warehouse | 2,603 | 3,136 | 17.0 |
| Iqaluit | Low Rise Office | 3,085 | 4,492 | 31.3 |
| | Low Rise MURB | 4,923 | 5,758 | 14.5 |
| | Education | 7,057 | 9,145 | 22.8 |
| | Retail without Anchor Store | 7,113 | 7,494 | 5.1 |
| | Warehouse | 4,504 | 5,651 | 20.3 |
| Whitehorse | Low Rise Office | 2,695 | 3,363 | 19.9 |
| | Low Rise MURB | 3,790 | 4,260 | 11.0 |
| | Education | 5,105 | 6,443 | 20.8 |
| | Retail without Anchor Store | 5,014 | 4,868 | -3.0 |
| | Warehouse | 3,329 | 4,039 | 17.6 |
| Yellowknife | Low Rise Office | 2,850 | 3,997 | 28.7 |
| | Low Rise MURB | 4,387 | 5,106 | 14.1 |
| | Education | 6,086 | 7,845 | 22.4 |
| | Retail without Anchor Store | 5,991 | 5,924 | -1.1 |
| | Warehouse | 3,809 | 4,771 | 20.1 |

Table 3: NECB Maximum Window to Wall Ratio, by Location

| Location | NECB Max Window to Wall Ratio |
|-----------------|--------------------------------------|
| Toronto | 40% |
| Montreal | 39% |
| Halifax | 40% |
| Vancouver | 40% |
| Winnipeg | 29% |
| Calgary | 33% |
| St. Johns | 35% |
| Regina | 29% |
| Saint John | 36% |
| Charlottetown | 37% |
| Iqaluit | 20% |
| Whitehorse | 23% |
| Yellowknife | 20% |

