Exhibit E – ASHRAE 90.1-2010 Mandatory Provisions Checklist (as modified by SB-10 Division 3, revised June 27, 2011)

This form records whether all mandatory requirements of ASHRAE 90.1-2010, as modified by SB-10 (ASHRAE 90.1M), have been "met" or "not met" according to the information the simulator has received from the project's professional architect(s) and engineer(s). It is understood that design professionals are responsible for ensuring the energy code conformity itself. Simulators are responsible only for noting the conformity on this form. This form must be completed by the simulator and attached to the Compliance Report in the HPNC submission.

It is recommended that simulators request and retain in their files, written records (typically emails or copies of checklist pages with professional's sign off etc.) that indicate the appropriate professional has verified that the requirement is "MET".

In the case of a conflict between this document, Supplementary Standard SB-10, or ANSI/ASHRAE/IESNA Standard 90.1, the full text of the applicable document governs.

If a mandatory provision is "NOT MET", provide the reason why in the “Notes” section. Where an exemption has been granted by HPNC, check "NOT MET" and indicate in the “Notes” section where in the submission the exemption documentation can be found. If a mandatory provision is not applicable, check "NOT MET" and provide the reason why in the note section.

SCOPE (as modified by SB-10 Division 3, revised June 27, 2011)

1.2.1. Application of ANSI/ASHRAE/IESNA Standard 90.1 (SB-10, Division 3)

	Met	Not Met
Building Type is not exempted under 1.2.1.1. Exceptions (SB-10 Division 3)		

Applicability of ASHRAE 90.1

	Met	Not Met
Building Type is not exempted under Section 2.2		
Building Type and spaces definition conforms to defined terms in Section 3.		

Notes:

Section 5: BUILDING ENVELOPE (as modified by SB-10 Division 3, revised June 27, 2011)

5.4.1 Insulation

	Met	Not Met
Where insulation is required in 5.5 or 5.6, it shall comply with the requirements found in 5.8.1.1 to 5.8.1.9.		

5.4.2 Fenestration and Doors

	Met	Not Met
Procedures for determining fenestration and door performance are described in 5.8.2. Product samples used for determining fenestration performance shall be production line units or representative of units purchased by the consumer or contractor.		

5.4.3 Air Leakage

	Met	Not Met
5.4.3.1.A. Air Barrier Materials, Assemblies and Systems (SB-10 Division 3) (1) The air barrier materials, assemblies and systems that are in conformance with Part 5 of Division B of the Building Code shall be deemed to be in compliance with Sentence 5.4.3.1.3 and Sentence 5.4.3.2.		
5.4.3.1. Continuous Air Barrier The entire building envelope shall be designed and constructed with a continuous air barrier.		
Exceptions to 5.4.3.1:		
a) Semi-heated spaces in climate zones 5 through 6		
b) Single wythe concrete masonry buildings in climate zone 5B		
5.4.3.1.1 Air Barrier Design The air barrier shall be designed and noted in the following manner:		
a) All air barrier components of each building envelope assembly shall be clearly identified or otherwise noted on construction documents(a)		
b) The joints, interconnections, and penetrations of the air barrier components including lighting fixtures shall be detailed or otherwise noted.		
c) The continuous air barrier shall extend over all s surfaces of the building envelope (at the lowest floor, exterior walls, and ceiling or roof).		
d) The continuous air barrier shall be designed to resist positive and negative pressures from wind, stack effect, and mechanical ventilation.		

5.4.3.1.2 Air Barrier Installation The following areas of the continuous air barrier in the building envelope shell shall be wrapped, sealed, caulked, gasketed, or taped in an approved manner to minimize air leakage:		
a) Joints around fenestration and door frames (both manufactured and site-built)		
b) Junctions between walls and floors, between walls and building corners, between walls and roofs or ceilings.		
c) Penetrations through the air barrier in the building envelope roofs, walls, and floors.		
d) Building assemblies used as ducts or plenums		
e) Joints, seams, connections between planes, and other changes in air barrier materials.		
5.4.3.1.3 Acceptable Materials and Assemblies Continuous air barrier materials and assemblies for the opaque building envelope shall comply with requirements found in 5.4.3.1.3a and 5.4.3.1.3b.		
5.4.3.2 Fenestration and Doors. Except as provided in 5.4.3.2.4, where components of the air barrier system are covered in the scope of the standards listed below, the components shall conform to the requirements of the respective standards: (5.4.3.2.1)		
a) CAN/CGSB-63.14-M, “Plastic Skylights”,		
b) CAN/CGSB-82.1-M, “Sliding Doors”,		
c) CAN/CGSB-82.5-M, “Insulated Steel Doors”,		
d) CAN/CSA-A440-M, “Windows”.		
Skylights not covered in the scope of CAN/CGSB-63.14-M, “Plastic Skylights” shall conform, to the performance requirements of that standard. (5.4.3.2.2)		
Except as provided in 5.4.3.2.4, windows and sliding doors covered in the scope of CAN/CGSB-82.1-M, “Sliding Doors”, and CAN/CSA-A440-M, “Windows” which are installed as components in an air barrier system shall conform at least to the airtightness requirements in CAN/CSA-A440.1, “User Selection Guide to CAN/CSA 440-00. Windows”. (5.4.3.2.3)		
Where a wired glass assembly is installed as a component in an air barrier system in a required fire separation, the assembly need not conform to CAN/CSA-A440-M, “Windows” or CAN/CSA-A440.1, “User Selection Guide to CAN/CSA 440-00. Windows”. (5.4.3.2.4)		
5.4.3.3 Loading Dock Weatherseals. In Climate Zones 5 through 8, cargo doors and loading dock doors shall be equipped with weatherseals to restrict infiltration when vehicles are parked in the doorway.		

