

BUILDING CODE ACT, 1992

RULING OF THE MINISTER OF MUNICIPAL AFFAIRS AND HOUSING

No. MR-11-S-16

Pursuant to clause 29(1)(b) of the *Building Code Act*, 1992, as amended, the Director of the Building and Development Branch as delegate of the Minister of Municipal Affairs and Housing hereby adopts the following amendments to a code, standard, guideline, protocol or procedure that has been adopted by reference in the Building Code (O. Reg. 350/06 as amended):

1. Description of code, standard, guideline, protocol or procedure that has been adopted by reference in the Building Code:

Issuing Agency: **Ministry of Municipal Affairs and Housing**
Issue Date: **Revised May 18, 2011**
Document Number: **Supplementary Standard SB-10**
Title of Document: **Energy Efficiency Supplement**

2. Amendment of the code, standard, guideline, protocol or procedure that is adopted in this Ruling:

Edition Adopted: **Supplementary Standard SB-10**
Energy Efficiency Supplement
Revised June 27, 2011

3. Conditions under which the amendments of the codes, standards, guidelines, protocols or procedures are adopted.

1. This Ruling comes into force on July 1, 2011.

Dated at Toronto this 27th day of June, 2011.



DENISE K. EVANS, DIRECTOR
BUILDING AND DEVELOPMENT BRANCH

Supplementary Standard SB-10

Energy Efficiency Supplement

July 1, 2011 update

COMMENCEMENT

Supplementary Standard SB-10 comes into force on the 31st day of December, 2006.

- m₂** Ruling of the Minister of Municipal Affairs and Housing (Minister's Ruling) MR-07-S-03 takes effect on the 2nd day of April, 2007.
- m₈** Ruling of the Minister of Municipal Affairs and Housing (Minister's Ruling) MR-09-S-09 takes effect on the 1st day of January, 2010.
- m₁₅** Ruling of the Minister of Municipal Affairs and Housing (Minister's Ruling) MR-11-S-16 takes effect on the 1st day of July, 2011.

ERRATA

- e₁** Issued April 2nd, 2007.
- e₂** Issued June 18th, 2008.

ACKNOWLEDGEMENT

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NOMENCLATURE

This standard is organized into a hierarchy of Divisions, Chapters, Parts or Sections, Subsections, Articles, Sentences, Clauses and Subclauses.

FOREWORD

This Supplementary Standard contains 4 Divisions, as follows:

- Division 1 addresses general requirements.
- Division 2 applies to construction for which a permit has been applied for before January 1, 2012.
- Division 3 applies to construction for which a permit has been applied for after December 31, 2011.
- Division 4 contains simplified energy efficiency requirements for the construction of certain non-residential buildings within the scope of Part 9 of Division B of the Building Code for which a permit has been applied for after December 31, 2011.

Division 2 of this Supplementary Standard contains the energy efficiency requirements for the design and construction of buildings for which a permit has been applied for before January 1, 2012 as addressed in Article 12.2.1.1. of Division B of the Building Code. This Article makes reference to Supplementary Standard SB-10 “Energy Efficiency Supplement”. This Division modifies the requirements of:

- ANSI/ASHRAE/IESNA 90.1-2004, “Energy Standard for Buildings Except Low-Rise Residential Buildings”.
- the 1997 Edition of CCBFC, “Model National Energy Code for Buildings.”

Division 3 of this Supplementary Standard contains requirements for the design and construction of buildings for which a permit has been applied for after December 31, 2011. The energy efficiency design of buildings is required to meet one of the following three requirements

- achieve the energy efficiency levels attained by conforming to the ANSI/ASHRAE/IESNA 90.1, “Energy Standard for Buildings Except Low-Rise Residential Buildings” as modified by Chapter 2 of this Division.
- exceed by not less than 5% the energy efficiency levels attained by conforming to the ANSI/ASHRAE/IESNA 90.1, “Energy Standard for Buildings Except Low-Rise Residential Buildings”, or
- exceed by not less than 25% the energy efficiency levels attained by conforming to the CCBFC, “Model National Energy Code for Buildings.”

Division 3 outlines the modifications outlined above. These modifications enhance the building envelope provisions of ANSI/ASHRAE/IESNA Standard 90.1-2010 and enables the use of Canadian testing procedures for HVAC and service water heating equipment.

The application of the above documents to existing buildings is limited to the scope of Part 10 and Part 11 of the Code.

^{m₁₅}Supplementary Standard SB-10

Energy Efficiency Supplement

Division 1

General

Section 1.1. General

1.1.1. Application of Supplementary Standard SB-10

Section 1.2. Terms and Abbreviations

1.2.1. Definitions of Words and Phrases

1.2.2. Symbols and Other Abbreviations

Section 1.3. Referenced Documents and Organizations

1.3.1. Referenced Documents

1.3.2. Abbreviations

m₁₅ Division 1

General

Section 1.1. General

1.1.1. Application of Supplementary Standard SB-10

1.1.1.1. Application

(1) This Supplementary Standard applies to the energy efficiency design and *construction of buildings* required to comply with Sentences 12.2.1.1.(2) and 12.2.1.2.(2) of Division B of the Building Code.

1.1.1.2. Energy Efficiency Design Before January 1, 2012

(1) The energy efficiency design and *construction of buildings* required to comply with Sentence 12.2.1.1.(2) of Division B of the Building Code shall comply with Division 2 of this Standard.

1.1.1.3. Energy Efficiency Design after December 31, 2011

(1) Except as permitted in Sentence (2), the energy efficiency design and *construction of buildings* required to comply with Sentence 12.2.1.2.(2) of Division B of the Building Code shall comply with Division 3 of this Standard.

(2) The energy efficiency of a *building* or part of a *building* may conform to the design requirements of Division 4 of this Supplementary Standard, if the *building* or part of the *building*,

- (a) is within the scope of Part 9 of Division B of the Building Code,
- (b) does not contain a *residential occupancy*,
- (c) does not use *electric space heating*, and
- (d) is intended for *occupancy* on a continuing basis during the winter months.

1.1.1.4. Internal Cross-references

(1) If a provision of this Supplementary Standard contains a reference to another provision of this Supplementary Standard but no Division is specified, both provisions are in the same Division of this Supplementary Standard.

Section 1.2. Terms and Abbreviations

1.2.1. Definitions of Words and Phrases

1.2.1.1. Non-defined Terms

(1) Definitions of words and phrases used in this Supplementary Standard that are not included in the list of definitions in Articles 1.4.1.2. and 1.4.1.3. of Division A of the Building Code and are not defined in another provision of the Code shall have the meanings that are commonly assigned to them in the context in which they are used, taking into account the specialized use of terms by the various trades and professions to which the terminology applies.

1.2.1.2. Defined Terms

(1) Each of the words and terms in italics in this Supplementary Standard has the same meaning as in subsection 1(1) of the *Building Code Act, 1992* or Clause 1.4.1.2.(1)(b) of Division A of the Building Code.

1.2.2. Symbols and Other Abbreviations

1.2.2.1. Symbols and Other Abbreviations

(1) Where used in this Supplementary Standard, a symbol or abbreviation listed in Column 2 of Table 1.4.2.1. of Division B of the Building Code shall have the meaning listed opposite it in Column 3.

Section 1.3. Referenced Documents and Organizations

1.3.1. Referenced Documents

1.3.1.1. Effective Date

(1) Unless otherwise specified in this Supplementary Standard, the documents referenced in this Supplementary Standard shall include all amendments, revisions and supplements effective to May 18, 2011.

1.3.1.2. Applicable Editions

(1) Unless otherwise specified in this Supplementary Standard, documents referenced in this Standard shall be the editions designated in Column 2 of Table 1.3.1.2. of Division B of the Building Code.

(2) Where the ANSI/ASHRAE/IESNA Standard 90.1, “Energy Standard for Buildings Except Low-Rise Residential Buildings” is referenced in this Standard, it shall be the edition designated in Table 1.3.1.2.

Table 1.3.1.2.
Referenced Documents
Forming Part of Sentence 1.3.1.2.(2)

Issuing Agency	Document Number	Title of Document	Supplementary Standard Reference
ANSI/ASHRAE/IESNA	90.1-2004	Energy Standard for Buildings Except Low-Rise Residential Buildings	Division 2
ANSI/ASHRAE/IESNA	90.1-2010	Energy Standard for Buildings Except Low-Rise Residential Buildings	Division 3
Column 1	2	3	4

1.3.2. Abbreviations

1.3.2.1. Abbreviations of Proper Names

(1) Where used in this Supplementary Standard, abbreviations of proper names listed in Column 1 of Table 1.3.2.1. in Division B of the Building Code shall have the meaning assigned opposite it in Column 2.

m₁₅ Division 2

Energy Efficiency Design Before January 1, 2012 (Applies to construction for which a permit has been applied for before January 1, 2012)

Chapter 1	General
Section 1.1.	Scope
1.1.1.	Supplement to ANSI/ASHRAE/IESNA Standard 90.1
1.1.2.	Supplement to MNECB
Section 1.2.	Application
1.2.1.	Application of ANSI/ASHRAE/IESNA Standard 90.1 and MNECB
Section 1.3.	Additional Referenced Documents
1.3.1.	Referenced Documents
Chapter 2	Supplement to ANSI/ASHRAE/ IESNA Standard 90.1 ⁽¹⁾
Section 4	Administration and Enforcement
Section 5	Building Envelope
Section 6	Heating, Ventilating and Air-Conditioning
Section 7	Service Water Heaters
Section 9	Lighting
Section 10	Other Equipment
Section 11	Energy Cost Budget Method
Chapter 3	Supplement to MNECB ⁽²⁾
Part 3	Building Envelope
Part 4	Lighting
Part 5	Heating, Ventilating and Air-Conditioning Systems
Part 6	Service Water Heating Systems
Part 7	Electrical Power

(1) The Section numbers and titles listed in Chapter 2 of Division 2 of SB-10 correspond with those contained in ANSI/ASHRAE/IESNA Standard 90.1-2004.

(2) The Part numbers and titles listed in Chapter 3 of Division 2 of SB-10 correspond with those contained in MNEBC-1997.

FOREWORD

- m₁₅** The 2006 Building Code references ANSI/ASHRAE/IESNA Standard 90.1-2004, “Energy Standard for Buildings Except Low-Rise Residential Buildings” and CCFBC, “Model National Energy Code of Canada for Buildings, 1997” (MNECB) as acceptable good design practice for which a permit has been applied for before January 1, 2012. The application of the above documents to existing buildings is limited to the scope of Part 10 and Part 11 of the Code.

The intent of this Supplementary Standard is to assist the user of ANSI/ASHRAE/IESNA Standard 90.1 and the MNECB by providing additional information to clarify and modify certain requirements in these documents to ensure compatibility with Ontario climatic conditions and Ontario construction practices.

- m₈** In all cases, the 2006 Building Code, Supplementary Standard SB-10 and other applicable law supersede those requirements of ANSI/ASHRAE/IESNA Standard 90.1 and MNECB (ie. where the provisions of the *Green Energy Act, 2009* are more restrictive than the requirements of ANSI/ASHRAE/IESNA Standard 90.1 and MNECB, the *Green Energy Act, 2009* shall apply).

Compliance with this Supplementary Standard and ANSI/ASHRAE/IESNA Standard 90.1 or MNECB does not necessarily ensure that the actual annual energy cost of a building is less than or equal to the theoretical values arrived at using the building energy cost budget method of ANSI/ASHRAE/IESNA Standard 90.1 or building energy performance compliance of MNECB. Factors such as workmanship, thermal resistance depreciation of building materials, occupant/user lifestyle, building operation and maintenance, etc. impact on the actual energy consumption of a building.

- m₁₅** Summary of the Contents of Division 2 of Supplementary Standard SB-10

Chapter 1: General

This Chapter sets out the application and exemptions common to both ANSI/ASHRAE/IESNA Standard 90.1 and MNECB.

Chapter 2: Supplement to ANSI/ASHRAE/IESNA Standard 90.1.

This Chapter contains additions and/or substitutions to ANSI/ASHRAE/IESNA Standard 90.1. The Section numbers and the sequential numbering system that follow in this Chapter correspond directly with those in ANSI/ASHRAE/IESNA Standard 90.1. Where necessary, modifications have been made to the numbering system.

Chapter 3: Supplement to MNECB

This Chapter contains additions and/or substitutions to MNECB. The Part numbers and the sequential numbering system that follow in this Chapter correspond directly with those in MNECB. Where necessary, modifications have been made to the numbering system.

Recommended Resource Material: ANSI/ASHRAE/IESNA Standard 90.1-2004 User’s Manual

Chapter 1

General

1.1. Scope

1.1.1. Supplement to ANSI/ASHRAE/IESNA Standard 90.1

1.1.1.1. Chapter 2

(1) Chapter 2 shall be deemed to supplement the ANSI/ASHRAE/IESNA Standard 90.1, “Energy Standard for Buildings Except Low-Rise Residential Buildings”, and applies where compliance with energy efficiency requirements is achieved in accordance with Clause 12.2.1.1.(2)(a) of Division B.

1.1.2. Supplement to MNECB

1.1.2.1. Chapter 3

(1) Chapter 3 shall be deemed to supplement the CCFBC, “Model National Energy Code of Canada for Buildings, 1997”, and applies where compliance with energy efficiency requirements is achieved in accordance with Clause 12.2.1.1.(2)(b) of Division B.

1.2. Application

1.2.1. Application of ANSI/ASHRAE/IESNA Standard 90.1 and MNECB

1.2.1.1. Exceptions

(1) This Standard and the requirements of ANSI/ASHRAE/IESNA Standard 90.1, “Energy Standard for Buildings Except Low-Rise Residential Buildings” or the CCBFC, “Model National Energy Code for Buildings 1997” do not apply to

- (a) a building or part of a building of residential occupancy that is within the scope of Part 9 of Division B.
- (b) a heritage building,
- (c) any building space which uses energy at a rate less than 12 W/m² under peak conditions,
- (d) temporary structures such as construction trailers, tents, air-supported structures and portable classrooms,
- (e) warehouses and storage rooms where the design indoor temperature does not exceed 10°C, and
- (f) unheated storage garages and unheated storage rooms except as required in Sentence (2).

(2) Conditioned spaces of buildings exposed to unheated storage garages and unheated storage rooms shall meet the building envelope requirements in ANSI/ASHRAE/IESNA Standard 90.1, “Energy Standard for Buildings Except Low-Rise Residential Buildings” or the CCBFC, “Model National Energy Code for Buildings 1997”.

(3) Energy consumption of systems and equipment located in a storage garage but which do not serve the storage garage need not be considered as energy used in the storage garage but shall be included as energy used for the rest of the building.

(4) The exceptions listed in Sentence 12.2.1.1.(5) of Division B exempts buildings or parts of buildings from compliance with energy efficient design requirements where

- (a) the areas are intended primarily for manufacturing processing, commercial processing or industrial processing, and
- (b) the environmental condition within the buildings or parts of buildings are governed by the operation or process within the building.

(5) Table 1.2.1.1. contains some examples of occupancies which can be exempted from compliance with ANSI/ASHRAE/IESNA Standard 90.1 and MNECB. The list is not intended to be exhaustive and other exemptions may be made.

Table 1.2.1.1.
Examples of Occupancies Exempt from Compliance with ANSI/ASHRAE/IESNA Standard 90.1 and MNECB

GROUP A, DIVISION 4	GROUP F, DIVISION 1	GROUP F, DIVISION 2	GROUP F, DIVISION 3
Amusement Park Structures (not elsewhere classified) Bleachers Grandstands Reviewing Stands Stadia	Bulk Plants for Flammable Liquids Bulk Storage Warehouses for Hazardous Substances Cereal Mills Chemical Manufacturing or Processing Plants Distilleries	Dry Cleaning Establishments not using flammable or explosive solvents or cleaners Electrical Substations Helicopter Landing Areas on Roofs Laundries, except self-service Planing Mills Printing Plants Repair Garages Woodworking Factories	Creameries Power Plants Open-air Parking Garages Pumping Stations
GROUP C Part 9 Buildings ⁽¹⁾ Camps for Housing Workers (Part 3 & 9 Buildings) Recreational Camps	Dry Cleaning Plants Feed Mills Flour Mills Grain Elevators Lacquer Factories Paint, Varnish and Pyroxylin Product Factories Rubber Processing Plants Spray Painting Operations Waste Paper Processing Plants		
Column 1	2	3	4

Notes to Table 1.2.1.1.:

- (1) Part 9 buildings are exempt from compliance with ANSI/ASHRAE/IESNA Standard 90.1 or MNECB where the energy efficiency design conforms to Subsection 12.3.4. of Division B of the Building Code.

1.3. Additional Referenced Documents

1.3.1. Referenced Documents

1.3.1.1. Applicable Editions

(1) Where this Supplementary Standard specifies substitutions to referenced documents specified in ANSI/ASHRAE/IESNA Standard 90.1 and MNECB, the referenced documents shall be in the editions designated in Column 2 of Table 1.3.1.1.

Table 1.3.1.1.
Additional Referenced Documents

Issuing Agency	Document Number	Title of Document	Supplementary Standard Reference
CGSB	CAN/CGSB-63.14-M89	Plastic Skylights	5.4.3.2.1 Chapter 2 5.4.3.2.2 Chapter 2
CGSB	CAN/CGSB-82.1-M89	Sliding Doors	5.4.3.2.1 Chapter 2 5.4.3.2.3 Chapter 2
CGSB	CAN/CGSB-82.5-M88	Insulated Steel Doors	5.4.3.2.1 Chapter 2
CSA	CGA P.2-1991	Testing Method for Measuring Annual Fuel Utilization Efficiencies of Residential Furnaces and Boilers	Table 7.8 Chapter 2
CSA	CGA-P.6-1993	Testing Method for Measuring Thermal and Operating Efficiencies of Gas-Fired Pool Heaters	Table 6.8.1E Chapter 2
CSA	CGA P.8-97	Thermal Efficiencies of Industrial and Commercial Gas-Fired Package Furnaces	Table 6.8.1E Chapter 2
CSA	ANSI Z21.47-2003 / CSA 2.3-2003	Gas-Fired Central Furnaces	Table 6.8.1E Chapter 2
CSA	ANSI Z83.8-2002 / CSA 2.6-2002	Gas Unit Heaters and Gas-Fired Duct Furnaces	Table 6.8.1E Chapter 2
CSA	CAN/CSA-P.3-2004	Testing Method for Measuring Energy Consumption and Determining Efficiencies of Gas-Fired Water Heaters	Table 7.8 Chapter 2
CSA	ANSI Z21.10.3-2004 / CSA 4.3-2004	Gas Water Heaters - Volume III, Storage Water Heaters With Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous	Table 7.8 Chapter 2
CSA	CAN/CSA-B211-00	Energy Efficiency of Oil-Fired Storage Tank Water Heaters	Table 7.8 Chapter 2
CSA	CSA B212-00	Energy Utilization Efficiencies of Oil-Fired Furnaces and Boilers	Table 6.8.1E Chapter 2
CSA	CAN/CSA-A440-00	Windows	5.4.3.2.1 Chapter 2 5.4.3.2.3 Chapter 2 5.4.3.2.4 Chapter 2
CSA	CAN/CSA-C191-04	Performance of Electric Storage Tank Water Heaters for Domestic Hot Water Service	Table 7.8 Chapter 2
CSA	CSA C368.1-M90	Performance Standard for Room Air Conditioners	Table 6.8.1D Chapter 2
CSA	CAN/CSA-C390-98	Energy Efficiency Test Methods for Three-Phase Induction Motors	10.4.1 Chapter 2
CSA	CAN/CSA-C654-M91	Fluorescent Lamp Ballast Efficacy Measurements	9.1.5.1.3 Chapter 2
CSA	CAN/CSA-C656-05	Performance Standard for Split-System and Single Package Central Air Conditioners and Heat Pumps	Table 6.8.1A Chapter 2 Table 6.8.1B Chapter 2
CSA	CAN/CSA-C743-02	Performance Standard for Rating Packaged Water Chillers	Table 6.8.1C Chapter 2
CSA	ARI 310/380-2004 / CAN/CSA-C744-04 /	Standard for Packaged Terminal Air Conditioners and Heat Pumps	Table 6.8.1D Chapter 2
CSA	CSA C745-03	Energy Efficiency of Electric Storage Tank Water Heaters and Heat Pump Water Heaters	Table 7.8 Chapter 2
CSA	CAN/CSA-C746-98	Performance Standard for Rating Large Air Conditioners and Heat Pumps	Table 6.8.1A Chapter 2 Table 6.8.1B Chapter 2 Table 6.8.1D Chapter 2
CSA	CAN/CSA-C13256-1-01	Water-Source Heat Pumps — Testing and Rating for Performance — Part 1: Water-to-Air Heat and Brine-to-Air Heat Pumps (Adopted ISO 13256-1:1998, first edition, 1998-08-15, with Canadian deviations)	Table 6.8.1B Chapter 2
Column 1	2	3	4

Chapter 2

Supplement to ANSI/ASHRAE/IESNA Standard 90.1

Section 4 Administration and Enforcement

4.2.1.1 is replaced with the following:

4.2.1.1 New Buildings. New buildings and additions to existing buildings shall comply with provisions of either Sections 5 to 10 or Section 11.