Figure 1: NECB-2011 and ASHRAE 90.1-2010 Energy Use Comparison - TORONTO

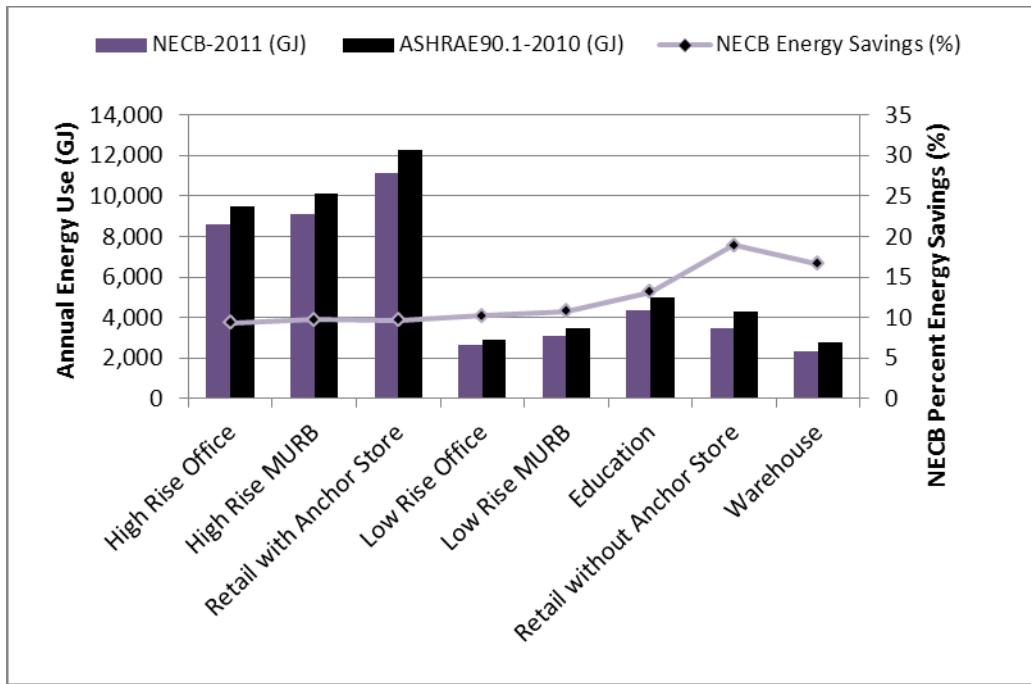


Figure 2: NECB-2011 and ASHRAE 90.1-2010 Energy Use Comparison - MONTREAL

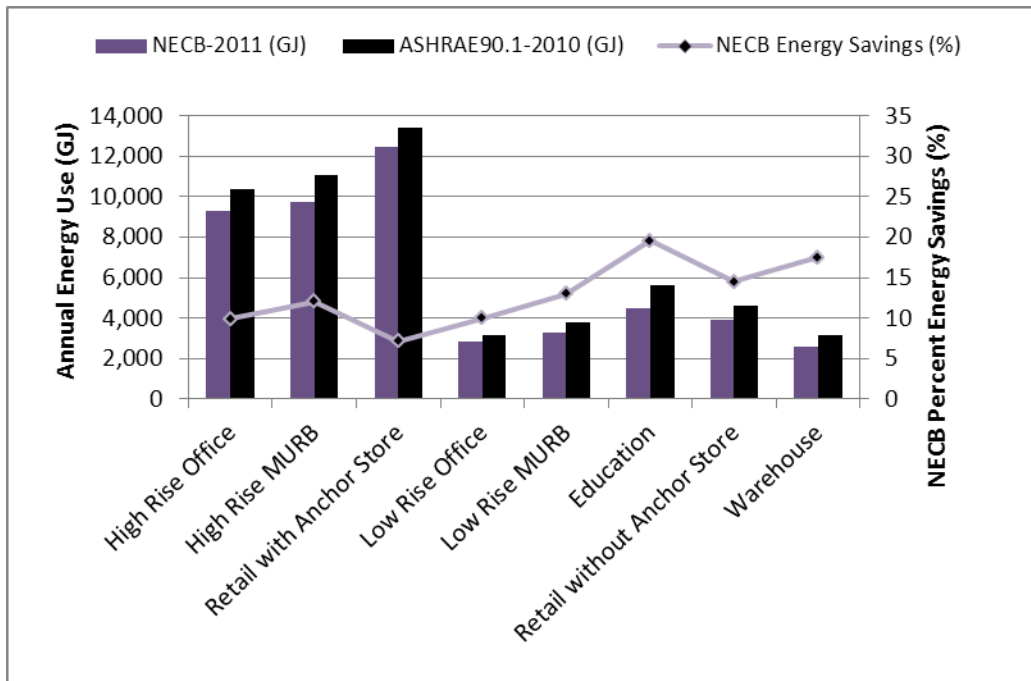


Figure 3: NECB-2011 and ASHRAE 90.1-2010 Energy Use Comparison - HALIFAX

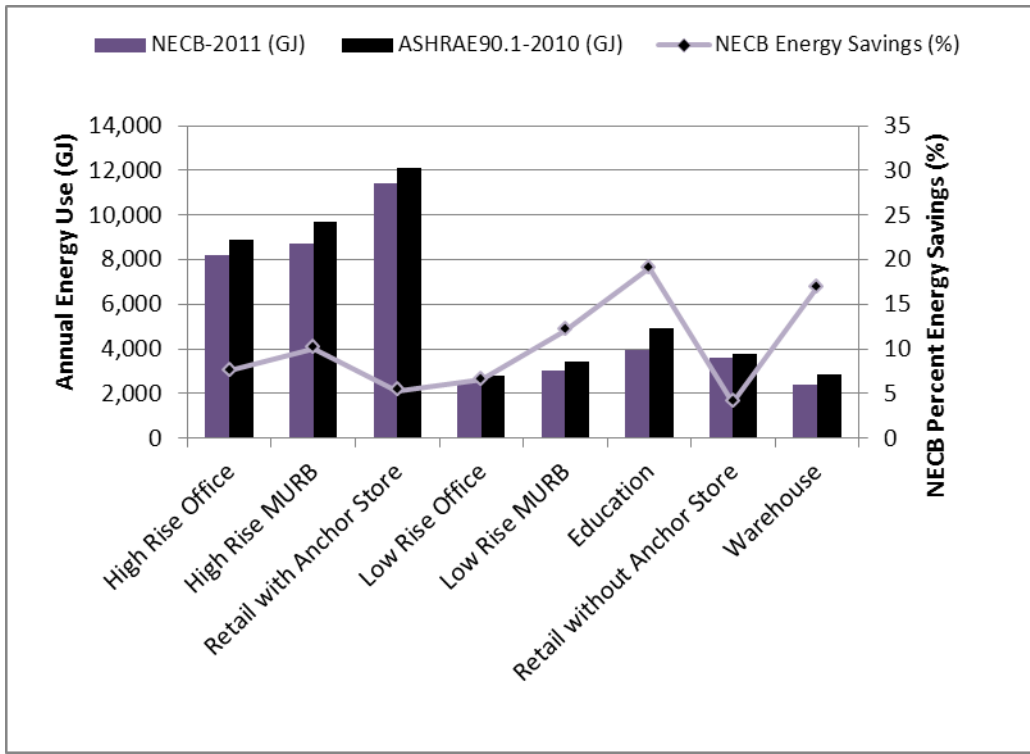


Figure 4: NECB-2011 and ASHRAE 90.1-2010 Energy Use Comparison - VANCOUVER

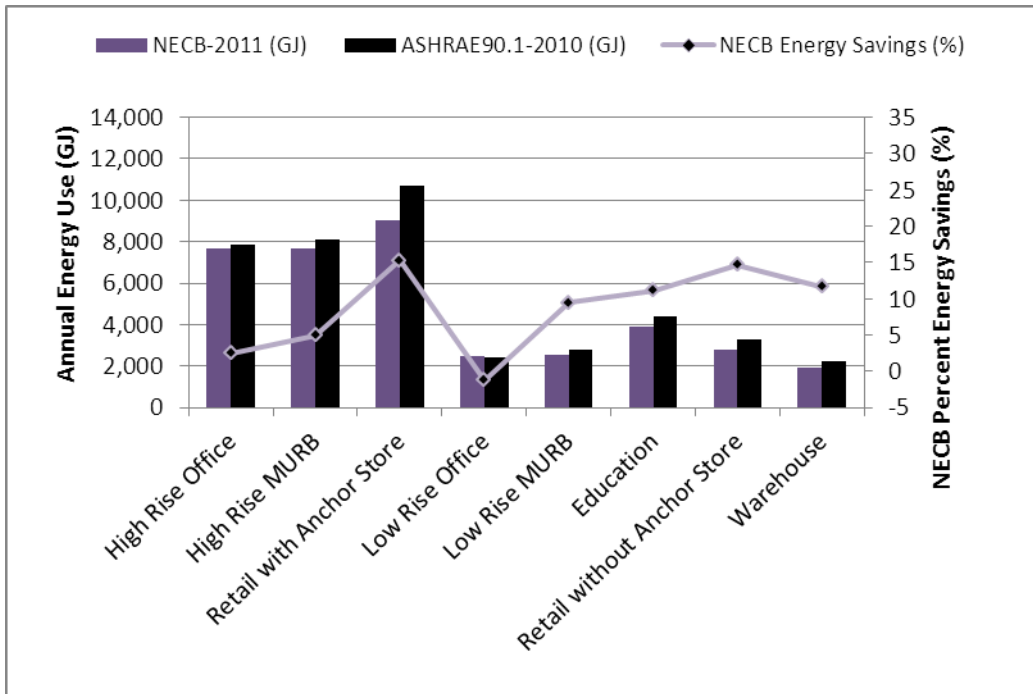


Figure 5: NECB-2011 and ASHRAE 90.1-2010 Energy Use Comparison - WINNIPEG

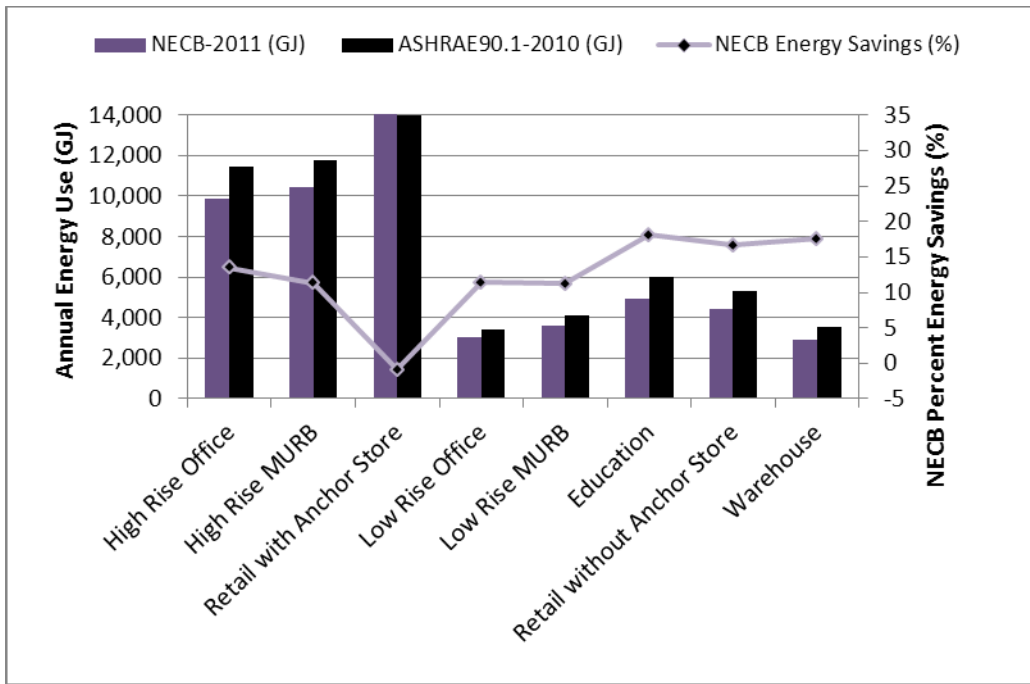


Figure 6: NECB-2011 and ASHRAE 90.1-2010 Energy Use Comparison - CALGARY

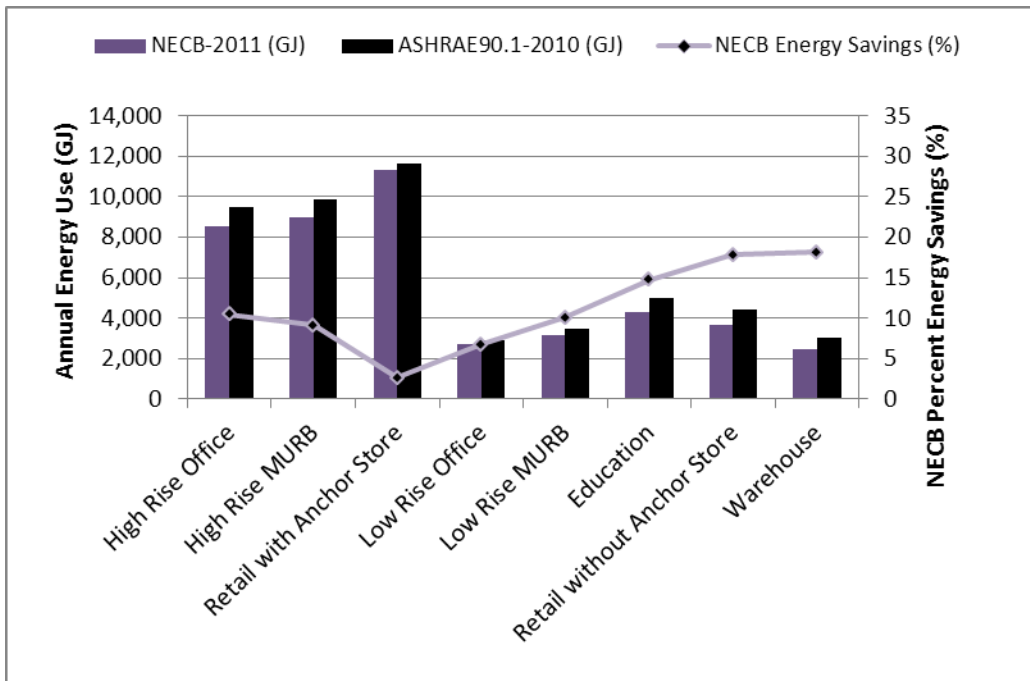


Figure 7: NECB-2011 and ASHRAE 90.1-2010 Energy Use Comparison - REGINA

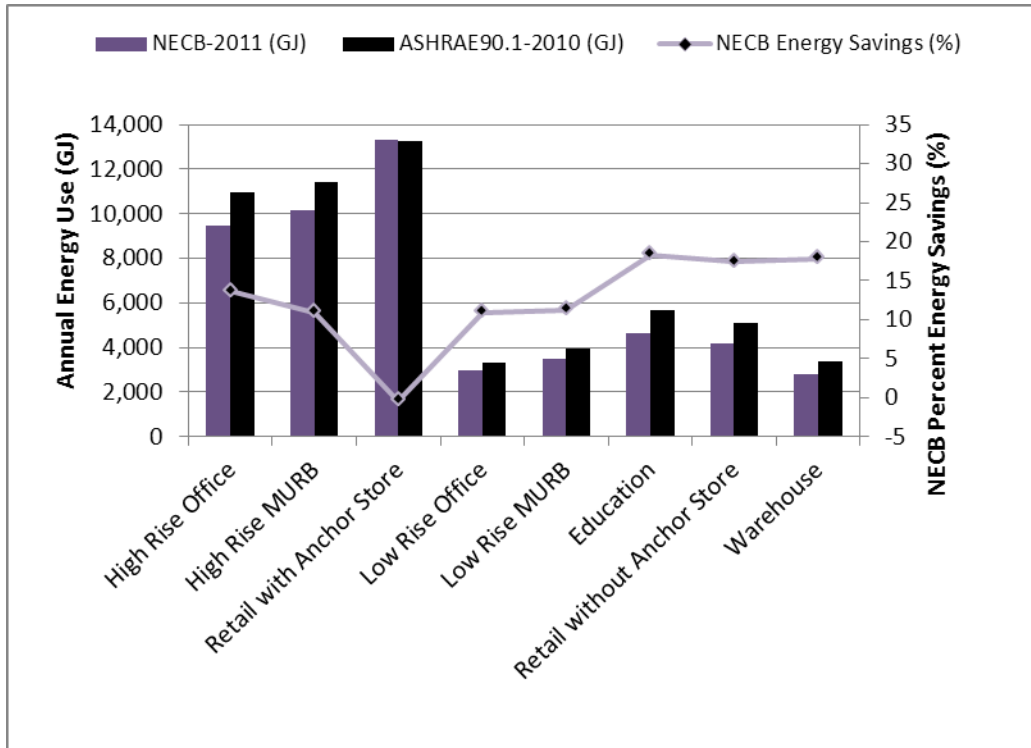


Figure 8: NECB-2011 and ASHRAE 90.1-2010 Energy Use Comparison – SAINT JOHN

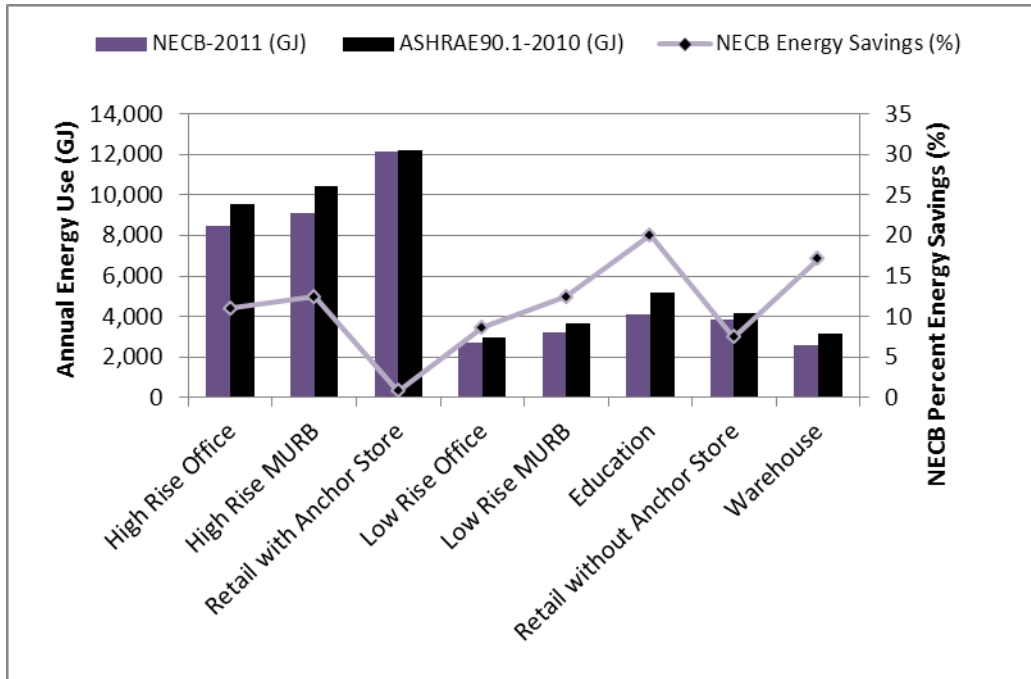


Figure 9: NECB-2011 and ASHRAE 90.1-2010 Energy Use Comparison – St. JOHNS

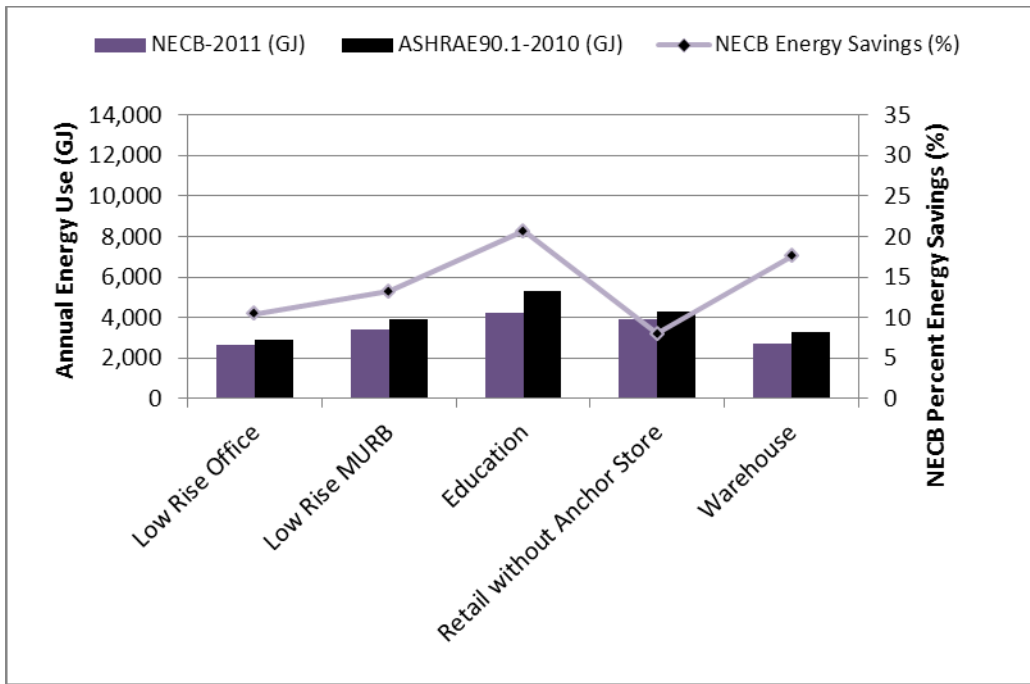


Figure 10: NECB-2011 and ASHRAE 90.1-2010 Energy Use Comparison – CHARLOTTETOWN

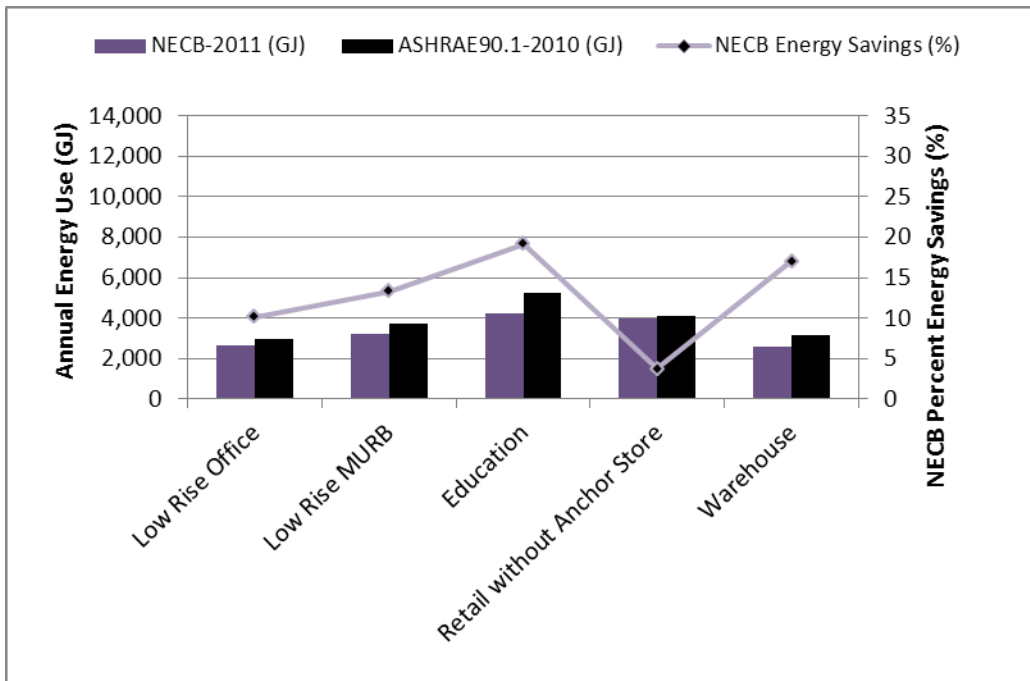


Figure 11: NECB-2011 and ASHRAE 90.1-2010 Energy Use Comparison – IQALUIT

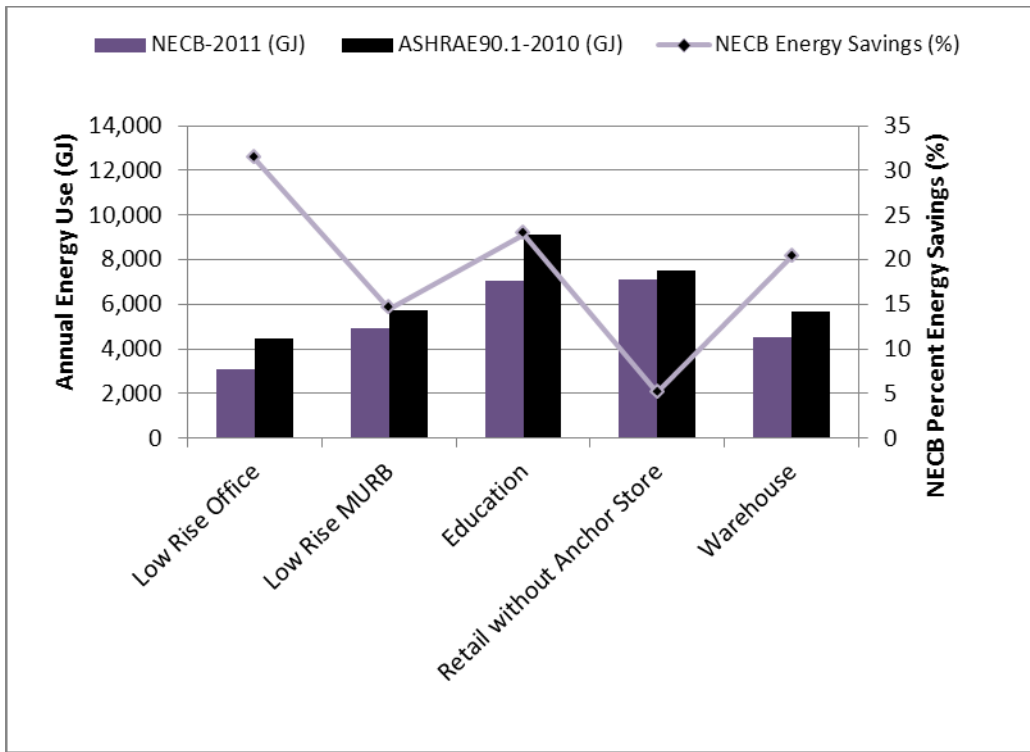


Figure 12: NECB-2011 and ASHRAE 90.1-2010 Energy Use Comparison – WHITEHORSE

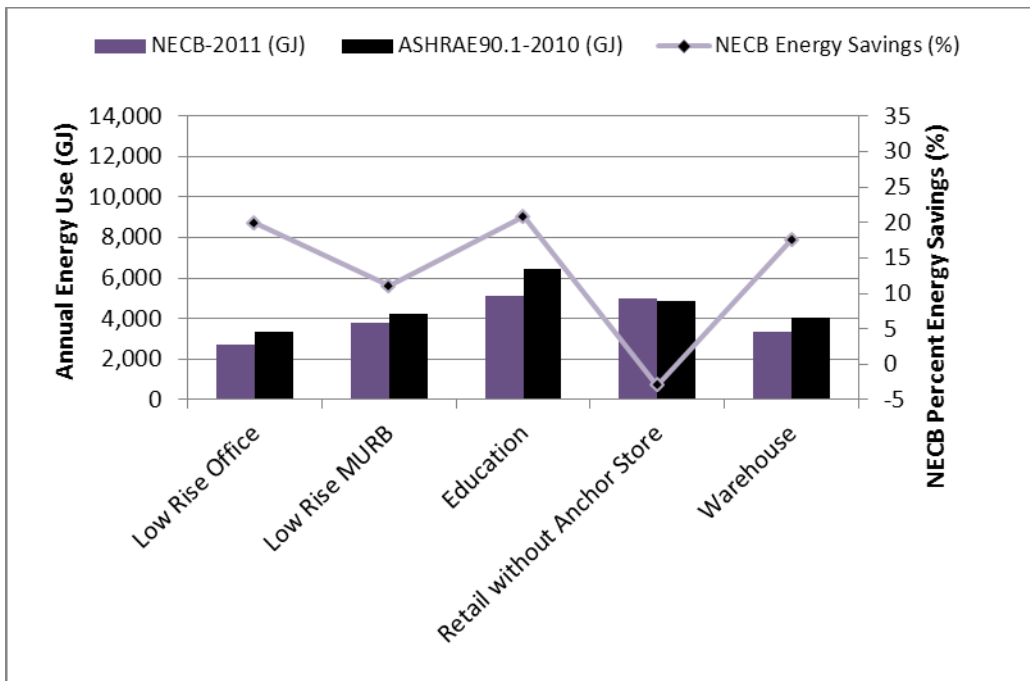
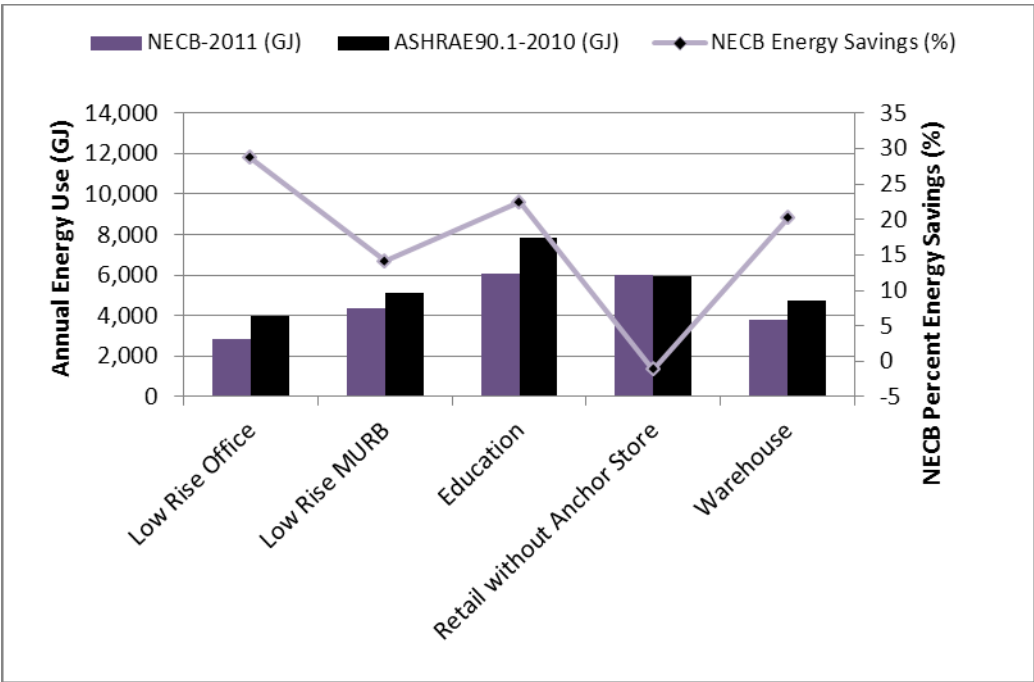


Figure 13: NECB-2011 and ASHRAE 90.1-2010 Energy Use Comparison – YELLOWKNIFE



APPENDICES

Appendix A: High Rise Office

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Toronto High Rise Office | BUILDING CODE | |
|-------------------------------------|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 1,786.0 | 1,784.1 |
| Appliances | 1,688.8 | 1,688.8 |
| Space Heat | 2,961.2 | 3,937.7 |
| Space Cool | 402.7 | 416.7 |
| Heat Rejection | 156.2 | 141.9 |
| Pumps | 96.6 | 59.5 |
| Fans | 704.4 | 655.2 |
| DHW | 820.6 | 820.6 |
| <i>Total</i> | 8,616.6 | 9,504.5 |
| Electricity | | |
| Demand (kW) | 497.8 | 501.1 |
| Energy (kWh) | 1,369,857.7 | 1,350,197.1 |
| Natural Gas | | |
| Consumption (m ³) | 9,773.7 | 12,316.5 |
| Charges (\$) | | |
| Electric (consumption) | 71,218.0 | 70,196.0 |
| Electric (demand) | 41,486.0 | 40,858.0 |
| Natural Gas | 24,379.0 | 30,332.0 |
| <i>Total</i> | 137,083.0 | 141,386.0 |

| Montreal High Rise Office | BUILDING CODE | |
|--------------------------------------|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 1,786.0 | 1,784.1 |
| Appliances | 1,688.8 | 1,688.8 |
| Space Heat | 3,565.9 | 4,749.8 |
| Space Cool | 480.9 | 421.1 |
| Heat Rejection | 203.6 | 145.8 |
| Pumps | 125.9 | 63.7 |
| Fans | 633.6 | 655.2 |
| DHW | 841.5 | 841.5 |
| <i>Total</i> | 9,326.2 | 10,350.0 |
| Electricity | | |
| Demand (kW) | 535.2 | 510.2 |
| Energy (kWh) | 1,399,187.5 | 1,360,803.9 |
| Natural Gas | | |
| Consumption (m ³) | 11,375.6 | 14,457.4 |
| Charges (\$) | | |
| Electric (consumption) | 62,403.0 | 60,690.0 |
| Electric (demand) | 60,340.0 | 56,877.0 |
| Natural Gas | 46,205.0 | 58,247.0 |
| <i>Total</i> | 168,948.0 | 175,814.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Halifax High Rise Office | BUILDING CODE | |
|-------------------------------------|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 1,786.0 | 1,784.1 |
| Appliances | 1,688.8 | 1,688.8 |
| Space Heat | 2,709.6 | 3,510.9 |
| Space Cool | 342.5 | 279.7 |
| Heat Rejection | 133.9 | 85.1 |
| Pumps | 103.8 | 55.8 |
| Fans | 595.8 | 626.2 |
| DHW | 853.3 | 853.3 |
| <i>Total</i> | 8,213.6 | 8,884.0 |
| Electricity | | |
| Demand (kW) | 475.1 | 438.5 |
| Energy (kWh) | 1,317,673.5 | 1,285,179.2 |
| Oil | | |
| Consumption (L) | 89,737.8 | 110,103.7 |
| Charges (\$) | | |
| Electric (consumption) | 133,606.0 | 129,349.0 |
| Electric (demand) | 40,502.0 | 37,965.0 |
| Oil | 96,802.0 | 118,773.0 |
| <i>Total</i> | 270,910.0 | 286,087.0 |

| Vancouver High Rise Office | BUILDING CODE | |
|---------------------------------------|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 1,786.0 | 1,784.1 |
| Appliances | 1,688.8 | 1,688.8 |
| Space Heat | 2,113.1 | 2,472.3 |
| Space Cool | 387.8 | 297.0 |
| Heat Rejection | 155.1 | 93.5 |
| Pumps | 108.1 | 46.9 |
| Fans | 613.7 | 665.6 |
| DHW | 789.8 | 789.8 |
| <i>Total</i> | 7,642.4 | 7,838.0 |
| Electricity | | |
| Demand (kW) | 461.3 | 410.6 |
| Energy (kWh) | 1,335,605.4 | 1,290,775.6 |
| Natural Gas | | |
| Consumption (m ³) | 7,516.3 | 8,463.1 |
| Charges (\$) | | |
| Electric (consumption) | 66,668.0 | 64,711.0 |
| Electric (demand) | 29,703.0 | 26,251.0 |
| Natural Gas | 23,230.0 | 26,118.0 |
| <i>Total</i> | 119,601.0 | 117,080.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Winnipeg High Rise Office | BUILDING CODE | |
|--------------------------------------|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 1,786.0 | 1,784.1 |
| Appliances | 1,688.8 | 1,688.8 |
| Space Heat | 4,129.7 | 5,817.4 |
| Space Cool | 439.6 | 411.6 |
| Heat Rejection | 164.2 | 149.7 |
| Pumps | 110.6 | 66.9 |
| Fans | 683.5 | 625.8 |
| DHW | 885.5 | 885.5 |
| <i>Total</i> | 9,887.9 | 11,429.8 |
| Electricity | | |
| Demand (kW) | 519.8 | 506.4 |
| Energy (kWh) | 1,390,338.8 | 1,359,631.8 |
| Natural Gas | | |
| Consumption (m ³) | 12,950.1 | 17,333.6 |
| Charges (\$) | | |
| Electric (consumption) | 50,548.0 | 49,581.0 |
| Electric (demand) | 35,128.0 | 34,157.0 |
| Natural Gas | 52,529.0 | 69,997.0 |
| <i>Total</i> | 138,205.0 | 153,735.0 |

| Calgary High Rise Office | BUILDING CODE | |
|-------------------------------------|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 1,786.0 | 1,784.1 |
| Appliances | 1,688.8 | 1,688.8 |
| Space Heat | 2,992.7 | 4,087.6 |
| Space Cool | 290.8 | 286.0 |
| Heat Rejection | 115.3 | 98.3 |
| Pumps | 102.7 | 59.7 |
| Fans | 677.6 | 643.6 |
| DHW | 868.9 | 868.9 |
| <i>Total</i> | 8,522.8 | 9,517.0 |
| Electricity | | |
| Demand (kW) | 435.0 | 428.2 |
| Energy (kWh) | 1,322,068.6 | 1,300,063.9 |
| Natural Gas | | |
| Consumption (m ³) | 9,981.3 | 12,828.4 |
| Charges (\$) | | |
| Electric (consumption) | 155,445.0 | 152,860.0 |
| Electric (demand) | 32,744.0 | 31,864.0 |
| Natural Gas | 25,257.0 | 32,373.0 |
| <i>Total</i> | 213,446.0 | 217,097.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Regina High Rise Office | BUILDING CODE | |
|------------------------------------|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 1,786.0 | 1,784.1 |
| Appliances | 1,688.8 | 1,688.8 |
| Space Heat | 3,847.9 | 5,429.8 |
| Space Cool | 347.2 | 361.0 |
| Heat Rejection | 127.4 | 117.9 |
| Pumps | 101.8 | 62.9 |
| Fans | 678.6 | 625.1 |
| DHW | 884.0 | 884.0 |
| <i>Total</i> | 9,461.8 | 10,953.6 |
| Electricity | | |
| Demand (kW) | 456.0 | 460.8 |
| Energy (kWh) | 1,348,233.9 | 1,332,353.1 |
| Natural Gas | | |
| Consumption (m ³) | 12,222.2 | 16,330.9 |
| Charges (\$) | | |
| Electric (consumption) | 86,294.0 | 85,351.0 |
| Electric (demand) | 44,271.0 | 43,632.0 |
| Natural Gas | 28,662.0 | 37,986.0 |
| <i>Total</i> | 159,227.0 | 166,969.0 |

| Saint John High Rise Office | BUILDING CODE | |
|--|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 1,786.0 | 1,784.1 |
| Appliances | 1,688.8 | 1,688.8 |
| Space Heat | 3,036.8 | 4,186.5 |
| Space Cool | 281.9 | 237.8 |
| Heat Rejection | 112.4 | 75.9 |
| Pumps | 98.3 | 56.5 |
| Fans | 614.4 | 641.3 |
| DHW | 874.6 | 874.6 |
| <i>Total</i> | 8,493.3 | 9,545.5 |
| Electricity | | |
| Demand (kW) | 443.3 | 421.8 |
| Energy (kWh) | 1,301,294.5 | 1,280,666.9 |
| Oil | | |
| Consumption (L) | 98,497.6 | 127,634.3 |
| Charges (\$) | | |
| Electric (consumption) | 119,225.0 | 117,036.0 |
| Electric (demand) | 26,034.0 | 24,840.0 |
| Oil | 111,157.0 | 144,037.0 |
| <i>Total</i> | 256,416.0 | 285,913.0 |

Appendix B: High Rise MURB

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Toronto High Rise MURB | BUILDING CODE | |
|---|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 949.1 | 936.3 |
| Appliances | 652.4 | 652.4 |
| Space Heat | 3,284.4 | 4,306.9 |
| Space Cool | 338.7 | 315.6 |
| Heat Rejection | 155.0 | 134.7 |
| Pumps | 62.2 | 35.7 |
| Fans | 962.1 | 1,005.7 |
| DHW | 2,712.8 | 2,712.8 |
| <i>Total</i> | 9,116.7 | 10,100.1 |
| Electricity | | |
| Demand (kW) | 275.1 | 274.8 |
| Energy (kWh) | 896,449.3 | 889,973.9 |
| Natural Gas | | |
| Consumption (m ³) | 15,621.7 | 18,292.4 |
| Charges (\$) | | |
| Electric (consumption) | 46,607.0 | 46,269.0 |
| Electric (demand) | 24,794.0 | 24,770.0 |
| Natural Gas | 38,069.0 | 44,224.0 |
| <i>Total</i> | 109,470.0 | 115,263.0 |

| Montreal High Rise MURB | BUILDING CODE | |
|--|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 949.1 | 936.3 |
| Appliances | 652.4 | 652.4 |
| Space Heat | 3,534.4 | 5,087.5 |
| Space Cool | 515.8 | 351.5 |
| Heat Rejection | 221.4 | 149.6 |
| Pumps | 64.2 | 12.1 |
| Fans | 996.1 | 1,072.7 |
| DHW | 2,784.4 | 2,785.3 |
| <i>Total</i> | 9,717.8 | 11,047.5 |
| Electricity | | |
| Demand (kW) | 287.7 | 273.9 |
| Energy (kWh) | 976,791.3 | 922,995.6 |
| Natural Gas | | |
| Consumption (m ³) | 16,449.2 | 20,490.5 |
| Charges (\$) | | |
| Electric (consumption) | 43,567.0 | 41,165.0 |
| Electric (demand) | 39,232.0 | 37,159.0 |
| Natural Gas | 66,028.0 | 81,818.0 |
| <i>Total</i> | 148,827.0 | 160,142.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Halifax High Rise MURB | BUILDING CODE | |
|---|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 949.1 | 936.3 |
| Appliances | 652.4 | 652.4 |
| Space Heat | 2,697.1 | 3,990.3 |
| Space Cool | 397.4 | 219.8 |
| Heat Rejection | 177.7 | 103.3 |
| Pumps | 54.8 | 8.8 |
| Fans | 946.3 | 938.4 |
| DHW | 2,821.5 | 2,821.5 |
| <i>Total</i> | 8,696.3 | 9,670.8 |
| Electricity | | |
| Demand (kW) | 258.9 | 241.6 |
| Energy (kWh) | 907,993.7 | 827,007.1 |
| Oil | | |
| Consumption (L) | 140,383.8 | 173,125.3 |
| Charges (\$) | | |
| Electric (consumption) | 90,790.0 | 83,048.0 |
| Electric (demand) | 25,864.0 | 24,129.0 |
| Oil | 151,436.0 | 186,755.0 |
| <i>Total</i> | 268,090.0 | 293,932.0 |

| Vancouver High Rise MURB | BUILDING CODE | |
|---|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 949.1 | 936.3 |
| Appliances | 652.4 | 652.4 |
| Space Heat | 1,844.6 | 2,660.2 |
| Space Cool | 431.0 | 235.7 |
| Heat Rejection | 183.3 | 109.4 |
| Pumps | 54.5 | 38.8 |
| Fans | 960.1 | 844.3 |
| DHW | 2,605.7 | 2,603.5 |
| <i>Total</i> | 7,680.6 | 8,080.7 |
| Electricity | | |
| Demand (kW) | 249.1 | 226.0 |
| Energy (kWh) | 913,853.8 | 803,390.8 |
| Natural Gas | | |
| Consumption (m ³) | 11,646.2 | 13,762.5 |
| Charges (\$) | | |
| Electric (consumption) | 48,254.0 | 43,432.0 |
| Electric (demand) | 14,770.0 | 12,561.0 |
| Natural Gas | 35,830.0 | 42,287.0 |
| <i>Total</i> | 98,854.0 | 98,280.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Winnipeg High Rise MURB | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 949.1 | 936.3 |
| Appliances | 652.4 | 652.4 |
| Space Heat | 4,219.4 | 5,435.7 |
| Space Cool | 446.2 | 506.9 |
| Heat Rejection | 212.3 | 222.8 |
| Pumps | 64.7 | 15.7 |
| Fans | 982.8 | 1,085.3 |
| DHW | 2,935.3 | 2,937.8 |
| <i>Total</i> | 10,462.1 | 11,792.9 |
| Electricity | | |
| Demand (kW) | 294.7 | 302.7 |
| Energy (kWh) | 955,958.6 | 992,760.1 |
| Natural Gas | | |
| Consumption (m ³) | 18,622.6 | 21,801.1 |
| Charges (\$) | | |
| Electric (consumption) | 36,867.0 | 38,025.0 |
| Electric (demand) | 20,369.0 | 21,035.0 |
| Natural Gas | 75,135.0 | 87,799.0 |
| <i>Total</i> | 132,371.0 | 146,859.0 |

| Calgary High Rise MURB | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 949.1 | 936.3 |
| Appliances | 652.4 | 652.4 |
| Space Heat | 2,898.7 | 3,748.7 |
| Space Cool | 388.7 | 441.5 |
| Heat Rejection | 184.4 | 182.8 |
| Pumps | 61.8 | 12.1 |
| Fans | 938.2 | 998.5 |
| DHW | 2,878.1 | 2,879.0 |
| <i>Total</i> | 8,951.5 | 9,851.4 |
| Electricity | | |
| Demand (kW) | 243.7 | 251.0 |
| Energy (kWh) | 908,052.3 | 925,310.3 |
| Natural Gas | | |
| Consumption (m ³) | 15,072.9 | 17,295.0 |
| Charges (\$) | | |
| Electric (consumption) | 106,765.0 | 108,794.0 |
| Electric (demand) | 20,697.0 | 21,115.0 |
| Natural Gas | 37,983.0 | 43,537.0 |
| <i>Total</i> | 165,445.0 | 173,446.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Regina High Rise MURB | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 949.1 | 936.3 |
| Appliances | 652.4 | 652.4 |
| Space Heat | 3,889.3 | 5,027.1 |
| Space Cool | 449.5 | 510.4 |
| Heat Rejection | 203.0 | 214.5 |
| Pumps | 66.5 | 15.0 |
| Fans | 1,021.1 | 1,121.4 |
| DHW | 2,930.5 | 2,932.7 |
| <i>Total</i> | 10,161.3 | 11,409.7 |
| Electricity | | |
| Demand (kW) | 281.3 | 288.4 |
| Energy (kWh) | 963,108.0 | 998,444.4 |
| Natural Gas | | |
| Consumption (m ³) | 17,756.5 | 20,730.9 |
| Charges (\$) | | |
| Electric (consumption) | 63,392.0 | 65,494.0 |
| Electric (demand) | 27,321.0 | 28,179.0 |
| Natural Gas | 41,221.0 | 47,969.0 |
| <i>Total</i> | 131,934.0 | 141,642.0 |

| Saint John High Rise MURB | BUILDING CODE | |
|------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 949.1 | 936.3 |
| Appliances | 652.4 | 652.4 |
| Space Heat | 3,138.2 | 4,630.6 |
| Space Cool | 344.8 | 203.1 |
| Heat Rejection | 156.4 | 100.9 |
| Pumps | 55.1 | 10.0 |
| Fans | 936.4 | 994.5 |
| DHW | 2,895.2 | 2,895.2 |
| <i>Total</i> | 9,127.5 | 10,423.1 |
| Electricity | | |
| Demand (kW) | 250.9 | 241.5 |
| Energy (kWh) | 888,713.9 | 843,063.7 |
| Oil | | |
| Consumption (L) | 153,329.8 | 191,089.8 |
| Charges (\$) | | |
| Electric (consumption) | 81,173.0 | 77,073.0 |
| Electric (demand) | 17,120.0 | 16,425.0 |
| Oil | 173,037.0 | 215,651.0 |
| <i>Total</i> | 271,330.0 | 309,149.0 |

Appendix C: Retail with Anchor Store

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Toronto Retail with Anchor | BUILDING CODE | |
|---|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 3,758.8 | 3,751.1 |
| Appliances | 562.4 | 562.4 |
| Space Heat | 4,556.1 | 5,383.8 |
| Space Cool | 527.7 | 569.4 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 988.5 | 1,319.2 |
| DHW | 710.9 | 710.9 |
| <i>Total</i> | 11,104.4 | 12,296.7 |
| Electricity | | |
| Demand (kW) | 559.4 | 635.4 |
| Energy (kWh) | 1,663,976.3 | 1,783,463.8 |
| Natural Gas | | |
| Consumption (m ³) | 13,563.6 | 15,585.0 |
| Charges (\$) | | |
| Electric (consumption) | 76,595.0 | 82,091.0 |
| Electric (demand) | 49,142.0 | 53,003.0 |
| Natural Gas | 30,759.0 | 35,082.0 |
| <i>Total</i> | 156,496.0 | 170,176.0 |

| Montreal Retail with Anchor | BUILDING CODE | |
|--|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 3,758.8 | 3,751.1 |
| Appliances | 562.4 | 562.4 |
| Space Heat | 5,634.0 | 6,439.8 |
| Space Cool | 634.7 | 583.6 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 1,132.6 | 1,349.0 |
| DHW | 710.9 | 710.9 |
| <i>Total</i> | 12,433.4 | 13,396.8 |
| Electricity | | |
| Demand (kW) | 695.4 | 702.2 |
| Energy (kWh) | 1,749,270.1 | 1,811,768.1 |
| Natural Gas | | |
| Consumption (m ³) | 16,274.9 | 18,233.1 |
| Charges (\$) | | |
| Electric (consumption) | 78,019.0 | 80,803.0 |
| Electric (demand) | 77,990.0 | 78,954.0 |
| Natural Gas | 65,201.0 | 72,866.0 |
| <i>Total</i> | 221,210.0 | 232,623.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Halifax Retail with Anchor | BUILDING CODE | |
|---|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 3,758.8 | 3,751.1 |
| Appliances | 562.4 | 562.4 |
| Space Heat | 4,974.7 | 5,483.3 |
| Space Cool | 312.3 | 267.9 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 1,112.3 | 1,293.9 |
| DHW | 729.0 | 729.0 |
| <i>Total</i> | 11,449.5 | 12,087.5 |
| Electricity | | |
| Demand (kW) | 549.0 | 551.3 |
| Energy (kWh) | 1,636,287.3 | 1,689,936.6 |
| Oil | | |
| Consumption (L) | 14,743.5 | 15,923.4 |
| Charges (\$) | | |
| Electric (consumption) | 164,567.0 | 169,293.0 |
| Electric (demand) | 48,135.0 | 48,656.0 |
| Oil | 155,081.0 | 167,491.0 |
| <i>Total</i> | 367,783.0 | 385,440.0 |

| Vancouver Retail with Anchor | BUILDING CODE | |
|---|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 3,758.8 | 3,751.1 |
| Appliances | 562.4 | 562.4 |
| Space Heat | 2,492.3 | 4,173.1 |
| Space Cool | 340.6 | 268.1 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 1,183.3 | 1,209.8 |
| DHW | 710.9 | 710.9 |
| <i>Total</i> | 9,048.2 | 10,675.2 |
| Electricity | | |
| Demand (kW) | 524.5 | 507.2 |
| Energy (kWh) | 1,650,087.9 | 1,643,553.8 |
| Natural Gas | | |
| Consumption (m ³) | 8,241.7 | 12,620.4 |
| Charges (\$) | | |
| Electric (consumption) | 80,400.0 | 80,111.0 |
| Electric (demand) | 35,966.0 | 35,095.0 |
| Natural Gas | 25,443.0 | 38,802.0 |
| <i>Total</i> | 141,809.0 | 154,008.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Winnipeg Retail with Anchor | BUILDING CODE | |
|--------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 3,758.8 | 3,751.1 |
| Appliances | 562.4 | 562.4 |
| Space Heat | 7,383.5 | 6,912.6 |
| Space Cool | 539.7 | 519.2 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 1,162.1 | 1,532.2 |
| DHW | 710.9 | 710.9 |
| <i>Total</i> | 14,117.4 | 13,988.2 |
| Electricity | | |
| Demand (kW) | 635.4 | 6,650.0 |
| Energy (kWh) | 1,745,988.4 | 1,835,794.5 |
| Natural Gas | | |
| Consumption (m ³) | 20,772.8 | 19,572.8 |
| Charges (\$) | | |
| Electric (consumption) | 61,753.0 | 65,478.0 |
| Electric (demand) | 45,348.0 | 47,440.0 |
| Natural Gas | 83,702.0 | 78,920.0 |
| <i>Total</i> | 190,803.0 | 191,838.0 |

| Calgary Retail with Anchor | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 3,758.8 | 3,751.1 |
| Appliances | 562.4 | 562.4 |
| Space Heat | 4,817.3 | 4,858.2 |
| Space Cool | 323.4 | 293.6 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 1,156.9 | 1,465.6 |
| DHW | 710.9 | 710.9 |
| <i>Total</i> | 11,329.6 | 11,641.7 |
| Electricity | | |
| Demand (kW) | 539.3 | 563.0 |
| Energy (kWh) | 1,657,061.4 | 1,732,158.6 |
| Natural Gas | | |
| Consumption (m ³) | 14,226.8 | 14,337.7 |
| Charges (\$) | | |
| Electric (consumption) | 194,839.0 | 203,663.0 |
| Electric (demand) | 40,499.0 | 41,755.0 |
| Natural Gas | 35,869.0 | 36,145.0 |
| <i>Total</i> | 271,207.0 | 281,563.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Regina Retail with Anchor | BUILDING CODE | |
|--|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 3,758.8 | 3,751.1 |
| Appliances | 562.4 | 562.4 |
| Space Heat | 6,640.3 | 6,270.5 |
| Space Cool | 439.5 | 408.5 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 1,190.9 | 1,548.6 |
| DHW | 710.9 | 710.9 |
| <i>Total</i> | 13,302.7 | 13,252.0 |
| Electricity | | |
| Demand (kW) | 574.2 | 599.9 |
| Energy (kWh) | 1,719,266.4 | 1,803,124.4 |
| Natural Gas | | |
| Consumption (m ³) | 18,867.3 | 17,931.4 |
| Charges (\$) | | |
| Electric (consumption) | 108,363.0 | 113,344.0 |
| Electric (demand) | 58,928.0 | 61,313.0 |
| Natural Gas | 43,741.0 | 41,617.0 |
| <i>Total</i> | 211,032.0 | 216,274.0 |

| Saint John Retail with Anchor | BUILDING CODE | |
|--|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 3,758.8 | 3,751.1 |
| Appliances | 562.4 | 562.4 |
| Space Heat | 5,755.3 | 5,757.2 |
| Space Cool | 250.7 | 192.1 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 1,071.5 | 1,238.4 |
| DHW | 729.0 | 729.0 |
| <i>Total</i> | 12,127.6 | 12,230.2 |
| Electricity | | |
| Demand (kW) | 542.5 | 523.3 |
| Energy (kWh) | 1,612,378.1 | 1,657,852.5 |
| Oil | | |
| Consumption (L) | 16,770.8 | 16,609.0 |
| Charges (\$) | | |
| Electric (consumption) | 147,628.0 | 151,577.0 |
| Electric (demand) | 31,983.0 | 32,347.0 |
| Oil | 184,550.0 | 182,768.0 |
| <i>Total</i> | 364,161.0 | 366,692.0 |