5.4.3.4 Vestibules. Building entrances that separate conditioned space from the exterior shall be protected with an enclosed vestibule, with all doors opening into and out of the vestibule equipped with self-closing deices. Vestibules shall be designed so that in passing through the vestibule it is not necessary for the interior and exterior doors to open at the same time. Interior and exterior doors shall have a minimum distance between them of not less than 7ft when in the close position. The exterior envelope of conditioned vestibules shall comply with the requirements for a conditioned space. The interior and exterior envelope of unconditioned vestibules shall comply with the requirements for a semi-heated space.		
Exceptions to 5.4.3.4:		
a) Building entrances with revolving doors.		
b) Doors not intended to be used as a building entrance.		
c) Doors opening directly from a dwelling unit.		
d) Building entrances in buildings located in climate zone 1 or 2.		
e) Building entrances in buildings located in climate zone 3 that are less than four stories above grade and less than 10,000 ft² in area.		
f) Building entrances in buildings located in climate zone 4 through 8 that are less than 1,000 ft² in area.		
g) Doors that open directly from a space that is less than 3,000 ft² in area and is separate from the building entrance.		

Section 6: HEATING, VENTILATION AND AIR CONDITIONING (as modified by SB-10 Division 3, revised June 27, 2011)

6.4.1 Equipment Efficiencies, Verification, and Labeling Requirements

	Met	Not Met
6.4.1.A. Testing Procedures for Minimum Equipment Efficiency – Ontario Regulations (SB-10 Division 3) 1) Where the test procedure of equipment listed in Tables 6.8.1A to 6.8.1G is regulated by an Ontario Regulation, compliance with the applicable test procedure listed in Column 5 of SB-10 Table 6.4.1.A.2 shall be deemed to be compliance with the test procedures given in Tables 6.8.1A to 6.8.1G. 2) Where the test procedure of equipment is not regulated by an Ontario Regulation, the applicable test procedure is permitted to be selected from Column 4 or Column 5 of Table 6.4.1.A.2.		

6.4.1.1 Minimum Equipment Efficiencies – Listed Equipment – Standard Rating and Operating Conditions Equipment shown in Tables 6.8.1A to 6.8.1K shall have a minimum performance at the specified rating conditions when tested in accordance with the specified test procedure. Otherwise, the minimum efficiency values, test procedures and standards specified in ANSI/ASHRAE/IESNA Standard 90.1 shall apply. When multiple rating conditions or performance requirements are provided, the equipment shall satisfy all stated requirements, unless otherwise exempted by footnotes in the table. Equipment regulated under the Federal Energy Policy Act of 1992 (EPACT) shall have no minimum efficiency requirements for operation at minimum capacity or other than standard rating conditions. Equipment used to provide water heating functions as part of a combination system shall satisfy all requirements for the appropriate space heating or cooling category.		
Tables are as follows:		
a) Table 6.8.1A – Air Conditioners and Condensing Units		
b) Table 6.8.1B – Heat Pumps		
c) Table 6.8.1C – Water Chilling Packages (see 6.4.1.2 for water-cooled centrifugal waterchilling packages designed to operate at nonstandard conditions)		
d) Table 6.8.1D – Packaged Terminal and Room Air Conditioners and Heat Pumps		
e) Table 6.8.1E – Furnaces, Duct Furnaces and Unit Heaters		
f) Table 6.8.1F – Boilers		
g) Table 6.8.1G – Heat Rejection Equipment		
h) Table 6.8.1H – Heat Transfer Equipment		
i) Table 6.8.1I – Variable Refrigerant Flow Air Conditioners		
j) Table 6.8.1 J – Variable Refrigerant Flow Air-to-Air and Applied Heat Pumps		
k) Table 6.8.1 K – Air Conditioners Serving Computer Rooms		
All furnaces with input ratings of >66 kW (>225,000 Btu/hr), including electric furnaces, that are not located within the conditioned space shall have jacket losses not exceeding 0.75% of the input rating.		
Air conditioners primarily serving computer rooms and covered by ASHRAE Standard 127 shall meet the requirements in Table 6.8.1K. All other air conditioners shall meet the requirements in Table 6.8.1A		
6.4.1.2 Minimum Equipment Efficiencies – Listed Equipment – Nonstandard Conditions.		
6.4.1.2.1 Water-cooled centrifugal water-chilling packages: Equipment not designed for operation at ARI Standard 550/590 test conditions (and thus cannot be tested to meet the requirements of Table 6.8.1C) of 44°F leaving chilled water temperature and 85°F entering condenser water temperature with 3 gpm/ton condenser water flow shall have a maximum full-load kW/ton and a minimum NPLV adjusted using the equation outlined in 6.4.1.2.1.		

6.4.1.2.2 Positive displacement chilling packages: Equipment with an evaporator leaving fluid temperature higher than 32 °F shall show compliance with Table 6.8.1C when tested or certified with water at standard rating conditions, per the referenced test procedure.		
6.4.1.3 Equipment Not Listed. Equipment not listed in the tables referenced in 6.4.1.1 and 6.4.1.2 may be used.		
6.4.1.4 Verification of Equipment Efficiencies. Equipment efficiency information supplied by manufacturers shall be verified as follows:		
a) Equipment covered under EPACT shall comply with U.S. Department of Energy certification requirements.		
b) If a certification program exists for a covered product, and it includes provisions for verification and challenge of equipment efficiency ratings, then the product shall be listed in the certification program, or		
c) If a certification program exists for a covered product, and it includes provisions for verification and challenge of equipment efficiency ratings, but the product is not listed in the existing certification program, the ratings shall be verified by an independent laboratory test report, or		
d) If no certification program exists for a covered product, the equipment efficiency ratings shall be supported by data furnished by the manufacturer, or		
e) Where components such as indoor or outdoor coils from different manufacturers are used, the system designer shall specify component efficiencies whose combined efficiency meets the minimum equipment efficiency requirements in 6.4.1.		
f) Requirements for plate type liquid-to-liquid heat exchangers are listed in Table 6.8.1H.		
6.4.1.5 Labeling.		
6.4.1.5.1 Mechanical Equipment. Mechanical equipment that is not covered by the U.S. National Appliance Conservation Act (NACEC) of 1987 shall carry a permanent label installed by the manufacturer stating that the equipment complies with the requirements of Standard 90.1.		
6.4.1.5.2 Packaged Terminal Air Conditioners. Nonstandard size packaged terminal air conditioners and heat pumps with existing sleeves having an external wall opening of less than 16 in. high or less than 42 in. wide and having a cross-sectional area less than 670 in2 shall be factory labeled as follows: Manufactured for nonstandard size applications only: not to be installed in new construction projects.		