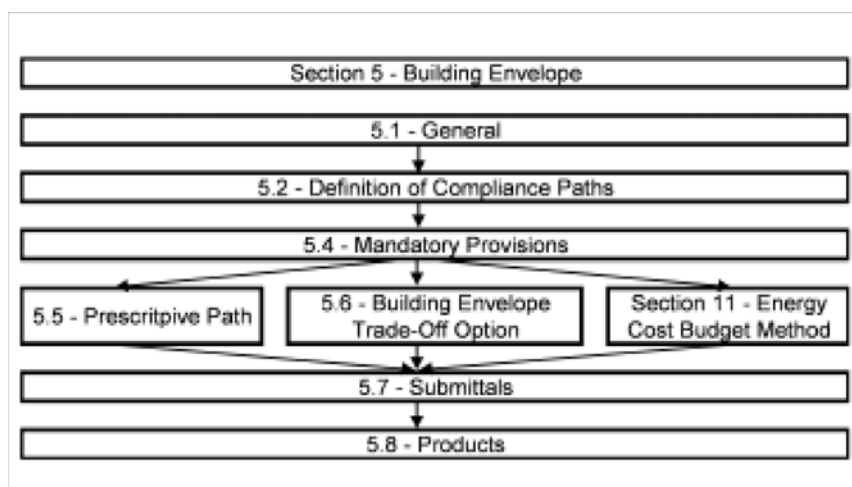
4.2.1.2 is replaced with the following:

4.2.1.1 Existing Buildings. Change of use of existing buildings shall conform to Part 10 of Division B. Renovation of existing buildings shall conform to Part 11 of Division B.

Section 5 Building Envelope

Section 5 is replaced with the following:

5. Building Envelope



5.1 General

5.1.1 Scope. Section 5 specifies requirements for the building envelope.

5.1.2 Reserved.

5.1.3 Reserved.

5.2 Compliance Paths

5.2.1 Compliance. The building envelope shall comply with 5.1, General; 5.3, Required Calculation Procedures; 5.4, Mandatory Provisions; 5.7, Submittals; and 5.8, Product Information and Installation Requirements; and either

- (a) 5.5, Prescriptive Criteria, using Tables of Alternate Component Packages (ACP), or
- (b) 5.6, System Performance Criteria.

5.2.2 Projects using the Energy Cost Budget Method (Section 11), must comply with 5.3 and 5.4, the mandatory provisions of this section, as a portion of that compliance path.

5.3 Required Calculation Procedures. The following procedures shall be used to calculate the thermal performance of above- and below-grade envelope sections of any building that is heated or mechanically cooled.

5.3.1 Overall Thermal Transmittance (U_o). The overall thermal transmittance of the building envelope assembly shall be calculated in accordance with:

$$\begin{aligned}
 U_o &= \sum U_i A_i / A_o \\
 &= (U_1 A_1 + U_2 A_2 + \dots + U_n A_n) / A_o \quad (5-1)
 \end{aligned}$$

where

- U_o = the area-weighted average thermal transmittance of the gross area of an envelope assembly, i.e., the exterior wall assembly including fenestration and doors, the roof and ceiling assembly, and the floor assembly,
- A_o = the gross area of the envelope assembly,
- U_i = the thermal transmittance of each individual path of the envelope assembly, i.e., the opaque portion or the fenestration, (see 5.3.2)
- U_i = $1/R_i$ (where R_i is the total resistance to heat flow of an individual path through an envelope assembly),
- A_i = the area of each individual element of the envelope assembly.

5.3.2 Thermal Transmittance (U_i) of an Individual Path through an Envelope Assembly.

5.3.2.1 Except as permitted in 5.3.2.2, the thermal transmittance of each envelope assembly shall be determined with due consideration of all major series and parallel heat flow paths through the elements of the assembly and film coefficients. Compression of insulation shall be considered in determining the thermal resistance. The thermal transmittance of each envelope assembly shall be calculated in accordance with ASHRAE 2005 Fundamentals or Appendix A of this Standard.

5.3.2.2 For the purposes of Section 5, the effects of thermal bridging are waived for:

- (a) intermediate structural connections of continuous steel shelf angles (or similar structural element) used to support the building facade provided there is a thermal break between the remaining contact surface of the supporting element and the building structure. This provision is intended to substantially reduce thermal bridging effects caused by the continuous bearing between structural elements supporting building facade and the building frame (ie. steel shelf angle attached to perimeter floor slab to support brick veneer), or
- (b) structural connections of load bearing elements where a thermal break cannot be achieved.

- 5.3.2.2.1.** In addition to the exceptions permitted above, the effects of thermal bridging are also waived for:
- exposed structural projections of buildings where the total cross-sectional area of the exposed element does not exceed 2% of the exterior building envelope area and the cross-sectional area of the exposed structural element is measured where it penetrates the insulation component of the building envelope. For example, the total cross-sectional area of cantilevered concrete balconies and other projections penetrating the insulation component of the building envelope cannot exceed 2% of the exterior building envelope area,
 - ties in masonry construction,
 - insulation clips in masonry construction,
 - flashing, and
 - top exposed portion of foundation walls provided the exposure does not exceed 200 mm measured from the top of the foundation wall to the top of exterior wall insulation which meets the minimum insulation RSI-Value for wall below grade stipulated in the appropriate Alternate Component Package Tables. (See Figure 5-1)

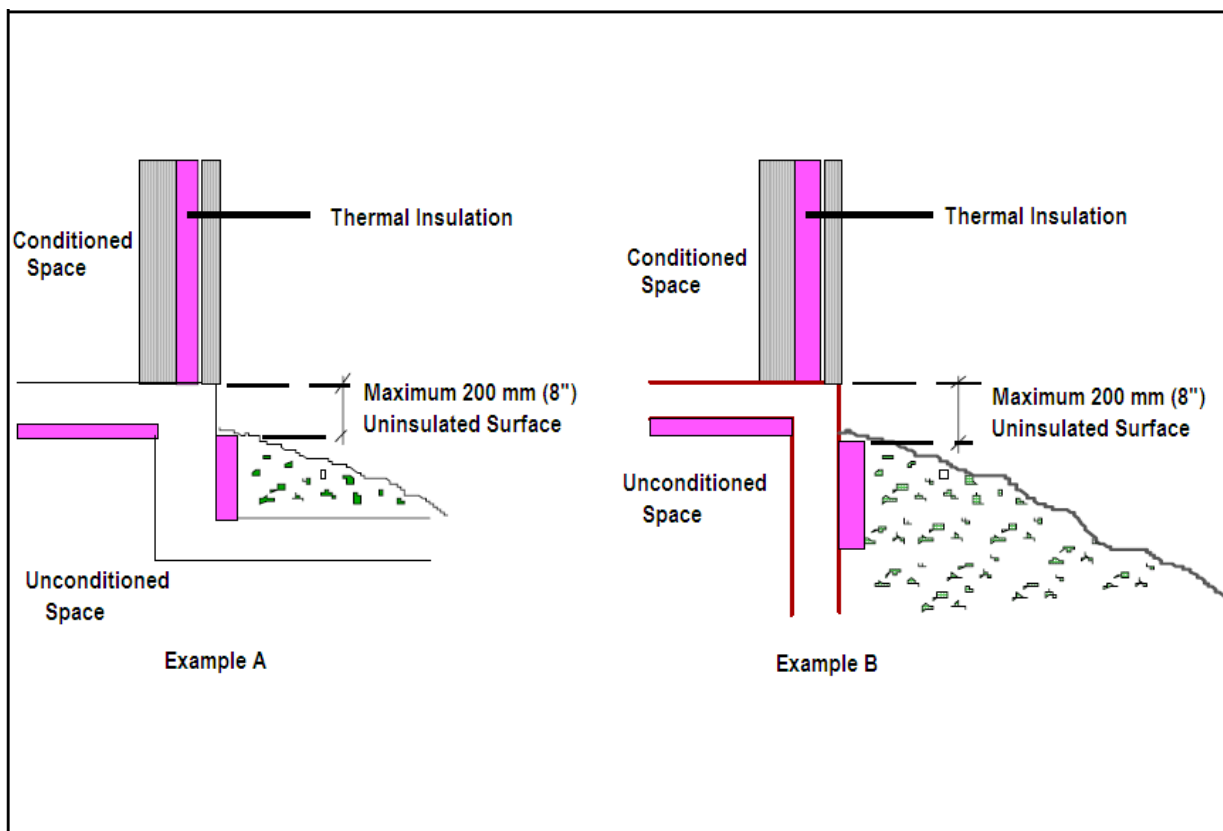


Figure 5-1 Maximum Uninsulated Surface of Foundation Wall

5.3.3 Reserved.

5.3.4 Shading Coefficients. The shading coefficient (SC) for fenestration shall be obtained from Chapter 31 of the ASHRAE Handbook—2005 Fundamentals or from manufacturer's test data. For the prescriptive or system performance envelope compliance calculations in 5.5 and 5.6, a factor SC_x is used. SC_x is the shading coefficient of the fenestration including internal and external shading devices but excluding the effect of external shading projections, which is calculated separately. The shading coefficient used for louvered shade screens shall be determined using a profile angle of 30° as found in Table 41, Chapter 27, of ASHRAE Handbook – 1985 Fundamentals.

5.3.5 Reserved.

5.3.6 Shell Buildings. The following conditions shall be assumed when determining building envelope compliance by either the prescriptive method of 5.5 or the system performance method of 5.6.

- (a) **Lighting power density and equipment power density:** For 5.5, the total power density shall be assumed to be those listed in Table 5-1. For 5.6, the values in Table 5-1 shall be apportioned as two-thirds lighting and one-third for other equipment. Note that these are not recommended design values but are for compliance purposes only to simulate the most stringent compliance situation that is likely to occur.
- (b) **Fenestration shading devices:** Only those shading devices that are part of the design when it is being evaluated for compliance shall be considered when determining compliance.
- (c) **Electric lighting controls for perimeter daylighting utilization:** Only those controls that are part of the design when it is being evaluated for compliance shall be considered when determining compliance.

Table 5-1
Assumed Internal Loads For Shell and Speculative Buildings

Shell Buildings	HDD18 < 1650	(HDD65 < 3000)	1650 < HDD18 < 3300	(3000 < HDD65 < 6000)	HDD18 > 3300	(HDD65 > 6000)
	32.3 W/m ²	(3.00 W/ft ²)	24.2 W/m ²	(2.25 W/ft ²)	16.1 W/m ²	(1.5 W/ft ²)
Speculative Buildings	Use the lighting power densities from Table 9.6.1 and the average equipment power density from Table 5-4					
Column 1	2		3		4	

5.3.7 Reserved.

5.3.8 Reserved.

5.3.9 Thermal Resistance of Below-Grade Components (RSI). In all below-grade applications, the thermal performance of the adjacent ground shall be excluded in determining the thermal resistance of the below-grade components.

5.3.9.1 Slabs. The RSI-Value and dimensions required for slabs refer only to the insulation materials. Insulation continuity shall be maintained in the design of slab edge insulation systems. Continuity shall be maintained from the wall insulation through the slab/wall/footing intersection to the body of the slab edge insulation. Several representative configurations are illustrated in Figure 5-2.

5.3.9.1.1 Where insulative continuity is impossible because of structural constraints, a minimum overlapping of insulation is acceptable. The insulation must overlap by a distance equal to (or greater than) two times the minimum insulation separation, as shown in Figure 5-3. The overlapping insulation must have a thermal resistance (R-Value) equal to or greater than that specified for the wall below grade in the Alternate Component Package Tables (or from the Standard 90.1 ENVSTD23 or ENVSTD24 Envelope Software).

5.3.9.2 Below-Grade Walls. The RSI-Value required for below-grade walls refers to the overall RSI-Value of the wall assembly excluding air film coefficients and the adjacent ground.

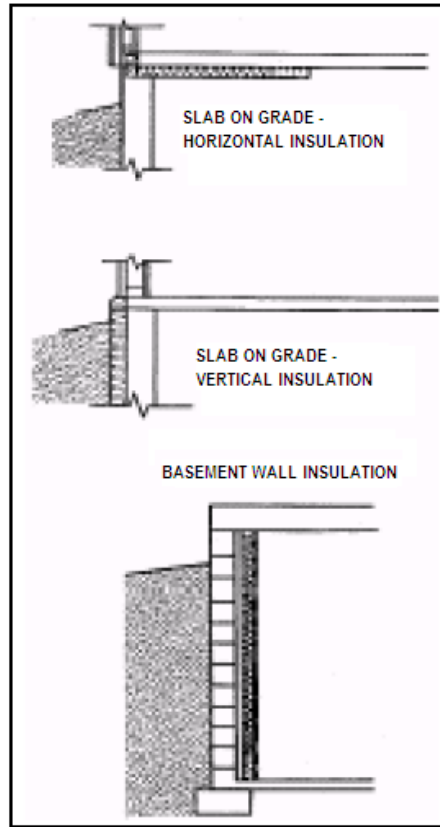


Figure 5-2 Continuity of Insulation on or Below Grade

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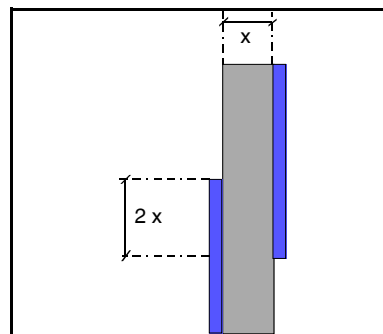


Figure 5-3 Minimum Permissible Insulation Overlap

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5.4 Mandatory Provisions

5.4.1 Insulation. 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. 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

5.4.3.1 Building Envelope Sealing. The following areas of the building envelope shall be sealed, caulked, gasketed, or weather-stripped to minimize air leakage:

- (a) joints around fenestration and door frames,
- (b) junctions between walls and foundations, between walls at building corners, between walls and structural floors or roofs, and between walls and roof or wall panels,
- (c) openings at penetrations of utility services through roofs, walls, and floors,
- (d) site-built fenestration and doors,
- (e) building assemblies used as ducts or plenums,
- (f) joints, seams, and penetrations of vapor retarders,
- (g) all other openings in the building envelope.

5.4.3.2 Fenestration and Doors

5.4.3.2.1 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:

- (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", or
- (d) CAN/CSA-A440-M, "Windows".

5.4.3.2.2. Skylights not covered in the scope of CAN/CGSB-63.14-M, "Plastic Skylights" shall conform to the performance requirements of that standard.

5.4.3.2.3 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, "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-A440-00, Windows".

5.4.3.2.4 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, "Windows" or CAN/CSA-A440.1, "User Selection Guide to CAN/CSA-A440-00, Windows".

5.4.3.3 Loading Dock Weatherseals. 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. A door that separates 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 devices. 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.

Exceptions to 5.4.3.4:

- (a) Doors in buildings less than five stories above grade.
- (b) Doors not intended to be used as a building entrance door, such as doors as to mechanical or electrical equipment rooms.
- (c) Doors opening directly from a dwelling unit.
- (d) Doors that open directly from a space less than 279 m² (3000 ft²) in area.
- (e) Doors in building entrances with revolving doors.
- (f) Doors used primarily to facilitate vehicular movement or material handling and adjacent personnel doors.
- (g) Doors intended to be used as a service or emergency exit door only.

5.5 Prescriptive Criteria

5.5.1 Purpose. This section provides a simple compliance path using pre-calculated prescriptive requirements for selected exterior envelope configurations.

5.5.2 Reserved.

5.5.3 General. Each alternate component package (ACP) provides a limited number of complying combinations of building variables for a set of climate variable ranges. For most climate locations and envelope parameters, the Prescriptive Criteria may be slightly more stringent than the System Performance Criteria of 5.6.

For buildings with high internal heat gains, unusual operating schedules, or applications of innovative design strategies not covered in 5.5, consideration shall be given to using the provisions of Section 11.

The ACPs provide design criteria for the following:

- (a) **Base Case Buildings:** buildings with envelopes designed without perimeter daylighting.
- (b) **Perimeter Daylighting Buildings:** buildings that are allotted additional fenestration area due to the incorporation of automatic electric lighting controls for daylight utilization in the perimeter zones.

5.5.4 Compliance. The envelope design of the building being evaluated is in compliance with the prescriptive criteria of 5.5 provided that all of the following are met:

- (a) The proposed design complies with 5.1, 5.3, 5.4, 5.5, 5.7, and 5.8.
- (b) The percentage of fenestration relative to the gross external wall area is less than or equal to the value chosen from the selected ACP Table for the internal load range and glazing selected.
- (c) All U-Values are less than or equal to those listed in the ACP Table for roofs, opaque walls, walls adjacent to unconditioned spaces, and floors over unconditioned spaces.
- (d) Slab-on-grade floors shall have insulation around the perimeter of the floor with the thermal resistance of the insulation as listed in the ACP Table. The slab insulation specified shall extend either in a vertical plane downward from the top of the slab for the minimum distance shown or downward to the bottom of the slab then in a horizontal plane beneath the slab or outward from the building for the minimum distance shown. The horizontal length, or vertical depth, of insulation required varies from 600 mm to 1200 mm (24 in. to 48 in.) depending upon the RSI-Value selected. For heated slabs, an RSI-Value of 0.35 (R-2) shall be added to the thermal resistance required. Vertical insulation shall not be required to extend below the foundation footing.
- (e) The thermal resistance of the below-grade wall assembly must be greater than or equal to that listed in the ACP Table, or the heat loss calculated in accordance with Chapter 30 of the ASHRAE Handbook—2005 Fundamentals shall be less than or equal to that of a wall below grade having a thermal resistance equal to that specified in Figure 5-6. No insulation is required for climates for those portions of wall more than one story below grade.
- (f) When a building is heated by electric space heating, the envelope design shall meet the requirements prescribed in 5.5.5.1.3.

5.5.5 Procedure for Using the Alternative Component Package (ACP) Tables. The Prescriptive Envelope Criteria for each of 5 climate ranges for Ontario are contained in Tables 5A-1, 5A-2, 5A-3, 5A-4 or 5AA of this Supplement. This Supplement also contains simplified versions of ACP Tables which are provided as Tables 5A-1S, 5A-2S, 5A-3S, 5A-4S or 5A-5S. The following steps shall be used to determine compliance with these criteria.

5.5.5.1 Determine Appropriate ACP Table. Climate data for most Ontario locations, including HDD18 C (equivalent to HDD65 F), are available in Supplementary Standard SB-1. Table 5A-G1 of this Supplement contains location numbers corresponding to Ontario locations for Standard 90.1 ENVSTD23 or ENVSTD24 Envelope Software. Table 5A-G2 of this Supplement contains climatic data for heating and cooling degree day ratings along with the appropriate ACP Table reference corresponding to a particular Ontario location number.

The applicable ACP Table shall be determined based on Tables 5A-G1, 5A-G2 and the 5A-G3. Table 5A-G3 shall apply only buildings that are heated by electric space heating. Where electric space heating is used, applicable Table will be determined based on 5A-G3 after determining which Table would be applicable based on 5A-G1 and G2, as if, the electric space heating was not used.