Appendix D: Low Rise Office

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Toronto Low Rise Office | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 396.2 | 395.7 |
| Appliances | 441.6 | 441.6 |
| Space Heat | 924.5 | 1,248.0 |
| Space Cool | 428.9 | 454.7 |
| Heat Rejection | | |
| Pumps | 19.3 | 19.3 |
| Fans | 316.4 | 267.8 |
| DHW | 105.2 | 105.2 |
| <i>Total</i> | 2,632.0 | 2,932.3 |
| Electricity | | |
| Demand (kW) | 128.0 | 130.9 |
| Energy (kWh) | 452,517.2 | 448,210.0 |
| Natural Gas | | |
| Consumption (m ³) | 2,659.5 | 3,497.4 |
| Charges (\$) | | |
| Electric (consumption) | 23,527.0 | 23,302.0 |
| Electric (demand) | 11,002.0 | 11,003.0 |
| Natural Gas | 7,440.0 | 9,471.0 |
| <i>Total</i> | 41,969.0 | 43,776.0 |

| Montreal Low Rise Office | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 396.2 | 395.7 |
| Appliances | 441.6 | 441.6 |
| Space Heat | 1,106.9 | 1,487.9 |
| Space Cool | 520.1 | 456.2 |
| Heat Rejection | | |
| Pumps | 22.8 | 27.9 |
| Fans | 269.9 | 267.8 |
| DHW | 107.5 | 107.5 |
| <i>Total</i> | 2,865.0 | 3,184.5 |
| Electricity | | |
| Demand (kW) | 139.1 | 136.0 |
| Energy (kWh) | 466,727.9 | 453,279.0 |
| Natural Gas | | |
| Consumption (m ³) | 3,142.0 | 4,118.2 |
| Charges (\$) | | |
| Electric (consumption) | 29,752.0 | 29,100.0 |
| Electric (demand) | 9,109.0 | 8,466.0 |
| Natural Gas | 13,775.0 | 17,616.0 |
| <i>Total</i> | 52,636.0 | 55,182.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Halifax Low Rise Office | BUILDING CODE | |
|------------------------------------|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 396.2 | 395.7 |
| Appliances | 441.6 | 441.6 |
| Space Heat | 929.6 | 1,179.5 |
| Space Cool | 419.4 | 346.8 |
| Heat Rejection | | |
| Pumps | 19.3 | 22.9 |
| Fans | 267.4 | 264.7 |
| DHW | 119.4 | 123.8 |
| <i>Total</i> | 2,592.9 | 2,775.0 |
| Electricity | | |
| Demand (kW) | 126.5 | 119.2 |
| Energy (kWh) | 436,519.1 | 418,323.5 |
| Oil | | |
| Consumption (L) | 26,415.9 | 32,818.0 |
| Charges (\$) | | |
| Electric (consumption) | 42,443.0 | 40,568.0 |
| Electric (demand) | 10,510.0 | 9,900.0 |
| Oil | 28,497.0 | 35,400.0 |
| <i>Total</i> | 81,450.0 | 85,868.0 |

| Vancouver Low Rise Office | BUILDING CODE | |
|--------------------------------------|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 396.2 | 395.7 |
| Appliances | 441.6 | 441.6 |
| Space Heat | 787.0 | 888.1 |
| Space Cool | 438.7 | 321.2 |
| Heat Rejection | | |
| Pumps | 19.2 | 19.2 |
| Fans | 288.6 | 275.2 |
| DHW | 101.8 | 101.8 |
| <i>Total</i> | 2,473.1 | 2,443.0 |
| Electricity | | |
| Demand (kW) | 120.4 | 109.0 |
| Energy (kWh) | 446,657.1 | 410,705.3 |
| Natural Gas | | |
| Consumption (m ³) | 2,294.6 | 2,557.9 |
| Charges (\$) | | |
| Electric (consumption) | 28,117.0 | 26,482.0 |
| Electric (demand) | 3,309.0 | 2,884.0 |
| Natural Gas | 7,299.0 | 8,102.0 |
| <i>Total</i> | 38,725.0 | 37,468.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Winnipeg Low Rise Office | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 396.2 | 395.7 |
| Appliances | 441.6 | 441.6 |
| Space Heat | 1,302.0 | 1,717.1 |
| Space Cool | 481.7 | 482.5 |
| Heat Rejection | | |
| Pumps | 26.2 | 29.6 |
| Fans | 276.5 | 246.7 |
| DHW | 112.7 | 112.7 |
| <i>Total</i> | 3,036.8 | 3,425.9 |
| Electricity | | |
| Demand (kW) | 145.4 | 146.0 |
| Energy (kWh) | 460,193.9 | 456,707.1 |
| Natural Gas | | |
| Consumption (m ³) | 3,660.6 | 4,725.8 |
| Charges (\$) | | |
| Electric (consumption) | 21,249.0 | 21,139.0 |
| Electric (demand) | 5,595.0 | 5,511.0 |
| Natural Gas | 15,512.0 | 19,757.0 |
| <i>Total</i> | 42,356.0 | 46,407.0 |

| Calgary Low Rise Office | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 396.2 | 395.7 |
| Appliances | 441.6 | 441.6 |
| Space Heat | 1,039.1 | 1,307.9 |
| Space Cool | 435.9 | 399.6 |
| Heat Rejection | | |
| Pumps | 23.0 | 26.3 |
| Fans | 289.5 | 251.4 |
| DHW | 111.0 | 111.0 |
| <i>Total</i> | 2,736.2 | 2,933.5 |
| Electricity | | |
| Demand (kW) | 124.9 | 121.5 |
| Energy (kWh) | 448,297.9 | 431,069.2 |
| Natural Gas | | |
| Consumption (m ³) | 2,976.6 | 3,664.5 |
| Charges (\$) | | |
| Electric (consumption) | 51,559.0 | 49,578.0 |
| Electric (demand) | 6,073.0 | 5,861.0 |
| Natural Gas | 7,753.0 | 9,472.0 |
| <i>Total</i> | 65,385.0 | 64,911.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Regina Low Rise Office | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 396.2 | 395.7 |
| Appliances | 441.6 | 441.6 |
| Space Heat | 1,233.3 | 1,616.5 |
| Space Cool | 464.3 | 458.3 |
| Heat Rejection | | |
| Pumps | 24.5 | 29.8 |
| Fans | 274.3 | 253.9 |
| DHW | 112.6 | 112.6 |
| <i>Total</i> | 2,946.7 | 3,308.4 |
| Electricity | | |
| Demand (kW) | 132.5 | 132.5 |
| Energy (kWh) | 453,718.5 | 451,433.0 |
| Natural Gas | | |
| Consumption (m ³) | 3,483.7 | 4,464.7 |
| Charges (\$) | | |
| Electric (consumption) | 32,962.0 | 33,098.0 |
| Electric (demand) | 7,169.0 | 7,400.0 |
| Natural Gas | 10,797.0 | 8,492.0 |
| <i>Total</i> | 50,928.0 | 48,990.0 |

| Saint John Low Rise Office | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 396.2 | 395.7 |
| Appliances | 441.6 | 441.6 |
| Space Heat | 1,041.1 | 1,353.4 |
| Space Cool | 418.5 | 348.3 |
| Heat Rejection | | |
| Pumps | 21.1 | 26.2 |
| Fans | 268.2 | 273.6 |
| DHW | 122.0 | 126.3 |
| <i>Total</i> | 2,708.6 | 2,965.0 |
| Electricity | | |
| Demand (kW) | 124.4 | 118.6 |
| Energy (kWh) | 437,105.1 | 423,626.9 |
| Oil | | |
| Consumption (L) | 29,355.0 | 37,236.1 |
| Charges (\$) | | |
| Electric (consumption) | 39,372.0 | 38,118.0 |
| Electric (demand) | 6,792.0 | 6,652.0 |
| Oil | 33,127.0 | 42,022.0 |
| <i>Total</i> | 79,291.0 | 86,792.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| St. Johns Low Rise Office | BUILDING CODE | |
|------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 396.2 | 395.7 |
| Appliances | 441.6 | 441.6 |
| Space Heat | 1,035.2 | 1,388.2 |
| Space Cool | 352.9 | 286.2 |
| Heat Rejection | | |
| Pumps | 19.5 | 24.8 |
| Fans | 261.7 | 274.3 |
| DHW | 122.9 | 127.4 |
| <i>Total</i> | 2,630.0 | 2,938.3 |
| Electricity | | |
| Demand (kW) | 115.5 | 109.8 |
| Energy (kWh) | 417,327.2 | 406,515.4 |
| Oil | | |
| Consumption (L) | 29,161.2 | 38,144.8 |
| Charges (\$) | | |
| Electric (consumption) | 34,001.0 | 33,017.0 |
| Electric (demand) | 6,902.0 | 6,541.0 |
| Oil | 32,535.0 | 42,562.0 |
| <i>Total</i> | 73,438.0 | 82,120.0 |

| Charlottetown Low Rise Office | BUILDING CODE | |
|----------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 396.2 | 395.7 |
| Appliances | 441.6 | 441.6 |
| Space Heat | 1,061.1 | 1,372.7 |
| Space Cool | 373.0 | 345.5 |
| Heat Rejection | | |
| Pumps | 21.1 | 26.2 |
| Fans | 265.2 | 275.5 |
| DHW | 121.3 | 125.5 |
| <i>Total</i> | 2,679.6 | 2,982.7 |
| Electricity | | |
| Demand (kW) | 119.2 | 114.9 |
| Energy (kWh) | 424,535.2 | 423,480.4 |
| Oil | | |
| Consumption (L) | 29,769.8 | 37,710.9 |
| Charges (\$) | | |
| Electric (consumption) | 43,044.0 | 42,948.0 |
| Electric (demand) | 11,705.0 | 11,159.0 |
| Oil | 31,758.0 | 40,227.0 |
| <i>Total</i> | 86,507.0 | 94,334.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Iqaluit Low Rise Office | BUILDING CODE | |
|--|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 396.2 | 395.7 |
| Appliances | 441.6 | 441.6 |
| Space Heat | 1,501.9 | 2,942.9 |
| Space Cool | 195.1 | 277.9 |
| Heat Rejection | | |
| Pumps | 21.4 | 35.2 |
| Fans | 382.2 | 247.4 |
| DHW | 146.6 | 150.9 |
| <i>Total</i> | 3,085.0 | 4,491.7 |
| Electricity | | |
| Demand (kW) | 105.6 | 113.6 |
| Energy (kWh) | 410,558.8 | 410,793.2 |
| Oil | | |
| Consumption (L) | 41,561.4 | 77,924.3 |
| Charges (\$) | | |
| Electric (consumption) | 178,261.0 | 178,363.0 |
| Electric (demand) | 7,616.0 | 7,821.0 |
| Oil | 34,293.0 | 64,295.0 |
| <i>Total</i> | 220,170.0 | 250,479.0 |

| Whitehorse Low Rise Office | BUILDING CODE | |
|---|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 396.2 | 395.7 |
| Appliances | 441.6 | 441.6 |
| Space Heat | 1,138.1 | 1,821.1 |
| Space Cool | 248.3 | 277.1 |
| Heat Rejection | | |
| Pumps | 23.1 | 33.4 |
| Fans | 315.2 | 257.8 |
| DHW | 132.3 | 136.5 |
| <i>Total</i> | 2,694.9 | 3,363.4 |
| Electricity | | |
| Demand (kW) | 109.0 | 112.9 |
| Energy (kWh) | 404,024.8 | 405,314.0 |
| Oil | | |
| Consumption (L) | 32,081.2 | 49,254.3 |
| Charges (\$) | | |
| Electric (consumption) | 54,415.0 | 54,585.0 |
| Electric (demand) | 7,117.0 | 7,269.0 |
| Oil | 41,805.0 | 64,183.0 |
| <i>Total</i> | 103,337.0 | 126,037.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Yellowknife Low Rise Office | BUILDING CODE | |
|--|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 396.2 | 395.7 |
| Appliances | 441.6 | 441.6 |
| Space Heat | 1,266.6 | 2,444.8 |
| Space Cool | 207.7 | 288.8 |
| Heat Rejection | | |
| Pumps | 21.3 | 35.1 |
| Fans | 378.7 | 249.0 |
| DHW | 138.2 | 142.3 |
| <i>Total</i> | 2,850.4 | 3,997.3 |
| Electricity | | |
| Demand (kW) | 100.7 | 107.2 |
| Energy (kWh) | 411,320.6 | 410,998.3 |
| Oil | | |
| Consumption (L) | 35,421.4 | 65,120.2 |
| Charges (\$) | | |
| Electric (consumption) | 72,554.0 | 72,496.0 |
| Electric (demand) | 9,559.0 | 9,746.0 |
| Oil | 42,814.0 | 78,715.0 |
| <i>Total</i> | 124,927.0 | 160,957.0 |

Appendix E: Education

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Toronto Education | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 678.7 | 675.8 |
| Appliances | 327.8 | 327.8 |
| Space Heat | 1,789.2 | 2,463.0 |
| Space Cool | 275.4 | 263.3 |
| Heat Rejection | | |
| Pumps | 71.5 | 71.3 |
| Fans | 391.0 | 395.0 |
| DHW | 828.7 | 828.7 |
| <i>Total</i> | 4,362.2 | 5,025.0 |
| Electricity | | |
| Demand (kW) | 249.8 | 256.6 |
| Energy (kWh) | 484,425.4 | 481,407.5 |
| Natural Gas | | |
| Consumption (m ³) | 6,944.5 | 8,732.0 |
| Charges (\$) | | |
| Electric (consumption) | 25,184.0 | 25,027.0 |
| Electric (demand) | 19,399.0 | 19,512.0 |
| Natural Gas | 17,721.0 | 21,915.0 |
| <i>Total</i> | 62,304.0 | 66,454.0 |

| Montreal Education | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 678.7 | 675.8 |
| Appliances | 327.8 | 327.8 |
| Space Heat | 1,922.3 | 3,035.4 |
| Space Cool | 300.3 | 280.0 |
| Heat Rejection | | |
| Pumps | 67.2 | 66.6 |
| Fans | 393.1 | 400.7 |
| DHW | 828.7 | 828.7 |
| <i>Total</i> | 4,518.0 | 5,615.0 |
| Electricity | | |
| Demand (kW) | 305.0 | 308.4 |
| Energy (kWh) | 490,725.0 | 486,271.4 |
| Natural Gas | | |
| Consumption (m ³) | 7,297.7 | 10,250.5 |
| Charges (\$) | | |
| Electric (consumption) | 30,916.0 | 30,700.0 |
| Electric (demand) | 23,424.0 | 22,838.0 |
| Natural Gas | 30,155.0 | 41,709.0 |
| <i>Total</i> | 84,495.0 | 95,247.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Halifax Education | BUILDING CODE | |
|------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 678.7 | 675.8 |
| Appliances | 327.8 | 327.8 |
| Space Heat | 1,504.3 | 2,449.7 |
| Space Cool | 161.1 | 139.7 |
| Heat Rejection | | |
| Pumps | 69.2 | 69.0 |
| Fans | 378.4 | 392.6 |
| DHW | 849.8 | 849.9 |
| <i>Total</i> | 3,969.3 | 4,904.5 |
| Electricity | | |
| Demand (kW) | 240.1 | 241.7 |
| Energy (kWh) | 448,561.6 | 445,719.4 |
| Oil | | |
| Consumption (L) | 60,893.1 | 85,349.7 |
| Charges (\$) | | |
| Electric (consumption) | 47,385.0 | 47,106.0 |
| Electric (demand) | 17,238.0 | 17,233.0 |
| Oil | 65,690.0 | 92,068.0 |
| <i>Total</i> | 130,313.0 | 156,407.0 |

| Vancouver Education | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 678.7 | 675.8 |
| Appliances | 327.8 | 327.8 |
| Space Heat | 1,476.2 | 1,990.9 |
| Space Cool | 160.5 | 135.3 |
| Heat Rejection | | |
| Pumps | 74.1 | 74.1 |
| Fans | 375.9 | 380.0 |
| DHW | 828.7 | 828.7 |
| <i>Total</i> | 3,921.8 | 4,412.5 |
| Electricity | | |
| Demand (kW) | 204.6 | 193.1 |
| Energy (kWh) | 449,030.4 | 442,408.5 |
| Natural Gas | | |
| Consumption (m ³) | 6,114.2 | 7,479.6 |
| Charges (\$) | | |
| Electric (consumption) | 27,960.0 | 27,672.0 |
| Electric (demand) | 6,933.0 | 6,603.0 |
| Natural Gas | 18,952.0 | 23,118.0 |
| <i>Total</i> | 53,845.0 | 57,393.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Winnipeg Education | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 678.7 | 675.8 |
| Appliances | 327.8 | 327.8 |
| Space Heat | 2,378.7 | 3,472.3 |
| Space Cool | 274.7 | 269.6 |
| Heat Rejection | | |
| Pumps | 64.4 | 63.6 |
| Fans | 379.2 | 386.6 |
| DHW | 828.7 | 828.7 |
| <i>Total</i> | 4,932.1 | 6,024.4 |
| Electricity | | |
| Demand (kW) | 288.6 | 296.5 |
| Energy (kWh) | 478,975.5 | 478,623.9 |
| Natural Gas | | |
| Consumption (m ³) | 8,508.4 | 11,409.5 |
| Charges (\$) | | |
| Electric (consumption) | 21,840.0 | 21,829.0 |
| Electric (demand) | 13,500.0 | 13,688.0 |
| Natural Gas | 34,829.0 | 46,390.0 |
| <i>Total</i> | 70,169.0 | 81,907.0 |

| Calgary Education | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 678.7 | 675.8 |
| Appliances | 327.8 | 327.8 |
| Space Heat | 1,852.7 | 2,603.5 |
| Space Cool | 149.9 | 139.3 |
| Heat Rejection | | |
| Pumps | 67.8 | 67.3 |
| Fans | 378.5 | 384.3 |
| DHW | 828.7 | 828.7 |
| <i>Total</i> | 4,284.1 | 5,026.8 |
| Electricity | | |
| Demand (kW) | 204.7 | 210.2 |
| Energy (kWh) | 445,104.1 | 442,848.0 |
| Natural Gas | | |
| Consumption (m ³) | 7,113.0 | 9,104.5 |
| Charges (\$) | | |
| Electric (consumption) | 52,332.0 | 52,068.0 |
| Electric (demand) | 13,788.0 | 13,886.0 |
| Natural Gas | 18,088.0 | 23,066.0 |
| <i>Total</i> | 84,208.0 | 89,020.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Regina Education | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 678.7 | 675.8 |
| Appliances | 327.8 | 327.8 |
| Space Heat | 2,163.6 | 3,213.5 |
| Space Cool | 212.9 | 202.9 |
| Heat Rejection | | |
| Pumps | 63.3 | 62.8 |
| Fans | 378.9 | 383.9 |
| DHW | 828.7 | 828.7 |
| <i>Total</i> | 4,653.8 | 5,695.4 |
| Electricity | | |
| Demand (kW) | 251.2 | 258.7 |
| Energy (kWh) | 461,424.5 | 459,139.1 |
| Natural Gas | | |
| Consumption (m ³) | 7,937.8 | 10,723.0 |
| Charges (\$) | | |
| Electric (consumption) | 33,556.0 | 33,421.0 |
| Electric (demand) | 15,829.0 | 15,859.0 |
| Natural Gas | 18,954.0 | 33,421.0 |
| <i>Total</i> | 68,339.0 | 82,701.0 |

| Saint John Education | BUILDING CODE | |
|-------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 678.7 | 675.8 |
| Appliances | 327.8 | 327.8 |
| Space Heat | 1,710.5 | 2,728.9 |
| Space Cool | 107.1 | 109.6 |
| Heat Rejection | | |
| Pumps | 69.3 | 69.8 |
| Fans | 392.1 | 407.9 |
| DHW | 849.8 | 849.8 |
| <i>Total</i> | 4,135.3 | 5,169.6 |
| Electricity | | |
| Demand (kW) | 185.8 | 215.4 |
| Energy (kWh) | 437,427.4 | 441,851.8 |
| Oil | | |
| Consumption (L) | 66,225.4 | 92,567.7 |
| Charges (\$) | | |
| Electric (consumption) | 40,779.0 | 41,293.0 |
| Electric (demand) | 10,596.0 | 10,966.0 |
| Oil | 74,739.0 | 104,468.0 |
| <i>Total</i> | 126,114.0 | 156,727.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| St. Johns Education | BUILDING CODE | |
|------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 678.7 | 675.8 |
| Appliances | 327.8 | 327.8 |
| Space Heat | 1,824.4 | 2,917.6 |
| Space Cool | 78.0 | 71.8 |
| Heat Rejection | | |
| Pumps | 71.7 | 70.6 |
| Fans | 397.1 | 413.6 |
| DHW | 849.8 | 849.9 |
| <i>Total</i> | 4,227.5 | 5,327.1 |
| Electricity | | |
| Demand (kW) | 214.1 | 212.1 |
| Energy (kWh) | 431,332.9 | 433,149.5 |
| Oil | | |
| Consumption (L) | 69,172.6 | 97,452.4 |
| Charges (\$) | | |
| Electric (consumption) | 37,493.0 | 37,571.0 |
| Electric (demand) | 11,361.0 | 11,263.0 |
| Oil | 77,181.0 | 108,731.0 |
| <i>Total</i> | 126,035.0 | 157,565.0 |

| Charlottetown Education | BUILDING CODE | |
|----------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 678.7 | 675.8 |
| Appliances | 327.8 | 327.8 |
| Space Heat | 1,775.6 | 2,789.7 |
| Space Cool | 169.1 | 156.6 |
| Heat Rejection | | |
| Pumps | 70.7 | 69.3 |
| Fans | 389.2 | 401.2 |
| DHW | 849.8 | 849.8 |
| <i>Total</i> | 4,260.8 | 5,270.3 |
| Electricity | | |
| Demand (kW) | 210.5 | 209.6 |
| Energy (kWh) | 454,216.6 | 452,898.1 |
| Oil | | |
| Consumption (L) | 67,909.1 | 94,142.2 |
| Charges (\$) | | |
| Electric (consumption) | 45,807.0 | 45,685.0 |
| Electric (demand) | 21,320.0 | 21,272.0 |
| Oil | 72,441.0 | 100,425.0 |
| <i>Total</i> | 139,568.0 | 167,382.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Iqaluit Education | BUILDING CODE | |
|------------------------------|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 678.7 | 675.8 |
| Appliances | 327.8 | 327.8 |
| Space Heat | 4,701.3 | 6,811.0 |
| Space Cool | 37.6 | 45.4 |
| Heat Rejection | | |
| Pumps | 53.0 | 48.0 |
| Fans | 408.6 | 387.4 |
| DHW | 849.8 | 849.8 |
| <i>Total</i> | 7,056.7 | 9,145.2 |
| Electricity | | |
| Demand (kW) | 183.5 | 191.7 |
| Energy (kWh) | 418,118.4 | 412,258.3 |
| Oil | | |
| Consumption (L) | 143,587.5 | 198,157.7 |
| Charges (\$) | | |
| Electric (consumption) | 181,544.0 | 178,992.0 |
| Electric (demand) | 12,217.0 | 12,270.0 |
| Oil | 118,475.0 | 163,499.0 |
| <i>Total</i> | 312,236.0 | 354,761.0 |

| Whitehorse Education | BUILDING CODE | |
|---------------------------------|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 678.7 | 675.8 |
| Appliances | 327.8 | 327.8 |
| Space Heat | 2,749.8 | 4,091.3 |
| Space Cool | 59.7 | 58.1 |
| Heat Rejection | | |
| Pumps | 57.6 | 49.4 |
| Fans | 381.3 | 390.7 |
| DHW | 849.8 | 849.8 |
| <i>Total</i> | 5,104.6 | 6,442.9 |
| Electricity | | |
| Demand (kW) | 187.8 | 190.4 |
| Energy (kWh) | 417,971.9 | 417,092.8 |
| Oil | | |
| Consumption (L) | 93,108.0 | 127,808.9 |
| Charges (\$) | | |
| Electric (consumption) | 56,256.0 | 56,142.0 |
| Electric (demand) | 11,477.0 | 11,529.0 |
| Oil | 121,335.0 | 166,557.0 |
| <i>Total</i> | 189,068.0 | 234,228.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Yellowknife Education | BUILDING CODE | |
|----------------------------------|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 678.7 | 675.8 |
| Appliances | 327.8 | 327.8 |
| Space Heat | 3,682.6 | 5,456.4 |
| Space Cool | 76.3 | 85.9 |
| Heat Rejection | | |
| Pumps | 58.7 | 53.6 |
| Fans | 412.5 | 395.3 |
| DHW | 849.8 | 849.8 |
| <i>Total</i> | 6,086.3 | 7,844.6 |
| Electricity | | |
| Demand (kW) | 192.6 | 206.1 |
| Energy (kWh) | 431,538.0 | 427,260.1 |
| Oil | | |
| Consumption (L) | 117,237.1 | 163,118.4 |
| Charges (\$) | | |
| Electric (consumption) | 76,114.0 | 75,364.0 |
| Electric (demand) | 15,803.0 | 15,994.0 |
| Oil | 141,711.0 | 197,170.0 |
| <i>Total</i> | 233,628.0 | 288,528.0 |