6.4.2 Calculations

	Met	Not Met
6.4.2.1 Load Calculations. Heating and cooling system design loads for the purpose of sizing systems and equipment shall be determined in accordance with ANSI/ASHRAE/ACCA Standard 183-2007, Peak Cooling and Heating Load Calculations in Buildings Except Low-Rise Residential Buildings.		
6.4.2.2 Pump Head. Pump differential pressure (head) for the purpose of sizing pumps shall be determined in accordance with generally accepted engineering standards and handbooks acceptable to the adopting authority. The pressure drop through each device and pipe segment in the critical circuit at design conditions shall be calculated.		

6.4.3 Controls

	Met	Not Met
6.4.3.1 Zone Thermostatic Controls.		
6.4.3.1.1 General. The supply of heating and cooling energy to each zone shall be individually controlled by thermostatic controls responding to temperature within the zone. For the purposes of 6.4.3.1, a dwelling unit shall be permitted to be considered a single zone.		
Exceptions to 6.4.3.1.1: Independent perimeter systems that are designed to offset only building envelope loads shall be permitted to serve one or more zones also served by an interior system provided:		
a) The perimeter system includes at least one thermostatic control zone for each building exposure having exterior walls facing only one orientation for 50 contiguous feet or more, and		
b) The perimeter system heating and cooling supply is controlled by a thermostatic control(s) located within the zones(s) served by the system.		
c) Exterior walls are considered to have different orientations if the directions they face differ by more than 45 degrees.		
6.4.3.1.2 Dead Band. Where used to control both heating and cooling, zone thermostatic controls shall be capable of providing a temperature range or dead band of at least 5°F within which the supply of heating and cooling energy to the zone is shut off or reduced to a minimum.		
Exceptions to 6.4.3.1.2:		
a) Thermostats that require manual changeover between heating and cooling modes.		

b) Special occupancy or special applications where wide temperature ranges are not acceptable (such as retirement homes, process applications, data processing, museums, some areas of hospitals) and are approved by the authority having jurisdiction.		
6.4.3.2 Setpoint Overlap Restriction. Where heating and cooling to a zone are controlled by separate zone thermostatic controls located within the zone, means (such as limit switches, mechanical stops, or, for DDC systems, software programming) shall be provided to prevent the heating setpoint from exceeding the cooling setpoint minus any applicable proportional band.		
6.4.3.3 Off-Hour Controls. HVAC systems shall have the off-hour controls required by Sections 6.4.3.3.1 through 6.4.3.3.4.		
Exceptions to 6.4.3.3:		
a) HVAC systems intended to operate continuously.		
b) HVAC systems having a design heating capacity and cooling capacity less than 15,000 Btu/h that are equipped with readily accessible manual ON/OFF controls.		
6.4.3.3.1 Automatic Shutdown. HVAC systems shall be equipped with at least one of the following:		
a) Controls that can start and stop the system under different time schedules for seven different day-types per week, are capable of retaining programming and time setting during loss of power for a period of at least 10 hours, and include an accessible manual override, or equivalent function, that allows temporary operation of the system for up to two hours.		
b) An occupant sensor that is capable of shutting the system off when no occupant is sensed for a period of up to 30 minutes.		
c) A manually operated timer capable of being adjusted to operate the system for up to two hours.		
d) An interlock to a security system that shuts the system off when the security system is activated.		
Exception to 6.4.3.3.1:		
Residential occupancies may use controls that can start and stop the system under two different time schedules per week.		

6.4.3.3.2 Setback Controls. Heating systems located in climate zones 2-8 shall be equipped with controls that have the capability to automatically restart and temporarily operate the system as required to maintain zone temperatures above a heating setpoint adjustable down to 55°F or lower. Cooling systems located in climate zones 1b, 2b, and 3b shall be equipped with controls that have the capability to automatically restart and temporarily operate the system as required to maintain zone temperatures below a cooling setpoint adjustable up to 90°F or higher or to prevent high space humidity levels.		
Exception to 6.4.3.2.2: Radiant floor and ceiling heating systems.		
6.4.3.3.3 Optimum Start Controls. Individual heating and cooling air distribution systems with a total design supply air capacity exceeding 10,000 cfm, served by one or more supply fans, shall have optimum start controls. The control algorithm shall, as a minimum, be a function of the difference between space temperature and occupied setpoint and the amount of time prior to scheduled occupancy.		
6.4.3.3.4 Zone Isolation. HVAC systems serving zones that are intended to operate or be occupied non-simultaneously shall be divided into isolation areas. Zones may be grouped into a single isolation area provided it does not exceed 25,000 ft² of conditioned floor area nor include more than one floor. Each isolation area shall be equipped with isolation devices capable of automatically shutting off the supply of conditioned air and outdoor air to and exhaust air from the area. Each isolation area shall be controlled independently by a device meeting the requirements of 6.4.3.3.1 (Automatic Shutdown). For central systems and plants, controls and devices shall be provided to allow stable system and equipment operation for any length of time while serving only the smallest isolation area served by the system or plant.		
Exceptions to 6.4.3.3.4: Isolation devices and controls are not required for the following:		
a) Exhaust air and outdoor air connections to isolation zones when the fan system to which they connect is 5,000 cfm and smaller.		
b) Exhaust airflow from a single isolation zone of less than 10% of the design airflow of the exhaust system to which it connects.		
c) Zones intended to operate continuously or intended to be inoperative only when all other zones are inoperative.		

TABLE 6.4.3.4.3 Maximum Damper Leakage
(cfm per ft² at 1.0 in. w.g.)