Table 5A-G1
Location Numbers and Ontario Locations for Standard 90.1 ENVSTD23 or ENVSTD24 Envelope Software

No.	Location	No.	Location	No.	Location	No.	Location
281	Ailsa Craig	334	Cobourg	334	Guthrie	236	Martin
333	Ajax	331	Cochrane	260	Haileybury	331	Matheson
292	Alexandria	334	Colborne	281	Haldimand	291	Mattawa
343	Alliston	343	Collingwood	287	Haliburton	343	Midland
292	Almonte	292	Cornwall	333	Halton Hills	281	Milton
241	Armstrong	345	Corunna	333	Hamilton	343	Milverton
292	Arnprior	291	Deep River	343	Hanover	287	Minden
236	Atikokan	334	Deseronto	334	Hastings	333	Mississauga
334	Aurora	281	Dorchester	292	Hawkesbury	281	Mitchell
287	Bancroft	330	Dorion	277	Hearst	241	Moosonee
334	Barrie	345	Dresden	343	Honey Harbour	292	Morrisburg
334	Barriefield	278	Dryden	277	Hornepayne	287	Mount Forest
287	Beaverton	281	Dunnville	287	Huntsville	287	Muskoka
334	Belleville	343	Durham	281	Ingersoll	277	Nakina
281	Belmont	281	Dutton	331	Iroquois Falls	281	Nanticoke
241	Big Trout Lake	260	Earlton	277	Jellicoe	334	Napanee
343	Bordon CFB	278	Edison	277	Kapuskasing	334	Newcastle
287	Bracebridge	343	Elmvale	292	Kemptville	260	New Liskeard
334	Bradford	281	Embro	278	Kenora	334	Newmarket
333	Brampton	260	Englehart	291	Killaloe	345	Niagara Falls
281	Brantford	323	Espanola	281	Kincardine	291	North Bay
334	Brighton	281	Exeter	334	Kingston	334	Norwood
334	Brockville	287	Fenelon Falls	287	Kinmount	333	Oakville
287	Burks Falls	343	Fergus	260	Kirkland Lake	343	Orangeville
345	Burlington	281	Forest	281	Kitchener	343	Orillia
281	Cambridge	333	Fort Erie	334	Lakefield	333	Oshawa
334	Campbellford	278	Fort Frances	241	Lansdowne House	292	Ottawa
287	Cannington	334	Gananoque	345	Leamington	343	Owen Sound
292	Carleton Place	277	Geraldton	287	Lindsay	277	Pagwa River
334	Cavan	281	Glencoe	343	Lion's Head	281	Paris
281	Centralia	281	Goderich	343	Listowel	281	Parkhill
236	Chapleau	270	Gore Bay	281	London	287	Parry Sound
345	Chatham	236	Graham	281	Lucan	333	Pelham
343	Chesley	287	Gravenhurst	292	Maitland	292	Pembroke
281	Clinton	345	Grimsby	343	Markdale	343	Penetanguishene
287	Coboconk	281	Guelph	333	Markham	292	Perth

Table 5A-G1 (Cont'd)
Reference Numbers and Ontario Locations for Standard 90.1 ENVSTD23 or ENVSTD24 Envelope Software

No	Location	No.	Location	No.	Location	No.	Location
292	Petawawa	292	Renfrew	281	Stratford	333	Vaughan
334	Peterborough	333	Richmond Hill	281	Strathroy	281	Vittoria
281	Petrolia	292	Rockland	291	Sturgeon Falls	343	Walkerton
333	Pickering	281	Sarnia	323	Sudbury	345	Wallaceburg
334	Picton	314	Sault Ste.Marie	291	Sundridge	281	Waterloo
281	Plattsville	330	Schreiber	281	Tavistock	281	Watford
292	Point Alexander	281	Seaforth	260	Temagami	330	Wawa
281	Port Burwell	281	Simcoe	281	Thamesford	345	Welland
333	Port Colborne	319	Sioux Lookout	281	Theford	345	West Lorne
343	Port Elgin	292	Smiths Falls	330	Thunder Bay	333	Whitby
334	Port Hope	333	Smithville	281	Tilsonburg	236	White River
334	Port Perry	277	Smooth Rock Falls	331	Timmins	343	Warton
281	Port Stanley	343	Southampton	333	Toronto/ Metropolitan Etobicoke North York Scarborough	345	Windsor
292	Prescott	291	South River			281	Wingham
281	Princeton	345	St. Catharines			281	Woodstock
236	Raith	281	St. Marys	334	Trenton	281	Wyoming
323	Rayside-Balfour	281	St. Thomas	291	Trout Creek		
319	Red Lake	334	Stirling	334	Uxbridge		

Table 5A-G2
Reference Ontario Locations in Standard 90.1 ENVSTD23 and ENVSTD24 Envelope Software (SI Units)

Location Number	HDD10	HDD18	VSN	VSEW	VSS	CDD10	CDD18	CDH27	DR	No. Hrs T < 12.8	8 am - 4 pm 12.8 ≤ T ≤ 20.6	ACP Table
236	3794	6191	2465	7180	9929	712	77	161	14	1975	647	5A-5
241	5173	7757	2511	6896	10485	489	42	27	10.1	2273	492	5A-5
260	3632	5996	2772	6930	9258	759	91	235	13.1	1946	627	5A-5
270	2665	4884	2454	7327	9417	915	103	62	10.3	1833	755	5A-3
277	4074	6524	2863	6771	9156	654	74	193	13.3	2059	572	5A-5
278	3736	5987	2624	7498	10417	920	139	187	10.3	1920	632	5A-5
281	2163	4198	2681	7089	8429	1213	216	358	12.1	1635	679	5A-2
287	2756	4986	2772	7202	8952	907	106	169	13	1749	718	5A-3
291	3159	5436	2829	6964	9020	853	98	72	10.5	1908	715	5A-4
292	2679	4758	2363	6748	9099	1164	212	407	11.4	1738	657	5A-3
314	2883	5206	2556	6941	8884	787	79	127	13.1	1914	701	5A-4
319	3988	6337	2533	7134	10054	786	104	188	11.4	1970	611	5A-5
323	3250	5513	2613	7009	9327	884	116	193	11.4	1909	657	5A-4
330	3443	5851	2420	7384	10315	684	61	177	13.4	1973	671	5A-4
331	3886	6303	2772	6861	9270	694	79	231	13.9	2012	588	5A-5
333	2163	4218	2340	6657	8316	1201	224	510	12.5	1654	669	5A-2
334	2229	4282	2806	7418	9327	1181	202	205	11.1	1659	711	5A-3
343	2359	4559	2829	7066	8202	950	118	114	10.9	1767	741	5A-3
345	1819	3687	2636	7282	8827	1535	372	781	10.9	1542	646	5A-1

Table 5A-G2
Reference Ontario Locations in Standard 90.1 ENVSTD23 and ENVSTD24 Envelope Software (Imperial Units)

Location Number	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	No. Hrs T < 55	8 am - 4 pm 55 ≤ T ≤ 69	ACP Table
236	6829	11144	217	632	874	1281	138	289	25.2	1975	647	5A-5
241	9312	13963	221	607	923	881	75	49	18.1	2273	492	5A-5
260	6538	10792	244	610	815	1367	164	423	23.6	1946	627	5A-5
270	4797	8791	216	645	829	1647	185	112	18.5	1833	755	5A-3
277	7333	11744	252	596	806	1178	133	347	23.9	2059	572	5A-5
278	6724	10776	231	660	917	1656	251	336	18.5	1920	632	5A-5
281	3893	7556	236	624	742	2183	389	645	21.7	1635	679	5A-2
287	4960	8974	244	634	788	1632	190	305	23.4	1749	718	5A-3
291	5687	9785	249	613	794	1535	176	129	18.9	1908	715	5A-4
292	4822	8565	208	594	801	2095	381	732	20.6	1738	657	5A-3
314	5190	9371	225	611	782	1417	142	229	23.5	1914	701	5A-4
319	7178	11407	223	628	885	1415	187	338	20.6	1970	611	5A-5
323	5850	9924	230	617	821	1591	209	347	20.6	1909	657	5A-4
330	6198	10532	213	650	908	1232	109	318	24.1	1973	671	5A-4
331	6995	11346	244	604	816	1249	143	415	25.1	2012	588	5A-5
333	3894	7593	206	586	732	2161	404	918	22.5	1654	669	5A-2
334	4012	7707	247	653	821	2126	364	369	19.9	1659	711	5A-3
343	4247	8206	249	622	722	1710	213	206	19.7	1767	741	5A-3
345	3274	6636	232	641	777	2763	669	1405	19.6	1542	646	5A-1

Table 5A-G3
Electric Space Heating

ACP Table based on 5A-G1 and 5A-G2, assuming that the building is not heated by electric space heating	Applicable ACP Table for a building that is heated by electric space heating
5A-1 or 5A-1S	5A-3 or 5A-3S
5A-2 or 5A-2S	5A-4 or 5A-4S
5A-3 or 5A-3S	5A-5 or 5A-5S
5A-4 or 5A-4S	5A-5 or 5A-5S
5A-5 or 5A-5S	5A-5 or 5A-5S

For Ontario locations not listed in Table 5A-G1, select the location that is climatologically closest to the climatic data listed in Table 5A-G2 along with the appropriate ACP Table.

5.5.5.1.1 Simplified ACP Tables. Simplified ACP Tables 5A-1S, 5A-2S, 5A-3S, 5A-4S or 5A-5S of this Supplement may be used in lieu of ACP Tables 5A-1, 5A-2, 5A-3, 5A-4 or 5A-5. These Simplified ACP Tables offer flexibility with choice of U-Values and shading coefficients of fenestration as well as heat capacity of opaque wall assembly in order to determine maximum percent fenestration. The Simplified ACP Tables assume an internal load density (ILD) of 16.14 W/m² (1.5 W/ft²) and projection factor (PF) of 0.0. Perimeter daylighting criteria has not been accounted for in the Simplified ACP Tables.

The envelope design of a proposed building is in compliance with the Simplified ACP Tables provided that:

1. All envelope thermal transmittance (U-Values) for the proposed building design are less than or equal to those in the appropriate Simplified ACP Table for fenestration, opaque walls, roofs, walls adjacent to unconditioned spaces, and floors over unconditioned spaces.
2. All envelope thermal transmittance (RSI-Values) for the proposed building design are greater than or equal to those in the appropriate ACP Table for walls below grade and slabs on grade.

The required U_{of} for the desired percentage of fenestration is determined using the appropriate Simplified ACP Table as determined in 5.5.5.1. Select either the heated and cooled building or the heated-only building column as appropriate. The maximum overall U-Value (U_{of}) for fenestration is shown under that column. Fenestration assemblies in the proposed building design shall not exceed the maximum fenestration U_{of} in the Table.

Exception. For the purposes of the ACP Tables and the Simplified ACP Tables, where fenestration consists of fixed sealed windows in combination with operable windows, the fenestration U-Values for the fixed sealed window portion may also be used for the operable window portion provided the area of the operable window portion does not exceed 20% of the total area of the window unit. The operable window portion need not consist of sealed windows but shall contain the same framing material, shading coefficient and number of glazing layers as the fixed sealed portion of the window unit.

In the Simplified ACP Tables, the maximum U is determined based on the heat capacity (HC) of the opaque wall assembly. The heat capacity is the product of the specific heat and the mass of the opaque wall components. Select the maximum opaque wall U in the row with the appropriate range of HC for the proposed design. Opaque wall assemblies in the proposed design shall not exceed the maximum opaque wall U in the Table.

5.5.5.2 Determine the Maximum Allowable Percent Fenestration. Using the appropriate ACP Table as determined in 5.5.5.1, determine the maximum allowable percent fenestration. The maximum allowable percent fenestration is the total area of fenestration assemblies divided by the total gross exterior wall area, considering all elevations of the building.

Determining the maximum allowable percent fenestration requires the following five steps (a) to (e):

- (a) Based on the internal load density (ILD) for the proposed design, select one of the three internal load ranges as the point of entry to the Tables. Note: For ILDs greater than 37.6 W/m² (3.5 W/ft²), use 5.6.

Determine the internal load density (ILD) of the proposed design, based on the sum of the lighting power density (LPD), the equipment power density (EPD), and occupant load adjustment (OLA), as shown in Equation 5-2.

$$ILD = LPD + EPD + OLA \quad (5-2)$$

where

The lighting power density (LPD) shall be one of the following:

1. the building average lighting power density in W/m^2 (W/ft^2) as determined from the building lighting power allowance from 9.5 or 9.6 divided by the gross lighted floor area.
2. the average of the lighting power allowances for all activity areas within 4.5 m (15 ft) of each exterior wall divided by the sum of those activity areas, based on the procedures specified in 9.6.
3. the actual lighting power density of the proposed design in W/m^2 (W/ft^2), either building average or average of the lighting power within 4.5 m (15 ft) of each exterior wall.

The equipment power density (EPD) shall be either:

1. either the building average receptacle power density selected from Table 5-4 in W/m^2 (W/ft^2), or
2. or the actual average receptacle power density for all activity areas within 4.5 m (15 ft) of each exterior wall in W/m^2 (W/ft^2), considering diversity. For determining compliance with the ACP Tables, the actual average receptacle power densities calculated by this method that exceed $10.7 W/m^2$ ($1.0 W/ft^2$) shall be limited to $10.7 W/m^2$ ($1.0 W/ft^2$) in Equation 5-2.

Table 5-4
Average Receptacle Power Densities

Building Type	W/m^2	(W/ft^2)
Assembly	2.69	(0.25)
Office	8.07	(0.75)
Retail	2.69	(0.25)
Warehouse	1.08	(0.10)
School	5.32	(0.50)
Hotel or Motel	2.69	(0.25)
Restaurant	1.08	(0.10)
Health	10.76	(1.00)
Multifamily	8.07	(0.75)
Column 1	2	

The occupant load adjustment (OLA) shall be

1. either $0.0 W/m^2$ (W/ft^2), which recognizes the assumed occupant sensible load of $6.46 W/m^2$ ($0.6 W/ft^2$) that is built into the ACP Tables, or
2. a positive or negative difference between the actual occupant load and $6.46 W/m^2$ ($0.6 W/ft^2$) if the design building has a larger or smaller occupant load.

- (b) Select the external shading projection factor (PF). If no external shading projections are used in the proposed design, select the projection factor (PF) range of 0.000 to 0.249. If external shading projections are used, determine the average area-weighted projection factor on the window, then select the appropriate column in the ACP Table.

$$PF = P_d / H \quad (5-3)$$

where

- PF = external shading projection factor;
 P_d = external horizontal shading projection depth;
 H = sum of height of the fenestration and the distance from the top of the fenestration to the bottom of the external shading projection in units consistent with P_d .

- (c) Select the shading coefficient of the fenestration (SCx) including internal, integral, and external shading devices but excluding the effect of external shading projections (PF). Note that this includes curtains, shades, or blinds. Reference ASHRAE Handbook—1985 Fundamentals, Chapter 27.
- (d) Select one of the daylighting options:
1. either base case, no daylighting,
 2. or perimeter daylighting (automatic daylight controls for lighting system must be used). Note that this option is not available in some locations.
- (e) Select appropriate fenestration type. For most options, this is determined by the thermal transmittance value (U_{of}) of the fenestration assembly. For some fenestration options (see ACP Tables), the visible light transmittance of the fenestration (VLT) should not be less than the shading coefficient of the glazed portion of the fenestration assembly, not considering any shading devices. The ranges generally correspond to single glazing, double glazing, triple glazing, and high performance glazing incorporating low-emissivity coatings/films or more than two glazing layers. Each ACP Table includes, at most, three ranges of glazing U-Values.

5.5.5.3 Determine the Maximum U_{ow} for the Opaque Wall Assembly. In the appropriate ACP Table, the maximum U_{ow} for the opaque wall assembly is determined using the following steps.

- (a) For a lightweight wall assembly, heat capacity (HC) less than 100.3 kJ/(m²·K) (5 Btu/(ft²·°F)), use the value indicated. This U_{ow} is constant over all internal load ranges.
- (b) To use the mass wall adjustment, the following additional steps are necessary:
1. Select the same internal load range as that used in determining the maximum allowable percent fenestration.
 2. Select the mass wall heat capacity (HC) and insulation position. If the wall insulation is positioned internal to or integral with the wall mass, use the column headed Interior Insulation. If the wall insulation is positioned external to the wall mass, use the column headed Exterior Insulation. For HC less than 100.3 kJ/(m²·K) (5 Btu/(ft²·°F)), this adjustment Table cannot be used. At this step you will have two choices of U_{ow} that are keyed to a small or large percent fenestration. This represents the full range of U_{ow} values allowed.
 3. Select or interpolate for the appropriate maximum U_{ow} for the opaque wall based on the maximum allowable percent fenestration determined in 5.5.5.2 or the actual building percent fenestration, whichever value is lower. The U_{ow} shall be determined by straight line interpolation for fenestration percentages between the smallest and largest values listed. If the design building percentage fenestration is less than the smallest value listed, select the U_{ow} for the smallest percentage fenestration listed. If the design building percentage fenestration is greater than the largest value listed, select the U_{ow} for the largest percentage fenestration listed.

5.5.5.4 Determine Other Envelope Criteria. In each ACP Table, the criteria for roof, wall adjacent to unconditioned space, wall below grade (first story only), floor over unconditioned space, and slab-on-grade floors shall be met. For heated slabs-on-grade, the RSI-Value shall be the RSI-Value for the unheated slab-on-grade plus RSI-0.35 (R-2.0).

5.5.5.5 Skylights The total skylight area shall be less than 5% of the gross roof area.

- (a) The skylights, including framing shall have an minimum overall thermal transmittance of $3.97 \text{ W}/(\text{m}^2\cdot\text{K})$ ($0.7 \text{ Btu}/(\text{h}\cdot\text{ft}^2\cdot^\circ\text{F})$).
- (b) Skylight curbs have thermal transmittance U-Values less than or equal to $1.19 \text{ W}/(\text{m}^2\cdot\text{K})$ ($0.21 \text{ Btu}/(\text{h}\cdot\text{ft}^2\cdot^\circ\text{F})$).
- (c) The infiltration coefficient of the skylights is less than or equal to $0.25 \text{ L}/\text{s}\cdot\text{m}^2$ ($0.05 \text{ cfm}/\text{ft}^2$).

5.5.5.5.1 Skylight areas may be increased by 50% if a shading device is used that blocks over 50% of the solar gain during the peak cooling design condition.

5.6 System Performance Criteria

5.6.1 Purpose. The following provisions of 5.6 provide a system approach to compliance with the envelope requirements of this standard. They provide more flexibility than the prescriptive approach of 5.5 but also require more analysis.

5.6.2 Reserved.

5.6.3 General. For building designs with high internal heat gains or unusual operating schedules or that incorporate innovative design strategies not covered in the following provisions of 5.6, consideration shall be given to using the provisions of Section 11.

5.6.4 Compliance. The building envelope shall comply with the provisions of 5.1, 5.3, 5.4, 5.6, 5.7, and 5.8.

5.6.5 Compliance with System Performance Criteria. Compliance with System Performance Criteria shall be demonstrated by either

- (a) use of envelope compliance Standard 90.1 ENVSTD 23 or ENVSTD24 Envelope Software, or
- (b) calculations.

5.6.6 Where the envelope compliance software referred in 5.6.5(a) is used, the System Performance Criteria for a given climate zone impeded in the program shall be acceptable and the output of the software verifying compliance shall be deemed to be demonstration of compliance with System Compliance Criteria.

5.6.6.1 Applicable climate zone shall be determined based on 5.5.5.1 and Tables 5A-G1 to 5A-G3. Where appropriate, variations may be made based on local weather patterns (experience and professional judgment should be applied).

5.6.7 Where the calculation method used to demonstrate compliance with the System Performance Criteria, the thermal transmittance requirements of roofs, floors, walls above and below grade and fenestration shall be determined based on methods required in 8.6 of ASHRAE/IES 90.1-1989.

5.6.8 For the purpose of 5.6.5, lighting power density, equipment power density, and loads from occupants used in calculating the compliance value shall be either the building average calculated in accordance with 5.5 or the average of actual load.

5.8 Product Information and Installation Requirements

5.8.1 Insulation

5.8.1.1 Labeling of Building Envelope Insulation. The RSI-Value shall be clearly identified by an identification mark applied by the manufacturer to each piece of building envelope insulation.

Exception to 5.8.1.1: When insulation does not have such an identification mark, the installer of such insulation shall provide a signed and dated certification for the installed insulation listing the type of insulation, the manufacturer, the RSI-Value, and, where appropriate, the initial installed thickness, the settled thickness, and the coverage area.

5.8.1.2 Compliance with Manufacturer's Requirements. Insulation materials shall be installed in accordance with manufacturer's recommendations and in such a manner as to achieve the RSI-Value of insulation.

Exception to 5.8.1.2: Where metal building roof and metal building wall insulation is compressed between the roof or wall skin and the structure.

5.8.1.3 Loose-fill Insulation Limitation. Where loose-fill insulation is installed in an unconfined sloped space, such as an attic space over a sloped ceiling, the supporting slope shall not be more than

- (a) 4.5 in 12 for mineral fibre or cellulose fibre insulation, and
- (b) 2.5 in 12 for other types of insulation.

5.8.1.4 Baffles. When eave vents are installed, baffling of the vent openings shall be provided to deflect the incoming air above the surface of the insulation.

5.8.1.5 Installation. Insulation shall be installed in a permanent manner in accordance with manufacturer's recommendations for the framing system used. Flexible batt insulation installed in floor cavities shall be supported in a permanent manner by supports no greater than 600 mm (24 in) on center.

Exception to 5.8.1.5: Insulation materials that rely on air-spaces adjacent to reflective surfaces for their rated performance.

5.8.1.6 Recessed Equipment. Lighting fixtures; heating, ventilating, and air-conditioning equipment, including wall heaters, ducts, and plenums; and other equipment shall not be recessed in such a manner as to affect the insulation thickness unless:

- (a) the total combined area affected (including necessary clearances) is less than one percent of the opaque area of the assembly, or
- (b) the entire roof, wall, or floor is covered with insulation to the full depth required, or
- (c) the effects of reduced insulation are included in calculations using an area-weighted average method and compressed insulation values obtained from Table A9.4.C of ANSI/ASHRAE/IESNA Standard 90.1. In all cases, air leakage through or around the recessed equipment to the conditioned space shall be limited in accordance with 5.4.3.