Appendix F: Warehouse

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Toronto Warehouse | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 286.1 | 286.1 |
| Appliances | 41.4 | 41.4 |
| Space Heat | 1,752.0 | 2,201.4 |
| Space Cool | 5.9 | 7.1 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 119.1 | 133.7 |
| DHW | 121.6 | 121.6 |
| <i>Total</i> | 2,326.1 | 2,791.2 |
| Electricity | | |
| Demand (kW) | 54.1 | 57.8 |
| Energy (kWh) | 148,377.8 | 160,713.3 |
| Natural Gas | | |
| Consumption (m ³) | 4,940.4 | 5,869.3 |
| Charges (\$) | | |
| Electric (consumption) | 7,714.0 | 8,355.0 |
| Electric (demand) | 5,187.0 | 5,491.0 |
| Natural Gas | 12,902.0 | 15,102.0 |
| <i>Total</i> | 25,803.0 | 28,948.0 |

| Montreal Warehouse | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 286.1 | 286.1 |
| Appliances | 41.4 | 41.4 |
| Space Heat | 2,019.2 | 2,555.0 |
| Space Cool | 5.3 | 6.2 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 119.1 | 133.7 |
| DHW | 121.6 | 121.6 |
| <i>Total</i> | 2,592.7 | 3,144.0 |
| Electricity | | |
| Demand (kW) | 58.1 | 62.7 |
| Energy (kWh) | 151,688.8 | 166,983.6 |
| Natural Gas | | |
| Consumption (m ³) | 5,429.1 | 6,745.0 |
| Charges (\$) | | |
| Electric (consumption) | 13,214.0 | 14,260.0 |
| Electric (demand) | 242.0 | 517.0 |
| Natural Gas | 22,649.0 | 27,808.0 |
| <i>Total</i> | 36,105.0 | 42,585.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Halifax Warehouse | BUILDING CODE | |
|------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 286.1 | 286.1 |
| Appliances | 41.4 | 41.4 |
| Space Heat | 1,815.8 | 2,279.6 |
| Space Cool | 1.7 | 2.0 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 119.1 | 133.7 |
| DHW | 120.2 | 126.4 |
| <i>Total</i> | 2,384.2 | 2,869.2 |
| Electricity | | |
| Demand (kW) | 53.2 | 57.0 |
| Energy (kWh) | 143,572.5 | 157,519.6 |
| Oil | | |
| Consumption (L) | 48,299.1 | 59,547.7 |
| Charges (\$) | | |
| Electric (consumption) | 14,937.0 | 16,266.0 |
| Electric (demand) | 5,021.0 | 5,313.0 |
| Oil | 52,100.0 | 64,233.0 |
| <i>Total</i> | 72,058.0 | 85,812.0 |

| Vancouver Warehouse | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 286.1 | 286.1 |
| Appliances | 41.4 | 41.4 |
| Space Heat | 1,378.7 | 1,621.6 |
| Space Cool | 0.6 | 0.8 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 119.1 | 133.7 |
| DHW | 121.6 | 121.6 |
| <i>Total</i> | 1,947.5 | 2,205.3 |
| Electricity | | |
| Demand (kW) | 47.2 | 49.4 |
| Energy (kWh) | 137,800.3 | 146,297.5 |
| Natural Gas | | |
| Consumption (m ³) | 3,850.1 | 4,452.6 |
| Charges (\$) | | |
| Electric (consumption) | 12,317.0 | 13,070.0 |
| Electric (demand) | 402.0 | 493.0 |
| Natural Gas | 12,044.0 | 13,883.0 |
| <i>Total</i> | 24,763.0 | 27,446.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Winnipeg Warehouse | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 286.1 | 286.1 |
| Appliances | 41.4 | 41.4 |
| Space Heat | 2,323.7 | 2,925.8 |
| Space Cool | 5.6 | 6.4 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 119.1 | 133.7 |
| DHW | 121.6 | 121.6 |
| <i>Total</i> | 2,897.6 | 3,515.0 |
| Electricity | | |
| Demand (kW) | 59.0 | 62.6 |
| Energy (kWh) | 157,900.5 | 171,173.6 |
| Natural Gas | | |
| Consumption (m ³) | 6,178.0 | 7,689.5 |
| Charges (\$) | | |
| Electric (consumption) | 10,410.0 | 11,048.0 |
| Electric (demand) | 388.0 | 541.0 |
| Natural Gas | 25,542.0 | 31,566.0 |
| <i>Total</i> | 36,340.0 | 43,155.0 |

| Calgary Warehouse | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 286.1 | 286.1 |
| Appliances | 41.4 | 41.4 |
| Space Heat | 1,917.4 | 2,452.9 |
| Space Cool | 3.0 | 3.6 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 119.1 | 133.7 |
| DHW | 121.6 | 121.6 |
| <i>Total</i> | 2,488.5 | 3,039.2 |
| Electricity | | |
| Demand (kW) | 55.9 | 59.6 |
| Energy (kWh) | 147,791.8 | 159,599.9 |
| Natural Gas | | |
| Consumption (m ³) | 5,189.8 | 6,537.6 |
| Charges (\$) | | |
| Electric (consumption) | 16,996.0 | 18,354.0 |
| Electric (demand) | 2,994.0 | 3,153.0 |
| Natural Gas | 13,281.0 | 16,650.0 |
| <i>Total</i> | 33,271.0 | 38,157.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Regina Warehouse | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 286.1 | 286.1 |
| Appliances | 41.4 | 41.4 |
| Space Heat | 2,212.3 | 2,801.8 |
| Space Cool | 5.5 | 6.2 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 119.1 | 133.7 |
| DHW | 121.6 | 121.6 |
| <i>Total</i> | 2,786.0 | 3,390.8 |
| Electricity | | |
| Demand (kW) | 59.1 | 62.8 |
| Energy (kWh) | 154,999.7 | 167,979.9 |
| Natural Gas | | |
| Consumption (m ³) | 5,909.9 | 7,390.3 |
| Charges (\$) | | |
| Electric (consumption) | 15,384.0 | 16,331.0 |
| Electric (demand) | 503.0 | 755.0 |
| Natural Gas | 14,190.0 | 17,668.0 |
| <i>Total</i> | 30,077.0 | 34,754.0 |

| Saint John Warehouse | BUILDING CODE | |
|-------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 286.1 | 286.1 |
| Appliances | 41.4 | 41.4 |
| Space Heat | 2,029.9 | 2,544.6 |
| Space Cool | 0.8 | 1.1 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 119.1 | 133.7 |
| DHW | 120.2 | 126.4 |
| <i>Total</i> | 2,597.5 | 3,133.1 |
| Electricity | | |
| Demand (kW) | 55.2 | 59.9 |
| Energy (kWh) | 146,912.8 | 162,061.2 |
| Oil | | |
| Consumption (L) | 53,503.2 | 65,949.8 |
| Charges (\$) | | |
| Electric (consumption) | 13,655.0 | 15,009.0 |
| Electric (demand) | 3,450.0 | 3,667.0 |
| Oil | 60,378.0 | 74,426.0 |
| <i>Total</i> | 77,483.0 | 93,102.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| St. Johns Warehouse | BUILDING CODE | |
|------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 286.1 | 286.1 |
| Appliances | 41.4 | 41.4 |
| Space Heat | 2,138.5 | 2,694.3 |
| Space Cool | 0.4 | 0.5 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 119.1 | 133.7 |
| DHW | 120.2 | 126.4 |
| <i>Total</i> | 2,705.7 | 3,282.3 |
| Electricity | | |
| Demand (kW) | 51.9 | 56.3 |
| Energy (kWh) | 147,879.7 | 163,789.9 |
| Oil | | |
| Consumption (L) | 56,210.3 | 69,644.7 |
| Charges (\$) | | |
| Electric (consumption) | 12,698.0 | 13,981.0 |
| Electric (demand) | 4,112.0 | 4,375.0 |
| Oil | 62,714.0 | 77,707.0 |
| <i>Total</i> | 79,524.0 | 96,063.0 |

| Charlottetown Warehouse | BUILDING CODE | |
|----------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 286.1 | 286.1 |
| Appliances | 41.4 | 41.4 |
| Space Heat | 2,034.0 | 2,545.9 |
| Space Cool | 1.8 | 2.2 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 119.1 | 133.7 |
| DHW | 120.2 | 126.4 |
| <i>Total</i> | 2,602.6 | 3,135.7 |
| Electricity | | |
| Demand (kW) | 53.7 | 58.1 |
| Energy (kWh) | 148,377.8 | 163,643.4 |
| Oil | | |
| Consumption (L) | 53,500.5 | 65,867.9 |
| Charges (\$) | | |
| Electric (consumption) | 17,335.0 | 18,757.0 |
| Electric (demand) | 4,093.0 | 4,521.0 |
| Oil | 57,069.0 | 70,263.0 |
| <i>Total</i> | 78,497.0 | 93,541.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Iqaluit Warehouse | BUILDING CODE | |
|------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 286.1 | 286.1 |
| Appliances | 41.4 | 41.4 |
| Space Heat | 3,936.4 | 5,063.1 |
| Space Cool | 0.6 | 0.8 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 119.1 | 133.7 |
| DHW | 120.2 | 126.4 |
| <i>Total</i> | 4,503.8 | 5,651.4 |
| Electricity | | |
| Demand (kW) | 63.0 | 69.6 |
| Energy (kWh) | 183,274.7 | 210,289.8 |
| Oil | | |
| Consumption (L) | 99,428.2 | 126,594.5 |
| Charges (\$) | | |
| Electric (consumption) | 79,575.0 | 91,310.0 |
| Electric (demand) | 5,061.0 | 5,518.0 |
| Oil | 82,038.0 | 104,453.0 |
| <i>Total</i> | 166,674.0 | 201,281.0 |

| Whitehorse Warehouse | BUILDING CODE | |
|-------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 286.1 | 286.1 |
| Appliances | 41.4 | 41.4 |
| Space Heat | 2,761.5 | 3,451.1 |
| Space Cool | 0.6 | 0.7 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 119.1 | 133.7 |
| DHW | 120.2 | 126.4 |
| <i>Total</i> | 3,328.8 | 4,039.4 |
| Electricity | | |
| Demand (kW) | 64.5 | 68.5 |
| Energy (kWh) | 161,856.0 | 176,564.9 |
| Oil | | |
| Consumption (L) | 71,028.3 | 88,040.4 |
| Charges (\$) | | |
| Electric (consumption) | 20,973.0 | 23,110.0 |
| Electric (demand) | 4,381.0 | 4,632.0 |
| Oil | 92,561.0 | 114,730.0 |
| <i>Total</i> | 117,915.0 | 142,472.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Yellowknife Warehouse | BUILDING CODE | |
|--------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 286.1 | 286.1 |
| Appliances | 41.4 | 41.4 |
| Space Heat | 3,242.0 | 4,182.1 |
| Space Cool | 0.7 | 0.9 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 119.1 | 133.7 |
| DHW | 120.2 | 126.4 |
| <i>Total</i> | 3,809.5 | 4,770.6 |
| Electricity | | |
| Demand (kW) | 62.6 | 68.3 |
| Energy (kWh) | 170,704.8 | 193,559.2 |
| Oil | | |
| Consumption (L) | 82,637.1 | 105,374.5 |
| Charges (\$) | | |
| Electric (consumption) | 30,110.0 | 34,141.0 |
| Electric (demand) | 6,049.0 | 6,515.0 |
| Oil | 99,886.0 | 127,371.0 |
| <i>Total</i> | 136,045.0 | 168,027.0 |

Appendix G: Low Rise MURB

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Toronto Low rise MURB | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 270.6 | 266.9 |
| Appliances | 196.1 | 196.1 |
| Space Heat | 1,041.4 | 1,418.3 |
| Space Cool | 81.3 | 81.9 |
| Heat Rejection | | |
| Pumps | 44.2 | 44.9 |
| Fans | 166.2 | 166.8 |
| DHW | 1,312.3 | 1,312.3 |
| <i>Total</i> | 3,112.1 | 3,487.3 |
| Electricity | | |
| Demand (kW) | 78.4 | 81.0 |
| Energy (kWh) | 214,157.5 | 215,446.7 |
| Natural Gas | | |
| Consumption (m ³) | 6,210.2 | 7,193.0 |
| Charges (\$) | | |
| Electric (consumption) | 11,133.0 | 11,201.0 |
| Electric (demand) | 6,811.0 | 6,923.0 |
| Natural Gas | 16,022.0 | 18,335.0 |
| <i>Total</i> | 33,966.0 | 36,459.0 |

| Montreal Low rise MURB | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 270.6 | 266.9 |
| Appliances | 196.1 | 196.1 |
| Space Heat | 1,151.1 | 1,664.6 |
| Space Cool | 101.9 | 82.4 |
| Heat Rejection | | |
| Pumps | 47.5 | 47.6 |
| Fans | 166.5 | 166.7 |
| DHW | 1,347.2 | 1,347.2 |
| <i>Total</i> | 3,280.9 | 3,771.5 |
| Electricity | | |
| Demand (kW) | 80.4 | 79.9 |
| Energy (kWh) | 221,248.2 | 217,204.7 |
| Natural Gas | | |
| Consumption (m ³) | 6,589.9 | 7,929.6 |
| Charges (\$) | | |
| Electric (consumption) | 17,847.0 | 17,651.0 |
| Electric (demand) | 2,274.0 | 2,100.0 |
| Natural Gas | 27,474.0 | 32,712.0 |
| <i>Total</i> | 47,595.0 | 52,463.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Halifax Low rise MURB | BUILDING CODE | |
|--------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 270.6 | 266.9 |
| Appliances | 196.1 | 196.1 |
| Space Heat | 920.4 | 1,358.2 |
| Space Cool | 59.1 | 39.1 |
| Heat Rejection | | |
| Pumps | 44.1 | 43.7 |
| Fans | 166.6 | 166.6 |
| DHW | 1,364.9 | 1,364.9 |
| <i>Total</i> | 3,021.7 | 3,435.5 |
| Electricity | | |
| Demand (kW) | 70.9 | 69.3 |
| Energy (kWh) | 208,150.9 | 203,052.6 |
| Oil | | |
| Consumption (L) | 58,775.5 | 69,950.4 |
| Charges (\$) | | |
| Electric (consumption) | 21,236.0 | 20,700.0 |
| Electric (demand) | 6,608.0 | 6,419.0 |
| Oil | 63,402.0 | 75,458.0 |
| <i>Total</i> | 91,246.0 | 102,577.0 |

| Vancouver Low rise MURB | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 270.6 | 266.9 |
| Appliances | 196.1 | 196.1 |
| Space Heat | 539.5 | 844.8 |
| Space Cool | 69.6 | 35.2 |
| Heat Rejection | | |
| Pumps | 38.4 | 37.1 |
| Fans | 166.8 | 166.3 |
| DHW | 1,259.6 | 1,259.6 |
| <i>Total</i> | 2,540.7 | 2,806.1 |
| Electricity | | |
| Demand (kW) | 67.0 | 62.9 |
| Energy (kWh) | 207,975.1 | 197,895.7 |
| Natural Gas | | |
| Consumption (m ³) | 4,753.2 | 5,553.3 |
| Charges (\$) | | |
| Electric (consumption) | 17,256.0 | 16,791.0 |
| Electric (demand) | 1,366.0 | 1,148.0 |
| Natural Gas | 14,800.0 | 17,241.0 |
| <i>Total</i> | 33,422.0 | 35,180.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Winnipeg Low rise MURB | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 270.6 | 266.9 |
| Appliances | 196.1 | 196.1 |
| Space Heat | 1,426.7 | 1,898.7 |
| Space Cool | 93.7 | 83.0 |
| Heat Rejection | | |
| Pumps | 50.2 | 50.5 |
| Fans | 166.9 | 167.2 |
| DHW | 1,420.8 | 1,420.8 |
| <i>Total</i> | 3,625.0 | 4,083.3 |
| Electricity | | |
| Demand (kW) | 88.9 | 88.4 |
| Energy (kWh) | 220,779.4 | 219,109.3 |
| Natural Gas | | |
| Consumption (m ³) | 7,507.9 | 8,739.3 |
| Charges (\$) | | |
| Electric (consumption) | 13,305.0 | 13,253.0 |
| Electric (demand) | 1,774.0 | 1,717.0 |
| Natural Gas | 30,842.0 | 35,749.0 |
| <i>Total</i> | 45,921.0 | 50,719.0 |

| Calgary Low rise MURB | BUILDING CODE | |
|-------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 270.6 | 266.9 |
| Appliances | 196.1 | 196.1 |
| Space Heat | 1,005.4 | 1,373.7 |
| Space Cool | 58.6 | 44.3 |
| Heat Rejection | | |
| Pumps | 46.6 | 46.7 |
| Fans | 166.7 | 166.9 |
| DHW | 1,392.5 | 1,392.5 |
| <i>Total</i> | 3,136.5 | 3,487.2 |
| Electricity | | |
| Demand (kW) | 70.3 | 70.5 |
| Energy (kWh) | 209,000.6 | 205,338.0 |
| Natural Gas | | |
| Consumption (m ³) | 6,324.3 | 7,289.6 |
| Charges (\$) | | |
| Electric (consumption) | 24,038.0 | 23,617.0 |
| Electric (demand) | 3,816.0 | 3,715.0 |
| Natural Gas | 16,117.0 | 18,530.0 |
| <i>Total</i> | 43,971.0 | 45,862.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Regina Low rise MURB | BUILDING CODE | |
|---------------------------------------|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 270.6 | 266.9 |
| Appliances | 196.1 | 196.1 |
| Space Heat | 1,321.9 | 1,783.3 |
| Space Cool | 80.3 | 67.9 |
| Heat Rejection | | |
| Pumps | 48.0 | 48.0 |
| Fans | 167.2 | 167.4 |
| DHW | 1,418.4 | 1,418.4 |
| <i>Total</i> | 3,502.6 | 3,948.1 |
| Electricity | | |
| Demand (kW) | 83.8 | 84.5 |
| Energy (kWh) | 216,179.2 | 213,893.8 |
| Natural Gas | | |
| Consumption (m ³) | 7,226.1 | 8,430.0 |
| Charges (\$) | | |
| Electric (consumption) | 18,891.0 | 18,767.0 |
| Electric (demand) | 2,201.0 | 2,130.0 |
| Natural Gas | 17,282.0 | 20,110.0 |
| <i>Total</i> | 38,374.0 | 41,007.0 |

| Saint John Low rise MURB | BUILDING CODE | |
|---|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 270.6 | 266.9 |
| Appliances | 196.1 | 196.1 |
| Space Heat | 1,100.3 | 1,585.0 |
| Space Cool | 40.3 | 19.1 |
| Heat Rejection | | |
| Pumps | 43.9 | 43.4 |
| Fans | 166.4 | 166.3 |
| DHW | 1,400.4 | 1,400.4 |
| <i>Total</i> | 3,218.0 | 3,677.2 |
| Electricity | | |
| Demand (kW) | 67.3 | 65.4 |
| Energy (kWh) | 203,550.7 | 198,218.0 |
| Oil | | |
| Consumption (L) | 64,279.7 | 76,652.6 |
| Charges (\$) | | |
| Electric (consumption) | 18,766.0 | 18,252.0 |
| Electric (demand) | 4,380.0 | 4,205.0 |
| Oil | 72,543.0 | 86,507.0 |
| <i>Total</i> | 95,689.0 | 108,964.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| St. Johns Low rise MURB | BUILDING CODE | |
|----------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 270.6 | 266.9 |
| Appliances | 196.1 | 196.1 |
| Space Heat | 1,281.1 | 1,816.4 |
| Space Cool | 24.7 | 12.0 |
| Heat Rejection | | |
| Pumps | 44.7 | 44.3 |
| Fans | 166.1 | 166.1 |
| DHW | 1,412.3 | 1,412.3 |
| <i>Total</i> | 3,395.6 | 3,914.2 |
| Electricity | | |
| Demand (kW) | 65.6 | 63.2 |
| Energy (kWh) | 200,122.5 | 197,456.2 |
| Oil | | |
| Consumption (L) | 69,194.5 | 82,855.4 |
| Charges (\$) | | |
| Electric (consumption) | 17,017.0 | 16,749.0 |
| Electric (demand) | 5,205.0 | 5,047.0 |
| Oil | 77,203.0 | 92,446.0 |
| <i>Total</i> | 99,425.0 | 114,242.0 |

| Charlottetown Low rise MURB | BUILDING CODE | |
|--------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 270.6 | 266.9 |
| Appliances | 196.1 | 196.1 |
| Space Heat | 1,121.5 | 1,644.6 |
| Space Cool | 60.1 | 41.0 |
| Heat Rejection | | |
| Pumps | 46.5 | 46.2 |
| Fans | 166.3 | 166.3 |
| DHW | 1,393.1 | 1,393.1 |
| <i>Total</i> | 3,254.3 | 3,754.3 |
| Electricity | | |
| Demand (kW) | 70.6 | 68.6 |
| Energy (kWh) | 209,293.6 | 205,425.9 |
| Oil | | |
| Consumption (L) | 64,683.6 | 77,978.9 |
| Charges (\$) | | |
| Electric (consumption) | 23,008.0 | 22,646.0 |
| Electric (demand) | 6,263.0 | 6,049.0 |
| Oil | 68,999.0 | 83,183.0 |
| <i>Total</i> | 98,270.0 | 111,878.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Iqaluit Low rise MURB | BUILDING CODE | |
|--|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 270.6 | 266.9 |
| Appliances | 196.1 | 196.1 |
| Space Heat | 2,485.5 | 3,312.4 |
| Space Cool | 9.9 | 15.6 |
| Heat Rejection | | |
| Pumps | 49.4 | 54.5 |
| Fans | 165.8 | 167.0 |
| DHW | 1,745.3 | 1,745.3 |
| <i>Total</i> | 4,922.6 | 5,757.9 |
| Electricity | | |
| Demand (kW) | 61.9 | 68.0 |
| Energy (kWh) | 200,151.8 | 206,187.7 |
| Oil | | |
| Consumption (L) | 108,690.1 | 129,732.8 |
| Charges (\$) | | |
| Electric (consumption) | 86,897.0 | 89,519.0 |
| Electric (demand) | 5,201.0 | 5,424.0 |
| Oil | 89,680.0 | 107,042.0 |
| <i>Total</i> | 181,778.0 | 201,985.0 |

| Whitehorse Low rise MURB | BUILDING CODE | |
|---|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 270.6 | 266.9 |
| Appliances | 196.1 | 196.1 |
| Space Heat | 1,536.8 | 2,011.6 |
| Space Cool | 19.1 | 16.8 |
| Heat Rejection | | |
| Pumps | 52.3 | 52.9 |
| Fans | 166.2 | 166.7 |
| DHW | 1,548.6 | 1,548.6 |
| <i>Total</i> | 3,789.8 | 4,259.6 |
| Electricity | | |
| Demand (kW) | 64.6 | 66.2 |
| Energy (kWh) | 200,884.3 | 201,939.2 |
| Oil | | |
| Consumption (L) | 79,318.8 | 91,375.1 |
| Charges (\$) | | |
| Electric (consumption) | 26,474.0 | 26,642.0 |
| Electric (demand) | 4,873.0 | 4,925.0 |
| Oil | 103,363.0 | 119,075.0 |
| <i>Total</i> | 134,710.0 | 150,642.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Yellowknife Low rise MURB | BUILDING CODE | |
|------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 270.6 | 266.9 |
| Appliances | 196.1 | 196.1 |
| Space Heat | 2,055.0 | 2,757.8 |
| Space Cool | 21.7 | 29.8 |
| Heat Rejection | | |
| Pumps | 44.6 | 55.3 |
| Fans | 165.7 | 166.8 |
| DHW | 1,633.4 | 1,633.4 |
| <i>Total</i> | 4,387.2 | 5,106.0 |
| Electricity | | |
| Demand (kW) | 61.0 | 66.3 |
| Energy (kWh) | 200,825.7 | 208,678.3 |
| Oil | | |
| Consumption (L) | 94,772.6 | 112,633.4 |
| Charges (\$) | | |
| Electric (consumption) | 35,423.0 | 36,808.0 |
| Electric (demand) | 6,488.0 | 6,764.0 |
| Oil | 114,554.0 | 136,144.0 |
| <i>Total</i> | 156,465.0 | 179,716.0 |