Climate Zone	Ventilation Air Intake		Exhaust/Relief	
	non-motorized[1]	motorized	non-motorized[1]	motorized
1, 2	-	-	-	
any height	20	4	20	4
3	-	-	-	
any height	20	10	20	10
4, 5b, 5c	-	-	-	
less than 3 stories	not allowed	10	20	10
3 or more stories	not allowed	10	not allowed	10
5a, 6, 7, 8	-	-	-	
less than 3 stories	not allowed	4	20	4
3 or more stories	not allowed	4	not allowed	4

[1] Dampers smaller than 24 in. in either dimension may have leakage of 40 cfm/ft²

	Met	Not Met
6.4.3.4.5 Enclosed Parking Garage Ventilation. Enclosed parking garage ventilation systems shall automatically detect contaminant levels and stage fans or modulate fan airflow rates to 50% or less of design capacity provided acceptable contaminant levels are maintained.		
Exceptions to 6.4.3.4.5:		
a) Garages less than 30,000 ft² with ventilation systems that do not utilize mechanical cooling or mechanical heating		
b) Garages that have a garage area to ventilation system motor nameplate hp ratio that exceeds 1,500 ft²/hp and do not utilize mechanical cooling or mechanical heating		
c) Where not permitted by the authority having jurisdiction.		
6.4.3.5 Heat Pump Auxiliary Heat Control. Heat pumps equipped with internal electric resistance heaters shall have controls that prevent supplemental heater operation when the heating load can be met by the heat pump alone during both steady-state operation and setback recovery. Supplemental heater operation is permitted during outdoor coil defrost cycles.		
Exception to 6.4.3.4: Heat pumps whose minimum efficiency is regulated by NAECA and whose HSPF rating both meets the requirements shown in Table 6.8.1.B and includes all usage of internal electric resistance heating.		

6.4.3.6 Humidifier Preheat. Humidifiers with preheating jackets mounted in the airstream shall be provided with an automatic valve to shut off preheat when humidification is not required.		
6.4.3.7 Humidification and Dehumidification. Where a zone is served by a system or systems with both humidification and dehumidification capability, means (such as limit switches, mechanical stops, or, for DDC systems, software programming) shall be provided capable of preventing simultaneous operation of humidification and dehumidification equipment.		
Exceptions to 6.4.3.7:		
a) Zones served by desiccant systems, used with direct evaporative cooling in series.		
b) Systems serving zones where specific humidity levels are required, such as computer rooms, museums, and hospitals, and approved by the authority having jurisdiction.		
6.4.3.8 Freeze Protection and Snow/Ice Melting Systems. Freeze protection systems, such as heat tracing of outdoor piping and heat exchangers, including self-regulating heat tracing, shall include automatic controls capable of shutting off the systems when outdoor air temperatures are above 40°F or when the conditions of the protected fluid will prevent freezing. Snow- and ice-melting systems shall include automatic controls capable of shutting off the systems when the pavement temperature is above 50°F and no precipitation is falling and an automatic or manual control that will allow shutoff when the outdoor temperature is above 40°F so that the potential for snow or ice accumulation is negligible.		
6.4.3.9 Ventilation Controls for High-Occupancy Areas. Demand control ventilation (DCV) is required for spaces larger than 500 ft² and with a design occupancy for ventilation greater than 40 people per 1,000 ft² of floor area and served by systems with one or more of the following:		
a) an air-side economizer		
b) automatic modulating control of the outdoor air damper, or		
c) a design outdoor airflow greater than 3,000 cfm.		
Exception to 6.4.3.9:		
a) Systems with energy recovery complying with 6.5.6.1.		
b) Multiple-zone systems without DDC of individual zones communicating with a central control panel.		
c) Systems with a design outdoor airflow less than 1,200 cfm		
d) Spaces where the supply airflow rate minus any makeup or outgoing transfer air requirement is less than 1,200 cfm.		
6.4.3.10 Single Zone Variable-Air-Volume Controls. HVAC systems shall have variable airflow controls as follows:		

a)	Air-handling and fan-coil units with chilled-water cooling coils and supply fans with motors greater than or equal to 5 hp shall have their supply fans controlled by two-speed motors or variable –speed drives. At cooling demands less than or equal to 50%, the supply fan controls shall be able to reduce the airflow to no greater than the larger of the following: 1) One half the full fan speed or 2) The volume of outdoor air required to meet ventilation requirements of Standard 62.1		
b)	Effective January 1, 2012, all air-conditioning equipment and air-handling units with direct expansion cooling and a cooling capacity at AHRI conditions greater than or equal to 110,000 Btu/h that serve single zones shall have their supply fans controlled by two-speed motors or variable-speed drives. At cooling demands less than or equal to 50%, the supply fan controls shall be able to reduce the airflow to no greater than the larger of the following:		
	1) Two-thirds of the full fan speed, or		
	2) The volume of outdoor air required to meet the ventilation requirements of Standard 62.1		

6.4.4 HVAC System Construction and InsulationNotes:

	Met	Not Met
6.4.4.1 Insulation		
6.4.4.1.1 General. Insulation required by this section shall be installed in accordance with industry-accepted standards (see Informative Appendix E). These requirements do not apply to HVAC equipment. Insulation shall be protected from damage, including that due to sunlight, moisture, equipment maintenance and wind, but not limited to the following:		
a) Insulation exposed to weather shall be suitable for outdoor service, e.g., protected by aluminum, sheet metal, painted canvas, or plastic cover. Cellular foam insulation shall be protected as above or painted with a coating that is water retardant and provides shielding from solar radiation that can cause degradation of the material.		
b) Insulation covering chilled water piping, refrigerant suction piping, or cooling ducts located outside the conditioned space shall include a vapor retardant located outside the insulation (unless the insulation is inherently vapor retardant), all penetrations and joints of which shall be sealed.		
6.4.4.1.2 Duct and Plenum Insulation. All supply and return ducts and plenums installed as part of an HVAC air distribution system shall be thermally insulated in accordance with Tables 6.8.2A and 6.8.2B.		
Exceptions to 6.4.4.1.2:		