5.8.1.7 Insulation Protection. Exterior insulation shall be covered with a protective material to prevent damage from sunlight, moisture, landscaping operations, equipment maintenance, and wind.

5.8.1.7.1 In attics and mechanical rooms, a way to access equipment that prevents damaging or compressing the insulation shall be provided.

5.8.1.7.2 Foundation vents shall not interfere with the insulation.

5.8.1.7.3 Insulation materials in ground contact shall have a water absorption rate no greater than 0.3% when tested in accordance with ASTM C272.

5.8.1.8 Location of Roof Insulation. The roof insulation shall not be installed on a suspended ceiling with removable ceiling panels.

5.8.1.9 Extent of Insulation. Insulation shall extend over the full component area, unless otherwise allowed in 5.8.1.

5.8.2 Fenestration

5.8.2.1 Rating of Fenestration Products. The overall thermal transmittance (U_{of}) value for all manufactured products shall be determined by

- (a) in conformance with 8.4.2.2. of ASHRAE 90.1-1989, or
- (b) a laboratory accredited by a nationally recognized accreditation organization.

Table 5A-1^{(1),(3),(4)}
Alternate Component Packages for Location Number 345 (SI Units)
HDD10 = 1780-2220, CDD18 = 281-640, VSEW = 6362-9599

Design Parameters			Maximum Percent Fenestration						Maximum Wall U-Value (Uow) Light-weight Walls			
Internal Load Density (ILD) Range	Projection Factor (PF) Range	Shading Coefficient (SCx) Range	Fenestration U-Value (Uof)						ILD Range 0.00 – 37.66			
			Base Case			Perimeter Daylighting ⁽²⁾			Percent Fenestration	HC Range	All Insulation Positions	
						VLT < SC		VLT ≥ SC				
			3.35 to 2.96	2.95 to 2.22	2.21 to 0.00	3.35 to 2.96	2.95 to 2.22	2.21 to 0.00	0 - 100	0.0 – 100.2	0.432	
0.00 – 16.14	0.00 - 0.25	1.00 - 0.72	21	22	23	22	23	25	Maximum Wall U-Value (Uow) Mass Walls			
		0.71 - 0.61	24	25	28	25	26	30				
		0.60 - 0.51	27	28	32	27	29	34				
		0.50 - 0.39	29	32	36	30	33	38				
		0.38 - 0.26	32	36	43	32	36	45				
	0.25 - 0.00	35	40	53	34	39	52	ILD Range 0.00 – 16.14				
	0.26 - 0.50	1.00 - 0.72	28	29	33	29	31	35	Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.71 - 0.61	31	33	38	31	34	41				
		0.60 - 0.51	33	36	43	33	37	45				
0.50 - 0.39		35	39	48	34	38	50					
0.51 +	0.38 - 0.00	36	41	55	35	40	54	21	100.3 - 202.4 202.5 - 304.6 304.7 +	0.449 0.483 0.511	0.568 0.625 0.625	
	1.00 - 0.72	33	36	41	33	36	44					
	0.71 - 0.61	35	39	47	34	39	50					
	0.60 - 0.51	36	41	52	35	40	54					
	0.50 - 0.00	37	43	56	36	41	56					
16.15 – 32.28	0.00 - 0.25	1.00 - 0.72	16	18	19	22	23	25	Maximum Wall U-Value (Uow) Mass Walls			
		0.71 - 0.61	21	21	23	25	26	30				
		0.60 - 0.51	23	24	26	26	30	34				
		0.50 - 0.39	26	28	31	31	33	39				
		0.38 - 0.26	31	33	38	33	37	47				
	0.25 - 0.00	36	40	49	37	42	55	ILD Range 16.15 – 32.28				
	0.26 - 0.50	1.00 - 0.72	24	25	27	29	30	36	Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.71 - 0.61	27	29	32	32	34	41				
		0.60 - 0.51	30	32	36	34	37	46				
0.50 - 0.39		33	36	41	35	39	51					
0.51 +	0.38 - 0.00	37	41	49	37	42	56	16	100.3 - 202.4 202.5 - 304.6 304.7 +	0.454 0.494 0.534	0.568 0.681 0.681	
	1.00 - 0.72	29	31	34	33	36	45					
	0.71 - 0.61	32	35	40	35	39	51					
	0.60 - 0.51	35	38	45	37	41	55					
	0.50 - 0.00	37	41	50	38	43	57					
32.29 – 37.66	0.00 - 0.25	1.00 - 0.72	16	16	17	21	22	25	Maximum Wall U-Value (Uow) Mass Walls			
		0.71 - 0.61	18	19	20	24	26	29				
		0.60 - 0.51	21	22	23	27	29	34				
		0.50 - 0.39	24	25	27	30	32	38				
		0.38 - 0.26	28	30	34	33	37	46				
	0.25 - 0.00	35	38	45	37	41	55	ILD Range 32.29 – 37.66				
	0.26 - 0.50	1.00 - 0.72	21	22	23	28	29	35	Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.71 - 0.61	24	26	28	31	33	40				
		0.60 - 0.51	27	29	32	33	36	45				
0.50 - 0.39		30	32	37	35	39	50					
0.51 +	0.38 - 0.00	35	38	44	37	42	56	16	100.3 - 202.4 202.5 - 304.6 304.7 +	0.454 0.500 0.539	0.568 0.681 0.681	
	1.00 - 0.72	26	27	30	32	35	44					
	0.71 - 0.61	29	31	35	35	38	50					
	0.60 - 0.51	32	35	40	36	40	54					
	0.50 - 0.00	35	38	45	37	42	57					

Notes to Table 5A-1:

- (1) See Table 5AA for other envelope criteria to Table 5A-1.
- (2) Perimeter daylighting must use daylight sensing controls.
- (3) This Table represents stringent criteria. Use of the System Performance Path (Standard 90.1 ENVSTD 23 or ENVSTD24 Envelope Software) can produce criteria that are substantially less stringent, in some cases, and can provide greater compliance flexibility.
- (4) Units for variables: U-Values - W/(m²·K) ILD - W/m² HC - kJ/(m²·K)

Table 5A-2^{(1),(3),(4)}
Alternate Component Packages for Location Number 281, 333 (SI Units)
HDD10 = 1780-2220, CDD18 = 0-280, VSEW = 6362-9599

Design Parameters			Maximum Percent Fenestration					Maximum Wall U-Value (Uow) Light-weight Walls			
Internal Load Density (ILD) Range	Projection Factor (PF) Range	Shading Coefficient (SCx) Range	Fenestration U-Value (Uof)					ILD Range 0.00 – 37.66			
			Base Case			Perimeter Daylighting ⁽²⁾		Percent Fenestration	HC Range	All Insulation Positions	
			3.35 to 2.96	2.95 to 2.22	2.21 to 0.00	VLT < SC	VLT ≥ SC			0 - 100	0.0 – 100.2
0.00 – 16.14	0.00 - 0.25	1.00 - 0.72	26	29	30			Maximum Wall U-Value (Uow) Mass Walls			
		0.71 - 0.61	29	33	36			ILD Range 0.00 – 16.14			
		0.60 - 0.51	31	37	42			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.50 - 0.39	33	41	47						
		0.38 - 0.26	34	46	56			26	100.3 - 202.4 202.5 - 304.6 304.7 +	0.426 0.466 0.494	0.568 0.625 0.681
	0.25 - 0.00	34	49	66							
	1.00 - 0.72	33	39	43							
	0.71 - 0.61	35	44	50							
	0.60 - 0.51	36	48	56							
0.51 +	0.50 - 0.39	36	50	63							
	0.38 - 0.00	36	52	70							
	1.00 - 0.72	37	47	54							
		0.71 - 0.61	38	51	62						
		0.60 - 0.51	38	53	68						
		0.50 - 0.00	38	54	73						
16.15 – 32.28	.00 - 0.25	1.00 - 0.72	22	24	25			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.71 - 0.61	26	28	30						
		0.60 - 0.51	28	32	35			73	100.3 - 202.4 202.5 - 304.6 304.7 +	0.426 0.454 0.483	0.511 0.625 0.625
		0.50 - 0.39	31	36	40						
		0.38 - 0.26	34	43	50						
	0.25 - 0.00	38	50	63							
	1.00 - 0.72	29	33	35							
	0.26 - 0.50	0.71 - 0.61	32	38	42						
		0.60 - 0.51	35	42	48						
0.50 - 0.39		37	46	54							
0.51 +	0.38 - 0.00	39	51	64							
	1.00 - 0.72	34	41	45							
	0.71 - 0.61	37	46	53							
		0.60 - 0.51	38	50	59						
		0.50 - 0.00	40	53	66						
32.29 – 37.66	0.00 - 0.25	1.00 - 0.72	20	22	22			ILD Range 32.29 - 37.66			
		0.71 - 0.61	23	26	27			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.60 - 0.51	26	29	31						
		0.50 - 0.39	29	33	37			20	100.3 - 202.4 202.5 - 304.6 304.7 +	0.432 0.483 0.522	0.568 0.681 0.738
		0.38 - 0.26	33	40	45						
	0.25 - 0.00	37	48	59							
	1.00 - 0.72	27	30	32							
	0.71 - 0.61	30	35	38							
	0.26 - 0.50	0.60 - 0.51	33	39	43						
0.50 - 0.39		35	43	49							
0.38 - 0.00		38	49	59							
0.51 +	1.00 - 0.72	32	37	41							
	0.71 - 0.61	35	42	48							
	0.60 - 0.51	37	46	54							
		0.50 - 0.00	39	50	60						

Notes to Table 5A-2:

- (1) See Table 5AA for other envelope criteria to Table 5A-2.
- (2) Perimeter daylighting must use daylight sensing controls.
- (3) This Table represents stringent criteria. Use of the System Performance Path (Standard 90.1 ENVSTD 23 or ENVSTD24 Envelope Software) can produce criteria that are substantially less stringent, in some cases, and can provide greater compliance flexibility.
- (4) Units for variables: U-Values - W/(m²·K) ILD - W/m² HC - kJ/(m²·K)

Table 5A-3^{(1),(3),(4)}
Alternate Component Packages for Location Number 270, 287, 292, 334, 343 (SI Units)
 HDD10 = 2221-2780, CDD18 = 0-640, VSEW = 6362-9599

Design Parameters			Maximum Percent Fenestration				Maximum Wall U-Value (Uow) Light-weight Walls				
Internal Load Density (ILD) Range	Projection Factor (PF) Range	Shading Coefficient (SCx) Range	Fenestration U-Value (Uof)				ILD Range 0.00 – 37.66				
			Base Case			Perimeter Daylighting ⁽²⁾		Percent Fenestration	HC Range	All Insulation Positions	
			2.95 to 2.22	2.21 to 1.71	1.70 to 0.00	VLT < SC	VLT ≥ SC				
						N/A	N/A	0 - 100	0.0 – 100.2	0.369	
0.00 – 16.14	0.00 - 0.25	1.00 - 0.72	23	25	26			Maximum Wall U-Value (Uow) Mass Walls			
		0.71 - 0.61	26	29	31			ILD Range 0.00 – 16.14			
		0.60 - 0.51	28	33	36			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.50 - 0.39	31	37	42						
		0.38 - 0.26	30	43	51			23	100.3 - 202.4 202.5 - 304.6 304.7 +	0.380 0.409 0.432	0.488 0.545 0.568
	0.25 - 0.00	29	42	60							
1.00 - 0.72	30	34	37								
0.71 - 0.61	33	39	44								
0.60 - 0.51	33	43	50								
0.50 - 0.39	32	48	56								
0.38 - 0.00	31	46	66								
	0.51 +	1.00 - 0.72	35	42	48						
		0.71 - 0.61	34	47	55						
		0.60 - 0.51	33	50	62						
		0.50 - 0.00	32	48	68						
16.15 – 32.28	0.00 - 0.25	1.00 - 0.72	19	20	21			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.71 - 0.61	22	24	25						
		0.60 - 0.51	25	28	30			68	100.3 - 202.4 202.5 - 304.6 304.7 +	0.380 0.403 0.426	0.471 0.534 0.551
		0.50 - 0.39	28	32	35						
		0.38 - 0.26	32	38	43						
	0.25 - 0.00	33	45	57							
	1.00 - 0.72	26	28	30							
	0.71 - 0.61	29	33	36							
	0.60 - 0.51	32	37	41							
0.50 - 0.39	34	42	47								
0.38 - 0.00	34	47	57								
	0.51 +	1.00 - 0.72	31	35	39						
		0.71 - 0.61	34	41	46						
		0.60 - 0.51	35	45	52						
		0.50 - 0.00	35	49	58						
32.29 – 37.66	0.00 - 0.25	1.00 - 0.72	17	18	19			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.71 - 0.61	20	22	23						
		0.60 - 0.51	23	25	26			58	100.3 - 202.4 202.5 - 304.6 304.7 +	0.380 0.409 0.437	0.494 0.562 0.568
		0.50 - 0.39	26	29	31						
		0.38 - 0.26	30	35	39						
	0.25 - 0.00	33	45	53							
	1.00 - 0.72	23	25	27							
	0.71 - 0.61	26	30	32							
	0.60 - 0.51	29	34	37							
	0.50 - 0.39	32	38	43							
	0.38 - 0.00	34	45	52							
		0.51 +	1.00 - 0.72	28	32	34					
		0.71 - 0.61	32	37	41						
		0.60 - 0.51	34	41	46						
		0.50 - 0.00	35	45	53						

Notes to Table 5A-3:

- (1) See Table 5AA for other envelope criteria to Table 5A-3.
- (2) Perimeter daylighting must use daylight sensing controls.
- (3) This Table represents stringent criteria. Use of the System Performance Path (Standard 90.1 ENVSTD 23 or ENVSTD24 Envelope Software) can produce criteria that are substantially less stringent, in some cases, and can provide greater compliance flexibility.
- (4) Units for variables: U-Values - W/(m²·K) ILD - W/m² HC - kJ/(m²·K)

Table 5A-4^{(1),(3),(4)}
Alternate Component Packages for Location Number 291, 314, 323, 330 (SI Units)
HDD10 = 2781-3610, CDD18 = 0-640, VSEW = 6362-9599

Design Parameters			Maximum Percent Fenestration				Maximum Wall U-Value (Uow) Light-weight Walls				
Internal Load Density (ILD) Range	Projection Factor (PF) Range	Shading Coefficient (SCx) Range	Fenestration U-Value (Uof)				ILD Range 0.00 – 37.66				
			Base Case			Perimeter Daylighting ⁽²⁾		Percent Fenestration	HC Range	All Insulation Positions	
			2.95 to 2.22	2.21 to 1.71	1.70 to 0.00	VLT < SC	VLT ≥ SC				
						N/A	N/A	0 - 100	0.0 – 100.2	0.329	
0.00 – 16.14	0.00 - 0.25	1.00 - 0.72	26	30	33			Maximum Wall U-Value (Uow) Mass Walls			
		0.71 - 0.61	29	35	39			ILD Range 0.00 – 16.14			
		0.60 - 0.51	30	38	44			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.50 - 0.39	31	41	49						
		0.38 - 0.26	30	43	56			26	100.3 - 202.4 202.5 - 304.6 304.7 +	0.335 0.352 0.363	0.403 0.443 0.454
	0.25 - 0.00	29	42	59							
	0.26 - 0.50	1.00 - 0.72	32	40	46						
		0.71 - 0.61	33	44	52						
		0.60 - 0.51	32	46	57						
0.50 - 0.39		32	46	61							
0.51 +	0.38 - 0.00	31	45	64							
	1.00 - 0.72	34	40	58							
	0.71 - 0.61	33	48	62							
	0.60 - 0.51	32	47	66							
	0.50 - 0.00	32	46	66							
16.15 – 32.28	0.00 - 0.25	1.00 - 0.72	23	25	27			Maximum Wall U-Value (Uow) Mass Walls			
		0.71 - 0.61	25	29	32			ILD Range 16.15 - 32.2			
		0.60 - 0.51	28	33	36			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.50 - 0.39	30	36	42						
		0.38 - 0.26	31	41	49			66	100.3 - 202.4 202.5 - 304.6 304.7 +	0.335 0.352 0.363	0.403 0.437 0.449
	0.25 - 0.00	32	44	59							
	0.26 - 0.50	1.00 - 0.72	29	34	37						
		0.71 - 0.61	31	38	43						
		0.60 - 0.51	32	41	48						
0.50 - 0.39		32	44	53							
0.51 +	0.38 - 0.00	33	45	61							
	1.00 - 0.72	32	40	46							
	0.71 - 0.61	33	44	52							
	0.60 - 0.51	33	46	57							
	0.50 - 0.00	33	46	62							
32.29 – 37.66	0.00 - 0.25	1.00 - 0.72	21	23	24			Maximum Wall U-Value (Uow) Mass Walls			
		0.71 - 0.61	24	27	29			ILD Range 32.29 - 37.66			
		0.60 - 0.51	26	30	34			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.50 - 0.39	29	34	38						
		0.38 - 0.26	31	39	46			21	100.3 - 202.4 202.5 - 304.6 304.7 +	0.341 0.358 0.369	0.414 0.460 0.471
	0.25 - 0.00	33	45	57							
	0.26 - 0.50	1.00 - 0.72	27	31	34						
		0.71 - 0.61	29	35	40						
		0.60 - 0.51	32	38	45						
0.50 - 0.39		33	42	50							
0.51 +	0.38 - 0.00	34	46	57							
	1.00 - 0.72	31	37	43							
	0.71 - 0.61	33	41	49							
	0.60 - 0.51	34	44	53							
	0.50 - 0.00	34	47	58							

Notes to Table 5A-4:

- (1) See Table 5AA for other envelope criteria to Table 5A-4.
- (2) Perimeter daylighting must use daylight sensing controls.
- (3) This Table represents stringent criteria. Use of the System Performance Path (Standard 90.1 ENVSTD 23 or ENVSTD24 Envelope Software) can produce criteria that are substantially less stringent, in some cases, and can provide greater compliance flexibility.
- (4) Units for variables: U-Values - W/(m²· K) ILD - W/m² HC - kJ/(m²· K)

Table 5A-5^{(1),(3),(4)}
Alternate Component Packages for Location No. 236, 241, 260, 277, 278, 319, 331 (SI Units)
HDD10 > 3610, CDD18 < 55, VSEW < 6362