Appendix H: Retail without Anchor Store

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Toronto Retail without Anchor | BUILDING CODE | |
|----------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 850.9 | 848.5 |
| Appliances | 140.6 | 140.6 |
| Space Heat | 1,503.9 | 2,225.3 |
| Space Cool | 226.6 | 222.9 |
| Heat Rejection Pumps | | |
| Fans | 439.4 | 536.3 |
| DHW | 317.2 | 317.2 |
| <i>Total</i> | 3,478.7 | 4,290.9 |
| Electricity | | |
| Demand (kW) | 177.7 | 187.3 |
| Energy (kWh) | 460,340.4 | 485,538.8 |
| Natural Gas | | |
| Consumption (m ³) | 4,831.0 | 6,744.7 |
| Charges (\$) | | |
| Electric (consumption) | 21,190.0 | 22,349.0 |
| Electric (demand) | 14,150.0 | 14,892.0 |
| Natural Gas | 11,858.0 | 16,048.0 |
| <i>Total</i> | 47,198.0 | 53,289.0 |

| Montreal Retail without Anchor | BUILDING CODE | |
|-----------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 850.9 | 848.5 |
| Appliances | 140.6 | 140.6 |
| Space Heat | 1,978.0 | 2,550.9 |
| Space Cool | 228.9 | 224.3 |
| Heat Rejection Pumps | | |
| Fans | 427.0 | 533.5 |
| DHW | 325.2 | 325.2 |
| <i>Total</i> | 3,950.6 | 4,623.0 |
| Electricity | | |
| Demand (kW) | 195.1 | 204.6 |
| Energy (kWh) | 457,498.3 | 485,157.9 |
| Natural Gas | | |
| Consumption (m ³) | 6,109.4 | 7,629.3 |
| Charges (\$) | | |
| Electric (consumption) | 29,305.0 | 30,646.0 |
| Electric (demand) | 14,489.0 | 15,820.0 |
| Natural Gas | 25,328.0 | 31,292.0 |
| <i>Total</i> | 69,122.0 | 77,758.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Halifax Retail without Anchor | BUILDING CODE | |
|---|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 850.9 | 848.5 |
| Appliances | 140.6 | 140.6 |
| Space Heat | 1,753.7 | 1,798.9 |
| Space Cool | 119.1 | 111.9 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 432.3 | 548.7 |
| DHW | 329.9 | 329.9 |
| <i>Total</i> | 3,626.6 | 3,778.6 |
| Electricity | | |
| Demand (kW) | 167.6 | 176.8 |
| Energy (kWh) | 428,520.0 | 458,201.5 |
| Oil | | |
| Consumption (L) | 5,527.3 | 5,647.1 |
| Charges (\$) | | |
| Electric (consumption) | 43,371.0 | 46,321.0 |
| Electric (demand) | 13,047.0 | 13,866.0 |
| Oil | 58,140.0 | 59,400.0 |
| <i>Total</i> | 114,558.0 | 119,587.0 |

| Vancouver Retail without Anchor | BUILDING CODE | |
|---|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 850.9 | 848.5 |
| Appliances | 140.6 | 140.6 |
| Space Heat | 946.1 | 1,409.7 |
| Space Cool | 130.0 | 110.6 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 441.7 | 482.8 |
| DHW | 305.8 | 305.8 |
| <i>Total</i> | 2,815.2 | 3,298.0 |
| Electricity | | |
| Demand (kW) | 152.2 | 152.0 |
| Energy (kWh) | 434,116.4 | 439,478.4 |
| Natural Gas | | |
| Consumption (m ³) | 3,321.1 | 4,550.9 |
| Charges (\$) | | |
| Electric (consumption) | 27,310.0 | 27,543.0 |
| Electric (demand) | 4,401.0 | 4,446.0 |
| Natural Gas | 10,431.0 | 14,182.0 |
| <i>Total</i> | 42,142.0 | 46,171.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Winnipeg Retail without Anchor | BUILDING CODE | |
|-----------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 850.9 | 848.5 |
| Appliances | 140.6 | 140.6 |
| Space Heat | 2,446.7 | 3,202.9 |
| Space Cool | 208.5 | 214.2 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 428.2 | 552.1 |
| DHW | 341.7 | 341.7 |
| <i>Total</i> | 4,416.5 | 5,300.0 |
| Electricity | | |
| Demand (kW) | 205.7 | 220.9 |
| Energy (kWh) | 452,165.6 | 487,531.3 |
| Natural Gas | | |
| Consumption (m ³) | 7,397.1 | 9,402.8 |
| Charges (\$) | | |
| Electric (consumption) | 20,996.0 | 22,109.0 |
| Electric (demand) | 8,660.0 | 9,721.0 |
| Natural Gas | 30,400.0 | 38,394.0 |
| <i>Total</i> | 60,056.0 | 70,224.0 |

| Calgary Retail without Anchor | BUILDING CODE | |
|----------------------------------|---------------|------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 850.9 | 848.5 |
| Appliances | 140.6 | 140.6 |
| Space Heat | 1,764.2 | 2,433.9 |
| Space Cool | 120.8 | 119.4 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 438.7 | 565.1 |
| DHW | 335.7 | 335.7 |
| <i>Total</i> | 3,650.8 | 4,443.2 |
| Electricity | | |
| Demand (kW) | 160.0 | 173.4 |
| Energy (kWh) | 430,746.9 | 464,794.1 |
| Natural Gas | | |
| Consumption (m ³) | 5,570.4 | 7,347.0 |
| Charges (\$) | | |
| Electric (consumption) | 50,647.0 | 54,648.0 |
| Electric (demand) | 10,688.0 | 11,551.0 |
| Natural Gas | 14,233.0 | 18,673.0 |
| <i>Total</i> | 75,568.0 | 84,872.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Regina Retail without Anchor | BUILDING CODE | |
|---|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 850.9 | 848.5 |
| Appliances | 140.6 | 140.6 |
| Space Heat | 2,253.7 | 3,006.6 |
| Space Cool | 171.3 | 172.4 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 445.1 | 577.6 |
| DHW | 341.3 | 341.3 |
| <i>Total</i> | 4,202.9 | 5,087.1 |
| Electricity | | |
| Demand (kW) | 186.7 | 201.2 |
| Energy (kWh) | 446,569.2 | 482,989.7 |
| Natural Gas | | |
| Consumption (m ³) | 6,883.8 | 8,881.2 |
| Charges (\$) | | |
| Electric (consumption) | 32,674.0 | 34,839.0 |
| Electric (demand) | 11,172.0 | 12,628.0 |
| Natural Gas | 16,478.0 | 21,170.0 |
| <i>Total</i> | 60,324.0 | 68,637.0 |

| Saint John Retail without Anchor | BUILDING CODE | |
|---|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 850.9 | 848.5 |
| Appliances | 140.6 | 140.6 |
| Space Heat | 2,010.1 | 2,241.3 |
| Space Cool | 94.7 | 84.3 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 405.8 | 498.3 |
| DHW | 338.0 | 338.0 |
| <i>Total</i> | 3,840.1 | 4,151.1 |
| Electricity | | |
| Demand (kW) | 154.7 | 161.7 |
| Energy (kWh) | 414,338.6 | 436,519.1 |
| Oil | | |
| Consumption (L) | 6,228.6 | 6,842.1 |
| Charges (\$) | | |
| Electric (consumption) | 38,037.0 | 40,043.0 |
| Electric (demand) | 8,481.0 | 8,864.0 |
| Oil | 68,542.0 | 75,292.0 |
| <i>Total</i> | 115,060.0 | 124,199.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| St. Johns Retail without Anchor | BUILDING CODE | |
|--|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 850.9 | 848.5 |
| Appliances | 140.6 | 140.6 |
| Space Heat | 2,163.0 | 2,428.6 |
| Space Cool | 65.5 | 63.3 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 386.2 | 470.1 |
| DHW | 340.8 | 340.8 |
| <i>Total</i> | 3,947.0 | 4,292.0 |
| Electricity | | |
| Demand (kW) | 143.1 | 153.4 |
| Energy (kWh) | 400,831.1 | 422,835.7 |
| Oil | | |
| Consumption (L) | 6,642.0 | 7,346.7 |
| Charges (\$) | | |
| Electric (consumption) | 33,515.0 | 35,374.0 |
| Electric (demand) | 8,173.0 | 8,657.0 |
| Oil | 72,259.0 | 79,926.0 |
| <i>Total</i> | 113,947.0 | 123,957.0 |

| Charlottetown Retail without Anchor | BUILDING CODE | |
|--|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 850.9 | 848.5 |
| Appliances | 140.6 | 140.6 |
| Space Heat | 2,111.6 | 2,158.1 |
| Space Cool | 133.9 | 130.8 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 410.8 | 525.6 |
| DHW | 336.2 | 336.2 |
| <i>Total</i> | 3,984.0 | 4,139.9 |
| Electricity | | |
| Demand (kW) | 150.0 | 160.8 |
| Energy (kWh) | 426,615.5 | 457,000.1 |
| Oil | | |
| Consumption (L) | 6,493.4 | 6,616.8 |
| Charges (\$) | | |
| Electric (consumption) | 43,240.0 | 46,066.0 |
| Electric (demand) | 15,350.0 | 16,662.0 |
| Oil | 67,541.0 | 68,824.0 |
| <i>Total</i> | 126,131.0 | 131,552.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Iqaluit Retail without Anchor | BUILDING CODE | |
|--|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 850.9 | 848.5 |
| Appliances | 140.6 | 140.6 |
| Space Heat | 5,312.0 | 5,418.8 |
| Space Cool | 23.9 | 29.3 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 369.4 | 640.1 |
| DHW | 416.3 | 416.3 |
| <i>Total</i> | 7,113.1 | 7,493.7 |
| Electricity | | |
| Demand (kW) | 132.9 | 161.5 |
| Energy (kWh) | 384,569.3 | 460,633.4 |
| Oil | | |
| Consumption (L) | 15,195.7 | 15,478.9 |
| Charges (\$) | | |
| Electric (consumption) | 166,986.0 | 199,997.0 |
| Electric (demand) | 9,046.0 | 10,790.0 |
| Oil | 122,257.0 | 124,534.0 |
| <i>Total</i> | 298,289.0 | 335,321.0 |

| Whitehorse Retail without Anchor | BUILDING CODE | |
|---|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 850.9 | 848.5 |
| Appliances | 140.6 | 140.6 |
| Space Heat | 3,215.7 | 2,903.4 |
| Space Cool | 39.2 | 39.1 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 396.5 | 564.8 |
| DHW | 371.5 | 371.5 |
| <i>Total</i> | 5,014.4 | 4,868.0 |
| Electricity | | |
| Demand (kW) | 138.7 | 155.1 |
| Energy (kWh) | 396,377.4 | 442,437.8 |
| Oil | | |
| Consumption (L) | 9,515.9 | 8,687.2 |
| Charges (\$) | | |
| Electric (consumption) | 53,407.0 | 59,490.0 |
| Electric (demand) | 7,871.0 | 9,683.0 |
| Oil | 120,919.0 | 110,389.0 |
| <i>Total</i> | 182,197.0 | 179,562.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Yellowknife Retail without Anchor | BUILDING CODE | |
|--|----------------------|-------------------------|
| | NECB-2011 | ASHRAE-90.1-2010 |
| End-Use (GJ) | | |
| Lights | 850.9 | 848.5 |
| Appliances | 140.6 | 140.6 |
| Space Heat | 4,188.4 | 3,865.0 |
| Space Cool | 57.6 | 65.2 |
| Heat Rejection | | |
| Pumps | | |
| Fans | 362.9 | 614.4 |
| DHW | 390.7 | 390.7 |
| <i>Total</i> | 5,991.0 | 5,924.5 |
| Electricity | | |
| Demand (kW) | 135.5 | 160.2 |
| Energy (kWh) | 392,158.1 | 463,475.6 |
| Oil | | |
| Consumption (L) | 12,146.9 | 11,289.1 |
| Charges (\$) | | |
| Electric (consumption) | 69,172.0 | 81,747.0 |
| Electric (demand) | 11,723.0 | 13,812.0 |
| Oil | 143,168.0 | 133,057.0 |
| <i>Total</i> | 224,063.0 | 228,616.0 |

Appendix I: Energy Criteria Tables

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

Energy Criteria - High Rise Office

The high rise office archetype represents a square 144,000 ft² (13,380 m²), 10-storey building with a wall-to-roof area ratio of 4.3. The maximum window-to-wall area ratio is 40% (varies by location). The zoning includes 5 zones per floor, with a 1,570ft² (146 m²) perimeter zone on each of the four major orientations and a core zone that accounts for 57% of the floor space. The HVAC system includes six built-up variable air volume (VAV) systems. A single natural gas boiler provides heating. A water-cooled electric compression chiller and cooling tower provide cooling. Walls are 75% curtain wall and 25% concrete block with brick veneer and interior insulation and drywall.

| Item | ASHRAE 90.1-2010 | | | | | NECB 2011 |
|--|----------------------------|------------------|-----------|-------|---|-----------|
| Exterior Walls (ft²·°F/Btuh) | | | | | | |
| Wall Type | Mass | Metal | Steel | Other | R _o | All |
| Toronto | 25% | 0% | 75% | 0% | 14.8 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Montreal | 25% | 0% | 75% | 0% | 14.8 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Halifax | 25% | 0% | 75% | 0% | 14.8 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Vancouver | 25% | 0% | 75% | 0% | 14.5 | 18.0 |
| | 11.1 | 14.5 | 15.6 | 15.6 | | |
| Winnipeg | 25% | 0% | 75% | 0% | 15.2 | 27.0 |
| | 14.1 | 17.5 | 15.6 | 19.6 | | |
| Calgary | 25% | 0% | 75% | 0% | 15.2 | 27.0 |
| | 14.1 | 17.5 | 15.6 | 19.6 | | |
| Regina | 25% | 0% | 75% | 0% | 15.2 | 27.0 |
| | 14.1 | 17.5 | 15.6 | 19.6 | | |
| Saint John | 25% | 0% | 75% | 0% | 14.8 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Roof (ft²·°F/Btuh) | | | | | | |
| Toronto | 20.8 | | | | | 31.0 |
| Montreal | 20.8 | | | | | 31.0 |
| Halifax | 20.8 | | | | | 31.0 |
| Vancouver | 20.8 | | | | | 25.0 |
| Winnipeg | 20.8 | | | | | 35.0 |
| Calgary | 20.8 | | | | | 35.0 |
| Regina | 20.8 | | | | | 35.0 |
| Saint John | 20.8 | | | | | 31.0 |
| Exposed Floor (ft²·°F/Btuh) | | | | | | |
| Toronto | 15.6 | | | | | 31.0 |
| Montreal | 15.6 | | | | | 31.0 |
| Halifax | 15.6 | | | | | 31.0 |
| Vancouver | 13.5 | | | | | 25.0 |
| Winnipeg | 15.6 | | | | | 35.0 |
| Calgary | 15.6 | | | | | 35.0 |
| Regina | 15.6 | | | | | 35.0 |
| Saint John | 15.6 | | | | | 31.0 |
| Glazing | | | | | | |
| Glazing Percent | 40% | | | | Toronto - 40%, Montreal - 39%, Halifax - 40%, Vancouver - 40%, Winnipeg - 29%, Calgary - 33%, Regina - 29%, Saint John - 36%, | |
| Window U-value | CurtainWall/ Storefront | Entrance Door | All Other | | All | |
| Toronto | 0.45 | 0.80 | 0.55 | | 0.387 | |
| Montreal | 0.45 | 0.80 | 0.55 | | 0.387 | |
| Halifax | 0.45 | 0.80 | 0.55 | | 0.387 | |
| Vancouver | 0.45 | 0.80 | 0.55 | | 0.423 | |
| Winnipeg | 0.40 | 0.80 | 0.45 | | 0.387 | |
| Calgary | 0.40 | 0.80 | 0.45 | | 0.387 | |
| Regina | 0.40 | 0.80 | 0.45 | | 0.387 | |
| Saint John | 0.45 | 0.80 | 0.55 | | 0.387 | |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria – High Rise Office (cont'd) | | |
|--|--|---|
| Window SHGC | ASHRAE 90.1-2010 | NECB 2011 |
| Toronto | 0.40 | No Requirement |
| Montreal | 0.40 | No Requirement |
| Halifax | 0.40 | No Requirement |
| Vancouver | 0.40 | No Requirement |
| Winnipeg | 0.45 | No Requirement |
| Calgary | 0.45 | No Requirement |
| Regina | 0.45 | No Requirement |
| Saint John | 0.40 | No Requirement |
| Swinging Doors | | |
| Fully Glazed U-Value | See under Glazing | 0.476 |
| Opaque Door - Uvalue | 0.7 Toronto, Montreal, Halifax, Vancouver, Saint John 0.5 Winnipeg, Calgary, Regina | Toronto, Montreal, Halifax, Winnipeg, Calgary, Regina, Saint John = 0.387 Vancouver = 0.423 |
| Underground Wall and Roof (ft ² ·°F/Btuh) | | |
| Toronto | Wall only: R-7.5 | 20.0 |
| Montreal | Wall only: R-7.5 | 20.0 |
| Halifax | Wall only: R-7.5 | 20.0 |
| Vancouver | Wall only: R-7.5 | 10.0 |
| Winnipeg | Wall only: R-7.5 | 20.0 |
| Calgary | Wall only: R-7.5 | 20.0 |
| Regina | Wall only: R-7.5 | 20.0 |
| Saint John | Wall only: R-7.5 | 20.0 |
| Floors-on-Ground (ft ² ·°F/Btuh) | | |
| Toronto | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Montreal | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Halifax | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Vancouver | No Requirement | 7.5 (Min 1.2m from Perimeter) |
| Winnipeg | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Calgary | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Regina | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Saint John | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Leakage Rates | | |
| Envelope L/s/m ² | No Requirement | No Requirement |
| LIGHTING | | |
| Interior Lighting (W/ft ²) | 0.900 | 0.901 |
| Interior Lighting Control | Occupancy Sensors in specified spaces | Occupancy Sensors in specified spaces |
| Daylighting Control | No Requirement | No Requirement |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria – High Rise Office (cont'd) | | |
|---|---|--|
| HVAC | ASHRAE 90.1-2010 | NECB 2011 |
| Hot water Flow | No requirement when pumping power is less than 7.5 kW, riding curve | No requirement when pumping power is less than 7.5 kW, riding curve |
| Chilled Water flow | VSD pump with Variable flow down to 50% flow | No requirement when pumping power is less than 7.5 kW, riding curve |
| HVAC System | VAV reheat | VAV reheat |
| Economizer | 100 % Differential Enthalpy | 100 % Differential Enthalpy |
| Fan Power Limit | bhp = CFM * (0.0013 + 0.000121) Set as follows: Supply / Return Static = 4.0 in / 1.0 in Supply / Return Eff = 0.55 / 0.42 | Power input = 2.65 W/(L/s) Set as follows: Supply / Return Static = 4.0 in / 1.0 in Supply / Return Eff = 0.55 / 0.30 |
| Fan Control | VSD | VSD |
| Cooling Supply T Control | Zone Reset | Zone Reset |
| Heating Supply T Control | Constant at 55°F | Constant at 55°F |
| Humidification | N/A | N/A |
| Demand Control Ventilation | None | None |
| AHU Air to Air heat recovery | No Requirement | No Requirement |
| Space temperature Setback | Occupied: 71.6°/75.2°F; Setback: 64.4°/99°F | Occupied: 71.6°/75.2°F; Setback: 64.4°/99°F |
| Hot water Loop T control | Constant | Constant |
| Chilled water Loop T control | Constant | Constant |
| Outside Air | 19,600 CFM | 19,600 CFM |
| Boiler Heating Efficiency | 82% Ec, or 80%Et if < 733 kW (gas), 84% Ec (oil) | 83% Et, or 83.3% Ec if < 733 kW (gas), 85.8% |
| Boiler Type and Number | Single stage, 1 | Fully Modulating, 1, or Two-Stage |
| Hot water temperature | 28.8°F drop; 180°F supply | 28.8°F drop; 180°F supply |
| Chiller Cooling Efficiency | COP = 6.11, or COP 5.5 if < 1055 kW | COP = 6.1, or COP = 5.55 if < 1055 kW |
| Chiller Type and Number | Centrifugal, 1 | Centrifugal, 1 |
| Chilled water temperature | 11°F rise; 44°F supply | 11°F rise; 44°F supply |
| Cooling Tower | One cell cooling tower with 85°F - 95°F temperature rise, with one speed Fan . DOE2 TWR-EIR = 0.01388 (axial fan assumed). | One cell cooling tower with 85°F - 95°F temperature rise, with one speed Fan . DOE2 TWR-EIR = 0.015. |
| Tower Sizing, Number of Cells | Auto-sized to meet the Load, 1 | Auto-sized to meet the Load, 1 |
| Cooling Tower Pump | Constant Speed Pump, 60ft head | Constant Speed Pump, 60ft head |
| SERVICE WATER HEATING | | |
| Thermal Efficiency or EF | 80% Et (gas), 78% Et (oil) | 0.67 - 0.0019V EF (V in gallons) (gas), 0.55 EF (oil) |
| Stanby loss | Q/800+110*√V (Btu/h, V in gallons) | No Requirement |
| Supply Temperature | 140°F | 140°F |
| Showers (L/min) | No Requirement | No Requirement |
| Lavatory Faucets (L/min) | No Requirement | No Requirement |
| Electric Power | | |
| Motor Efficiency | Premium | Premium |
| Pump Efficiency | 65% | 65% |
| Equipment density (W/ft ²) | 0.6968 | 0.6968 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria - High Rise MURB | | | | | | | |
|--|----------------------------|------------------|-----------|-------|---|----------------|------------------|
| <p>The high rise MURB archetype represents a square 146,450 ft² (13,611 m²), 20-storey building with a wall-to-roof area ratio of 8.1. The maximum window-to-wall area ratio is 40% (varies by location). The zoning includes 6 apartments and 1 core zone per floor. The HVAC system is a two-pipe fan coil system serving the apartments and a hydronically heated and cooled make-up air unit providing fresh air to the core zones. Fresh air infiltrates into the suites from the core zone via the door undercut. The fan coils are supplied by a single natural gas boiler and a single water-cooled chiller. Walls are 75% window wall and 25% concrete block with brick veneer and interior insulation and drywall.</p> | | | | | | | |
| Item | ASHRAE 90.1-2010 | | | | NECB 2011 | Notes and Assu | |
| Exterior Walls (ft ² ·F/Btuh) | | | | | | | |
| Wall Type | Mass | Metal | Steel | Other | R _o | All | |
| Toronto | 25% | 0% | 75% | 0% | 15.2 | 23.0 | |
| | 14.1 | 14.5 | 15.6 | 19.6 | | | |
| Montreal | 25% | 0% | 75% | 0% | 15.2 | 23.0 | |
| | 14.1 | 14.5 | 15.6 | 19.6 | | | |
| Halifax | 25% | 0% | 75% | 0% | 15.2 | 23.0 | |
| | 14.1 | 14.5 | 15.6 | 19.6 | | | |
| Vancouver | 25% | 0% | 75% | 0% | 14.8 | 18.0 | |
| | 12.5 | 14.5 | 15.6 | 19.6 | | | |
| Winnipeg | 25% | 0% | 75% | 0% | 21.4 | 27.0 | |
| | 14.1 | 17.5 | 23.8 | 19.6 | | | |
| Calgary | 25% | 0% | 75% | 0% | 21.4 | 27.0 | |
| | 14.1 | 17.5 | 23.8 | 19.6 | | | |
| Regina | 25% | 0% | 75% | 0% | 21.4 | 27.0 | |
| | 14.1 | 17.5 | 23.8 | 19.6 | | | |
| Saint John | 25% | 0% | 75% | 0% | 15.2 | 23.0 | |
| | 14.1 | 14.5 | 15.6 | 19.6 | | | |
| Roof (ft ² ·F/Btuh) | | | | | | | |
| Toronto | | | | | | 31.0 | MNECB: Roof Type |
| Montreal | | | | | | 31.0 | |
| Halifax | | | | | | 31.0 | |
| Vancouver | | | | | | 25.0 | |
| Winnipeg | | | | | | 35.0 | |
| Calgary | | | | | | 35.0 | |
| Regina | | | | | | 35.0 | |
| Saint John | | | | | | 31.0 | |
| Exposed Floor (ft ² ·F/Btuh) | | | | | | | |
| Toronto | | | | | | 17.5 | 31.0 |
| Montreal | | | | | | 17.5 | 31.0 |
| Halifax | | | | | | 17.5 | 31.0 |
| Vancouver | | | | | | 15.6 | 25.0 |
| Winnipeg | | | | | | 19.6 | 35.0 |
| Calgary | | | | | | 19.6 | 35.0 |
| Regina | | | | | | 19.6 | 35.0 |
| Saint John | | | | | | 17.5 | 31.0 |
| Glazing | | | | | | | |
| Glazing Percent | 40% | | | | Toronto - 40%, Montreal - 39%, Halifax - 40%, Vancouver - 40%, Winnipeg - 29%, Calgary - 33%, Regina - 29%, Saint John - 36%, | | MNECB: Glazing a |
| Window U-value | CurtainWall/ Storefront | Entrance Door | All Other | | All | | ASHRAE: Glazing |
| Toronto | 0.45 | 0.80 | 0.55 | | 0.387 | | 40% |
| Montreal | 0.45 | 0.80 | 0.55 | | 0.387 | | 39% |
| Halifax | 0.45 | 0.80 | 0.55 | | 0.387 | | 40% |
| Vancouver | 0.45 | 0.80 | 0.55 | | 0.423 | | 40% |
| Winnipeg | 0.40 | 0.80 | 0.45 | | 0.387 | | 29% |
| Calgary | 0.40 | 0.80 | 0.45 | | 0.387 | | 33% |
| Regina | 0.40 | 0.80 | 0.45 | | 0.387 | | 29% |
| Saint John | 0.45 | 0.80 | 0.55 | | 0.387 | | 36% |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria – High Rise MURB (cont'd) | | |
|--|--|---|
| Window SHGC | ASHRAE 90.1-2010 | NECB 2011 |
| Toronto | 0.40 | No Requirement |
| Montreal | 0.40 | No Requirement |
| Halifax | 0.40 | No Requirement |
| Vancouver | 0.40 | No Requirement |
| Winnipeg | No Requirement | No Requirement |
| Calgary | No Requirement | No Requirement |
| Regina | No Requirement | No Requirement |
| Saint John | 0.40 | No Requirement |
| Swinging Doors | | |
| Fully Glazed U-Value | See under Glazing | 0.476 |
| Opaque Door - Uvalue | 0.7 Toronto, Montreal, Halifax, Vancouver, Saint John 0.5 Winnipeg, Calgary, Regina | Toronto, Montreal, Halifax, Winnipeg, Calgary, Regina, Saint John = 0.387 Vancouver = 0.423 |
| Underground Wall and Roof (ft ² ·°F/Btuh) | | |
| Toronto | Wall only: R-7.5 | 20.0 |
| Montreal | Wall only: R-7.5 | 20.0 |
| Halifax | Wall only: R-7.5 | 20.0 |
| Vancouver | Wall only: R-7.5 | 10.0 |
| Winnipeg | Wall only: R-10.0 | 20.0 |
| Calgary | Wall only: R-10.0 | 20.0 |
| Regina | Wall only: R-10.0 | 20.0 |
| Saint John | Wall only: R-7.5 | 20.0 |
| Floors-on-Ground (ft ² ·°F/Btuh) | | |
| Toronto | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Montreal | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Halifax | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Vancouver | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Winnipeg | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Calgary | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Regina | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Saint John | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Leakage Rates | | |
| Envelope L/s/m ² | No Requirement | No Requirement |
| LIGHTING | | |
| Interior Lighting (W/ft ²) | 0.600 | 0.604 |
| Interior Lighting Control | Manual | Manual |
| Daylighting Control | No Requirement | No Requirement |
| Parking Garage LPD (W/ft ²) | 0.25 | 0.251 |
| Interior Lighting Control | Occupancy Sensor in Garage | No Requirement |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria – High Rise MURB (cont'd) | | |
|---|---|---|
| HVAC | ASHRAE 90.1-2010 | NECB 2011 |
| Fan Coil Water flow | VSD pump with Variable flow down to 50% flow | No requirement when pumping power is less than 7.5 kW, riding curve |
| HVAC System | MUA unit with hot and chilled water coils, two pipe fan coils in suites | MUA unit with hot and chilled water coils, two pipe fan coils in suites |
| Economizer | No Requirement | No Requirement |
| Fan Power Limit | bhp = CFM * (0.00094) Set as follows: Supply Static = 2.6 in Supply Eff = 0.40 | Power input = 1.6 W/(L/s) Set as follows: Supply Static = 2.6 in Supply Eff = 0.40 |
| Fan Control | Constant | Constant |
| Cooling Supply T Control | Constant | Constant |
| Heating Supply T Control | Constant | Constant |
| Humidification | N/A | N/A |
| Demand Control Ventilation | None | None |
| AHU Air to Air heat recovery | No Requirement | No Requirement |
| Space temperature Setback | Daytime: 71.6°/75.2°F; Setback: 65.0°/none | Daytime: 71.6°/75.2°F; Setback: 65.0°/none |
| Hot water Loop T control | Constant | Constant |
| Chilled water Loop T control | Constant | Constant |
| Outside Air | 8,600 CFM | 8,600 CFM |
| Boiler Heating Efficiency | 80% Et (gas), 82% Et (oil) | 82.5% Ec and 83.0% Et (gas) 83.4% (oil) |
| Boiler Type and Number | Single stage, 1 | Fully Modulating, 1, or Two-Stage |
| Unit heaters in Garage | 80% Ec (oil and gas) | 82% Et (gas) 81%Et (oil) |
| Hot water temperature | 28.8°F drop; 180°F supply | 28.8°F drop; 180°F supply |
| Chiller Cooling Efficiency | COP = 5.55 | COP = 5.5 |
| Chiller Type and Number | Centrigual, 1 | Centrigual, 1 |
| Chilled water temperature | 11°F rise; 44°F supply | 11°F rise; 44°F supply |
| Cooling Tower | One cell cooling tower with 85°F - 95°F temperature rise, with one or two speed fan (two for > 7.5 hp) . DOE2 TWR-EIR = 0.01388 (axial fan assumed). | One cell cooling tower with 85°F - 95°F temperature rise, with one speed Fan . DOE2 TWR-EIR = 0.015. |
| Tower Sizing, Number of Cells | Auto-sized to meet the Load, 1 | Auto-sized to meet the Load, 1 |
| Cooling Tower Pump | Constant Speed Pump, 60ft head | Constant Speed Pump, 60ft head |
| Parking Garage Fan Control | Automatically detect contaminant levels and use fan with two flow rates. | No Requirement |
| SERVICE WATER HEATING | | |
| Thermal Efficiency or EF | 80% Et (gas), 78% Et (oil) | 0.67 - 0.0019V EF (V in gallons) (gas), |
| Stanby loss | $Q/800+110*\sqrt{V}$ (Btu/h, V in gallons) | No Requirement |
| Supply Temperature | 140°F | 140°F |
| Showers (L/min) | No Requirement | No Requirement |
| Lavatory Faucets (L/min) | No Requirement | No Requirement |
| Electric Power | | |
| Motor Efficiency | Premium | Premium |
| Pump Efficiency | 65% | 65% |
| Equipment demand (W/ft ²) | 0.4645 | 0.4645 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