a) Factory-installed plenums, casings, or ductwork furnished as a part of HVAC equipment tested and rated in accordance with 6.4.1.		
b) Ducts or plenums located in heated spaces, semi-heated spaces, or cooled spaces.		
c) For runouts less than 10 ft in length to air terminals or air outlets, the rated R-value of insulation need not exceed R-3.5.		
d) Backs of air outlets and outlet plenums exposed to unconditioned or indirectly conditioned spaces with face areas exceeding 5 ft² need not exceed R-2; those 5 ft² or smaller need not be insulated.		
6.4.4.1.3 Piping Insulation. Piping shall be thermally insulated in accordance with Tables 6.8.3A and 6.8.3B.		
Exceptions to 6.4.4.1.3:		
a) Factory-installed piping within HVAC equipment tested and rated in accordance with Section 6.4.1.		
b) Piping that conveys fluids having a design operating temperature range between 60°F and 105°F, inclusive.		
c) Piping that conveys fluids that have not been heated or cooled through the use of fossil fuels or electricity (such as roof and condensate drains, domestic cold water supply, natural gas piping)		
d) Where heat gain or heat loss will not increase energy usage (such as liquid refrigerant piping)		
e) In piping 1 in. or less, insulation is not required for strainers, control valves, and balancing valves.		
6.4.4.1.4 Sensible Heating Panel Insulation. All thermally ineffective panel surfaces of sensible heating panels, including U-bends and headers, shall be insulated with a minimum of R-3.5. Adjacent envelope insulation counts toward this requirement.		
6.4.4.1.5 Radiant Floor Heating. The bottom surfaces of floor structures incorporating radiant heating shall be insulated with a minimum of R-3.5. Adjacent envelope insulation counts towards this requirement.		
Exceptions to 6.4.4.1.5: Requirements for heated slab-on-grade floors incorporating radiant heating are in Chapter 5.		
6.4.4.2 Ducts and Plenum Leakage		

6.4.4.2.1 Duct Sealing. Ductwork and all plenums with pressure class ratings shall be constructed to seal class A, as required to meet the requirements of Section 6.4.4.2.2, and with standard industry practice (see Informative Appendix E). Openings for rotating shafts shall be sealed with bushings or other devices that seal off air leakage. Pressure-sensitive tape shall not be used as the primary sealant, unless it has been certified to comply with UL-18IA or UL-18IB by an independent testing laboratory and the tape is used in accordance with that certification. All connections shall be sealed, including but not limited to spin-ins, taps, other branch connections, access doors, access panels, and duct connections to equipment. Sealing that would void product listings is not required. Spiral lock seams need not be sealed. All duct pressure class ratings shall be designated in the design documents.		
6.4.4.2.2 Duct Leakage Tests. Ductwork that is designed to operate at static pressures in excess of 3 in. w.c. and all ductwork located outdoors shall be leak-tested according to industry-accepted test procedures (see Informative Appendix E). Representative sections totaling no less than 25% of the total installed duct area for the designated pressure class shall be tested. All sections shall be selected by the building owner or the designated representative of the building owner. Positive pressure leakage testing is acceptable for the negative pressure ductwork. The maximum permitted duct leakage shall be Lmax = CL P0.65 where Lmax = maximum permitted leakage in cfm/100 ft² duct surface area; CL = duct leakage class, cfm/100 ft² duct surface at 1 in. w.c., and P = test pressure, which shall be equal to the design duct pressure class rating, in. w.c.		

Section 7: SERVICE WATER HEATING (as modified by SB-10 Division 3, revised June 27, 2011)

7.4.1 Load Calculations

	Met	Not Met
Service water heating system design loads for the purpose of sizing systems and equipment shall be determined in accordance with manufacturers' published sizing guidelines or generally accepted engineering standards and handbooks acceptable to the adopting authority (e.g., ASHRAE Handbook—HVAC Applications).		

7.4.2 Equipment Efficiency

	Met	Not Met

7.4.2.A. Testing procedures for Minimum Equipment Efficiency - Ontario Regulations (SB-10, Division 3) 1) Where the test procedure of equipment listed in Table 7.8. is regulated by an Ontario Regulation, compliance with the applicable test procedure listed in Column 5 of Table 7.4.2.A. shall be deemed to be compliance with the test procedures given in Tables 6.8.1A to 6.8.1G. 2) Where the test procedure of equipment is not regulated by an Ontario Regulation, the applicable test procedure is permitted to be selected from Column 4 or Column 5 of Table 7.4.2.A. (as found in SB-10).		
7.4.2 Equipment Efficiency All water heating equipment, hot water supply boilers used solely for heating potable water, pool heaters, and hot water storage tanks shall meet the criteria listed in Table 7.8. Where multiple rating conditions or performance requirements are provided, all criteria shall be met. Omission of minimum performance requirements for certain classes of equipment does not preclude use of such equipment where appropriate. Equipment not listed in Table 7.8 has no minimum performance requirements.		
Exception to 7.4.2:		
All water heaters and hot water supply boilers having more than 140 gal of storage capacity are not required to meet the standby loss (SL) requirements of Table 7.8 when		
a) the tank surface is thermally insulated to R-12.5, and		
b) a standing pilot light is not installed, and		
c) gas- or oil-fired storage water heaters have a flue damper or fan-assisted combustion.		

7.4.3 Service Hot Water Piping Insulation

	Met	Not Met
The following piping shall be insulated to levels shown in Section 6, Table 6.8.3:		
a) Recirculating system piping, including the supply and return piping of a circulating tank type water heater.		
b) The first 8 ft of outlet piping for a constant temperature non-recirculating storage system.		
c) The inlet pipe between the storage tank and a heat trap in a non-recirculating storage system.		
d) Pipes that are externally heated (such as heat trace or impedance heating).		