Design Parameters			Maximum Percent Fenestration				Maximum Wall U-Value (Uow) Light-weight Walls				
Internal Load Density (ILD) Range	Projection Factor (PF) Range	Shading Coefficient (SCx) Range	Fenestration U-Value (Uof)				ILD Range 0.00 – 37.66				
			Base Case			Perimeter Daylighting ⁽²⁾		Percent Fenestration	HC Range	All Insulation Positions	
						VLT < SC	VLT ≥ SC				
			2.95 to 2.22	2.21 to 1.71	1.70 to 0.00	N/A	N/A	0 - 100	0.0 – 100.2	0.256	
0.00 – 16.14	0.00 - 0.25	1.00 - 0.72	30	40	50			Maximum Wall U-Value (Uow) Mass Walls			
		0.71 - 0.61	29	42	54			ILD Range 0.00 – 16.14			
		0.60 - 0.51	27	42	56			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.50 - 0.39	25	39	57						
		0.38 - 0.26	24	36	54			21	100.3 - 202.4 202.5 - 304.6 304.7 +	0.261 0.261 0.267	0.290 0.290 0.290
	0.25 - 0.00	21	32	48							
	1.00 - 0.72	29	44	58							
	0.26 - 0.50	0.71 - 0.61	27	42	60			62	100.3 - 202.4 202.5 - 304.6 304.7 +	0.261 0.267 0.273	0.307 0.318 0.318
		0.60 - 0.51	26	40	60						
0.50 - 0.39		24	37	57							
0.51 +	0.38 - 0.00	23	34	52			24	100.3 - 202.4 202.5 - 304.6 304.7 +	0.261 0.267 0.267	0.301 0.307 0.307	
	1.00 - 0.72	27	43	62							
	0.71 - 0.61	25	40	61							
16.15 – 32.28	0.00 - 0.25	0.60 - 0.51	27	38	49			56	100.3 - 202.4 202.5 - 304.6 304.7 +	0.261 0.267 0.273	0.307 0.312 0.312
		0.50 - 0.39	26	38	52						
		0.38 - 0.26	25	36	52						
0.26 - 0.50	0.25 - 0.00	24	34	49			27	100.3 - 202.4 202.5 - 304.6 304.7 +	0.261 0.267 0.267	0.301 0.307 0.307	
	1.00 - 0.72	28	40	51							
	0.71 - 0.61	27	40	53							
0.51 +	0.60 - 0.51	26	39	55			59	100.3 - 202.4 202.5 - 304.6 304.7 +	0.261 0.267 0.273	0.301 0.307 0.312	
	0.50 - 0.39	25	37	54							
	0.38 - 0.00	24	36	52							
32.29 – 37.66	0.00 - 0.25	1.00 - 0.72	27	40	55			Maximum Wall U-Value (Uow) Mass Walls			
		0.71 - 0.61	26	39	56			ILD Range 16.15 – 32.28			
		0.60 - 0.51	25	38	55			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.50 - 0.39	25	37	54						
		0.38 - 0.26	25	36	52			24	100.3 - 202.4 202.5 - 304.6 304.7 +	0.261 0.267 0.267	0.301 0.307 0.307
	0.25 - 0.00	24	34	49							
	1.00 - 0.72	28	40	51							
	0.26 - 0.50	0.71 - 0.61	27	40	53			62	100.3 - 202.4 202.5 - 304.6 304.7 +	0.261 0.267 0.273	0.307 0.318 0.318
		0.60 - 0.51	26	39	55						
0.50 - 0.39		25	37	54							
0.51 +	0.38 - 0.00	24	36	52			24	100.3 - 202.4 202.5 - 304.6 304.7 +	0.261 0.267 0.267	0.301 0.307 0.307	
	1.00 - 0.72	27	40	55							
	0.71 - 0.61	26	39	56							
16.15 – 32.28	0.00 - 0.25	0.60 - 0.51	25	38	55			56	100.3 - 202.4 202.5 - 304.6 304.7 +	0.261 0.267 0.273	0.307 0.312 0.312
		0.50 - 0.39	25	38	55						
		0.38 - 0.26	25	36	53						
0.26 - 0.50	0.25 - 0.00	25	36	53			24	100.3 - 202.4 202.5 - 304.6 304.7 +	0.261 0.267 0.267	0.301 0.307 0.307	
	1.00 - 0.72	27	40	55							
	0.71 - 0.61	26	39	56							
0.51 +	0.60 - 0.51	25	38	55			56	100.3 - 202.4 202.5 - 304.6 304.7 +	0.261 0.267 0.273	0.307 0.312 0.312	
	0.50 - 0.39	25	37	54							
	0.38 - 0.00	24	36	52							
32.29 – 37.66	0.00 - 0.25	1.00 - 0.72	27	40	55			Maximum Wall U-Value (Uow) Mass Walls			
		0.71 - 0.61	26	39	56			ILD Range 32.29 – 37.66			
		0.60 - 0.51	25	38	55			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.50 - 0.39	25	37	54						
		0.38 - 0.26	25	36	52			27	100.3 - 202.4 202.5 - 304.6 304.7 +	0.261 0.267 0.267	0.301 0.307 0.307
	0.25 - 0.00	24	34	49							
	1.00 - 0.72	28	40	51							
	0.26 - 0.50	0.71 - 0.61	27	40	53			62	100.3 - 202.4 202.5 - 304.6 304.7 +	0.261 0.267 0.273	0.307 0.318 0.318
		0.60 - 0.51	26	39	55						
0.50 - 0.39		25	37	54							
0.51 +	0.38 - 0.00	24	36	52			24	100.3 - 202.4 202.5 - 304.6 304.7 +	0.261 0.267 0.267	0.301 0.307 0.307	
	1.00 - 0.72	27	40	55							
	0.71 - 0.61	26	39	56							
16.15 – 32.28	0.00 - 0.25	0.60 - 0.51	25	38	55			56	100.3 - 202.4 202.5 - 304.6 304.7 +	0.261 0.267 0.273	0.307 0.312 0.312
		0.50 - 0.39	25	38	55						
		0.38 - 0.26	25	36	53						
0.26 - 0.50	0.25 - 0.00	25	36	53			24	100.3 - 202.4 202.5 - 304.6 304.7 +	0.261 0.267 0.267	0.301 0.307 0.307	
	1.00 - 0.72	27	40	55							
	0.71 - 0.61	26	39	56							
0.51 +	0.60 - 0.51	25	38	55			56	100.3 - 202.4 202.5 - 304.6 304.7 +	0.261 0.267 0.273	0.307 0.312 0.312	
	0.50 - 0.39	25	37	54							
	0.38 - 0.00	24	36	52							

Notes to Table 5A-5:

- (1) See Table 5AA for other envelope criteria to Table 5A-5.
- (2) Perimeter daylighting must use daylight sensing controls.
- (3) This Table represents stringent criteria. Use of the System Performance Path (Standard 90.1 ENVSTD 23 or ENVSTD24 Envelope Software) can produce criteria that are substantially less stringent, in some cases, and can provide greater compliance flexibility.
- (4) Units for variables: U-Values - W/(m²·K) ILD - W/m² HC - kJ/(m²·K)

Table 5AA^{(1),(2)}
Other Envelope Criteria (SI Units)

Other Envelope Criteria for Table 5A-1					
Minimum RSI-Value				Maximum U-Value	
Wall below grade	1.76			Roof	0.278
Unheated slab on grade	0.6 m	0.9 m	1.2 m	Wall adjacent to unconditioned space	0.681
Horizontal installation	3.17	2.64	1.94		
Vertical installation	1.41	1.06	0.70	Floor over unconditioned space	0.25
Other Envelope Criteria for Table 5A-2					
Minimum RSI-Value				Maximum U-Value	
Wall below grade	1.94			Roof	0.278
Unheated slab on grade	0.6 m	0.9 m	1.2 m	Wall adjacent to unconditioned space	0.625
Horizontal installation	3.17	2.64	1.94		
Vertical installation	1.41	1.06	0.70	Floor over unconditioned space	0.227
Other Envelope Criteria for Table 5A-3					
Minimum RSI-Value				Maximum U-Value	
Wall below grade	2.11			Roof	0.256
Unheated slab on grade	0.6 m	0.9 m	1.2 m	Wall adjacent to unconditioned space	0.625
Horizontal installation	3.17	2.64	1.94		
Vertical installation	1.41	1.06	0.70	Floor over unconditioned space	0.221
Other Envelope Criteria for Table 5A-4					
Minimum RSI-Value				Maximum U-Value	
Wall below grade	2.29			Roof	0.227
Unheated slab on grade	0.6 m	0.9 m	1.2 m	Wall adjacent to unconditioned space	0.568
Horizontal installation	3.17	2.64	1.94		
Vertical installation	1.41	1.06	0.70	Floor over unconditioned space	0.221
Other Envelope Criteria for Table 5A-5					
Minimum RSI-Value				Maximum U-Value	
Wall below grade	2.82			Roof	0.176
Unheated slab on grade	0.6 m	0.9 m	1.2 m	Wall adjacent to unconditioned space	0.494
Horizontal installation	3.17	2.64	1.94		
Vertical installation	1.41	1.06	0.70	Floor over unconditioned space	0.227

Notes to Table 5AA:

- (1) This Table represents stringent criteria. Use of the System Performance Path (Standard 90.1 ENVSTD 23 or ENVSTD24 Envelope Software) can produce criteria that are substantially less stringent, in some cases, and can provide greater compliance flexibility.
- (2) Units for variables: U-Values - $W/(m^2 \cdot K)$ RSI-Values - $(m^2 \cdot K)/W$

Table 5A-1S
Simplified Alternate Component Packages for Location Number 345

Window-to-Wall Ratio	Shading Coefficient (SC)	Maximum Overall U-Value (U_{gl}) for Fenestration, $W/(m^2 \cdot K)$ (Btu/h·ft ² ·F)	
		Heated and Cooled Building	Heated-only Building
≤ 0.20	≥ 0.80	4.20 (0.74)	4.03 (0.71)
	0.60 - 0.79	4.20 (0.74)	3.41 (0.60)
	0.40 - 0.59	4.20 (0.74)	2.73 (0.48)
	0.20 - 0.39	4.20 (0.74)	2.04 (0.36)
	0.00 - 0.19	4.20 (0.74)	1.25 (0.22)
0.21 - 0.40	≥ 0.80	NA	3.35 (0.59)
	0.60 - 0.79	NA	2.84 (0.50)
	0.40 - 0.59	1.87 (0.33)	2.27 (0.40)
	0.20 - 0.39	2.84 (0.50)	1.65 (0.29)
	0.00 - 0.19	3.41 (0.60)	0.91 (0.16)
0.41 - 0.60	≥ 0.80	NA	2.95 (0.52)
	0.60 - 0.79	NA	2.56 (0.45)
	0.40 - 0.59	NA	2.10 (0.37)
	0.20 - 0.39	1.48 (0.26)	1.48 (0.26)
	0.00 - 0.19	2.27 (0.40)	0.74 (0.13)

Opaque Envelope Component			Maximum Overall U-Value, $W/(m^2 \cdot K)$ (Btu/h·ft ² ·F)
Opaque wall	Heat Capacity, $kJ/(m^2 \cdot K)$ (Btu/(ft ² ·F))		
	HC < 204	HC < 10	0.449 (0.079)
	204 ≤ HC < 307	10 HC < 15	0.483 (0.085)
	HC ≥ 307	HC ≥ 15	0.511 (0.090)
Roof			0.278 (0.049)
Wall adjacent to unconditioned space			0.680 (0.120)
Floor over unconditioned space			0.250 (0.044)

Opaque Envelope Component			Minimum RSI-Value, $m^2 \cdot K/W$ (ft ² ·h·F/Btu)
Wall below grade			1.76 (10)
Unheated slab on grade	Insulation Position	Length, m (in.)	
		0.6 (24)	3.17 (18)
		Horizontal	0.9 (36)
	Vertical	1.2 (48)	1.94 (11)
		0.6 (24)	1.41 (8)
		0.9 (36)	1.06 (6)
Heated slab on grade	Insulation Position	Length, m (in.)	
		0.6 (24)	3.52 (20)
		Horizontal	0.9 (36)
	Vertical	1.2 (48)	2.29 (13)
		0.6 (24)	1.76 (10)
		0.9 (36)	1.41 (8)
		1.2 (48)	1.06 (6)

Table 5A-2S
Simplified Alternate Component Packages for Location Number 281, 333

Window-to-Wall Ratio	Shading Coefficient (SC)	Maximum Overall U-Value (U_o) for Fenestration, $W/(m^2 \cdot K)$ (Btu/h·ft ² ·F)	
		Heated and Cooled Building	Heated-only Building
≤ 0.20	≥ 0.80	4.20 (0.74)	3.63 (0.64)
	0.60 - 0.79	4.20 (0.74)	3.01 (0.53)
	0.40 - 0.59	4.20 (0.74)	2.38 (0.42)
	0.20 - 0.39	4.20 (0.74)	1.76 (0.31)
	0.00 - 0.19	4.20 (0.74)	1.02 (0.18)
0.21 - 0.40	≥ 0.80	NA	3.01 (0.53)
	0.60 - 0.79	NA	2.56 (0.45)
	0.40 - 0.59	2.10 (0.37)	2.04 (0.36)
	0.20 - 0.39	2.61 (0.46)	1.42 (0.25)
	0.00 - 0.19	2.95 (0.51)	0.74 (0.13)
0.41 - 0.60	≥ 0.80	NA	2.67 (0.47)
	0.60 - 0.79	NA	2.33 (0.41)
	0.40 - 0.59	NA	1.87 (0.33)
	0.20 - 0.39	1.59 (0.28)	1.31 (0.23)
	0.00 - 0.19	2.04 (0.36)	0.62 (0.11)

Opaque Envelope Component		Maximum Overall U-Value, $W/(m^2 \cdot K)$ (Btu/h·ft ² ·F)	
Opaque wall	Heat Capacity, $kJ/(m^2 \cdot K)$ (Btu/(ft ² ·F))		
	HC < 204	HC < 10	0.426 (0.075)
	204 HC < 307	10 HC < 15	0.466 (0.082)
	HC ≥ 307	HC ≥ 15	0.494 (0.087)
Roof		0.278 (0.049)	
Wall adjacent to unconditioned space		0.620 (0.110)	
Floor over unconditioned space		0.227 (0.040)	

Opaque Envelope Component		Minimum RSI-Value, $m^2 \cdot K/W$ (ft ² ·h·F/Btu)	
Wall below grade		1.94 (11)	
Unheated slab on grade	Insulation Position		
	Length, m (in.)		
	Horizontal	0.6 (24)	3.17 (18)
		0.9 (36)	2.64 (15)
		1.2 (48)	1.94 (11)
	Vertical	0.6 (24)	1.41 (8)
0.9 (36)		1.06 (6)	
1.2 (48)		0.70 (4)	
Heated slab on grade	Insulation Position		
	Length, m (in.)		
	Horizontal	0.6 (24)	3.52 (20)
		0.9 (36)	2.99 (17)
		1.2 (48)	2.29 (13)
	Vertical	0.6 (24)	1.76 (10)
0.9 (36)		1.41 (8)	
1.2 (48)		1.06 (6)	

Table 5A-3S
Simplified Alternate Component Packages for Location Number 270, 287, 292, 334, 343

Window-to-Wall Ratio	Shading Coefficient (SC)	Maximum Overall U-Value (U_{gl}) for Fenestration, $W/(m^2 \cdot K)$ (Btu/h·ft ² ·F)	
		Heated and Cooled Building	Heated-only Building
≤ 0.20	≥ 0.80	4.20 (0.74)	3.58 (0.63)
	0.60 - 0.79	4.20 (0.74)	3.01 (0.53)
	0.40 - 0.59	4.20 (0.74)	2.38 (0.42)
	0.20 - 0.39	4.20 (0.74)	1.76 (0.31)
	0.00 - 0.19	4.20 (0.74)	1.02 (0.18)
0.21 - 0.40	≥ 0.80	NA	2.95 (0.52)
	0.60 - 0.79	NA	2.50 (0.44)
	0.40 - 0.59	2.27 (0.40)	1.99 (0.35)
	0.20 - 0.39	2.56 (0.45)	1.42 (0.25)
	0.00 - 0.19	2.67 (0.47)	0.68 (0.12)
0.41 - 0.60	≥ 0.80	NA	2.56 (0.45)
	0.60 - 0.79	NA	2.21 (0.39)
	0.40 - 0.59	NA	1.82 (0.32)
	0.20 - 0.39	1.65 (0.29)	1.25 (0.22)
	0.00 - 0.19	1.87 (0.33)	0.62 (0.11)

Opaque Envelope Component			Maximum Overall U-Value, $W/(m^2 \cdot K)$ (Btu/h·ft ² ·F)
Opaque wall	Heat Capacity, $kJ/(m^2 \cdot K)$ (Btu/(ft ² ·F))		
	HC < 204	HC < 10	0.380 (0.067)
	204 ≤ HC < 307	10 HC < 15	0.409 (0.072)
	HC ≥ 307	HC ≥ 15	0.432 (0.076)
Roof			0.256 (0.045)
Wall adjacent to unconditioned space			0.620 (0.110)
Floor over unconditioned space			0.221 (0.039)

Opaque Envelope Component			Minimum RSI-Value, $m^2 \cdot K/W$ (ft ² ·h·F/Btu)
Wall below grade			2.11 (12)
Unheated slab on grade	Insulation Position	Length, m (in.)	
		0.6 (24)	3.17 (18)
		Horizontal	0.9 (36)
	Vertical	1.2 (48)	1.94 (11)
		0.6 (24)	1.41 (8)
		0.9 (36)	1.06 (6)
Heated slab on grade	Insulation Position	Length, m (in.)	
		0.6 (24)	3.52 (20)
		Horizontal	0.9 (36)
	Vertical	1.2 (48)	2.29 (13)
		0.6 (24)	1.76 (10)
		0.9 (36)	1.41 (8)
		1.2 (48)	1.06 (6)

Table 5A-4S
Simplified Alternate Component Packages for Location Number 291, 314, 323, 330

Window-to-Wall Ratio	Shading Coefficient (SC)	Maximum Overall U-Value (U_{ov}) for Fenestration, $W/(m^2 \cdot K)$ (Btu/h·ft ² ·F)	
		Heated and Cooled Building	Heated-only Building
≤ 0.20	≥ 0.80	4.20 (0.74)	3.58 (0.63)
	0.60 - 0.79	4.20 (0.74)	3.01 (0.53)
	0.40 - 0.59	4.20 (0.74)	2.44 (0.43)
	0.20 - 0.39	4.20 (0.74)	1.87 (0.33)
	0.00 - 0.19	4.20 (0.74)	1.14 (0.20)
0.21 - 0.40	≥ 0.80	NA	2.90 (0.51)
	0.60 - 0.79	2.04 (0.36)	2.44 (0.43)
	0.40 - 0.59	2.33 (0.41)	1.99 (0.35)
	0.20 - 0.39	2.44 (0.43)	1.42 (0.25)
	0.00 - 0.19	2.44 (0.43)	0.74 (0.13)
0.41 - 0.60	≥ 0.80	NA	2.50 (0.44)
	0.60 - 0.79	NA	2.16 (0.38)
	0.40 - 0.59	1.31 (0.23)	1.76 (0.31)
	0.20 - 0.39	1.70 (0.30)	1.25 (0.22)
	0.00 - 0.19	1.76 (0.31)	0.62 (0.11)

Opaque Envelope Component			Maximum Overall U-Value, $W/(m^2 \cdot K)$ (Btu/h·ft ² ·F)
Opaque wall	Heat Capacity, $kJ/(m^2 \cdot K)$ (Btu/(ft ² ·F))		
	HC < 204	HC < 10	0.335 (0.059)
	204 ≤ HC < 307	10 HC < 15	0.352 (0.062)
	HC ≥ 307	HC ≥ 15	0.363 (0.064)
Roof			0.227 (0.040)
Wall adjacent to unconditioned space			0.570 (0.100)
Floor over unconditioned space			0.221 (0.039)

Opaque Envelope Component			Minimum RSI-Value, $m^2 \cdot K/W$ (ft ² ·h·F/Btu)
Wall below grade			2.29 (13)
Unheated slab on grade	Insulation Position	Length, m (in.)	
		0.6 (24)	3.17 (18)
		0.9 (36)	2.64 (15)
	Vertical	1.2 (48)	1.94 (11)
		0.6 (24)	1.41 (8)
		0.9 (36)	1.06 (6)
Heated slab on grade	Insulation Position	Length, m (in.)	
		0.6 (24)	3.52 (20)
		0.9 (36)	2.99 (17)
	Vertical	1.2 (48)	2.29 (13)
		0.6 (24)	1.76 (10)
	0.9 (36)	1.41 (8)	
	1.2 (48)	1.06 (6)	

Table 5A-5S
Simplified Alternate Component Packages for Location Number 236, 241, 260, 277, 278, 319, 331

Window-to-Wall Ratio	Shading Coefficient (SC)	Maximum Overall U-Value (U_{oj}) for Fenestration, $W/(m^2 \cdot K)$ (Btu/h·ft ² ·F)	
		Heated and Cooled Building	Heated-only Building
≤ 0.20	≥ 0.80	4.20 (0.74)	3.80 (0.67)
	0.60 - 0.79	4.20 (0.74)	3.29 (0.58)
	0.40 - 0.59	4.20 (0.74)	2.78 (0.49)
	0.20 - 0.39	4.20 (0.74)	2.21 (0.39)
	0.00 - 0.19	4.20 (0.74)	1.53 (0.27)
0.21 - 0.40	≥ 0.80	1.76 (0.31)	2.90 (0.51)
	0.60 - 0.79	2.21 (0.39)	2.50 (0.44)
	0.40 - 0.59	2.38 (0.42)	2.04 (0.36)
	0.20 - 0.39	2.44 (0.43)	1.53 (0.27)
	0.00 - 0.19	2.38 (0.42)	0.91 (0.16)
0.41 - 0.60	≥ 0.80	NA	2.38 (0.42)
	0.60 - 0.79	NA	2.16 (0.38)
	0.40 - 0.59	1.48 (0.26)	1.76 (0.31)
	0.20 - 0.39	1.70 (0.30)	1.31 (0.23)
	0.00 - 0.19	1.70 (0.30)	0.68 (0.12)

Opaque Envelope Component		Maximum Overall U-Value, $W/(m^2 \cdot K)$ (Btu/h·ft ² ·F)	
Opaque wall	Heat Capacity, $kJ/(m^2 \cdot K)$ (Btu/(ft ² ·F))		
	HC < 204	HC < 10	0.261 (0.046)
	204 ≤ HC < 307	10 HC < 15	0.261 (0.046)
	HC ≥ 307	HC ≥ 15	0.267 (0.047)
Roof		0.176 (0.031)	
Wall adjacent to unconditioned space		0.494 (0.087)	
Floor over unconditioned space		0.227 (0.039)	