Energy Criteria - Retail with Anchor Store

The retail archetype represents a 1-storey building with a total floor area of 17,662 m² (190,123 ft²) and consists of several small retail outlets attached to one large anchor store. The floor area of each individual retail outlet ranges from 56 m² (600 ft²) to 223 m² (2,400 ft²). The anchor store has a floor area of 8,279 m² (89,115 ft²). The wall-to-roof area ratio is 0.42. The window-to-wall area ratio is 18.2%. Walls are insulated cavity walls with a brick veneer. Separate packaged constant volume systems serve each retail outlet. Several packaged constant volume systems serve the sales area in the anchor store. These packaged systems each contain a natural gas furnace and a DX cooling section. No zone reheat is provided by these systems. A packaged VAV system with DX cooling and electric reheat serves the administrative area of the anchor store.

| Item | ASHRAE 90.1-2010 | | | | | NECB 2011 |
|--|----------------------------|------------------|-----------|-------|----------------|-----------|
| Exterior Walls (ft²·°F/Btuh) | | | | | | |
| Wall Type | Mass | Metal | Steel | Other | R _o | All |
| Toronto | 100% | 0% | 0% | 0% | 12.5 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Montreal | 100% | 0% | 0% | 0% | 12.5 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Halifax | 100% | 0% | 0% | 0% | 12.5 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Vancouver | 100% | 0% | 0% | 0% | 11.1 | 18.0 |
| | 11.1 | 14.5 | 15.6 | 15.6 | | |
| Winnipeg | 100% | 0% | 0% | 0% | 14.1 | 27.0 |
| | 14.1 | 17.5 | 15.6 | 19.6 | | |
| Calgary | 100% | 0% | 0% | 0% | 14.1 | 27.0 |
| | 14.1 | 17.5 | 15.6 | 19.6 | | |
| Regina | 100% | 0% | 0% | 0% | 14.1 | 27.0 |
| | 14.1 | 17.5 | 15.6 | 19.6 | | |
| Saint John | 100% | 0% | 0% | 0% | 12.5 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Roof (ft²·°F/Btuh) | | | | | | |
| Toronto | 20.8 | | | | | 31.0 |
| Montreal | 20.8 | | | | | 31.0 |
| Halifax | 20.8 | | | | | 31.0 |
| Vancouver | 20.8 | | | | | 25.0 |
| Winnipeg | 20.8 | | | | | 35.0 |
| Calgary | 20.8 | | | | | 35.0 |
| Regina | 20.8 | | | | | 35.0 |
| Saint John | 20.8 | | | | | 31.0 |
| Exposed Floor (ft²·°F/Btuh) | | | | | | |
| Toronto | 15.6 | | | | | 31.0 |
| Montreal | 15.6 | | | | | 31.0 |
| Halifax | 15.6 | | | | | 31.0 |
| Vancouver | 13.5 | | | | | 25.0 |
| Winnipeg | 15.6 | | | | | 35.0 |
| Calgary | 15.6 | | | | | 35.0 |
| Regina | 15.6 | | | | | 35.0 |
| Saint John | 15.6 | | | | | 31.0 |
| Glazing | | | | | | |
| Glazing Percent | 18.2% | | | | | 18.2% |
| Window U-value | CurtainWall/ Storefront | Entrance Door | All Other | | | All |
| Toronto | 0.45 | 0.80 | 0.55 | | | 0.387 |
| Montreal | 0.45 | 0.80 | 0.55 | | | 0.387 |
| Halifax | 0.45 | 0.80 | 0.55 | | | 0.387 |
| Vancouver | 0.45 | 0.80 | 0.55 | | | 0.423 |
| Winnipeg | 0.40 | 0.80 | 0.45 | | | 0.387 |
| Calgary | 0.40 | 0.80 | 0.45 | | | 0.387 |
| Regina | 0.40 | 0.80 | 0.45 | | | 0.387 |
| Saint John | 0.45 | 0.80 | 0.55 | | | 0.387 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria – Retail with Anchor Store (cont'd) | | |
|--|--|---|
| Window SHGC | ASHRAE 90.1-2010 | NECB 2011 |
| Toronto | 0.40 | No Requirement |
| Montreal | 0.40 | No Requirement |
| Halifax | 0.40 | No Requirement |
| Vancouver | 0.40 | No Requirement |
| Winnipeg | 0.45 | No Requirement |
| Calgary | 0.45 | No Requirement |
| Regina | 0.45 | No Requirement |
| Saint John | 0.40 | No Requirement |
| Swinging Doors | | |
| Fully Glazed U-Value | See under Glazing | 0.476 |
| Opaque Door - Uvalue | 0.7 Toronto, Montreal, Halifax, Vancouver, Saint John 0.5 Winnipeg, Calgary, Regina | Toronto, Montreal, Halifax, Winnipeg, Calgary, Regina, Saint John = 0.387 Vancouver = 0.423 |
| Underground Wall and Roof (ft ² ·°F/Btuh) | | |
| Toronto | Wall only: R-7.5 | 20.0 |
| Montreal | Wall only: R-7.5 | 20.0 |
| Halifax | Wall only: R-7.5 | 20.0 |
| Vancouver | Wall only: R-7.5 | 10.0 |
| Winnipeg | Wall only: R-7.5 | 20.0 |
| Calgary | Wall only: R-7.5 | 20.0 |
| Regina | Wall only: R-7.5 | 20.0 |
| Saint John | Wall only: R-7.5 | 20.0 |
| Floors-on-Ground (ft ² ·°F/Btuh) | | |
| Toronto | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Montreal | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Halifax | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Vancouver | No Requirement | 7.5 (Min 1.2m from Perimeter) |
| Winnipeg | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Calgary | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Regina | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Saint John | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Leakage Rates | | |
| Envelope L/s/m ² | No Requirement | No Requirement |
| LIGHTING | | |
| Interior Lighting (W/ft ²) | 1.400 | 1.403 |
| Interior Lighting Control | Manual | Manual |
| Daylighting Control | No Requirement | No Requirement |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria – Retail with Anchor Store (cont'd) | | |
|---|---|--|
| HVAC | ASHRAE 90.1-2010 | NECB 2011 |
| Hot water Flow | N/A | N/A |
| Chilled Water flow | N/A | N/A |
| HVAC System | CV: Gas fired, DX cooling, no zone reheat. VAV: Gas fired, DX cooling, electric reheat. | CV: Gas fired, DX cooling, no zone reheat. VAV: Gas fired, DX cooling, electric reheat. |
| Economizer | 100 % Differential Enthalpy | 100 % Differential Enthalpy |
| CV Fan power limit | Without Heat Recovery: bhp = CFM * (0.00094 + 0.000121) Set as follows: Supply / Return Static = 2.0 in / 0.6 in Supply / Return Eff = 0.50 / 0.17 With Heat Recovery: bhp = CFM * (0.00094 + 0.000266) Set as follows: Supply / Return Static = 2.0 in / 0.6 in Supply / Return Eff = 0.50 / 0.13 | Power input = 1.6 W/(L/s) Set as follows: Supply / Return Static = 2.0 in / 0.6 in Supply / Return Eff = 0.50 / 0.25 |
| VAV Fan Power Limit | Without Heat Recovery: bhp = CFM * (0.0013 + 0.000121) Set as follows: Supply / Return Static = 4.0 in / 1.0 in Supply / Return Eff = 0.55 / 0.36 With Heat Recovery: bhp = CFM * (0.0013 + 0.000266) Set as follows: Supply / Return Static = 4.0 in / 1.0 in Supply / Return Eff = 0.55 / 0.26 | Power input = 2.65 W/(L/s) Set as follows: Supply / Return Static = 4.0 in / 1.0 in Supply / Return Eff = 0.55 / 0.30 |
| Fan Control | CV: Constant VAV: Riding Curve | CV: Constant VAV: Riding Curve |
| Cooling Supply T Control | Variable | Variable |
| Heating Supply T Control | Variable | Variable |
| Humidification | N/A | N/A |
| Demand Control Ventilation | None | None |
| AHU Air to Air heat recovery | 50% Effectiveness (Only on certain systems depending on OA ratio and supply flow rate) | None |
| Space temperature Setback | Occupied: 71.6°/75.2° Setback: 64.4°/95° | Occupied: 71.6°/75.2° Setback: 64.4°/95° |
| Outside Air | 35,870 CFM | 35,870 CFM |
| RTU Heating Efficiency | 80% Et (gas) 80% Et, or 81% Et if > 66 kW (oil) | 92.4% AFUE, or 81% Et if > 117.2 kW (gas) 84.5% Et, or 81.3% Et if > 66 kW (oil) |
| RTU DX Efficiency (EER) | < 65 kBtu/h: 13 SEER >=65, < 135 kBtu/h: 11.0 EER >=135, < 240 kBtu/h: 10.8 EER | < 65 kBtu/h: 15 SEER >=65, < 135 kBtu/h: 11.0 EER >=135, < 240 kBtu/h: 10.8 EER |
| SERVICE WATER HEATING | | |
| Thermal Efficiency or EF | 80% Et (gas), 78% Et (oil) | 0.67 - 0.0019V EF (V in gallons) (gas) 0.55 EF (oil) |
| Standby loss | Q/800+110*√V (Btu/h, V in gallons) | No Requirement |
| Supply Temperature | 140°F | 140°F |
| Showers (L/min) | No Requirement | No Requirement |
| Lavatory Faucets (L/min) | No Requirement | No Requirement |
| Electric Power | | |
| Motor Efficiency | N/A | N/A |
| Pump Efficiency | N/A | N/A |
| Equipment demand (W/ft ²) | 0.2323 | 0.2323 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

Energy Criteria - Low Rise Office

The low rise office archetype represents a square 32,000 ft² (2,974 m²), 2-storey building with a wall-to-roof area ratio of 1.85. The maximum window-to-wall area ratio 33% (varies by location). The zoning includes 5 zones per floor, with two 200 m² (2,175 ft²) perimeter zones, two 118 m² (1,275 ft²) perimeter zones, and a core zone that accounts for 57% of the floor space. The HVAC system is single packaged variable air volume (PVAV) system serving the entire building. Heating is by natural gas furnace section in the PVAV system. Re-heat in the zones is hydronic. There is a single natural gas boiler. Cooling is by DX cooling integral to the PVAV system. The walls are masonry with interior insulation and drywall. Windows are strip windows set into the concrete block walls.

| Item | ASHRAE 90.1-2010 | | | | | NECB 2011 |
|---|------------------|-------|-------|-------|----------------|-----------|
| Exterior Walls (ft²·F/Btuh) | | | | | | |
| Wall Type | Mass | Metal | Steel | Other | R ₀ | All |
| Toronto | 100% | 0% | 0% | 0% | 12.5 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Montreal | 100% | 0% | 0% | 0% | 12.5 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Halifax | 100% | 0% | 0% | 0% | 12.5 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Vancouver | 100% | 0% | 0% | 0% | 11.1 | 18.0 |
| | 11.1 | 14.5 | 15.6 | 15.6 | | |
| Winnipeg | 100% | 0% | 0% | 0% | 14.1 | 27.0 |
| | 14.1 | 17.5 | 15.6 | 19.6 | | |
| Calgary | 100% | 0% | 0% | 0% | 14.1 | 27.0 |
| | 14.1 | 17.5 | 15.6 | 19.6 | | |
| St. Johns | 100% | 0% | 0% | 0% | 12.5 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Regina | 100% | 0% | 0% | 0% | 14.1 | 27.0 |
| | 14.1 | 17.5 | 15.6 | 19.6 | | |
| Saint John | 100% | 0% | 0% | 0% | 12.5 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Charlottetown | 100% | 0% | 0% | 0% | 12.5 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Iqaluit | 100% | 0% | 0% | 0% | 14.1 | 31.0 |
| | 14.1 | 17.5 | 15.6 | 27.8 | | |
| Whitehorse | 100% | 0% | 0% | 0% | 14.1 | 27.0 |
| | 14.1 | 17.5 | 15.6 | 27.8 | | |
| Yellowknife | 100% | 0% | 0% | 0% | 14.1 | 31.0 |
| | 14.1 | 17.5 | 15.6 | 27.8 | | |
| Roof (ft²·F/Btuh) | | | | | | |
| Toronto | 20.8 | | | | | 31.0 |
| Montreal | 20.8 | | | | | 31.0 |
| Halifax | 20.8 | | | | | 31.0 |
| Vancouver | 20.8 | | | | | 25.0 |
| Winnipeg | 20.8 | | | | | 35.0 |
| Calgary | 20.8 | | | | | 35.0 |
| St. Johns | 20.8 | | | | | 31.0 |
| Regina | 20.8 | | | | | 35.0 |
| Saint John | 20.8 | | | | | 31.0 |
| Charlottetown | 20.8 | | | | | 31.0 |
| Iqaluit | 20.8 | | | | | 40.0 |
| Whitehorse | 20.8 | | | | | 35.0 |
| Yellowknife | 20.8 | | | | | 40.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria – Low Rise Office (cont'd) | | | | |
|--|---|------------------|-----------|---|
| Exposed Floor (ft ² ·°F/Btuh) | ASHRAE 90.1-2010 | | | NECB 2011 |
| Toronto | 15.6 | | | 31.0 |
| Montreal | 15.6 | | | 31.0 |
| Halifax | 15.6 | | | 31.0 |
| Vancouver | 13.5 | | | 25.0 |
| Winnipeg | 15.6 | | | 35.0 |
| Calgary | 15.6 | | | 35.0 |
| St. Johns | 15.6 | | | 31.0 |
| Regina | 15.6 | | | 35.0 |
| Saint John | 15.6 | | | 31.0 |
| Charlottetown | 15.6 | | | 31.0 |
| Iqaluit | 17.5 | | | 40.0 |
| Whitehorse | 17.5 | | | 35.0 |
| Yellowknife | 17.5 | | | 40.0 |
| Glazing | | | | |
| Glazing Percent | 33% | | | Toronto - 33%, Montreal - 33%, Halifax - 33%, Vancouver - 33%, Winnipeg - 29%, Calgary - 33%, St. Johns - 33%, Regina - 29%, Saint John - 33%, Charlottetown - 33%, Iqaluit - 20%, Whitehorse - 23%, Yellowknife - 20%, |
| Window U-value | CurtainWall/ Storefront | Entrance Door | All Other | All |
| Toronto | 0.45 | 0.80 | 0.55 | 0.387 |
| Montreal | 0.45 | 0.80 | 0.55 | 0.387 |
| Halifax | 0.45 | 0.80 | 0.55 | 0.387 |
| Vancouver | 0.45 | 0.80 | 0.55 | 0.423 |
| Winnipeg | 0.40 | 0.80 | 0.45 | 0.387 |
| Calgary | 0.40 | 0.80 | 0.45 | 0.387 |
| St. Johns | 0.45 | 0.80 | 0.55 | 0.387 |
| Regina | 0.40 | 0.80 | 0.45 | 0.387 |
| Saint John | 0.45 | 0.80 | 0.55 | 0.387 |
| Charlottetown | 0.45 | 0.80 | 0.55 | 0.387 |
| Iqaluit | 0.40 | 0.80 | 0.45 | 0.282 |
| Whitehorse | 0.40 | 0.80 | 0.45 | 0.387 |
| Yellowknife | 0.40 | 0.80 | 0.45 | 0.282 |
| Window SHGC | | | | |
| Toronto | 0.40 | | | No Requirement |
| Montreal | 0.40 | | | No Requirement |
| Halifax | 0.40 | | | No Requirement |
| Vancouver | 0.40 | | | No Requirement |
| Winnipeg | 0.45 | | | No Requirement |
| Calgary | 0.45 | | | No Requirement |
| St. Johns | 0.40 | | | No Requirement |
| Regina | 0.45 | | | No Requirement |
| Saint John | 0.40 | | | No Requirement |
| Charlottetown | 0.40 | | | No Requirement |
| Iqaluit | 0.45 | | | No Requirement |
| Whitehorse | 0.45 | | | No Requirement |
| Yellowknife | 0.45 | | | No Requirement |
| Swinging Doors | | | | |
| Fully Glazed U-Value | See under Glazing | | | 0.476 |
| Opaque Door - Uvalue | Toronto, Montreal, Halifax, Vancouver, St Johns Saint Johns, Charlottetown = 0.7 Winnipeg, Calgary, Regina, Iqaluit, Whitehorse, Yellowknife = 0.5 | | | Toronto, Montreal, Halifax, Winnipeg, Calgary, St. Johns, Regina, Saint John, Whitehorse, Charlottetown = 0.387 Vancouver = 0.423 Iqaluit, Yellowknife = 0.282 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria – Low Rise Office (cont'd) | | |
|--|---|--|
| Underground Wall and Roof | ASHRAE 90.1-2010 | NECB 2011 |
| Toronto | Wall only: R-7.5 | 20.0 |
| Montreal | Wall only: R-7.5 | 20.0 |
| Halifax | Wall only: R-7.5 | 20.0 |
| Vancouver | Wall only: R-7.5 | 10.0 |
| Winnipeg | Wall only: R-7.5 | 20.0 |
| Calgary | Wall only: R-7.5 | 20.0 |
| St. Johns | Wall only: R-7.5 | 20.0 |
| Regina | Wall only: R-7.5 | 20.0 |
| Saint John | Wall only: R-7.5 | 20.0 |
| Charlottetown | Wall only: R-7.5 | 20.0 |
| Iqaluit | Wall only: R-7.5 | 27.0 |
| Whitehorse | Wall only: R-7.5 | 20.0 |
| Yellowknife | Wall only: R-7.5 | 27.0 |
| Floors-on-Ground (ft ² ·F/Btuh) | | |
| Toronto | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Montreal | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Halifax | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Vancouver | No Requirement | 7.5 (Min 1.2m from Perimeter) |
| Winnipeg | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Calgary | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| St. Johns | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Regina | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Saint John | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Charlottetown | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Iqaluit | 15 (Min 24 in. from Perimeter) | 15.0 (Full Area) |
| Whitehorse | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Yellowknife | 15 (Min 24 in. from Perimeter) | 15.0 (Full Area) |
| Leakage Rates | | |
| Envelope L/s/m ² | No Requirement | No Requirement |
| LIGHTING | | |
| Interior Lighting (W/ft ²) | 0.900 | 0.901 |
| Interior Lighting Control | Occupancy Sensors in specified spaces | Occupancy Sensors in specified spaces |
| Daylighting Control | No Requirement | No Requirement |
| HVAC | | |
| Hot water Flow | No requirement when pumping power is less than 7.5 kW, riding curve | No requirement when pumping power is less than 7.5 kW, riding curve |
| HVAC System | VAV reheat | VAV reheat |
| Economizer | 100 % Differential Enthalpy | 100 % Differential Enthalpy |
| Fan Power Limit | bhp = CFM * (0.0013 + 0.000121) Set as follows: Supply / Return Static = 4.0 in / 1.0 in Supply / Return Eff = 0.55 / 0.40 | Power input = 2.65 W/(L/s) Set as follows: Supply / Return Static = 4.0 in / 1.0 in Supply / Return Eff = 0.55 / 0.30 |
| Fan Control | VSD if > 7.5 kW | VSD if > 7.5 kW |
| Cooling Supply T Control | Zone Reset | Zone Reset |
| Heating Supply T Control | Constant at 55°F | Constant at 55°F |
| Humidification | N/A | N/A |
| Demand Control Ventilation | None | None |
| AHU Air to Air heat recovery | No Requirement | Yes in Iq, Wh, Ye |
| PVAV Heating Efficiency | 80% Et (gas) 80% Et or 81% Et for > 66 kW (oil) | 92.4% AFUE or 81% Et for > 117.2 kW (gas) 84.5% Et or 81.3% Et for > 66 kW (oil) |
| PVAV DX Cooling Efficiency | 10 EER, or 9.7 EER if > 760 kbtu/h | 9.8 EER, or 9.5 EER if > 760 kbtu/h |
| Space temperature Setback | Occupied: 71.6°/75.2°F; Setback: 64.4°/99°F | Occupied: 71.6°/75.2°F; Setback: 64.4°/99°F |
| Hot water Loop T control | Constant | Constant |
| Outside Air | 4,350 CFM | 4,350 CFM |
| Boiler Heating Efficiency | 80% Et (gas), 82% Et (oil) | 82.5% Ec and 83.0% Et (gas) , 83.4% Et (oil) |
| Boiler Type and Number | Single stage, 1 | Single stage, 1 or Two stage, 1 |
| Hot water temperature | 28.8°F drop; 180°F supply | 28.8°F drop; 180°F supply |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria – Low Rise Office (cont'd) | | |
|--|---|--|
| SERVICE WATER HEATING | ASHRAE 90.1-2010 | NECB 2011 |
| Thermal Efficiency or EF | 0.67 - 0.0019V EF (V in gallons) (gas), 0.59 - 0.0019V EF (V in gallons) (oil) | 0.67 - 0.0019V EF (V in gallons) (gas), EF = 0.55 (oil) |
| Standby loss | No Requirement | No Requirement |
| Supply Temperature | 140°F | 140°F |
| Showers (L/min) | No Requirement | No Requirement |
| Lavatory Faucets (L/min) | No Requirement | No Requirement |
| Electric Power | | |
| Motor Efficiency | Premium | Premium |
| Pump Efficiency | 65% | 65% |
| Equipment demand (W/ft ²) | 0.6968 | 0.6968 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

Energy Criteria - Education

The education archetype represents a 69,697 ft² (6,475 m²), 2-storey building with a wall-to-roof area ratio of 0.71. The window-to-wall area ratio is 16.3%. Walls are insulated cavity walls with a brick veneer. The HVAC systems include two packaged VAV systems serving the classrooms, one packaged VAV system serving the administration area, and one packaged single zone system serving the gymnasium. All systems provide hydronic heating and DX cooling. A single gas boiler provides heating. Reheat in the zones is hydronic.