7.4.4 Service Water Heating System Controls

	Met	Not Met

7.4.4.1 Temperature Controls. Temperature controls shall be provided that allow for storage temperature adjustment from 120°F or lower to a maximum temperature compatible with the intended use.		
Exception to 7.4.4.1:		
When the manufacturer's installation instructions specify a higher minimum thermostat setting to minimize condensation and resulting corrosion.		
7.4.4.2 Temperature Maintenance Controls. Systems designed to maintain usage temperatures in hot water pipes, such as recirculating hot water systems or heat trace, shall be equipped with automatic time switches or other controls that can be set to switch off the usage temperature maintenance system during extended periods when hot water is not required.		
7.4.4.3 Outlet Temperature Controls. Temperature controlling means shall be provided to limit the maximum temperature of water delivered from lavatory faucets in public facility restrooms to 110°F.		
7.4.4.4 Circulating Pump Controls. When used to maintain storage tank water temperature, recirculating pumps shall be equipped with controls limiting operation to a period from the start of the heating cycle to a maximum of five minutes after the end of the heating cycle.		

7.4.5 Pools

	Met	Not Met
7.4.5.1 Pool Heaters. Pool heaters shall be equipped with a readily accessible on-off switch to allow shutting off the heater without adjusting the thermostat setting. Pool heaters fired by natural gas shall not have continuously burning pilot lights.		
7.4.5.2 Pool Covers (as modified by SB-10). Heated exterior swimming pools (including lap pools and permanent whirlpools) shall be equipped with pool covers.		
Exception to 7.4.5.2:		
Pools deriving over 60% of the energy for heating (computed over an annual operating season) from site-recovered or site- solar energy.		
7.4.5.3 Time Switches. Time switches shall be installed on swimming pool heaters and pumps.		
Exceptions to 7.4.5.3:		
a) Where public health standards require 24-hour pump operation.		
b) Where pumps are required to operate solar and waste heat recovery pool heating systems.		

7.4.6 Heat Traps

	Met	Not Met
Vertical pipe risers serving storage water heaters and storage tanks not having integral heat traps and serving a non-recirculating system shall have heat traps on both the inlet and outlet piping as close as practical to the storage tank. A heat trap is a means to counteract the natural convection of heated water in a vertical pipe run. The means is either a device specifically designed for the purpose or an arrangement of tubing that forms a loop of 360 degrees or piping that from the point of connection to the water heater (inlet or outlet) includes a length of piping directed downward before connection to the vertical piping of the supply water or hot-water distribution system, as applicable.		

Section 8: POWER

8.4.1 Voltage Drop

	Met	Not Met
Exceptions to 8.4.1. Feeder conductors and branch circuit that are dedicated to emergency services.		
8.4.1.1 Feeders. Feeder conductors shall be sized for a maximum voltage drop of 2% at design load.		
8.4.1.2 Branch Circuits. Branch circuit conductors shall be sized for a maximum voltage drop of 3% at design load.		

8.4.2 Automatic Receptacle Control

	Met	Not Met
At least 50% of all 125 volt 15- and 20-Ampere receptacles, including those installed in modular partitions, installed in the following space types: a) Private offices b) Open offices c) Computer Classrooms shall be controlled by an automatic control device that shall function on:		
a) a scheduled basis using a time-of-day operated control device that turns receptacles off at specific programmed times – an independent program schedule shall be provided for areas of no more than 25,000 ft² but not more than one floor, or		
b) an occupant sensor that shall turn receptacles off within 30 minutes of all occupants leaving a space, or		
c) signal from another control or alarm system that indicates the area is unoccupied.		
Exceptions to 8.4.2: Receptacles for the following shall not require an automatic control device:		

a)	Receptacles specifically designated for equipment requiring 24 hour operation.		
b)	Spaces where an automatic shutoff would endanger the safety or security of the room or building occupant(s).		

Section 9: LIGHTING

9.4.1 Lighting Control

		Met	Not Met
Building controls shall meet the provisions of 9.4.1.1, 9.4.1.2, 9.4.1.3, 9.4.1.5, 9.4.1.6, and 9.4.1.7. Any automatic control device required in sections 9.4.1.1, 9.4.1.2 and 9.4.1.4 shall either be manual on or shall be controlled automatically turn the lighting on to not more than 50% power, except in the following spaces where full automatic-on is allowed;			
a)	Public corridors and stairwells		
b)	Restrooms		
c)	Primary building entrance areas and lobbies, and		
d)	Areas where manual-on operation would endanger the safety or security of the room or building occupant(s).		
9.4.1.1 Automatic Lighting Shutoff. Interior lighting in buildings shall be controlled with an automatic control device to shut off building lighting in all spaces. This automatic control device shall function on either			
a)	a scheduled basis using a time-of-day operated control device that turns lighting off a specific programmed times—an independent program schedule shall be provided for areas of no more than 25,000 ft² but not more than one floor—or		
b)	an occupant sensor that shall turn lighting off within 30 minutes of an occupant leaving a space—or		
c)	a signal from another control or alarm system that indicates the area is unoccupied.		
Exceptions to 9.4.1.1:			
The following shall not require an automatic control device:			
a)	Lighting intended for 24-hour operation		
b)	Lighting in spaces where patient care is rendered.		
c)	Lighting in spaces where an automatic shutoff would endanger the safety or security of the room or building occupant(s).		

9.4.1.2 Space Control. Each space enclosed by ceiling height partitions shall have at least one control device to independently control the general lighting within the space. Each manual device shall be readily accessible and located so the occupants can see the controlled lighting. All controlled lighting shall meet the following requirements:			
a)	The controlled lighting shall have at least one control step between 30% and 70% (inclusive) of full lighting power in addition to all off.		
Exception to 9.4.1.2a:			
a)	Lights in corridors, electrical/mechanical rooms, public lobbies, restrooms, stairways, and storage rooms.		
b)	Spaces with only one luminaire with rated input power less than 100W.		
c)	Spaces types with lighting power allowance of less than 0.6 W/ft² (see Table 9.6.1)		
b)	An occupant sensor or a timer switch shall be installed that automatically turns lighting off within 30 minutes of all occupants leaving a space in:		
1)	classrooms and lecture halls,		
2)	conference, meeting and training rooms,		
3)	employee lunch and break rooms,		
4)	storage and supply rooms between 50 ft² and 1,000 ft²,		
5)	rooms used for document copying and printing,		
6)	office spaces up to 250 ft²		
7)	restrooms, and		
8)	dressing, locker, and fitting rooms.		
Exceptions to 9.4.1.2b: These spaces are not required to be connected to other automatic lighting shutoff controls:			
a)	Spaces with multi-scene control systems,		
b)	Shop and laboratory classrooms		
c)	Spaces where an automatic shutoff would endanger the safety or security of the rooms or building occupant(s), and		
d)	Lighting required for 24-hour operation.		
c)	For spaces not included in 9.4.1.2b, each control device shall be activated either manually by an occupant or automatically by sensing an occupant. Each control device shall control a maximum of 2,500 ft² area for a space 10,000 ft² or less and a maximum of 10,000 ft² for a space greater than 10,000 ft². The occupant shall be able to override any time-of-day scheduled shutoff control for no more than two hours.		
Exceptions to 9.4.1.2c: Remote location shall be permitted for reasons of safety or security when the remote control devices has an indicator pilot light as part of or next to the control device and the light is clearly labeled to identify the controlled lighting.			