Opaque Envelope Component		Minimum RSI-Value, $m^2 \cdot K/W$ (ft ² ·h·F/Btu)	
Wall below grade		2.82 (16)	
Unheated slab on grade	Insulation Position	Length, m (in.)	
	Horizontal	0.6 (24)	3.17 (18)
		0.9 (36)	2.64 (15)
		1.2 (48)	1.94 (11)
	Vertical	0.6 (24)	1.41 (8)
		0.9 (36)	1.06 (6)
1.2 (48)		0.70 (4)	
Heated slab on grade	Insulation Position	Length, m (in.)	
	Horizontal	0.6 (24)	3.52 (20)
		0.9 (36)	2.99 (17)
		1.2 (48)	2.29 (13)
	Vertical	0.6 (24)	1.76 (10)
		0.9 (36)	1.41 (8)
1.2 (48)		1.06 (6)	

Table 5A-1^{(1),(3),(4)}
Alternate Component Packages for Location Number 345 (Imperial Units)
HDD50 = 3201-4000, CDD65 = 501-1150, VSEW = 560-845

Design Parameters			Maximum Percent Fenestration						Maximum Wall U-value (Uow) Light-weight Walls							
Internal Load Density (ILD) Range	Projection Factor (PF) Range	Shading Coefficient (SCx) Range	Fenestration U-Value (Uof)						ILD Range 0.00 - 3.50							
			Base Case			Perimeter Daylighting ⁽²⁾			Percent Fenestration	HC Range	All Insulation Positions					
						VLT < SC		VLT ≥ SC								
			0.59 to 0.53	0.52 to 0.40	0.39 to 0.00	0.59 to 0.53	0.52 to 0.40	0.39 to 0.00	0 - 100	0.0 - 4.9	0.076					
0.59 to 0.53	0.52 to 0.40	0.39 to 0.00	0.59 to 0.53	0.52 to 0.40	0.39 to 0.00											
0.00 - 1.50	0.00 - 0.25	1.00 - 0.72	21	22	23	22	23	25					Maximum Wall U-value (Uow) Mass Walls			
		0.71 - 0.61	24	25	28	25	26	30								
		0.60 - 0.51	27	28	32	27	29	34								
		0.50 - 0.39	29	32	36	30	33	38								
		0.38 - 0.26	32	36	43	32	36	45								
	0.25 - 0.00	35	40	53	34	39	52	ILD Range 0.00 - 1.50								
	0.26 - 0.50	1.00 - 0.72	28	29	33	29	31	35	Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation				
		0.71 - 0.61	31	33	38	31	34	41								
		0.60 - 0.51	33	36	43	33	37	45								
0.51 +	0.50 - 0.39	35	39	48	34	38	50	21	5.0 - 9.9 10.0 - 14.9 15.0 +	0.079 0.085 0.090	0.10 0.11 0.11					
	0.38 - 0.00	36	41	55	35	40	54									
	1.00 - 0.72	33	36	41	33	36	44									
1.51 - 3.00	0.00 - 0.25	0.71 - 0.61	16	18	19	22	23	25	Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation				
		0.60 - 0.51	21	21	23	25	26	30								
		0.50 - 0.39	23	24	26	26	30	34								
		0.38 - 0.26	26	28	31	31	33	39								
		0.25 - 0.00	31	33	38	33	37	47								
	0.26 - 0.50	1.00 - 0.72	24	25	27	29	30	36	16	5.0 - 9.9 10.0 - 14.9 15.0 +	0.080 0.087 0.094	0.10 0.12 0.12				
		0.71 - 0.61	27	29	32	32	34	41								
		0.60 - 0.51	30	32	36	34	37	46								
	0.51 +	0.50 - 0.39	33	36	41	35	39	51	56	5.0 - 9.9 10.0 - 14.9 15.0 +	0.079 0.084 0.087	0.09 0.10 0.11				
0.38 - 0.00		37	41	49	37	42	56									
1.00 - 0.72		29	31	34	33	36	45									
3.01 - 3.50	0.00 - 0.25	0.71 - 0.61	16	16	17	21	22	25	Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation				
		0.60 - 0.51	18	19	20	24	26	29								
		0.50 - 0.39	21	22	23	27	29	34								
		0.38 - 0.26	24	25	27	30	32	38								
		0.25 - 0.00	28	30	34	33	37	46								
	0.26 - 0.50	1.00 - 0.72	21	22	23	28	29	35	16	5.0 - 9.9 10.0 - 14.9 15.0 +	0.080 0.088 0.095	0.10 0.12 0.12				
		0.71 - 0.61	24	26	28	31	33	40								
		0.60 - 0.51	27	29	32	33	36	45								
	0.51 +	0.50 - 0.39	30	32	37	35	39	50	57	5.0 - 9.9 10.0 - 14.9 15.0 +	0.079 0.084 0.088	0.09 0.10 0.11				
0.38 - 0.00		35	38	44	37	42	56									
1.00 - 0.72		26	27	30	32	35	44									
0.51 +	0.71 - 0.61	29	31	35	35	38	50	57	10.0 - 14.9 15.0 +	0.084 0.088	0.10 0.11					
	0.60 - 0.51	32	35	40	36	40	54									
	0.50 - 0.00	35	38	45	37	42	57									

Notes to Table 5A-1:

- (1) See Table 5AA for other envelope criteria to Table 5A-1.
- (2) Perimeter daylighting must use daylight sensing controls.
- (3) This Table represents stringent criteria. Use of the System Performance Path (Standard 90.1 ENVSTD 23 or ENVSTD24 Envelope Software) can produce criteria that are substantially less stringent, in some cases, and can provide greater compliance flexibility.
- (4) Units for variables: U-Values - Btu/(hr-ft²· F) ILD - W/ft² HC - Btu/(ft²· F)

Table 5A-2^{(1),(3),(4)}
Alternate Component Packages for Location Number 281, 333 (Imperial Units)
HDD50 = 3201-4000, CDD65 = 0-500, VSEW = 560-845

Design Parameters			Maximum Percent Fenestration					Maximum Wall U-value (Uow) Light-weight Walls				
Internal Load Density (ILD) Range	Projection Factor (PF) Range	Shading Coefficient (SCx) Range	Fenestration U-Value (Uof)					ILD Range 0.00 - 3.50				
			Base Case			Perimeter Daylighting ⁽²⁾		Percent Fenestration	HC Range	All Insulation Positions		
						VLT < SC	VLT ≥ SC					
			0.59 to 0.53	0.52 to 0.40	0.39 to 0.00			0 - 100	0.0 - 4.9	0.072		
0.00 - 1.50	0.00 - 0.25	1.00 - 0.72	26	29	30			Maximum Wall U-value (Uow) Mass Walls				
		0.71 - 0.61	29	33	36			ILD Range 0.00 - 1.50				
		0.60 - 0.51	31	37	42			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation	
		0.50 - 0.39	33	41	47							
		0.38 - 0.26	34	46	56			26	5.0 - 9.9 10.0 - 14.9 15.0 +	0.075 0.082 0.087	0.10 0.11 0.12	
		0.25 - 0.00	34	49	66							
	0.26 - 0.50	1.00 - 0.72	33	39	43			73	5.0 - 9.9 10.0 - 14.9 15.0 +	0.075 0.080 0.085	0.09 0.11 0.11	
		0.71 - 0.61	35	44	50							
		0.60 - 0.51	36	48	56							
0.50 - 0.39	0.50 - 0.39	36	50	63			22	5.0 - 9.9 10.0 - 14.9 15.0 +	0.076 0.084 0.091	0.10 0.12 0.13		
	0.38 - 0.26	36	52	70								
	0.25 - 0.00	37	47	54								
0.51 +	1.00 - 0.72	37	47	54			66	5.0 - 9.9 10.0 - 14.9 15.0 +	0.075 0.082 0.089	0.10 0.12 0.12		
	0.71 - 0.61	38	51	62								
	0.60 - 0.51	38	53	68								
0.60 - 0.51	0.60 - 0.51	38	54	73			20	5.0 - 9.9 10.0 - 14.9 15.0 +	0.076 0.085 0.092	0.10 0.12 0.13		
	0.50 - 0.39	38	54	73								
	0.38 - 0.26	38	54	73								
0.38 - 0.26	0.38 - 0.26	38	54	73			60	5.0 - 9.9 10.0 - 14.9 15.0 +	0.075 0.083 0.090	0.10 0.12 0.12		
	0.25 - 0.00	38	54	73								
	0.25 - 0.00	38	54	73								

Notes to Table 5A-2:

- (1) See Table 5AA for other envelope criteria to Table 5A-2.
- (2) Perimeter daylighting must use daylight sensing controls.
- (3) This Table represents stringent criteria. Use of the System Performance Path (Standard 90.1 ENVSTD 23 or ENVSTD24 Envelope Software) can produce criteria that are substantially less stringent, in some cases, and can provide greater compliance flexibility.
- (4) Units for variables: U-Values - Btu/(hr·ft²·F) ILD - W/ft² HC - Btu/(ft²·F)

Table 5A-3^{(1),(3),(4)}
Alternate Component Packages for Location Number 270, 287, 292, 334, 343 (Imperial Units)
HDD50 = 4001-5000, CDD65 = 0-1150, VSEW = 560-845

Design Parameters			Maximum Percent Fenestration					Maximum Wall U-Value (Uow) Light-weight Walls				
Internal Load Density (ILD) Range	Projection Factor (PF) Range	Shading Coefficient (SCx) Range	Fenestration U-Value (Uof)					ILD Range 0.00 – 3.50				
			Base Case			Perimeter Daylighting ⁽²⁾		Percent Fenestration	HC Range	All Insulation Positions		
						VLT < SC	VLT ≥ SC					
			0.52 to 0.40	0.39 to 0.31	0.30 to 0.00	N/A	N/A	0 - 100	0.0 - 4.9	0.065		
0.23 to 0.29	0.25 to 0.29	0.26 to 0.31	Maximum Wall U-Value (Uow) Mass Walls									
0.00 – 1.50	0.00 - 0.25	1.00 - 0.72	23	25	26	ILD Range 0.00 - 1.50						
		0.71 - 0.61	26	29	31	Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation			
		0.60 - 0.51	28	33	36							
	0.50 - 0.39	31	37	42	23	5.0 - 9.9 10.0 - 14.9 15.0 +	0.067 0.072 0.076	0.086 0.096 0.100				
	0.38 - 0.26	30	43	51								
	0.25 - 0.00	29	42	60								
0.26 - 0.50	1.00 - 0.72	30	34	37	Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation				
	0.71 - 0.61	33	39	44								
	0.60 - 0.51	33	43	50								
0.50 - 0.39	32	48	56	68	5.0 - 9.9 10.0 - 14.9 15.0 +	0.067 0.071 0.075	0.083 0.094 0.097					
0.38 - 0.00	31	46	66									
0.25 - 0.00	35	42	48					ILD Range 1.51 – 3.00				
1.51 – 3.00	0.00 - 0.25	1.00 - 0.72	19	20	21	Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation			
		0.71 - 0.61	22	24	25							
		0.60 - 0.51	25	28	30	19	5.0 - 9.9 10.0 - 14.9 15.0 +	0.068 0.073 0.078	0.089 0.100 0.110			
	0.50 - 0.39	28	32	35								
	0.38 - 0.26	32	38	43								
	0.25 - 0.00	33	45	57	58	5.0 - 9.9 10.0 - 14.9 15.0 +	0.067 0.072 0.077	0.087 0.099 0.100				
0.26 - 0.50	1.00 - 0.72	26	28	30					ILD Range 3.01 - 3.50			
	0.71 - 0.61	29	33	36					Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
	0.60 - 0.51	32	37	41								
0.50 - 0.39	34	42	47	17	5.0 - 9.9 10.0 - 14.9 15.0 +	0.068 0.074 0.079	0.090 0.100 0.110					
0.38 - 0.00	34	47	57									
0.25 - 0.00	31	35	39					53	5.0 - 9.9 10.0 - 14.9 15.0 +	0.067 0.073 0.077	0.088 0.100 0.110	
0.51 +	1.00 - 0.72	34	41	46								
	0.71 - 0.61	35	45	52								
	0.60 - 0.51	35	49	58								
3.01 – 3.50	0.00 - 0.25	1.00 - 0.72	17	18	19	Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation			
		0.71 - 0.61	20	22	23							
		0.60 - 0.51	23	25	26	17	5.0 - 9.9 10.0 - 14.9 15.0 +	0.068 0.074 0.079	0.090 0.100 0.110			
	0.50 - 0.39	26	29	31								
	0.38 - 0.26	30	35	39								
	0.25 - 0.00	33	45	53	53	5.0 - 9.9 10.0 - 14.9 15.0 +	0.067 0.073 0.077	0.088 0.100 0.110				
0.26 - 0.50	1.00 - 0.72	23	25	27								
	0.71 - 0.61	26	30	32								
	0.60 - 0.51	29	34	37								
0.50 - 0.39	32	38	43									
0.38 - 0.00	34	45	52									
0.51 +	1.00 - 0.72	28	32	34								
	0.71 - 0.61	32	37	41								
	0.60 - 0.51	34	41	46								
0.50 - 0.00	35	45	53									

Notes to Table 5A-3:

- (1) See Table 5AA for other envelope criteria to Table 5A-3.
- (2) Perimeter daylighting must use daylight sensing controls.
- (3) This Table represents stringent criteria. Use of the System Performance Path (Standard 90.1 ENVSTD 23 or ENVSTD24 Envelope Software) can produce criteria that are substantially less stringent, in some cases, and can provide greater compliance flexibility.
- (4) Units for variables: U-Values - Btu/(hr·ft²· F) IL D - W/ft² HC - Btu/(ft²· F)

Table 5A-4^{(1),(3),(4)}
Alternate Component Packages for Location Number 291, 314, 323, 330 (Imperial Units)
 HDD50 = 5001-6500, CDD65 = 0-1150, VSEW = 560-845

Design Parameters			Maximum Percent Fenestration					Maximum Wall U-value (Uow) Light-weight Walls			
Internal Load Density (ILD) Range	Projection Factor (PF) Range	Shading Coefficient (SCx) Range	Fenestration U-Value (Uof)					ILD Range 0.00 - 3.50			
			Base Case			Perimeter Daylighting ⁽²⁾		Percent Fenestration	HC Range	All Insulation Positions	
						VLT < SC	VLT ≥ SC				
			0.52 to 0.40	0.39 to 0.31	0.30 to 0.00	N/A		0 - 100		0.0 - 4.9	
								Maximum Wall U-value (Uow) Mass Walls			
0.00 - 1.50	0.00 - 0.25	1.00 - 0.72	26	30	33			ILD Range 0.00 - 1.50			
		0.71 - 0.61	29	35	39			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.60 - 0.51	30	38	44						
	0.50 - 0.39	31	41	49			26	5.0 - 9.9 10.0 - 14.9 15.0 +	0.059 0.062 0.064	0.071 0.078 0.080	
	0.38 - 0.26	30	43	56							
	0.25 - 0.00	29	42	59							
0.26 - 0.50	1.00 - 0.72	32	40	46			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation	
	0.71 - 0.61	33	44	52							
	0.60 - 0.51	32	46	57							
0.50 - 0.39	32	46	61			26	5.0 - 9.9 10.0 - 14.9 15.0 +	0.059 0.062 0.064	0.071 0.078 0.080		
0.38 - 0.00	31	45	64								
1.00 - 0.72	34	40	58								
0.51 +	0.71 - 0.61	33	48	62			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation	
	0.60 - 0.51	32	47	66							
	0.50 - 0.00	32	46	66							
1.51 - 3.00	0.00 - 0.25	1.00 - 0.72	23	25	27			ILD Range 1.51 - 3.00			
		0.71 - 0.61	25	29	32			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.60 - 0.51	28	33	36						
		0.50 - 0.39	30	36	42			23	5.0 - 9.9 10.0 - 14.9 15.0 +	0.059 0.062 0.065	0.073 0.080 0.083
		0.38 - 0.26	31	41	49						
		0.25 - 0.00	32	44	59						
	0.26 - 0.50	1.00 - 0.72	29	34	37			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.71 - 0.61	31	38	43						
		0.60 - 0.51	32	41	48						
	0.50 - 0.39	32	44	53			23	5.0 - 9.9 10.0 - 14.9 15.0 +	0.059 0.062 0.065	0.073 0.080 0.083	
	0.38 - 0.00	33	45	61							
	1.00 - 0.72	32	40	46							
0.51 +	0.71 - 0.61	33	44	52			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation	
	0.60 - 0.51	33	46	57							
	0.50 - 0.00	33	46	62							
3.01 - 3.50	0.00 - 0.25	1.00 - 0.72	21	23	24			ILD Range 3.01 - 3.50			
		0.71 - 0.61	24	27	29			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.60 - 0.51	26	30	34						
		0.50 - 0.39	29	34	38			21	5.0 - 9.9 10.0 - 14.9 15.0 +	0.060 0.063 0.065	0.073 0.081 0.083
		0.38 - 0.26	31	39	46						
		0.25 - 0.00	33	45	57						
	0.26 - 0.50	1.00 - 0.72	27	31	34			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation
		0.71 - 0.61	29	35	40						
		0.60 - 0.51	32	38	45						
	0.50 - 0.39	33	42	50			21	5.0 - 9.9 10.0 - 14.9 15.0 +	0.060 0.063 0.065	0.073 0.081 0.083	
	0.38 - 0.00	34	46	57							
	1.00 - 0.72	31	37	43							
0.51 +	0.71 - 0.61	33	41	49			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation	
	0.60 - 0.51	34	44	53							
	0.50 - 0.00	34	47	58							
0.51 +	0.71 - 0.61	33	41	49			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation	
	0.60 - 0.51	34	44	53							
	0.50 - 0.00	34	47	58							

Notes to Table 5A-4:

- (1) See Table 5AA for other envelope criteria to Table 5A-4.
- (2) Perimeter daylighting must use daylight sensing controls.
- (3) This Table represents stringent criteria. Use of the System Performance Path (Standard 90.1 ENVSTD 23 or ENVSTD24 Envelope Software) can produce criteria that are substantially less stringent, in some cases, and can provide greater compliance flexibility.
- (4) Units for variables: U-Values - Btu/(hr·ft²·F) ILD - W/ft² HC - Btu/(ft²·F)

Table 5A-5^{(1),(3),(4)}
Alternate Component Packages for Location No. 236, 241, 260, 277, 278, 319, 331 (Imperial Units)
HDD50 > 6500, CDD65 < 100, VSEW < 560

Design Parameters			Maximum Percent Fenestration				Maximum Wall U-value (Uow) Light-weight Walls					
Internal Load Density (ILD) Range	Projection Factor (PF) Range	Shading Coefficient (SCx) Range	Fenestration U-Value (Uof)				ILD Range 0.00 - 3.50					
			Base Case			Perimeter Daylighting ⁽²⁾		Percent Fenestration	HC Range	All Insulation Positions		
						VLT < SC	VLT SC					
0.52 to 0.40	0.39 to 0.31	0.30 to 0.00	N/A		N/A		0 - 100	0.0 - 4.9	0.045			
0.00 - 1.50	0.00 - 0.25	1.00 - 0.72	30	40	50			Maximum Wall U-value (Uow) Mass Walls				
		0.71 - 0.61	29	42	54			ILD Range 0.00 - 1.50				
		0.60 - 0.51	27	42	56			Percent Fenestration	HC Range	Interior Insulation	Exterior Insulation	
		0.50 - 0.39	25	39	57							
		0.38 - 0.26	24	36	54			21	5.0 - 9.9 10.0 - 14.9 15.0 +	0.046 0.046 0.047	0.051 0.051 0.051	
	0.25 - 0.00	21	32	48								
	1.00 - 0.72	29	44	58								
	0.26 - 0.50	0.71 - 0.61	27	42	60			62	5.0 - 9.9 10.0 - 14.9 15.0 +	0.046 0.047 0.048	0.054 0.056 0.056	
		0.60 - 0.51	26	40	60							
0.50 - 0.39		24	37	57								
0.51 +	0.38 - 0.00	23	34	52			24	5.0 - 9.9 10.0 - 14.9 15.0 +	0.046 0.047 0.047	0.053 0.054 0.054		
	1.00 - 0.72	27	43	62								
	0.71 - 0.61	25	40	61								
1.51 - 3.00	0.00 - 0.25	0.60 - 0.51	24	37	57			56	5.0 - 9.9 10.0 - 14.9 15.0 +	0.047 0.048 0.048	0.055 0.055 0.055	
		0.50 - 0.39	23	35	53							
		1.00 - 0.72	27	35	42							
0.26 - 0.50		0.71 - 0.61	27	37	47			27	5.0 - 9.9 10.0 - 14.9 15.0 +	0.046 0.047 0.047	0.054 0.055 0.054	
		0.60 - 0.51	27	38	49							
	0.50 - 0.39	26	38	52								
0.51 +	0.38 - 0.26	25	36	52			59	5.0 - 9.9 10.0 - 14.9 15.0 +	0.046 0.047 0.048	0.054 0.055 0.055		
	0.25 - 0.00	24	34	49								
	1.00 - 0.72	28	40	51								
3.01 - 3.50	0.00 - 0.25	0.71 - 0.61	27	40	53			27	5.0 - 9.9 10.0 - 14.9 15.0 +	0.046 0.047 0.047	0.054 0.055 0.054	
		0.60 - 0.51	26	39	55							
		0.50 - 0.39	25	37	54							
		0.26 - 0.50	0.38 - 0.26	24	36	52			56	5.0 - 9.9 10.0 - 14.9 15.0 +	0.046 0.047 0.048	0.054 0.055 0.055
			0.25 - 0.00	24	34	49						
	1.00 - 0.72		28	40	51							
	0.51 +	0.71 - 0.61	27	40	55			27	5.0 - 9.9 10.0 - 14.9 15.0 +	0.046 0.047 0.047	0.054 0.055 0.054	
		0.60 - 0.51	26	39	56							
		0.50 - 0.39	25	38	55							
3.01 - 3.50	0.00 - 0.25	0.38 - 0.26	25	36	53			56	5.0 - 9.9 10.0 - 14.9 15.0 +	0.046 0.047 0.048	0.054 0.055 0.055	
		0.25 - 0.00	24	36	52							
		1.00 - 0.72	27	40	55							
0.26 - 0.50		0.71 - 0.61	26	39	55			27	5.0 - 9.9 10.0 - 14.9 15.0 +	0.046 0.047 0.047	0.054 0.055 0.054	
		0.60 - 0.51	25	37	54							
	0.50 - 0.39	24	36	52								
0.51 +	0.38 - 0.26	24	36	52			56	5.0 - 9.9 10.0 - 14.9 15.0 +	0.046 0.047 0.048	0.054 0.055 0.055		
	0.25 - 0.00	24	34	49								
	1.00 - 0.72	28	40	51								