| Item | ASHRAE 90.1-2010 | | | | | NECB 2011 | | |
|--|------------------|-------|-------|-------|----------------|-----------|------|--|
| Exterior Walls (ft²·°F/Btuh) | | | | | | | | |
| Wall Type | Mass | Metal | Steel | Other | R _o | All | | |
| Toronto | 100% | 0% | 0% | 0% | 12.5 | 23.0 | | |
| | 12.5 | 14.5 | 15.6 | 19.6 | | | | |
| Montreal | 100% | 0% | 0% | 0% | 12.5 | 23.0 | | |
| | 12.5 | 14.5 | 15.6 | 19.6 | | | | |
| Halifax | 100% | 0% | 0% | 0% | 12.5 | 23.0 | | |
| | 12.5 | 14.5 | 15.6 | 19.6 | | | | |
| Vancouver | 100% | 0% | 0% | 0% | 11.1 | 18.0 | | |
| | 11.1 | 14.5 | 15.6 | 15.6 | | | | |
| Winnipeg | 100% | 0% | 0% | 0% | 14.1 | 27.0 | | |
| | 14.1 | 17.5 | 15.6 | 19.6 | | | | |
| Calgary | 100% | 0% | 0% | 0% | 14.1 | 27.0 | | |
| | 14.1 | 17.5 | 15.6 | 19.6 | | | | |
| St. Johns | 100% | 0% | 0% | 0% | 12.5 | 23.0 | | |
| | 12.5 | 14.5 | 15.6 | 19.6 | | | | |
| Regina | 100% | 0% | 0% | 0% | 14.1 | 27.0 | | |
| | 14.1 | 17.5 | 15.6 | 19.6 | | | | |
| Saint John | 100% | 0% | 0% | 0% | 12.5 | 23.0 | | |
| | 12.5 | 14.5 | 15.6 | 19.6 | | | | |
| Charlottetown | 100% | 0% | 0% | 0% | 12.5 | 23.0 | | |
| | 12.5 | 14.5 | 15.6 | 19.6 | | | | |
| Iqaluit | 100% | 0% | 0% | 0% | 14.1 | 31.0 | | |
| | 14.1 | 17.5 | 15.6 | 27.8 | | | | |
| Whitehorse | 100% | 0% | 0% | 0% | 14.1 | 27.0 | | |
| | 14.1 | 17.5 | 15.6 | 27.8 | | | | |
| Yellowknife | 100% | 0% | 0% | 0% | 14.1 | 31.0 | | |
| | 14.1 | 17.5 | 15.6 | 27.8 | | | | |
| Roof (ft²·°F/Btuh) | | | | | | | | |
| Toronto | | | | | | | 31.0 | |
| Montreal | | | | | | | 31.0 | |
| Halifax | | | | | | | 31.0 | |
| Vancouver | | | | | | | 25.0 | |
| Winnipeg | | | | | | | 35.0 | |
| Calgary | | | | | | | 35.0 | |
| St. Johns | | | | | | | 31.0 | |
| Regina | | | | | | | 35.0 | |
| Saint John | | | | | | | 31.0 | |
| Charlottetown | | | | | | | 31.0 | |
| Iqaluit | | | | | | | 40.0 | |
| Whitehorse | | | | | | | 35.0 | |
| Yellowknife | | | | | | | 40.0 | |
| Exposed Floor (ft²·°F/Btuh) | | | | | | | | |
| Toronto | | | | | | | 31.0 | |
| Montreal | | | | | | | 31.0 | |
| Halifax | | | | | | | 31.0 | |
| Vancouver | | | | | | | 25.0 | |
| Winnipeg | | | | | | | 35.0 | |
| Calgary | | | | | | | 35.0 | |
| St. Johns | | | | | | | 31.0 | |
| Regina | | | | | | | 35.0 | |
| Saint John | | | | | | | 31.0 | |
| Charlottetown | | | | | | | 31.0 | |
| Iqaluit | | | | | | | 40.0 | |
| Whitehorse | | | | | | | 35.0 | |
| Yellowknife | | | | | | | 40.0 | |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria – Education (cont'd) | | | | |
|---|---|------------------|-----------|--|
| Glazing | ASHRAE 90.1-2010 | | | NECB 2011 |
| Glazing Percent | 16.3% | | | 16.3% |
| Window U-value | CurtainWall/ Storefront | Entrance Door | All Other | All |
| Toronto | 0.45 | 0.80 | 0.55 | 0.387 |
| Montreal | 0.45 | 0.80 | 0.55 | 0.387 |
| Halifax | 0.45 | 0.80 | 0.55 | 0.387 |
| Vancouver | 0.45 | 0.80 | 0.55 | 0.423 |
| Winnipeg | 0.40 | 0.80 | 0.45 | 0.387 |
| Calgary | 0.40 | 0.80 | 0.45 | 0.387 |
| St. Johns | 0.45 | 0.80 | 0.55 | 0.387 |
| Regina | 0.40 | 0.80 | 0.45 | 0.387 |
| Saint John | 0.45 | 0.80 | 0.55 | 0.387 |
| Charlottetown | 0.45 | 0.80 | 0.55 | 0.387 |
| Iqaluit | 0.40 | 0.80 | 0.45 | 0.282 |
| Whitehorse | 0.40 | 0.80 | 0.45 | 0.387 |
| Yellowknife | 0.40 | 0.80 | 0.45 | 0.282 |
| Window SHGC | | | | |
| Toronto | 0.40 | | | No Requirement |
| Montreal | 0.40 | | | No Requirement |
| Halifax | 0.40 | | | No Requirement |
| Vancouver | 0.40 | | | No Requirement |
| Winnipeg | 0.45 | | | No Requirement |
| Calgary | 0.45 | | | No Requirement |
| St. Johns | 0.40 | | | No Requirement |
| Regina | 0.45 | | | No Requirement |
| Saint John | 0.40 | | | No Requirement |
| Charlottetown | 0.40 | | | No Requirement |
| Iqaluit | 0.45 | | | No Requirement |
| Whitehorse | 0.45 | | | No Requirement |
| Yellowknife | 0.45 | | | No Requirement |
| Swinging Doors | | | | |
| Fully Glazed U-Value | See under Glazing | | | 0.476 |
| Opaque Door - Uvalue | Toronto, Montreal, Halifax, Vancouver, St Johns Saint Johns, Charlottetown = 0.7 Winnipeg, Calgary, Regina, Iqaluit, Whitehorse, Yellowknife = 0.5 | | | Toronto, Montreal, Halifax, Winnipeg, Calgary, St. Johns, Regina, Saint John, Whitehorse, Charlottetown = 0.387 Vancouver = 0.423 Iqaluit, Yellowknife = 0.282 |
| Underground Wall and Roof (ft²·°F/Btuh) | | | | |
| Toronto | Wall only: R-7.5 | | | 20.0 |
| Montreal | Wall only: R-7.5 | | | 20.0 |
| Halifax | Wall only: R-7.5 | | | 20.0 |
| Vancouver | Wall only: R-7.5 | | | 10.0 |
| Winnipeg | Wall only: R-7.5 | | | 20.0 |
| Calgary | Wall only: R-7.5 | | | 20.0 |
| St. Johns | Wall only: R-7.5 | | | 20.0 |
| Regina | Wall only: R-7.5 | | | 20.0 |
| Saint John | Wall only: R-7.5 | | | 20.0 |
| Charlottetown | Wall only: R-7.5 | | | 20.0 |
| Iqaluit | Wall only: R-7.5 | | | 27.0 |
| Whitehorse | Wall only: R-7.5 | | | 20.0 |
| Yellowknife | Wall only: R-7.5 | | | 27.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria – Education (cont'd) | | |
|---|---|---|
| Floors-on-Ground (ft ² ·°F/Btuh) | ASHRAE 90.1-2010 | NECB 2011 |
| Toronto | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Montreal | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Halifax | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Vancouver | No Requirement | 7.5 (Min 1.2m from Perimeter) |
| Winnipeg | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Calgary | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| St. Johns | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Regina | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Saint John | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Charlottetown | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Iqaluit | 15 (Min 24 in. from Perimeter) | 15.0 (Full Area) |
| Whitehorse | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Yellowknife | 15 (Min 24 in. from Perimeter) | 15.0 (Full Area) |
| Leakage Rates | | |
| Envelope L/s/m ² | No Requirement | No Requirement |
| LIGHTING | | |
| Interior Lighting (W/ft ²) | 0.990 | 0.994 |
| Interior Lighting Control | Occupancy Sensors in specified spaces | Occupancy Sensors in specified spaces |
| Daylighting Control | No Requirement | No Requirement |
| HVAC | | |
| Hot water Flow | No requirement when pumping power is less than 7.5 kW, riding curve | No requirement when pumping power is less than 7.5 kW, riding curve |
| Chilled Water flow | N/A | N/A |
| HVAC System | Packaged VAV reheat | Packaged VAV reheat |
| Economizer | 100 % Differential Enthalpy | 100 % Differential Enthalpy |
| CV Fan power limit | <p>Without Heat Recovery: $bhp = CFM * (0.00094 + 0.000121)$ Set as follows: Supply / Return Static = 2.0 in / 0.6 in Supply / Return Eff = 0.50 / 0.18</p> <p>With Heat Recovery: $bhp = CFM * (0.00094 + 0.000266)$ Set as follows: Supply / Return Static = 2.0 in / 0.6 in Supply / Return Eff = 0.50 / 0.14</p> | <p>Power input = 1.6 W/(L/s) Set as follows: Supply / Return Static = 2.0 in / 0.6 in Supply / Return Eff = 0.50 / 0.25</p> |
| VAV Fan Power Limit | <p>Classroom Systems (50% HR): $bhp = CFM * (0.0013 + 0.000266)$ Set as follows: Supply / Return Static = 4.0 in / 1.0 in Supply / Return Eff = 0.55 / 0.30</p> <p>Administration System (no HR): $bhp = CFM * (0.0013 + 0.000121)$ Set as follows: Supply / Return Static = 4.0 in / 1.0 in Supply / Return Eff = 0.55 / 0.36 (0.55/0.42 for classrooms)</p> | <p>Power input = 2.65 W/(L/s) Set as follows: Supply / Return Static = 4.0 in / 1.0 in Supply / Return Eff = 0.55 / 0.30</p> |
| Fan Control | Classroom VAVs = VSD Administration VAV = Riding Curve CV = Fixed Speed | Classroom VAVs = VSD Administration VAV = Riding Curve CV=Fixed Speed |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria – Education (cont'd) | | |
|---|---|--|
| HVAC (continued) | ASHRAE 90.1-2010 | NECB 2011 |
| Cooling Supply T Control | VAV: Zone Reset | VAV: Zone Reset |
| Heating Supply T Control | VAV: Constant at 55°F | VAV: Constant at 55°F |
| Humidification | N/A | N/A |
| Demand Control Ventilation | None | None |
| AHU Air to Air heat recovery | 50% Effectiveness (Classrooms and Gym sometimes) | 50% Effectiveness (Classrooms only) |
| Percent of total outdoor air that has heat recovery | Varies by Location | Varies by Location |
| Space temperature Setback | Occupied: 69.8°/75.2° Setback: 64.4°/95° | Occupied: 69.8°/75.2° Setback: 64.4°/95° |
| Hot water Loop T control | Constant | Constant |
| Chilled water Loop T control | N/A | N/A |
| Outside Air | 18,570 CFM | 18,570 CFM |
| Boiler Heating Efficiency | 80% Et (gas); 82% Et (oil) | 82.5% Ec and 83.0% Et (gas) , 83.4% Et (oil) |
| Boiler Type and Number | Single stage, 1 | Fully Modulating, 1 or Two Stage, 1 |
| Hot water temperature | 28.8°F drop; 180°F supply | 28.8°F drop; 180°F supply |
| DX Efficiency (EER) | < 65 kBtu/h: 13 SEER >=65, < 135 kBtu/h: 11.0 EER >=135, < 240 kBtu/h: 10.8 EER >= 240 kbtu/h: 10.0 EER > 760 kbtu/h: 9.7 EER | < 65 kBtu/h: 15 SEER >=65, < 135 kBtu/h: 11.0 EER >=135, < 240 kBtu/h: 10.8 EER >= 240 kbtu/h: 9.8 EER > 760 kbtu/h: 9.5 EER |
| Chiller Cooling Efficiency | N/A | N/A |
| Chiller Type and Number | N/A | N/A |
| Chilled water temperature | N/A | N/A |
| Cooling Tower | N/A | N/A |
| Tower Sizing, Number of Cells | N/A | N/A |
| Cooling Tower Pump | N/A | N/A |
| SERVICE WATER HEATING | | |
| Thermal Efficiency or EF | 80% Thermal (gas); 78% Et (oil) | 0.67 - 0.0019V EF (V in gallons) (gas), 0.55 EF (oil) |
| Standby loss | $Q/800+110*\sqrt{V}$ (Btu/h, V in gallons) | No Requirement |
| Supply Temperature | 140°F | 140°F |
| Showers (L/min) | No Requirement | No Requirement |
| Lavatory Faucets (L/min) | No Requirement | No Requirement |
| Electric Power | | |
| Motor Efficiency | Premium | Premium |
| Pump Efficiency | 65% | 65% |
| Equipment demand (W/ft ²) | 0.4645 | 0.4645 |