9.4.1.3 Parking Garage Lighting Control Lighting for parking garages shall comply with the following requirements:		
a) Comply with Section 9.4.1.1.		
b) Shall be controlled by one or more devices that automatically reduce lighting power of each luminaire by a minimum of 30% when there is no activity detected within a lighting zone for no more than 30 minutes. Lighting zones for the requirement shall be no larger than 3,600 ft².		
c) Daylight transition zone lighting, as described in Section 9.2.2.3 exception r, shall be separately controlled by a device that automatically turns lighting on during day-light hours and off at sunset.		
d) For luminaires within 20 ft of any perimeter wall structure that has a net opening to wall ratio of at least 40% and no exterior obstructions within 20ft, the power shall be automatically reduced in response to daylight.		
Exceptions to 9.4.1.3:		
a) Daylight transitions zones and ramps without parking are exempt from sections b and d above.		
b) Applications using HID of 150 watts or less or Induction lamps are exempt from section b above.		
9.4.1.4 Automatic Daylighting Controls for Primary Sidelighted Areas. When the combined primary sidelighted area in an enclosed space equals or exceeds 250 ft², the lamps for general lighting in the primary sidelighted area shall be separately controlled by at least one multilevel photocontrol (including continuous dimming devices) having the following characteristics:		
a) The light sensor for the photocontrol shall be remote from where the calibration adjustments are made;		
b) the calibration adjustments shall be readily accessible; and		
c) The multilevel photocontrol shall reduce electric lighting in response to available daylight with at least one control step that is between 50% and 70% of design lighting power and another control step that is no greater than 35% (including off) of design power.		
Exceptions to 9.4.1.4		
a) Primary sidelighted areas where the top of the existing adjacent structures are twice as high above the windows as their distance away from the windows		
b) Primary sidelighted areas where the sidelighting effective aperture is less than 0.1 (10%)		
c) Retail spaces		

9.4.1.5 Automatic Daylighting Controls For Toplighting. When the total daylight area under skylights plus the total daylight area under rooftop monitors in an enclosed space exceeds 900 ft², the lamps for general lighting in the daylight area shall be separately controlled by at least one multilevel photocontrol (including continuous dimming devices having the following characteristics:		
a) The light sensor for the photocontrol shall be remote from where calibration adjustments are made,		
b) the calibration adjustments shall be readily accessible, and		
c) The multilevel photocontrol shall reduce electric lighting in response to available daylight with at least one control step that is between 50% and 70% of design lighting power and another control step that is no greater than 35% of design power.		
Exceptions to 9.4.1.5:		
a) Daylighted areas under skylights where it is documented that existing adjacent structures or natural objects block direct beam sunlight for more than 1,500 daytime hours per year between 8 a.m. and 4 p.m.		
b) Daylighted areas where the skylight effective aperture (EA) is less than 0.006 (0.6%)		
c) Buildings in climate zone 8 with daylight areas totaling less than 1,500 ft² in an enclosed space.		
9.4.1.6 Additional Control. Additional controls shall meet the following requirements:		
a) Display/Accent Lighting - Display or accent lighting shall have a separate control/ device.		
b) Case Lighting - Lighting in cases used for display purposes shall have a separate control device.		
c) Guest Room Lighting - Guestrooms in hotels, motels, boarding houses or similar buildings shall have one or more control device(s) at the entry door that collectively control all permanently installed luminaires and switched receptacles, except those in the bathroom(s). Suites shall have control(s) meeting these requirements at the entry to each room or at the primary entry to the suite. Bathrooms shall have a control device installed to automatically turn off the bathroom lighting, except for night lighting not exceeding 5 watts, within 60 minutes of the occupant leaving the space.		
d) Task Lighting - Supplemental task lighting, including permanently installed undershelf or undercabinet lighting, shall have a control device integral to the luminaires or be controlled by a wall-mounted control device provided the control device is readily accessible and located so that the occupant can see the controlled lighting.		
e) Nonvisual Lighting - Lighting for nonvisual applications, such as plant growth and food warming, shall have a separate control device.		

f)	Demonstration Lighting - Lighting equipment that is for sale or for demonstrations in lighting education shall have a separate control device.		
g)	Stairwell Lighting - Lighting in stairwells shall have one or more control devices to automatically reduce lighting power in anyone controlled zone by at least 50% within 30 minutes of all occupants leaving that controlled zone.		
9.4.1.7	Exterior Lighting Control. Lighting for exterior applications not exempted in section 9.1 shall meet the following requirements:		
a)	Lighting shall be controlled by a device that automatically turns off the lighting when sufficient daylight is available.		
b)	All building façade and landscape lighting shall be automatically shut off between midnight or business closing, whichever is later, and 6am or business opening, whichever comes first, or between times established by the authority having jurisdiction.		
c)	Lighting not specified in section b above. Including advertising signage, shall be controlled by a device that automatically reduces the connected lighting power by at least 30% for at least one of the following conditions:		
1)	From 12 midnight or within one (I) hour of the end of business operations, whichever is later, until 6am or business opening, whichever is earlier; or		
2)	During any period when no activity has been detected for a time of no longer than 15 minutes.		
All time switches shall be capable of retaining programming and the time setting during loss of power for a period of at least ten hours.			
Exceptions to 9.4.1.7: Lighting for covered vehicle entrances or exits from buildings or parking structures where required for safety, security, or eye adaptation.			