Notes to Table 5A-5:

- (1) See Table 5AA for other envelope criteria to Table 5A-5.
- (2) Perimeter daylighting must use daylight sensing controls.
- (3) This Table represents stringent criteria. Use of the System Performance Path (Standard 90.1 ENVSTD 23 or ENVSTD24 Envelope Software) can produce criteria that are substantially less stringent, in some cases, and can provide greater compliance flexibility.
- (4) Units for variables: U-Values - Btu/(hr-ft²· F) ILD - W/ft² HC - Btu/(ft²· F)

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Table 5AA^{(1),(2)}
Other Envelope Criteria (Imperial Units)

Other Envelope Criteria for Table 5A-1					
Minimum R-Value			Maximum U-Value		
Wall below grade	10			Roof	0.049
Unheated slab on grade	24 in.	36 in.	48 in.	Wall adjacent to unconditioned space	0.120
Horizontal installation	18	15	11		
Vertical installation	8	6	4	Floor over unconditioned space	0.044
Other Envelope Criteria for Table 5A-2					
Minimum R-Value			Maximum U-Value		
Wall below grade	11			Roof	0.049
Unheated slab on grade	24 in.	36 in.	48 in.	Wall adjacent to unconditioned space	0.110
Horizontal installation	18	15	11		
Vertical installation	8	6	4	Floor over unconditioned space	0.040
Other Envelope Criteria for Table 5A-3					
Minimum R-Value			Maximum U-Value		
Wall below grade	12			Roof	0.045
Unheated slab on grade	24 in.	36 in.	48 in.	Wall adjacent to unconditioned space	0.110
Horizontal installation	18	15	11		
Vertical installation	8	6	4	Floor over unconditioned space	0.039
Other Envelope Criteria for Table 5A-4					
Minimum R-Value			Maximum U-Value		
Wall below grade	13			Roof	0.040
Unheated slab on grade	24 in.	36 in.	48 in.	Wall adjacent to unconditioned space	0.100
Horizontal installation	18	15	11		
Vertical installation	8	6	4	Floor over unconditioned space	0.039
Other Envelope Criteria for Table 5A-5					
Minimum R-Value			Maximum U-Value		
Wall below grade	16			Roof	0.031
Unheated slab on grade	24 in.	36 in.	48 in.	Wall adjacent to unconditioned space	0.087
Horizontal installation	18	15	11		
Vertical installation	8	6	4	Floor over unconditioned space	0.040

Notes to Table 5AA:

- (1) This Table represents stringent criteria. Use of the System Performance Path Standard 90.1 ENVSTD 23 or ENVSTD24 Envelope Software can produce criteria that are substantially less stringent, in some cases, and can provide greater compliance flexibility.
- (2) Units for variables: U-Values - Btu/(hr·ft²· F) R-Values - (hr·ft²· F)/Btu

Section 6 Heating, Ventilating, and Air Conditioning

6.2 Compliance Path(s)

6.2.1 is replaced with the following:

6.2.1 Compliance with Section 6 shall be achieved by meeting all requirements for 6.1, General; 6.4, Mandatory Provisions; 6.5, Prescriptive Path, 6.7, Submittals, and 6.8, Minimum Equipment Efficiency.

6.4 Mandatory Provisions

6.4.1.1 Minimum Equipment Efficiencies – Listed Equipment – Standard Rating and Operating Conditions is replaced with the following:

m₈ 6.4.1.1 Minimum Equipment Efficiencies – Listed Equipment – Standard Rating and Operating Conditions.

Equipment shown in Tables 6.8.1A to 6.8.1G shall have a minimum performance at the specified rating conditions when tested in accordance with the specified test procedure. The minimum efficiency values, test procedures and standards specified in the *Green Energy Act, 2009* shall apply if provided. Otherwise, the minimum efficiency values, test procedures and standards specified in ANSI/ASHRAE/IESNA Standard 90.1 shall apply. Where multiple rating conditions or performance requirements are provided, the equipment shall satisfy all requirements, unless otherwise exempted by footnotes in the Table. Equipment regulated under the *Green Energy Act, 2009* 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 water-chilling packages that are 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

All furnaces with input ratings of ≥ 66 kW ($\geq 225,000$ Btu/h), including electric furnaces, that are not located within the conditioned space shall have jacket losses not exceeding 0.75% of the input rating.

6.4.1.4 Verification of Equipment Efficiencies is replaced with the following:

6.4.1.4 Verification of Equipment Efficiencies. Equipment efficiency information supplied by manufacturers shall be verified as follows:

- m₈**
- (a) Equipment covered under the *Green Energy Act, 2009* shall comply with the Ontario Ministry of Energy and Infrastructure 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,
 - (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) Products covered in Table 6.8.1G shall have efficiency ratings supported by data furnished by the manufacturer.

6.4.1.5 Labeling

6.4.1.5.1 Mechanical Equipment is replaced with the following:

- m₈ 6.4.1.5.1 Mechanical Equipment.** Mechanical equipment that is not regulated by the *Green Energy Act, 2009* shall carry a permanent label installed by the manufacturer stating that the equipment complies with the requirements of ANSI/ASHRAE/IESNA Standard 90.1.

Equipment Ratings. Equipment ratings certified under a nationally recognized certification program or rating procedure or data furnished by the equipment manufacturer shall be acceptable to satisfy these requirements. The equipment efficiencies must be tested in accordance with the appropriate Reference Standards as listed in Tables 10-1 to 10-10 to be acceptable.

6.4.3.4 Heat Pump Auxiliary Heat Control

Exceptions to 6.4.3.4 replaced with the following:

- m₈ Exceptions to 6.4.3.4:** Heat pumps whose minimum efficiency is regulated by the *Green Energy Act, 2009* and whose HSPF rating both meets the requirements shown in Table 6.8.1B and includes all usage of internal electric resistance heating.

6.8 Minimum Equipment Efficiency Tables

6.8.1 Minimum Efficiency Requirement Listed Equipment – Standard Rating and Operating Conditions

6.8.1 Tables 6.8.1A to 6.8.1G are replaced with the following:

Table 6.8.1A
Unitary Air Conditioners and Condensing Units, Electrically Operated, Minimum Efficiency Requirements

Equipment Type	Size Category	Sub-Category or Rating Condition	Minimum Efficiency ⁽¹⁾	Test Procedure
Air Conditioners, Air Cooled	< 19 kW (< 65,000 Btu/h)	Split System and Single Package	13.0 SEER ⁽²⁾	CAN/CSA-C656 ARI 210/240
	≥ 19 kW and < 40 kW (≥ 65,000 Btu/h and < 135,000 Btu/h)	Split System and Single Package	10.3 EER ⁽²⁾ 10.6 IPLV ⁽²⁾	CAN/CSA-C746 ARI 340/360
	≥ 40 kW and < 70 kW (≥ 135,000 Btu/h and < 240,000 Btu/h)	Split System and Single Package	9.7 EER ⁽²⁾ 9.9 IPLV ⁽²⁾	CAN/CSA-C746 ARI 340/360
	≥ 70 kW and < 223 kW (≥ 240,000 Btu/h and < 760,000 Btu/h)	Split System and Single Package	9.5 EER ⁽³⁾ 9.7 IPLV ⁽³⁾	ARI 340/360
	≥ 223 kW (≥ 760,000 Btu/h)	Split System and Single Package	9.2 EER ⁽³⁾ 9.4 IPLV ⁽³⁾	ARI 340/360
Through-the-Wall, Air Cooled	≤ 8.8 kW (≤ 30,000 Btu/h)	Split System and Single Package	10.9 SEER ⁽²⁾ (before 1/23/2010) 12.0 SEER ⁽²⁾ (as of 1/23/2010)	CAN/CSA-C656 ARI 210/240
Small-Duct High-Velocity, Air Cooled	< 19 kW (< 65,000 Btu/h)	Split System	11.0 SEER ⁽²⁾	CAN/CSA-C656 ARI 210/240
Air Conditioners, Water and Evaporatively Cooled	< 19 kW (< 65,000 Btu/h)	Split System and Single Package	12.1 EER ⁽³⁾	ARI 210/240
	≥ 19 kW and < 40 kW (≥ 65,000 Btu/h and < 135,000 Btu/h)	Split System and Single Package	11.5 EER ⁽²⁾	CAN/CSA-C746 ARI 340/360
	≥ 40 kW and < 70 kW (≥ 135,000 Btu/h and < 240,000 Btu/h)	Split System and Single Package	11.0 EER ⁽²⁾	CAN/CSA-C746 ARI 340/360
	≥ 70 kW (≥ 240,000 Btu/h)	Split System and Single Package	11.0 EER ⁽³⁾ 10.3 IPLV ⁽³⁾	ARI 340/360
Condensing Units, Air Cooled	≥ 40 kW (≥ 135,000 Btu/h)		10.1 EER ⁽²⁾ 11.2 IPLV ⁽²⁾	CAN/CSA-C746 ARI 365
Condensing Units, Water or Evaporatively Cooled	≥ 40 kW (≥ 135,000 Btu/h)		13.1 EER ⁽²⁾ 13.1 IPLV ⁽²⁾	CSA C746 ARI 365

Notes to Table 6.8.1A:

(1) IPLV's are only applicable to equipment with capacity modulation. For units with other than electric resistance heat deduct 0.2 EER and 0.2 IPLV.

m₈ (2) Minimum efficiency regulated by *Green Energy Act, 2009*.

(3) Minimum efficiency specified in ANSI/ASHRAE/IESNA Standard 90.1.

Table 6.8.1B
Unitary and Applied Heat Pumps, Electrically Operated, Minimum Efficiency Requirements

Equipment Type	Size Category	Sub-Category or Rating Condition	Minimum Efficiency ⁽¹⁾	Test Procedure
Air Cooled, (Cooling Mode)	< 19 kW (< 65,000 Btu/h)	Split System and Single Package	13.0 SEER ⁽²⁾	CAN/CSA-C656 ARI 210/240
	≥ 19 kW and < 40 kW (≥ 65,000 Btu/h and < 135,000 Btu/h)	Split System and Single Package	10.1 EER ⁽²⁾ 10.4 IPLV ⁽²⁾	CAN/CSA-C746 ARI 340/360
	≥ 40 kW and < 70 kW (≥ 135,000 Btu/h and < 240,000 Btu/h)	Split System and Single Package	9.3 EER ⁽²⁾ 9.5 IPLV ⁽²⁾	CAN/CSA-C746 ARI 340/360
	≥ 70 kW (≥ 240,000 Btu/h)	Split System and Single Package	9.0 EER ⁽³⁾ 9.2 IPLV ⁽³⁾	ARI 340/360
Through-the-Wall (Air Cooled, Cooling Mode)	≤ 8.8 kW (≤ 30,000 Btu/h)	Split System and Single Package	10.9 SEER ⁽²⁾ (before 1/23/2010) 12.0 SEER ⁽²⁾ (as of 1/23/2010)	CAN/CSA-C656 ARI 210/240
Small-Duct High-Velocity (Air Cooled, Cooling Mode)	< 19 kW (< 65,000 Btu/h)	Split System	11.0 SEER ⁽²⁾	CAN/CSA-C656 ARI 210/240
Water-Source (Cooling Mode)	< 5 kW (< 17,000 Btu/h)	30°C (86°F) Entering Water	3.28 COP _c ⁽²⁾	CAN/CSA-C13256-1
	≥ 5 kW and < 19 kW (≥ 17,000 Btu/h and < 65,000 Btu/h)	30°C (86°F) Entering Water	3.52 COP _c ⁽²⁾	CAN/CSA-C13256-1
	≥ 19 kW and < 40 kW (≥ 65,000 Btu/h and < 135,000 Btu/h)	30°C (86°F) Entering Water	3.52 COP _c ⁽²⁾	CAN/CSA-C13256-1
Groundwater Source (Cooling Mode)	< 40 kW (< 135,000 Btu/h)	15°C (59°F) Entering Water	4.75 COP _c ⁽²⁾	CAN/CSA-C13256-1
Ground Source (Cooling Mode)	< 40 kW (< 135,000 Btu/h)	25°C (77°F) Entering Water	3.93 COP _c ⁽²⁾	CAN/CSA-C13256-1
Air Cooled, (Heating Mode)	< 19 kW (< 65,000 Btu/h) Cooling Capacity	Split System and Single Package	6.7 HSPF V ⁽²⁾	CAN/CSA-C656 ARI 210/240
	≥ 19 kW and < 40 kW (≥ 65,000 Btu/h and < 135,000 Btu/h) Cooling Capacity	8.3°C db / 6.1°C wb (47°F db / 43°F wb) Outdoor Air	3.2 COP ⁽²⁾	CAN/CSA-C746 ARI 340/360
		-8.3°C db / -9.4°C wb (17°F db / 15°F wb) Outdoor Air	2.2 COP ⁽²⁾	
	≥ 40 kW (≥ 135,000 Btu/h) Cooling Capacity	8.3°C db / 6.1°C wb (47°F db / 43°F wb) Outdoor Air	3.1 COP ⁽²⁾	CAN/CSA-C746 ARI 340/360
		-8.3°C db / -9.4°C wb (17°F db / 15°F wb) Outdoor Air	2.0 COP ⁽²⁾	
	Through-the-Wall (Air Cooled, Heating Mode)	≤ 8.8 kW (≤ 30,000 Btu/h) Cooling Capacity	Split System and Single Package	6.2 HSPF V ⁽²⁾ (before 1/23/2010) 6.4 HSPF V ⁽²⁾ (as of 1/23/2010)
Small-Duct High-Velocity (Air Cooled, Heating Mode)	< 19 kW (< 65,000 Btu/h) Cooling Capacity	Split System	5.9 HSPF V ⁽²⁾	CAN/CSA-C656 ARI 210/240
Water-Source (Heating Mode)	< 40 kW (< 135,000 Btu/h) Cooling Capacity	20°C (68°F) Entering Water	4.2 COP ⁽²⁾	CAN/CSA-C13256-1
Groundwater Source (Heating Mode)	< 40 kW (< 135,000 Btu/h) Cooling Capacity	10°C (50°F) Entering Water	3.6 COP ⁽²⁾	CAN/CSA-C13256-1
Ground Source (Heating Mode)	< 40 kW (< 135,000 Btu/h) Cooling Capacity	0°C (32°F) Entering Water	3.1 COP ⁽²⁾	CAN/CSA-C13256-1

Notes to Table 6.8.1B:

- (1) IPLV's are only applicable to equipment with capacity modulation.
- (2) Minimum efficiency regulated by *Green Energy Act, 2009*.
- (3) Minimum efficiency specified in ANSI/ASHRAE/IESNA Standard 90.1.

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Table 6.8.1C
Water Chilling Packages, Minimum Efficiency Requirements

m ₈	Equipment Type	Size Category	<i>Green Energy Act, 2009</i> Minimum Efficiency	Test Procedure
	Air Cooled, With Condenser, Electrically Operated	< 528 kW (< 150 tons)	2.80 COP 3.05 IPLV	CAN/CSA-C743 ARI 550, ARI 590
		≥ 528 kW (≥ 150 tons)	2.80 COP 3.05 IPLV	CAN/CSA-C743 ARI 550, ARI 590
	Air Cooled, Without Condenser, Electrically Operated	All Capacities	3.10 COP 3.45 IPLV	CAN/CSA-C743 ARI 550, ARI 590
	Water Cooled, Electrically Operated, Positive Displacement (Reciprocating)	All Capacities	4.20 COP 5.05 IPLV	CAN/CSA-C743 ARI 590
	Water Cooled, Electrically Operated, Positive Displacement (Rotary Screw and Scroll)	< 528 kW (< 150 tons)	4.45 COP 5.20 IPLV	CAN/CSA-C743 ARI 550
		≥ 528 kW and < 1055 kW (≥ 150 tons and < 300 tons)	4.90 COP 5.60 IPLV	CAN/CSA-C743 ARI 550
		≥ 1055 kW (≥ 300 tons)	5.50 COP 6.15 IPLV	CAN/CSA-C743 ARI 550
	Water Cooled, Electrically Operated, (Centrifugal)	< 528 kW (< 150 tons)	5.00 COP 5.25 IPLV	CAN/CSA-C743 ARI 550
		≥ 528 kW and < 1055 kW (≥ 150 tons and < 300 tons)	5.55 COP 5.90 IPLV	CAN/CSA-C743 ARI 550
		≥ 1055 kW (≥ 300 tons)	6.10 COP 6.40 IPLV	CAN/CSA-C743 ARI 550
	Single Effect Absorption Air Cooled	All Capacities	0.60 COP	CAN/CSA-C743 ARI 560
	Single Effect Absorption Water Cooled	All Capacities	0.70 COP	CAN/CSA-C743 ARI 560
	Double Effect Absorption Indirect-Fired	All Capacities	1.00 COP 1.05 IPLV	CAN/CSA - C743 ARI 560
	Double Effect Absorption Direct-Fired	All Capacities	1.00 COP 1.00 IPLV	CAN/CSA-C743 ARI 560

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Table 6.8.1D
Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Single-Package Vertical Air Conditioners,
Single-Package Vertical Heat Pumps, Room Air Conditioners and Room Air Conditioner Heat Pumps,
Electrically Operated, Minimum Efficiency Requirements