| Energy Criteria - Warehouse | | | | | | |
|--|------------------|-------|-------|-------|----------------|------|
| The warehouse archetype represents a 3,891 m ² (41,883 ft ²), 1-storey building. The building contains an office area that is 10% of the total area of the building. The building has a wall-to-roof area ratio of 0.72. The window-to-wall area ratio is 3.5%. Walls are metal "sandwich panels" containing rigid insulation. The office area is served by a packaged constant volume system with a natural gas furnace and DX cooling section. The warehouse area contains natural gas-fired unit heaters and no cooling. | | | | | | |
| Item | ASHRAE 90.1-2010 | | | | NECB 2011 | |
| Exterior Walls (ft²·°F/Btuh) | | | | | | |
| Wall Type | Mass | Metal | Steel | Other | R _o | All |
| Toronto | 0% | 100% | 0% | 0% | 14.5 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Montreal | 0% | 100% | 0% | 0% | 14.5 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Halifax | 0% | 100% | 0% | 0% | 14.5 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Vancouver | 0% | 100% | 0% | 0% | 14.5 | 18.0 |
| | 11.1 | 14.5 | 15.6 | 15.6 | | |
| Winnipeg | 0% | 100% | 0% | 0% | 17.5 | 27.0 |
| | 14.1 | 17.5 | 15.6 | 19.6 | | |
| Calgary | 0% | 100% | 0% | 0% | 17.5 | 27.0 |
| | 14.1 | 17.5 | 15.6 | 19.6 | | |
| St. Johns | 0% | 100% | 0% | 0% | 14.5 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Regina | 0% | 100% | 0% | 0% | 17.5 | 27.0 |
| | 14.1 | 17.5 | 15.6 | 19.6 | | |
| Saint John | 0% | 100% | 0% | 0% | 14.5 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Charlottetown | 0% | 100% | 0% | 0% | 14.5 | 23.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Iqaluit | 0% | 100% | 0% | 0% | 17.5 | 31.0 |
| | 14.1 | 17.5 | 15.6 | 27.8 | | |
| Whitehorse | 0% | 100% | 0% | 0% | 17.5 | 27.0 |
| | 14.1 | 17.5 | 15.6 | 27.8 | | |
| Yellowknife | 0% | 100% | 0% | 0% | 17.5 | 31.0 |
| | 14.1 | 17.5 | 15.6 | 27.8 | | |
| Roof (ft²·°F/Btuh) | | | | | | |
| Toronto | | | | | 20.8 | 31.0 |
| Montreal | | | | | 20.8 | 31.0 |
| Halifax | | | | | 20.8 | 31.0 |
| Vancouver | | | | | 20.8 | 25.0 |
| Winnipeg | | | | | 20.8 | 35.0 |
| Calgary | | | | | 20.8 | 35.0 |
| St. Johns | | | | | 20.8 | 31.0 |
| Regina | | | | | 20.8 | 35.0 |
| Saint John | | | | | 20.8 | 31.0 |
| Charlottetown | | | | | 20.8 | 31.0 |
| Iqaluit | | | | | 20.8 | 40.0 |
| Whitehorse | | | | | 20.8 | 35.0 |
| Yellowknife | | | | | 20.8 | 40.0 |
| Exposed Floor (ft²·°F/Btuh) | | | | | | |
| Toronto | | | | | 15.6 | 31.0 |
| Montreal | | | | | 15.6 | 31.0 |
| Halifax | | | | | 15.6 | 31.0 |
| Vancouver | | | | | 13.5 | 25.0 |
| Winnipeg | | | | | 15.6 | 35.0 |
| Calgary | | | | | 15.6 | 35.0 |
| St. Johns | | | | | 15.6 | 31.0 |
| Regina | | | | | 15.6 | 35.0 |
| Saint John | | | | | 15.6 | 31.0 |
| Charlottetown | | | | | 15.6 | 31.0 |
| Iqaluit | | | | | 17.5 | 40.0 |
| Whitehorse | | | | | 17.5 | 35.0 |
| Yellowknife | | | | | 17.5 | 40.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria – Warehouse (cont'd) | | | | |
|---|---|------------------|-----------|--|
| Glazing | ASHRAE 90.1-2010 | | | NECB 2011 |
| Glazing Percent | 3.5% | | | 3.5% |
| Window U-value | CurtainWall/ Storefront | Entrance Door | All Other | All |
| Toronto | 0.45 | 0.80 | 0.55 | 0.387 |
| Montreal | 0.45 | 0.80 | 0.55 | 0.387 |
| Halifax | 0.45 | 0.80 | 0.55 | 0.387 |
| Vancouver | 0.45 | 0.80 | 0.55 | 0.423 |
| Winnipeg | 0.40 | 0.80 | 0.45 | 0.387 |
| Calgary | 0.40 | 0.80 | 0.45 | 0.387 |
| St. Johns | 0.45 | 0.80 | 0.55 | 0.387 |
| Regina | 0.40 | 0.80 | 0.45 | 0.387 |
| Saint John | 0.45 | 0.80 | 0.55 | 0.387 |
| Charlottetown | 0.45 | 0.80 | 0.55 | 0.387 |
| Iqaluit | 0.40 | 0.80 | 0.45 | 0.282 |
| Whitehorse | 0.40 | 0.80 | 0.45 | 0.387 |
| Yellowknife | 0.40 | 0.80 | 0.45 | 0.282 |
| Window SHGC | | | | |
| Toronto | 0.40 | | | No Requirement |
| Montreal | 0.40 | | | No Requirement |
| Halifax | 0.40 | | | No Requirement |
| Vancouver | 0.40 | | | No Requirement |
| Winnipeg | 0.45 | | | No Requirement |
| Calgary | 0.45 | | | No Requirement |
| St. Johns | 0.40 | | | No Requirement |
| Regina | 0.45 | | | No Requirement |
| Saint John | 0.40 | | | No Requirement |
| Charlottetown | 0.40 | | | No Requirement |
| Iqaluit | 0.45 | | | No Requirement |
| Whitehorse | 0.45 | | | No Requirement |
| Yellowknife | 0.45 | | | No Requirement |
| Swinging Doors | | | | |
| Fully Glazed U-Value | See under Glazing | | | 0.476 |
| Opaque Door - Uvalue | Toronto, Montreal, Halifax, Vancouver, St Johns Saint Johns, Charlottetown = 0.7 Winnipeg, Calgary, Regina, Iqaluit, Whitehorse, Yellowknife = 0.5 | | | Toronto, Montreal, Halifax, Winnipeg, Calgary, St. Johns, Regina, Saint John, Whitehorse, Charlottetown = 0.387 Vancouver = 0.423 Iqaluit, Yellowknife = 0.282 |
| Underground Wall and Roof (ft².°F/Btuh) | | | | |
| Toronto | Wall only: R-7.5 | | | 20.0 |
| Montreal | Wall only: R-7.5 | | | 20.0 |
| Halifax | Wall only: R-7.5 | | | 20.0 |
| Vancouver | Wall only: R-7.5 | | | 10.0 |
| Winnipeg | Wall only: R-7.5 | | | 20.0 |
| Calgary | Wall only: R-7.5 | | | 20.0 |
| St. Johns | Wall only: R-7.5 | | | 20.0 |
| Regina | Wall only: R-7.5 | | | 20.0 |
| Saint John | Wall only: R-7.5 | | | 20.0 |
| Charlottetown | Wall only: R-7.5 | | | 20.0 |
| Iqaluit | Wall only: R-7.5 | | | 27.0 |
| Whitehorse | Wall only: R-7.5 | | | 20.0 |
| Yellowknife | Wall only: R-7.5 | | | 27.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria – Warehouse (cont'd) | | |
|--|--|---|
| Floors-on-Ground (ft ² ·F/Btuh) | ASHRAE 90.1-2010 | NECB 2011 |
| Toronto | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Montreal | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Halifax | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Vancouver | No Requirement | 7.5 (Min 1.2m from Perimeter) |
| Winnipeg | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Calgary | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| St. Johns | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Regina | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Saint John | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Charlottetown | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Iqaluit | 15 (Min 24 in. from Perimeter) | 15.0 (Full Area) |
| Whitehorse | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Yellowknife | 15 (Min 24 in. from Perimeter) | 15.0 (Full Area) |
| Leakage Rates | | |
| Envelope L/s/m ² | No Requirement | No Requirement |
| LIGHTING | | |
| Interior Lighting (W/ft ²) | 0.660 | 0.660 |
| Interior Lighting Control | Manual | Manual |
| Daylighting Control | No Requirement | No Requirement |
| HVAC | | |
| Hot water Flow | N/A | N/A |
| Chilled Water flow | N/A | N/A |
| HVAC System | Office: Packaged CV, Gas fired, DX Cooling. Warehouse: Gas-fired unit heaters. | Office: Packaged CV, Gas fired, DX Cooling. Warehouse: Gas-fired unit heaters. |
| Economizer | 100 % Differential Enthalpy | 100 % Differential Enthalpy |
| Fan Power Limit | bhp = CFM * (0.00094 + 0.000121) Set as follows: Supply / Return Static = 2.0 in / 0.6 in Supply / Return Eff = 0.50 / 0.18 | Power input = 1.6 W/(L/s) Set as follows: Supply / Return Static = 2.0 in / 0.6 in Supply / Return Eff = 0.50 / 0.25 |
| Fan Control | Constant | Constant |
| Cooling Supply T Control | Office: Zone Reset | Office: Zone Reset |
| Heating Supply T Control | Office: Constant at 55°F | Office: Constant at 55°F |
| Humidification | N/A | N/A |
| Demand Control Ventilation | None | None |
| AHU Air to Air heat recovery | None | None |
| Space temperature Setback | Occupied: 71.6°/75.2° Setback: 64.4°/95° | Occupied: 71.6°/75.2° Setback: 64.4°/95° |
| Hot water Loop T control | N/A | N/A |
| Chilled water Loop T control | N/A | N/A |
| Outside Air | 3,120 CFM | 3,120 CFM |
| RTU Heating Efficiency | 80% Et (gas and oil) | 92.4% AFUE (gas), 84.5% Et (oil) |
| Boiler Type | N/A | N/A |
| Boiler Type and Number | N/A | N/A |
| Unit heaters in Warehouse | 80% Ec (oil and gas) | 82% Et (gas) 81%Et (oil) |
| Hot water temperature | N/A | N/A |
| RTU DX Efficiency (EER) | >=65, < 135 kBtu/h: 11.0 EER >=135, < 240 kBtu/h: 10.8 EER | >=65, < 135 kBtu/h: 11.0 EER >=135, < 240 kBtu/h: 10.8 EER |
| SERVICE WATER HEATING | | |
| Thermal Efficiency or EF | 0.67 - 0.0019V EF (V in gallons) (gas), 0.59 - 0.0019V EF (V in gallons) (oil) | 0.67 - 0.0019V EF (V in gallons) (gas), EF = 0.55 (oil) |
| Standby loss | No Requirement | No Requirement |
| Supply Temperature | 140°F | 140°F |
| Showers (L/min) | No Requirement | No Requirement |
| Lavatory Faucets (L/min) | No Requirement | No Requirement |
| Electric Power | | |
| Motor Efficiency | N/A | N/A |
| Pump Efficiency | N/A | N/A |
| Equipment demand (W/ft ²) | 0.0929 | 0.0929 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria - Low Rise MURB | | | | | | |
|---|------------------|-------|-------|-------|----------------|------|
| The low rise MURB archetype represents a square 42,000ft ² (3,900 m ²), 3-storey building with a wall-to-roof area ratio of 1.1. The maximum window-to-wall area ratio 29% (varies by location). There are 15 apartments and 1 core zone per floor. The HVAC system consists of package air conditioners (PACs) and hydronic baseboards serving each apartment with a hydronically heated, DX-cooled make-up air unit (MAU) providing fresh air to the core zones. A single gas boiler provides heating. Fresh air infiltrates into the suites from the core zone via the door undercut. Walls are concrete block with brick veneer and interior insulation and drywall. | | | | | | |
| Item | ASHRAE 90.1-2010 | | | | NECB 2011 | |
| Exterior Walls (ft²·F/Btuh) | | | | | | |
| Wall Type | Mass | Metal | Steel | Other | R _o | All |
| Toronto | 100% | 0% | 0% | 0% | 14.1 | 23.0 |
| | 14.1 | 14.5 | 15.6 | 19.6 | | |
| Montreal | 100% | 0% | 0% | 0% | 14.1 | 23.0 |
| | 14.1 | 14.5 | 15.6 | 19.6 | | |
| Halifax | 100% | 0% | 0% | 0% | 14.1 | 23.0 |
| | 14.1 | 14.5 | 15.6 | 19.6 | | |
| Vancouver | 100% | 0% | 0% | 0% | 12.5 | 18.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Winnipeg | 100% | 0% | 0% | 0% | 14.1 | 27.0 |
| | 14.1 | 17.5 | 23.8 | 19.6 | | |
| Calgary | 100% | 0% | 0% | 0% | 14.1 | 27.0 |
| | 14.1 | 17.5 | 23.8 | 19.6 | | |
| St. Johns | 100% | 0% | 0% | 0% | 14.1 | 23.0 |
| | 14.1 | 14.5 | 15.6 | 19.6 | | |
| Regina | 100% | 0% | 0% | 0% | 14.1 | 27.0 |
| | 14.1 | 17.5 | 23.8 | 19.6 | | |
| Saint John | 100% | 0% | 0% | 0% | 14.1 | 23.0 |
| | 14.1 | 14.5 | 15.6 | 19.6 | | |
| Charlottetown | 100% | 0% | 0% | 0% | 14.1 | 23.0 |
| | 14.1 | 14.5 | 15.6 | 19.6 | | |
| Iqaluit | 100% | 0% | 0% | 0% | 19.2 | 31.0 |
| | 19.2 | 17.5 | 27.0 | 27.8 | | |
| Whitehorse | 100% | 0% | 0% | 0% | 19.2 | 27.0 |
| | 19.2 | 17.5 | 27.0 | 27.8 | | |
| Yellowknife | 100% | 0% | 0% | 0% | 19.2 | 31.0 |
| | 19.2 | 17.5 | 27.0 | 27.8 | | |
| Roof (ft²·°F/Btuh) | | | | | | |
| Toronto | | | | | | 31.0 |
| Montreal | | | | | | 31.0 |
| Halifax | | | | | | 31.0 |
| Vancouver | | | | | | 25.0 |
| Winnipeg | | | | | | 35.0 |
| Calgary | | | | | | 35.0 |
| St. Johns | | | | | | 31.0 |
| Regina | | | | | | 35.0 |
| Saint John | | | | | | 31.0 |
| Charlottetown | | | | | | 31.0 |
| Iqaluit | | | | | | 40.0 |
| Whitehorse | | | | | | 35.0 |
| Yellowknife | | | | | | 40.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria – Low MURB (cont'd) | | | | |
|--|----------------------------|------------------|-----------|---|
| Exposed Floor (ft ² ·°F/Btuh) | ASHRAE 90.1-2010 | | | NECB 2011 |
| Toronto | 17.5 | | | 31.0 |
| Montreal | 17.5 | | | 31.0 |
| Halifax | 17.5 | | | 31.0 |
| Vancouver | 15.6 | | | 25.0 |
| Winnipeg | 19.6 | | | 35.0 |
| Calgary | 19.6 | | | 35.0 |
| St. Johns | 17.5 | | | 31.0 |
| Regina | 19.6 | | | 35.0 |
| Saint John | 17.5 | | | 31.0 |
| Charlottetown | 17.5 | | | 31.0 |
| Iqaluit | 19.6 | | | 40.0 |
| Whitehorse | 19.6 | | | 35.0 |
| Yellowknife | 19.6 | | | 40.0 |
| Glazing | | | | |
| Glazing Percent | 29% | | | Toronto - 29%, Montreal - 29%, Halifax - 29%, Vancouver - 29%, Winnipeg - 29%, Calgary - 29%, St. Johns - 29%, Regina - 29%, Saint John - 29%, Charlottetown - 29%, Iqaluit - 20%, Whitehorse - 23%, Yellowknife - 20%, |
| Window U-value | CurtainWall/ Storefront | Entrance Door | All Other | All |
| Toronto | 0.45 | 0.80 | 0.55 | 0.387 |
| Montreal | 0.45 | 0.80 | 0.55 | 0.387 |
| Halifax | 0.45 | 0.80 | 0.55 | 0.387 |
| Vancouver | 0.45 | 0.80 | 0.55 | 0.423 |
| Winnipeg | 0.40 | 0.80 | 0.45 | 0.387 |
| Calgary | 0.40 | 0.80 | 0.45 | 0.387 |
| St. Johns | 0.45 | 0.80 | 0.55 | 0.387 |
| Regina | 0.40 | 0.80 | 0.45 | 0.387 |
| Saint John | 0.45 | 0.80 | 0.55 | 0.387 |
| Charlottetown | 0.45 | 0.80 | 0.55 | 0.387 |
| Iqaluit | 0.40 | 0.80 | 0.45 | 0.282 |
| Whitehorse | 0.40 | 0.80 | 0.45 | 0.387 |
| Yellowknife | 0.40 | 0.80 | 0.45 | 0.282 |
| Window SHGC | | | | |
| Toronto | 0.40 | | | No Requirement |
| Montreal | 0.40 | | | No Requirement |
| Halifax | 0.40 | | | No Requirement |
| Vancouver | 0.40 | | | No Requirement |
| Winnipeg | 0.45 | | | No Requirement |
| Calgary | 0.45 | | | No Requirement |
| St. Johns | 0.40 | | | No Requirement |
| Regina | 0.45 | | | No Requirement |
| Saint John | 0.40 | | | No Requirement |
| Charlottetown | 0.40 | | | No Requirement |
| Iqaluit | 0.45 | | | No Requirement |
| Whitehorse | 0.45 | | | No Requirement |
| Yellowknife | 0.45 | | | No Requirement |
| Swinging Doors | | | | |
| Fully Glazed U-Value | See under Glazing | | | 0.476 |
| Opaque Door - Uvalue | 0.5 | | | Toronto, Montreal, Halifax, Winnipeg, Calgary, St. Johns, Regina, Saint John, Whitehorse, Charlottetown = 0.387 Vancouver = 0.423 Iqaluit, Yellowknife = 0.282 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria – Low MURB (cont'd) | | |
|---|--------------------------------|-------------------------------|
| Underground Wall and Roof | ASHRAE 90.1-2010 | NECB 2011 |
| Toronto | Wall only: R-7.5 | 20.0 |
| Montreal | Wall only: R-7.5 | 20.0 |
| Halifax | Wall only: R-7.5 | 20.0 |
| Vancouver | Wall only: R-7.5 | 10.0 |
| Winnipeg | Wall only: R-10.0 | 20.0 |
| Calgary | Wall only: R-10.0 | 20.0 |
| St. Johns | Wall only: R-7.5 | 20.0 |
| Regina | Wall only: R-10.0 | 20.0 |
| Saint John | Wall only: R-7.5 | 20.0 |
| Charlottetown | Wall only: R-7.5 | 20.0 |
| Iqaluit | Wall only: R-12.5 | 27.0 |
| Whitehorse | Wall only: R-12.5 | 20.0 |
| Yellowknife | Wall only: R-12.5 | 27.0 |
| Floors-on-Ground (ft ² ·°F/Btuh) | | |
| Toronto | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Montreal | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Halifax | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Vancouver | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Winnipeg | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Calgary | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| St. Johns | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Regina | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Saint John | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Charlottetown | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Iqaluit | 20 (Min 24 in. from Perimeter) | 15.0 (Full Area) |
| Whitehorse | 20 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Yellowknife | 20 (Min 24 in. from Perimeter) | 15.0 (Full Area) |
| Leakage Rates | | |
| Envelope L/s/m ² | No Requirement | No Requirement |
| LIGHTING | | |
| Interior Lighting (W/ft ²) | 0.600 | 0.604 |
| Interior Lighting Control | Manual | Manual |
| Daylighting Control | No Requirement | No Requirement |
| Parking Garage LPD (W/ft ²) | 0.25 | 0.251 |
| Interior Lighting Control | Occupancy Sensor in Garage | No Requirement |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria – Low MURB (cont'd) | | |
|---------------------------------------|---|---|
| HVAC | ASHRAE 90.1-2010 | NECB 2011 |
| Hot water Flow | No conditions when pumping power is less than 7.5 kW, riding curve | No conditions when pumping power is less than 7.5 kW, riding curve |
| Chilled Water flow | N/A | N/A |
| HVAC System | DXMUA unit with hot water coil, PAC in suites with Hydronic baseboards | DXMUA unit with hot water coil, PAC in suites with Hydronic baseboards |
| Economizer | No Requirement | No Requirement |
| Fan Power Limit | bhp = CFM * (0.00094) Set as follows: Supply Static = 2.6 in Supply Eff = 0.38 | Power input = 1.6 W/(L/s) Set as follows: Supply Static = 2.6 in Supply Eff = 0.40 |
| Fan Control | Constant | Constant |
| Cooling Supply T Control | Constant | Constant |
| Heating Supply T Control | Constant | Constant |
| Humidification | N/A | N/A |
| Demand Control Ventilation | None | None |
| AHU Air to Air heat recovery | No Requirement | No Requirement |
| Space temperature Setback | Daytime: 71.6°/75.2°F; Setback: 65.0°/none | Daytime: 71.6°/75.2°F; Setback: 65.0°/none |
| Hot water Loop T control | Reset | Constant |
| Chilled water Loop T control | N/A | N/A |
| Outside Air | 2,442 CFM | 2,442 CFM |
| Boiler Heating Efficiency | 80% Et (gas), 82% Et (oil) | 82.5% Ec and 83.0% Et (gas) , 83.4% Et (oil) |
| Boiler Type and Number | Single stage, 1 | Single stage, 1 or Two stage, 1 |
| Unit heaters in Garage | 80% Ec (oil and gas) | 82% Et (gas) 81%Et (oil) |
| Hot water temperature | 28.8°F drop; 180°F supply | 28.8°F drop; 180°F supply |
| MUA unit Heating | Hydronic | Hydronic |
| MUA unit DX efficiency (EER) | < 65 kBtu/h: 13 SEER >=65, < 135 kBtu/h: 11.0 EER >=135, < 240 kBtu/h: 10.8 EER | < 65 kBtu/h: 15 SEER >=65, < 135 kBtu/h: 11.0 EER >=135, < 240 kBtu/h: 10.8 EER |
| Chiller Type and Number | N/A | N/A |
| PAC | 10.37 EER | 10.37 EER |
| Chilled water temperature | N/A | N/A |
| Cooling Tower | N/A | N/A |
| Tower Sizing, Number of Cells | N/A | N/A |
| Cooling Tower Pump | N/A | N/A |
| Parking Garage Fan Control | Automatically detect contaminant levels and use fan with two flow rates. | No Requirement |
| SERVICE WATER HEATING | | |
| Thermal Efficiency or EF | 80% Et (gas), 78% Et (oil) | 0.67 - 0.0019V EF (V in gallons) (gas), 0.55 EF (oil) |
| Stanby loss | Q/800+110*√V (Btu/h, V in gallons) | No Requirement |
| Supply Temperature | 140°F | 140°F |
| Showers (L/min) | No Requirement | No Requirement |
| Lavatory Faucets (L/min) | No Requirement | No Requirement |
| Electric Power | | |
| Motor Efficiency | Premium | Premium |
| Pump Efficiency | 65% | 65% |
| Equipment demand (W/ft ²) | 0.4645 | 0.4645 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria - Retail without Anchor Store | | | | | | |
|---|------------------|-------|-------|-------|----------------|-----------|
| The retail archetype consists of a number of retail outlets with a total ground floor area of 3,993 m ² (42,980ft ²). Each retail area ranges from 56 m ² (600 ft ²) to 223 m ² (2,400 ft ²). The window-to-wall area ratio is 20% and the wall-to-roof area ratio is 0.95. Walls are brick, with air gap and insulation applied over 12 inch concrete block with drywall. The HVAC system in each store is a roof-top packaged constant volume system. The packaged system has a natural gas furnace section and DX cooling section. No zone re-heat is provided. | | | | | | |
| Item | ASHRAE 90.1-2010 | | | | | NECB 2011 |
| Exterior Walls (ft²·°F/Btuh) | | | | | | |
| Wall Type | Mass | Metal | Steel | Other | R _o | All |
| Toronto | 100% | 0% | 0% | 0% | 14.1 | 23.0 |
| | 14.1 | 14.5 | 15.6 | 19.6 | | |
| Montreal | 100% | 0% | 0% | 0% | 14.1 | 23.0 |
| | 14.1 | 14.5 | 15.6 | 19.6 | | |
| Halifax | 100% | 0% | 0% | 0% | 14.1 | 23.0 |
| | 14.1 | 14.5 | 15.6 | 19.6 | | |
| Vancouver | 100% | 0% | 0% | 0% | 12.5 | 18.0 |
| | 12.5 | 14.5 | 15.6 | 19.6 | | |
| Winnipeg | 100% | 0% | 0% | 0% | 14.1 | 27.0 |
| | 14.1 | 17.5 | 23.8 | 19.6 | | |
| Calgary | 100% | 0% | 0% | 0% | 14.1 | 27.0 |
| | 14.1 | 17.5 | 23.8 | 19.6 | | |
| St. Johns | 100% | 0% | 0% | 0% | 14.1 | 23.0 |
| | 14.1 | 14.5 | 15.6 | 19.6 | | |
| Regina | 100% | 0% | 0% | 0% | 14.1 | 27.0 |
| | 14.1 | 17.5 | 23.8 | 19.6 | | |
| Saint John | 100% | 0% | 0% | 0% | 14.1 | 23.0 |
| | 14.1 | 14.5 | 15.6 | 19.6 | | |
| Charlottetown | 100% | 0% | 0% | 0% | 14.1 | 23.0 |
| | 14.1 | 14.5 | 15.6 | 19.6 | | |
| Iqaluit | 100% | 0% | 0% | 0% | 19.2 | 31.0 |
| | 19.2 | 17.5 | 27.0 | 27.8 | | |
| Whitehorse | 100% | 0% | 0% | 0% | 19.2 | 27.0 |
| | 19.2 | 17.5 | 27.0 | 27.8 | | |
| Yellowknife | 100% | 0% | 0% | 0% | 19.2 | 31.0 |
| | 19.2 | 17.5 | 27.0 | 27.8 | | |
| Roof (ft²·°F/Btuh) | | | | | | |
| Toronto | 20.8 | | | | | 31.0 |
| Montreal | 20.8 | | | | | 31.0 |
| Halifax | 20.8 | | | | | 31.0 |
| Vancouver | 20.8 | | | | | 25.0 |
| Winnipeg | 20.8 | | | | | 35.0 |
| Calgary | 20.8 | | | | | 35.0 |
| St. Johns | 20.8 | | | | | 31.0 |
| Regina | 20.8 | | | | | 35.0 |
| Saint John | 20.8 | | | | | 31.0 |
| Charlottetown | 20.8 | | | | | 31.0 |
| Iqaluit | 20.8 | | | | | 40.0 |
| Whitehorse | 20.8 | | | | | 35.0 |
| Yellowknife | 20.8 | | | | | 40.0 |
| Exposed Floor (ft²·°F/Btuh) | | | | | | |
| Toronto | 17.5 | | | | | 31.0 |
| Montreal | 17.5 | | | | | 31.0 |
| Halifax | 17.5 | | | | | 31.0 |
| Vancouver | 15.6 | | | | | 25.0 |
| Winnipeg | 19.6 | | | | | 35.0 |
| Calgary | 19.6 | | | | | 35.0 |
| St. Johns | 17.5 | | | | | 31.0 |
| Regina | 19.6 | | | | | 35.0 |
| Saint John | 17.5 | | | | | 31.0 |
| Charlottetown | 17.5 | | | | | 31.0 |
| Iqaluit | 19.6 | | | | | 40.0 |
| Whitehorse | 19.6 | | | | | 35.0 |
| Yellowknife | 19.6 | | | | | 40.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria – Retail without Anchor Store (cont'd) | | | | |
|---|----------------------------|------------------|-----------|--|
| Glazing | ASHRAE 90.1-2010 | | | NECB 2011 |
| Glazing Percent | 20% | | | 20% |
| Window U-value | CurtainWall/ Storefront | Entrance Door | All Other | All |
| Toronto | 0.45 | 0.80 | 0.55 | 0.387 |
| Montreal | 0.45 | 0.80 | 0.55 | 0.387 |
| Halifax | 0.45 | 0.80 | 0.55 | 0.387 |
| Vancouver | 0.45 | 0.80 | 0.55 | 0.423 |
| Winnipeg | 0.40 | 0.80 | 0.45 | 0.387 |
| Calgary | 0.40 | 0.80 | 0.45 | 0.387 |
| St. Johns | 0.45 | 0.80 | 0.55 | 0.387 |
| Regina | 0.40 | 0.80 | 0.45 | 0.387 |
| Saint John | 0.45 | 0.80 | 0.55 | 0.387 |
| Charlottetown | 0.45 | 0.80 | 0.55 | 0.387 |
| Iqaluit | 0.40 | 0.80 | 0.45 | 0.282 |
| Whitehorse | 0.40 | 0.80 | 0.45 | 0.387 |
| Yellowknife | 0.40 | 0.80 | 0.45 | 0.282 |
| Window SHGC | | | | |
| Toronto | 0.40 | | | No Requirement |
| Montreal | 0.40 | | | No Requirement |
| Halifax | 0.40 | | | No Requirement |
| Vancouver | 0.40 | | | No Requirement |
| Winnipeg | 0.45 | | | No Requirement |
| Calgary | 0.45 | | | No Requirement |
| St. Johns | 0.40 | | | No Requirement |
| Regina | 0.45 | | | No Requirement |
| Saint John | 0.40 | | | No Requirement |
| Charlottetown | 0.40 | | | No Requirement |
| Iqaluit | 0.45 | | | No Requirement |
| Whitehorse | 0.45 | | | No Requirement |
| Yellowknife | 0.45 | | | No Requirement |
| Swinging Doors | | | | |
| Fully Glazed U-Value | See under Glazing | | | 0.476 |
| Opaque Door - Uvalue | 0.5 | | | Vancouver = 0.423 Iqaluit, Yellowknife = 0.282 All other cities in study = 0.387 |
| Underground Wall and Roof (ft²·°F/Btuh) | | | | |
| Toronto | Wall only: R-7.5 | | | 20.0 |
| Montreal | Wall only: R-7.5 | | | 20.0 |
| Halifax | Wall only: R-7.5 | | | 20.0 |
| Vancouver | Wall only: R-7.5 | | | 10.0 |
| Winnipeg | Wall only: R-10.0 | | | 20.0 |
| Calgary | Wall only: R-10.0 | | | 20.0 |
| St. Johns | Wall only: R-7.5 | | | 20.0 |
| Regina | Wall only: R-10.0 | | | 20.0 |
| Saint John | Wall only: R-7.5 | | | 20.0 |
| Charlottetown | Wall only: R-7.5 | | | 20.0 |
| Iqaluit | Wall only: R-12.5 | | | 27.0 |
| Whitehorse | Wall only: R-12.5 | | | 20.0 |
| Yellowknife | Wall only: R-12.5 | | | 27.0 |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Energy Criteria – Retail without Anchor Store (cont'd) | | |
|--|--|---|
| Floors-on-Ground (ft ² ·F/Btuh) | ASHRAE 90.1-2010 | NECB 2011 |
| Toronto | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Montreal | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Halifax | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Vancouver | 10 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Winnipeg | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Calgary | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| St. Johns | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Regina | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Saint John | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Charlottetown | 15 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Iqaluit | 20 (Min 24 in. from Perimeter) | 15.0 (Full Area) |
| Whitehorse | 20 (Min 24 in. from Perimeter) | 7.5 (Min 1.2m from Perimeter) |
| Yellowknife | 20 (Min 24 in. from Perimeter) | 15.0 (Full Area) |
| Leakage Rates | | |
| Envelope L/s/m ² | No Requirement | No Requirement |
| LIGHTING | | |
| Interior Lighting (W/ft ²) | 1.400 | 1.404 |
| Interior Lighting Control | Manual | Manual |
| Daylighting Control | No Requirement | No Requirement |
| Interior Lighting Control | No Requirement | No Requirement |
| HVAC | | |
| HVAC System | Roof top Packaged Constant volume, Gas fired. No zone reheat | Roof top Packaged Constant volume, Gas fired. No zone reheat |
| Economizer | 100 % Differential Enthalpy | 100 % Differential Enthalpy |
| Fan Power Limit | bhp = CFM * (0.00094 + 0.000121) Set as follows: Supply / Return Static = 2.0 in / 0.6 in Supply / Return Eff = 0.50 / 0.18 | Power input = 1.6 W/(L/s) Set as follows: Supply / Return Static = 2.0 in / 0.6 in Supply / Return Eff = 0.50 / 0.25 |
| Fan Control | Constant | Constant |
| Cooling Supply T Control | Variable | Variable |
| Heating Supply T Control | Variable | Variable |
| Humidification | N/A | N/A |
| Demand Control Ventilation | None | None |
| AHU Air to Air heat recovery | 50% Effectiveness (Only on certain systems depending on OA ratio) | None |
| Space temperature Setback | Occupied: 71.6°/72.1°; Setback: 64.4°/95° | Occupied: 71.6°/72.1°; Setback: 64.4°/95° |
| Outside Air | 9,850 CFM | 9,850 CFM |
| RTU Gas Fired Efficiency | 80% Et (gas) 80% Et or 81% Et for > 66 kW (oil) | 92.4% AFUE or 81% Et for > 117.2 kW (gas) 84.5% Et or 81.3% Et for > 66 kW (oil) |
| Chiller Type and Number | N/A | N/A |
| RTU DX Efficiency | < 65 kBtu/h: 13 SEER >=65, < 135 kBtu/h: 11.0 EER >=135, < 240 kBtu/h: 10.8 EER | < 65 kBtu/h: 15 SEER >=65, < 135 kBtu/h: 11.0 EER >=135, < 240 kBtu/h: 10.8 EER |
| SERVICE WATER HEATING | | |
| Thermal Efficiency or EF | 80% Et (gas), 78% Et (oil) | 0.67 - 0.0019V EF (V in gallons) (gas) 0.55 EF (oil) |
| Standby loss | Q/800+110*√V (Btu/h, V in gallons) | No Requirement |
| Supply Temperature | 140°F | 140°F |
| Showers (L/min) | 9.5 | 9.5 |
| Lavatory Faucets (L/min) | 8.3 | 8.3 |
| Electric Power | | |
| Motor Efficiency | N/A | N/A |
| Pump Efficiency | N/A | N/A |
| Equipment demand (W/ft ²) | 0.2320 | 0.2320 |

Appendix J: Utility Rate Summary

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Toronto | | | | | |
|--|-------------------------|---------------|-------------------|---------------------|---------|
| Electricity Price | | | | | |
| Rate: 50 kW - 999 kW | | | | | |
| Monthly \$ | \$/kWh | | | \$/kW | |
| 44.92 | 0.0460 | | | 9.258 | |
| Natural Gas Price | | | | | |
| \$/m ³ : tier m ³ | | | | | |
| 0.2523 | | 0-500 | | | |
| 0.2360 | | 500-1550 | | | |
| 0.2245 | | 1550-6050 | | | |
| 0.2172 | | 6050-13,050 | | | |
| 0.2139 | | 13,050-28,300 | | | |
| 0.2131 | | 28,300+ | | | |
| Montreal | | | | | |
| Electricity Price | | | | | |
| Rate: 0 kW - 100kW | | | | | |
| Monthly \$ | \$/kWh | tier kWh | | \$/kW | tier kW |
| 12.33 | 0.0878 | 0-15090 | | 0 | 0-50 |
| | 0.0485 | 15091+ | | 15.540 | 50+ |
| Rate: 100 kW+ | | | | | |
| Monthly \$ | \$/kWh | tier kWh | | \$/kW | |
| 12.33 | 0.0446 | 0-15090 | | 13.440 | |
| | 0.0319 | 15091+ | | | |
| Natural Gas Price | | | | | |
| Monthly \$ | tier m ³ /yr | | \$/m ³ | tier m ³ | |
| 12.52 | 0-10950 | | 0.5913 | 0-913 | |
| 23.53 | 10950-36500 | | 0.4942 | 913-3044 | |
| 27.70 | 36500-109500 | | 0.4822 | 3044-9131 | |
| 29.13 | 109500-365000 | | 0.4460 | 9131-30438 | |
| 37.61 | 365500-1095000 | | 0.4167 | 30438-91313 | |
| 48.96 | 1095000-3650000 | | 0.3919 | 91313-304375 | |
| 118.95 | 3650000+ | | 0.3806 | 304375-913125 | |
| | | | 0.3725 | 913125-3043750 | |
| | | | 0.3658 | 3043750+ | |
| Halifax | | | | | |
| Electricity Price | | | | | |
| Rate: 32,000+ kWh per year, 0-1800 kW | | | | | |
| Monthly \$ | \$/kWh | tier kWh/kW | | \$/kW | |
| 12.65 | 0.1112 | 0-200 | | 9.276 | |
| | 0.0822 | 200+ | | | |
| Heating Oil Price | | | | | |
| \$/L | | | | | |
| 1.0786 | | | | | |

| Vancouver | | | | | |
|--------------------------|--|-------------|-------|---------|--|
| Electricity Price | | | | | |
| | Rate: 35 kW - 150 kW | | | | |
| Monthly \$ | \$/kWh | tier kWh | \$/kW | tier kW | |
| 5.78 | 0.0894 | 0-14800 | 0.000 | 0-35 | |
| | 0.0455 | 14800+ | 4.623 | 35+ | |
| | Rate: 35 kW - 150 kW | | | | |
| Monthly \$ | \$/kWh | tier kWh | \$/kW | tier kW | |
| 5.78 | 0.0907 | 0-14800 | 0.000 | 0-35 | |
| | 0.0437 | 14800+ | 4.623 | 35-150 | |
| | | | 8.877 | 150+ | |
| Natural Gas Price | | | | | |
| Monthly \$ | \$/m ³ | | | | |
| 24.84 | 0.3060 | | | | |
| Winnipeg | | | | | |
| Electricity Price | | | | | |
| | Rate: 0 kW - 190 kW | | | | |
| Monthly \$ | \$/kWh | tier kWh | \$/kW | tier kW | |
| 18.25 | 0.0696 | 0-11000 | 0 | 0-47.5 | |
| | 0.0484 | 11000-19500 | 8.779 | 47.5+ | |
| | 0.0315 | 19500+ | | | |
| | Rate: 190 kW+ | | | | |
| Monthly \$ | \$/kWh | tier kWh | \$/kW | tier kW | |
| 27.60 | 0.0696 | 0-11000 | 0 | 0-47.5 | |
| | 0.0484 | 11000-19500 | 8.779 | 47.5+ | |
| | 0.0315 | 19500+ | | | |
| Natural Gas Price | | | | | |
| | Rate: 14,625 m³ - 680,000 m³ per year | | | | |
| Monthly \$ | \$/m ³ | | | | |
| 77 | 0.3997 | | | | |

| Calgary | | | |
|--------------------------|--|-------------|-------|
| Electricity Price | | | |
| | Rate: 0 kW - 142.5 kW, 5000+ kWh per month | | |
| Monthly \$ | \$/kWh | | \$/kW |
| 164.65 | 0.1150 | | 5.279 |
| | Rate: 50 kW - 999 kW | | |
| Monthly \$ | \$/kWh | | \$/kW |
| 465.16 | 0.1176 | | 7.749 |
| Natural Gas Price | | | |
| | Rate: 0 m³ - 32,362 m³ per year | | |
| Monthly \$ | \$/m ³ | | |
| 25.80 | 0.2508 | | |
| | Rate: 32,362 m³ - 215,747 m³ per year | | |
| Monthly \$ | \$/m ³ | | |
| 25.80 | 0.2507 | | |
| St Johns, NF | | | |
| Electricity Price | | | |
| | Rate: 10 kW - 100 kW | | |
| Monthly \$ | \$/kWh | tier kWh/kW | \$/kW |
| 20.76 | 0.0967 | 0-150 | 7.700 |
| | 0.0730 | 150+ | |
| | Rate: 100 kW - 950 kW | | |
| Monthly \$ | \$/kWh | tier kWh/kW | \$/kW |
| 93.47 | 0.0964 | 0-150 | 6.510 |
| | 0.0723 | 150+ | |
| Heating Oil Price | | | |
| | \$/L | | |
| | 1.1156 | | |

| Regina | | | | | |
|---|-------------------|-------------|--------|---------|--|
| Electricity Price | | | | | |
| Rate: 0 kW - 71.25 kW | | | | | |
| Monthly \$ | \$/kWh | tier kWh | \$/kW | tier kW | |
| 24.32 | 0.1007 | 0-14500 | 0.000 | 0-47.5 | |
| | 0.0588 | 14500+ | 11.263 | 47.5+ | |
| Rate: 71.25+ kW | | | | | |
| Monthly \$ | \$/kWh | tier kWh | \$/kW | tier kW | |
| 38.85 | 0.0899 | 0-14500 | 0.000 | 0-47.5 | |
| | 0.0595 | 14500+ | 11.895 | 47.5+ | |
| Natural Gas Price | | | | | |
| Rate: 0 m³ - 100,000 m³ per year | | | | | |
| Monthly \$ | \$/m ³ | | | | |
| 25.75 | 0.2356 | | | | |
| Rate: 100,000 m³ - 660,000 m³ per year | | | | | |
| Monthly \$ | \$/m ³ | | | | |
| 77.40 | 0.2276 | | | | |
| Saint John, NB | | | | | |
| Electricity Price | | | | | |
| Rate: 5000+ kWh per year | | | | | |
| Monthly \$ | \$/kWh | tier kWh/kW | \$/kW | | |
| 15.60 | 0.1080 | 0-100 | 6.300 | | |
| | 0.8400 | 100+ | | | |
| Heating Oil Price | | | | | |
| | \$/L | | | | |
| | 1.1284 | | | | |
| Charlottetown | | | | | |
| Electricity Price | | | | | |
| Monthly \$ | \$/kWh | tier kWh | \$/kW | tier kW | |
| 24.57 | 0.1518 | 0-5000 | 0.000 | 0-20 | |
| | 0.0931 | 5000+ | 13.430 | 20+ | |
| Heating Oil Price | | | | | |
| | \$/L | | | | |
| | 1.0666 | | | | |

ASHRAE 90.1 2010 and NECB 2011 Cross Canada Comparison

| Iqaluit | | |
|--------------------------|---------------------------------|-----------------------|
| Electricity Price | \$/kWh 0.4342 | \$/kW 8.000 |
| Heating Oil Price | \$/L 0.8663 | |
| Whitehorse | | |
| Electricity Price | Rate: 5000+ kWh per year | |
| | \$/kWh | tier kWh/kW |
| | 0.1035 | 0-2000 |
| | 0.1323 | 2000-15000 |
| | 0.1603 | 15000-20000 |
| | 0.1321 | 20000+ |
| | | \$/kW 7.390 |
| Heating Oil Price | \$/L 1.3030 | |
| Yellowknife | | |
| Electricity Price | \$/kWh 0.1764 | \$/kW 9.891 |
| Heating Oil Price | \$/L 1.2086 | |