9.4.2 Exit Signs

	Met	Not Met
Internally illuminated exit signs shall not exceed 5 watts per face.		

9.4.3 Exterior Building Lighting Power

	Met	Not Met

The total exterior lighting power allowance for all exterior building applications is the sum of the base site allowance plus the individual allowances for areas that are designed to be illuminated and are permitted in Table 9.4.3B for the applicable lighting zone. The installed exterior lighting power identified in accordance with Section 9.1.3 shall not exceed the exterior lighting power allowance developed in accordance with this section. Trade-offs are allowed only among exterior lighting applications listed in the Table 9.4.3B "Tradable Surfaces" section. The lighting zone for the building exterior is determined from Table 9.4.3A unless otherwise specified by the local jurisdiction.		
Exceptions to 9.4.3: Lighting used for the following exterior applications is exempt when equipped with a control device that complies with the requirements of Section 9.4.1.7 and is independent of the control of the nonexempt lighting:		
a) Specialized signal, directional, and marker lighting associated with transportation.		
b) Advertising signage or directional signage.		
c) Lighting integral to equipment or instrumentation and installed by its manufacturer.		
d) Lighting for theatrical purposes, including performance, stage, film production, and video production.		
e) Lighting for athletic playing areas.		
f) Temporary lighting.		
g) Lighting for industrial production, material handling, transportation sites, and associated		
h) Theme elements in theme/amusement parks.		
i) Lighting used to highlight features of public monuments and registered historic landmark structures or buildings.		
j) Lighting for hazardous locations.		
k) Lighting for swimming pools and water features.		
l) Searchlights.		

9.4.4 Functional Testing

	Met	Not Met
Lighting control devices and control systems shall be tested to ensure that control hardware and software are calibrated, adjusted, programmed, and in proper working condition in accordance with the construction documents and manufacturer's installation instructions. When occupant sensors, time switches, programmable schedule controls, or photosensors are installed, at a minimum, the following procedures shall be performed:		
a) Confirm that the placement, sensitivity and time-out adjustments for occupant sensors yield acceptable performance, lights turn off only after space is vacated and do not turn on unless space is occupied.		

b) Confirm that the time switches and programmable schedule controls are programmed to turn the lights off		
c) Confirm that photosensor controls reduce electric light levels based on the amount of usable daylight in the space as specified.		
The construction documents shall state the party who will conduct and certify the functional testing. The party responsible for the functional testing shall not be directly involved in either the design or construction of the project and shall provide documentation certifying that the installed lighting controls meet or exceed all documented performance criteria. Certification shall be specific enough to verify conformance.		

Section 10: OTHER EQUIPMENT (as modified by SB-10 Division 3, revised June 27, 2011)

10.4.1 Electric Motors

	Met	Not Met
10.4.1 A Standards for Electric Motors (SB-10, Division 3) 1) Where the minimum efficiency of an electric motor that is within the scope of ANSI/ASHRAE/IESNA Standard 90.1 is regulated by an Ontario Regulation, compliance with the requirements of Ontario Regulation shall be deemed to be compliance with the requirements of Section 10.4.1 and Tables 10.8a through 10.8c.		
Where the minimum efficiency of an electric motor that is within the scope of ANSI/ASHRAE/IESNA Standard 90.1 is regulated by an Ontario Regulation, the efficiency level shall be based on CSA-C390.		
Electric motors shall comply with the appropriate minimum nominal efficiency requirements of SB-10 Table 10.4.1.A.(a) or Table 10.4.1.A.(b).		

10.4.1. Electric Motors Electric motors manufactured before December 19, 2010 shall comply with the requirements of the Energy Policy Act of 1992 where applicable, as shown in Table 10.8a. Prior to December 19, 2010, motors not included in the scope of the Energy Policy Act of 1992 have no performance requirements in this section, such as but not limited to the following types: a) Footless designs b) Two-speed versions c) 50 Hertz d) 200/400 and 575 volt e) Design C and D f) Close-coupled pump motors g) TEAO motors h) TENV motors Electric motors manufactured alone or as a component of another piece of equipment on or after December 19, 2010 shall comply with the requirements of the Energy Independence and Security Act of 2007, as shown in Table 10.8b for general purpose electric motors (subtype I) and 10,8c for general purpose electric motors (subtype II). Fire pump motors and NEMA Design B general purpose electric motors with a power rating of more than 200 hp, but no more than 500 hp, manufactured on or after December 19, 2010, shall have a minimum nominal full load efficiency that is not less than as shown in Table 10.8C Motors that are not included in the scope of the Energy Independence and Security Act of 2007, Section 313, have no performance requirements in this section.		

10.4.2 Service Water Pressure Booster Systems

	Met	Not Met
Service water pressure booster systems shall be designed such that:		
a) One or more pressure sensors shall be used to vary pump speed and/or start and stop pumps. The sensor(s) shall either be located near the critical fixture(s) that determine the pressure required, or logic shall be employed that adjusts the setpoint to simulate operation of remote sensor(s).		
b) No device(s) shall be installed for the purpose of reducing the pressure of all of the water supplied by any booster system pump or booster system, except for safety devices.		
c) No booster system pumps shall operate when there is no service water flo		

10.4.3 Elevators

	Met	Not Met
Elevator systems shall comply with the requirements of this section:		

10.4.3.1 Lighting. All cab lighting systems shall have efficacy of not less than 35 lumens per Watt.		
10.4.3.2 Ventilation Power Limitation. Cab ventilation fans for elevators without air-conditioning shall not consume over 0.33 W/cfm at maximum speed.		
10.4.3.3 Standby Mode. When stopped and unoccupied with doors closed for over 15 minutes, cab interior lighting and ventilation shall be de-energized until required for operation.		