Equipment Type	Size Category (input)	Sub-Category or Rating Condition	Minimum Efficiency	Test Procedure
PTAC (Cooling Mode) New Construction	All Capacities	35°C (95°F) db Outdoor Air	12.5 - (0.213 x Cap ⁽³⁾ /293.1) EER ⁽¹⁾ 12.5 - (0.213 x Cap _o ⁽³⁾ /1000) EER ⁽¹⁾	CAN/CSA-C744 ARI 310/380
PTAC (Cooling Mode) Replacements ⁽⁴⁾	All Capacities	35°C (95°F) db Outdoor Air	10.9 - (0.213 x Cap ⁽³⁾ /293.1) EER ⁽¹⁾ 10.9 - (0.213 x Cap _o ⁽³⁾ /1000) EER ⁽¹⁾	CAN/CSA-C744 ARI 310/380
PTHP (Cooling Mode) New Construction	All Capacities	35°C (95°F) db Outdoor Air	12.3 - (0.213 x Cap ⁽³⁾ /293.1) EER ⁽¹⁾ 12.3 - (0.213 x Cap _o ⁽³⁾ /1000) EER ⁽¹⁾	CAN/CSA-C744 ARI 310/380
PTHP (Cooling Mode) Replacements ⁽⁴⁾	All Capacities	35°C (95°F) db Outdoor Air	10.8 - (0.213 x Cap ⁽³⁾ /293.1) EER ⁽¹⁾ 10.8 - (0.213 x Cap _o ⁽³⁾ /1000) EER ⁽¹⁾	CAN/CSA-C744 ARI 310/380
PTHP (Heating Mode) New Construction	All Capacities		3.2 - (0.026 x Cap ⁽³⁾ /293.1) COP ⁽¹⁾ 3.2 - (0.026 x Cap _o ⁽³⁾ /1000) COP ⁽¹⁾	CAN/CSA-C744 ARI 310/380
PTHP (Heating Mode) Replacements ⁽⁴⁾	All Capacities		2.9 - (0.026 x Cap ⁽³⁾ /293.1) COP ⁽¹⁾ 2.9 - (0.026 x Cap _o ⁽³⁾ /1000) COP ⁽¹⁾	CAN/CSA-C744 ARI 310/380
SPVAC (Cooling Mode)	All Capacities	35°C db / 23.9°C wb (95°F db / 75°F wb) Outdoor Air	8.6 EER ⁽¹⁾	CAN/CSA-C746 ARI 390
SPVHP (Cooling Mode)	All Capacities	35°C db / 23.9°C wb (95°F db / 75°F wb) Outdoor Air	8.6 EER ⁽¹⁾	CAN/CSA-C746 ARI 390
SPVHP (Heating Mode)	All Capacities	8.3°C db / 6.1°C wb (47°F db / 43°F wb) Outdoor Air	2.7 COP ⁽¹⁾	CAN/CSA-C746 ARI 390
Room Air Conditioners, With Louvered Sides	< 1.8 kW (< 6,000 Btu/h)		9.7 EER	CSA C368.1-M C368.1 only applies to equipment < 10.55kW (< 36,000 Btu/h) ANSI/AHAM RAC-1
	≥ 1.8 kW and < 2.3 kW (≥ 6,000 Btu/h and < 8,000 Btu/h)		9.7 EER ⁽¹⁾	
	≥ 2.3 kW and < 4.1 kW (≥ 8,000 Btu/h and < 14,000 Btu/h)		9.8 EER ⁽¹⁾	
	≥ 4.1 kW and < 5.9 kW (≥ 14,000 Btu/h and < 20,000 Btu/h)		9.7 EER ⁽¹⁾	
	≥ 5.9 kW (≥ 20,000 Btu/h)		8.5 EER ⁽¹⁾	
Room Air Conditioners, Without Louvered Sides	< 2.3 kW (< 8,000 Btu/h)		9.0 EER ⁽¹⁾	CSA C368.1-M ANSI/AHAM RAC-1
	≥ 2.3 kW and < 5.9 kW (≥ 8,000 Btu/h and < 20,000 Btu/h)		8.5 EER ⁽¹⁾	
	≥ 5.9 kW (≥ 20,000 Btu/h)		8.5 EER ⁽¹⁾	

Table 6.8.1D (Cont'd)
Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Single-Package Vertical Air Conditioners,
Single-Package Vertical Heat Pumps, Room Air Conditioners and Room Air Conditioner Heat Pumps,
Electrically Operated, Minimum Efficiency Requirements

Equipment Type	Size Category (input)	Sub-Category or Rating Condition	Minimum Efficiency	Test Procedure
Room Air Conditioner Heat Pumps With Louvered Sides	< 5.9 kW (< 20,000 Btu/h)		9.0 EER ⁽¹⁾	CSA C368.1-M ANSI/AHAM RAC-1
	≥ 5.9 kW (≥ 20,000 Btu/h)		8.5 EER ⁽¹⁾	
Room Air Conditioner Heat Pumps Without Louvered Sides	< 4.1 kW (< 14,000 Btu/h)		8.5 EER ⁽¹⁾	CSA C368.1-M ANSI/AHAM RAC-1
	≥ 4.1 kW (≥ 14,000 Btu/h)		8.0 EER ⁽¹⁾	
Room Air Conditioner, Casement Only	All Capacities		8.7 EER ⁽²⁾	ANSI/AHAM RAC-1
Room Air Conditioner, Casement-Slider	All Capacities		9.5 EER ⁽²⁾	ANSI/AHAM RAC-1

Notes to Table 6.8.1D:

- m_s** (1) Minimum efficiency regulated by *Green Energy Act, 2009*.
(2) Minimum efficiency specified in ANSI/ASHRAE/IESNA Standard 90.1.
(3) Cap is the rated cooling capacity in W, Cap_e is the rated cooling capacity in Btu/h. If unit capacity is less than 2,030 W (7,000 Btu/h), use 2,030 W (7,000 Btu/h) in calculation. If greater than 4,390 W (15,000 Btu/h), use 4,390 W (15,000 Btu/h) in calculation.
(4) Replacements must be factory labeled as follows: "MANUFACTURED FOR REPLACEMENT APPLICATIONS ONLY; NOT TO BE INSTALLED IN NEW CONSTRUCTION PROJECTS". Replacement efficiencies apply only to units with existing wall sleeves/less than 0.41 m (16 in) high and less than 1.07 m (42 in) wide.

Table 6.8.1E
Warm Air Furnaces and Combination Warm Air Furnaces/Air-Conditioning Units, Warm Air Duct Furnaces and
Units Heaters Minimum Efficiency Requirements

m_s Equipment Type	Size Category (input)	Sub-Category or Rating Condition	<i>Green Energy Act, 2009</i> Minimum Efficiency	Test Procedure
Warm Air Furnace, Gas-Fired	< 66 kW (< 225,000 Btu/h)	Single-phase	78% AFUE	CGA-P.2 DOE 10 CFR Part 430 or ANSI Z21.47
		Three-phase	78% AFUE or 80% E _t	
	≥ 66 kW and < 117 kW (≥ 225,000 Btu/h and < 400,000 Btu/h)	Maximum Capacity*	80% E _t	CSA 2.3 ANSI Z21.47
	≥ 117 kW (≥ 400,000 Btu/h)	Maximum Capacity*	80% E _t	CGA P.8 ANSI Z21.47
Warm Air Furnace, Oil-Fired	< 66 kW (< 225,000 Btu/h)		78% SEUE	CSA B212 DOE 10 CFR Part 430 or UL 727
	≥ 66 kW (≥ 225,000 Btu/h)	Maximum Capacity*	81% E _t	UL 727
Warm Air Duct Furnaces, Gas-Fired	All Capacities	Maximum Capacity*	80% E _t	ANSI Z83.9
Warm Air Unit Heaters, Gas-Fired	All Capacities	Maximum Capacity*	80% E _c	CSA 2.6 ANSI Z83.8
Unit Heaters, Oil-Fired	All Capacities	Maximum Capacity*	80% E _c	UL 731

E_t is thermal efficiency and E_c is combustion efficiency. E_c = 100% less flue losses
*Maximum capacity as provided for and allowed by unit controls.

Table 6.8.1F
Gas-Fired and Oil-Fired Boilers, Minimum Efficiency Requirements

Equipment Type	Size Category (input)	Sub-Category or Rating Condition	Minimum Efficiency	Test Procedure
Boilers, Gas-Fired	< 88 kW (< 300,000 Btu/h)	Hot Water	80% AFUE ⁽¹⁾	CGA P.2 DOE 10 CFR Part 430
		Steam	75% AFUE ⁽¹⁾	
	≥ 88 kW and ≤ 733 kW (≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h)	Maximum Capacity*	75% ⁽²⁾ E _t	Hydronics Institute BTS
	> 733 kW (> 2,500,000 Btu/h)	Hot Water	80% ⁽²⁾ E _c	Hydronics Institute BTS
Steam		80% ⁽²⁾ E _c		
Boilers, Oil-Fired	< 88 kW (< 300,000 Btu/h)		80% SEUE ⁽¹⁾	CSA B212 DOE 10 CFR Part 430
	≥ 88 kW and ≤ 733 kW (≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h)	Maximum Capacity*	78% ⁽²⁾ E _t	(Hydronics Institute)
	> 733 kW (> 2,500,000 Btu/h)	Hot Water	83% ⁽²⁾ E _c	Hydronics Institute BTS
		Steam	83% ⁽²⁾ E _c	
Boilers, Oil-Fired (Residual)	≥ 88 kW and ≤ 733 kW (≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h)	Maximum Capacity*	78% ⁽²⁾ E _t	Hydronics Institute BTS
	> 733 kW (> 2,500,000 Btu/h)	Hot Water	83% ⁽²⁾ E _c	Hydronics Institute BTS
		Steam	83% ⁽²⁾ E _c	

E_t is thermal efficiency and E_c is combustion efficiency. E_c = 100% less flue losses.
*Maximum capacity as provided for and allowed by the unit's controls.

Notes to Table 6.8.1F:

- m₈ (1) Minimum efficiency regulated by *Green Energy Act, 2009*.
(2) Minimum efficiency specified in ANSI/ASHRAE/IESNA Standard 90.1.

Table 6.8.1G
Cooling Tower Performance Requirements

Equipment Type	Size Category	Sub-Category or Rating Condition	ASHRAE 90.1-2004 Performance Required	Test Procedure
Propeller or Axial Fans	All Capacities	35°C (95°F) Entering Water 29°C (85°F) Leaving Water 24°C (75°F) wb Outdoor Air	≥ 3.23 L/s·kW (≥ 38.2 gpm/hp)	CTI ATC-105
Centrifugal Fans	All Capacities	35°C (95°F) Entering Water 29°C (85°F) Leaving Water 24°C (75°F) wb Outdoor Air	≥ 1.7 L/s·kW (≥ 20.0 gpm/hp)	CTI ATC-105
Air-cooled Condensers	All Capacities	52°C (125°F) Condensing Temperature R-22 Test Fluid 88°C (190°F) Entering Gas Temperature 35°C (95°F) Entering db 8°C (15°F) Subcooling	≥ 69 COP (≥ 176,000 Btu/h·hp)	ARI 460

For purpose of this Table, cooling tower performance is maximum flow rating divided by fan nameplate rated motor power.
Air-cooled condenser performance is defined as heat rejected from the refrigerant divided by the fan nameplate rated motor power.

Section 7 Service Water Heating

7.4 Mandatory Provisions

7.4.2 Equipment Efficiency

7.4.2 is replaced with the following:

m₈ **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. The minimum efficiency values of the *Green Energy Act, 2009* shall apply if provided. Otherwise, the minimum efficiency values of ANSI/ASHRAE/IESNA Standard 90.1 shall apply. Where multiple rating conditions or performance requirements are provided, the equipment shall satisfy all requirements. 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.

7.4.4.3 Temperature. The water outlet temperature refers only to the water temperature supplied to the fixture. It has no implication on the source temperature of the water which may be tempered by temperature gauges and control devices before it is supplied to the fixture.

7.4.5 Swimming Pool Covers

7.4.5.2 is replaced with the following:

7.4.5.2 Pool Covers. Heated exterior swimming pools (including lap pools and permanent whirlpools) shall be equipped with pool covers.

Exception. Pools deriving over 60% of their energy for heating (computed over an annual operating season) from site-recovered or site-solar energy.

Table 7.8 Performance Requirements for Water Heating Equipment

Replace Table 7.8 with the following:

Table 7.8
Water Heating Equipment, Performance Requirements

Equipment Type	Size Category	Sub-Category or Rating Condition	Minimum Efficiency	Test Procedure
Electric Storage Water Heaters	All Capacities	Resistance ≥ 50 L and ≤ 284 L (≥ 13.2 gal and ≤ 75 gal)	0.97 - 0.000349V EF ⁽⁴⁾ (0.97 - 0.00132 V _o EF) ⁽⁴⁾ 35 + 0.20V SL ⁽¹⁾ (119.4 + 2.583V _o SL _o) ⁽¹⁾ 40 + 0.20V SL ⁽²⁾ (136.5 + 2.583V _o SL _o) ⁽²⁾	CSA C745 CAN/CSA - C191
	All Capacities	Resistance > 284 L and ≤ 454 L (> 75 gal and < 120 gal)	0.97 - 0.000349V EF ⁽⁴⁾ (0.97 - 0.00132 V _o EF) ⁽⁴⁾ 0.472V - 38.5 SL ⁽¹⁾ (6.095V _o - 131.4 SL _o) ⁽¹⁾ 0.472V - 33.5 SL ⁽²⁾ (6.095V _o - 114.3 SL _o) ⁽²⁾	CSA C745 CAN/CSA-C191
	≤ 24 Amps and ≤ 250 volts	Heat Pump	0.93 - 0.000349V EF ⁽⁴⁾ (0.93 - 0.00132 V _o EF) ⁽⁴⁾	CSA C745 DOE 10 CFR Part 430
Gas Storage Water Heaters	≤ 21.98 kW (≤ 75,000 Btu/h)	≥ 75.7L and < 378.5 L (≥ 20 gal and < 100 gal)	0.67 - 0.0005V EF ⁽⁴⁾ (0.67 - 0.00189 V _o EF) ⁽⁴⁾	CSA P.3 DOE 10 CFR Part 430
	> 21.98 kW (> 75,000 Btu/h)	< 309.75 W/L (< 4,000 Btu/h/gal)	80% E _t ^{(3),(5)} $Q / 800 + 16.57\sqrt{V} SL$ $Q_r / 800 + 110\sqrt{V_o} SL_o$	CSA P.3 ANSI Z21.10.3
Gas Instantaneous Water Heaters	> 14.66 kW and < 58.62 kW (> 50,000 Btu/h and < 200,000 Btu/h)	≥ 309.75 W/L and < 7.57 L (≥ 4,000 Btu/h/gal and < 2 gal)	0.62 - 0.0005V EF ⁽⁴⁾ (0.62 - 0.00189 V _o EF)	CSA 4.3 DOE 10 CFR Part 430
	≥ 58.62 kW (≥ 200,000 Btu/h)	≥ 309.75 W/L and < 37.85 L (≥ 4,000 Btu/h/gal and < 10 gal)	80% E _t ^{(3),(4)}	CSA 4.3 ANSI Z21.10.3
	≥ 58.62 kW (≥ 200,000 Btu/h)	≥ 309.75 W/L and ≥ 37.85 L (≥ 4,000 Btu/h/gal and ≥ 10 gal)	80% E _t ^{(3),(5)} $Q / 800 + 16.57\sqrt{V} SL$ $Q_r / 800 + 110\sqrt{V_o} SL_o$	CSA 4.3 ANSI Z21.10.3
Oil Storage Water Heaters	≤ 30.78 kW (≤ 105,000 Btu/h)	≥ 75.7 L (≥ 20 gal)	0.59 - 0.0005V EF ⁽⁴⁾ (0.59 - 0.00189 V _o EF)	CAN/CSA-B211 DOE 10 CFR Part 430
	> 30.78 kW (> 105,000 Btu/h)	< 309.75 W/L (< 4,000 Btu/h/gal)	78% E _t ^{(3),(5)} $Q / 800 + 16.57\sqrt{V} SL$ $Q_r / 800 + 110\sqrt{V_o} SL_o$	ANSI Z21.10.3
Oil Instantaneous Water Heaters	≤ 61.55 kW (≤ 210,000 Btu/h)	≥ 309.75 W/L and < 7.57 L (≥ 4,000 Btu/h/gal and < 2 gal)	0.59 - 0.0005V EF ⁽⁵⁾ (0.59 - 0.0019V _o EF) ⁽⁵⁾	DOE 10 CFR Part 430
	> 61.55 kW (> 210,000 Btu/h)	≥ 309.75 W/L and < 37.85 L (≥ 4,000 Btu/h/gal and < 10 gal)	80% E _t ^{(3),(5)}	ANSI Z21.10.3
	> 61.55 kW (> 210,000 Btu/h)	≥ 309.75 W/L and ≥ 37.85 L (≥ 4,000 Btu/h/gal and ≥ 10 gal)	78% E _t ^{(3),(5)} $Q / 800 + 16.57\sqrt{V} SL$ $Q_r / 800 + 110\sqrt{V_o} SL_o$	ANSI Z21.10.3
Hot Water Supply Boilers Gas and Oil	≥ 87.93 kW and < 3663.8 kW (≥ 300,000 Btu/h and < 12,500,000 Btu/h)	≥ 309.75 W/L and < 37.85 L (≥ 4,000 Btu/h/gal and < 10 gal)	80% E _t ^{(3),(5)}	ANSI Z21.10.3
Hot Water Supply Boilers Gas		≥ 309.75 W/L and ≥ 37.85 L (≥ 4,000 Btu/h/gal and ≥ 10 gal)	80% E _t ^{(3),(5)} $Q / 800 + 16.57\sqrt{V} SL$ $Q_r / 800 + 110\sqrt{V_o} SL_o$	ANSI Z21.10.3

Table 7.8 (Cont'd)
Water Heating Equipment, Performance Requirements

Equipment Type	Size Category	Sub-Category or Rating Condition	Minimum Efficiency	Test Procedure
Hot Water Supply Boilers Oil		≥ 309.75 W/L and ≥ 37.85 L ($\geq 4,000$ Btu/h/gal and ≥ 10 gal)	$78\% E_1^{(3),(5)}$ $Q / 800 + 16.57\sqrt{V} SL$ $Q_T / 800 + 110\sqrt{V_o} SL_o$	ANSI Z21.10.3
Pool Heaters, Gas	All		$78\% E_1^{(3),(4)}$	CGA P.6 ASHRAE 146
Pool Heaters, Oil	All		$78\% E_1^{(3),(4)}$	ASHRAE 146
Heat Pump Pool Heaters	All		4.0 COP ⁽⁵⁾	ASHRAE 146
Unfired Storage Tanks	All		RSI-2.2 (R-12.5) ⁽⁵⁾	NONE

Notes to Table 7.8:

- (1) Without bottom inlet SL is the standby loss in W V is the storage capacity in litres
 (2) With bottom inlet SL_o is the standby loss in Btu/h V_o is the storage capacity in gallons
 (3) E_1 is the thermal efficiency.
 m₈ (4) Minimum efficiency regulated by *Green Energy Act, 2009*.
 (5) Minimum efficiency specified in ANSI/ASHRAE/IESNA Standard 90.1.

Section 9 Lighting

9.1 General

9.1 is amended by adding 9.1.5:

9.1.5 Ballasts

9.1.5.1 Fluorescent Lamp Ballasts

9.1.5.1.1 The ballast efficacy factor (BEF) of fluorescent lamp ballasts shall conform to Table 9.1.5.1 where

- the ballast operates at nominal input voltages of 120, 277 or 347 volts;
- the input frequency is 60 Hz;
- the maximum lamp operating current is less than 1, 000 milliamperes;
- the ballast is used to operate one of the following lamp types:
 - one or two 4-ft, nominal 40 W, rapid-start lamps,
 - two 8-ft, nominal 75 W, slimline lamps,
 - two 8-ft, nominal 110 W, high-output rapid-start lamps;
- the ballast is not specifically designed for starting at temperatures below 4.5°C (40°F); and
- the ballast is not specifically designed for use with dimming controls.

9.1.5.1.2 The ballast efficacy factor (BEF) shall be calculated in accordance with Equation 9-1:

$$BEF = \frac{BF}{\text{Power input}} \quad (9-1)$$

where

- BF = ballast factor, expressed as a percent, such as 95;
 power input = total wattage of combined lamps and ballasts.

9.1.5.1.3 Tests for BF and power input shall be in accordance with CAN/CSA-C654, “Fluorescent Lamp Ballast Efficacy Measurements”.

9.1.5.2 Other Fluorescent Lamp Ballasts. Ballasts that do not have all the characteristics listed in 9.1.5.1.1 are not required to meet the BEF in Table 9.1.5.1 and may be used as required.

9.1.5.3 One-lamp or three-lamp fluorescent luminaires recess-mounted within 3 m (10 ft) center to center of each other or pendant mounted or surface mounted within 0.3 m (1 ft) of each other, and within the same room, shall be tandem wired to eliminate unnecessary use of single-lamp ballasts.

Exception: Three-lamp ballasts may be used.

9.1.5.4 All ballasts shall have a power factor of 90% or greater.

Exceptions:

- (a) ballasts for circline and compact fluorescent lamps and low-wattage high-intensity discharge lamps of 100 W or less;
 (b) dimming ballasts.

Table 9.1.5.1
 Fluorescent Lamp Ballast Efficacy Factors⁽¹⁾

m_s	Application for Operation of:	Ballast Input Voltage	Total Nominal Lamp Watts	<i>Green Energy Act, 2009</i> Ballast Efficacy Factor
	One F40T12 Lamp ⁽²⁾	120 V	40	2.29
		277 V	40	2.29
		347 V	40	2.22
	Two F40T12 Lamps ⁽²⁾	120 V	80	1.17
		277 V	80	1.17
		347 V	80	1.12
	Two F96T12 Lamps ⁽³⁾	120 V	150	0.63
		277 V	150	0.63
		347 V	150	0.62
	Two 110W/F96T12HO Lamps ⁽⁴⁾	120 V	220	0.39
		277 V	220	0.39
		347 V	220	0.38
	Two F32T8 Lamps	120 V	64	1.25
		277 V	64	1.23
		347 V	64	1.2
	Column 1	2	3	4

Notes to Table 9.1.5.1:

- (1) All fluorescent lamp ballasts must have a minimum power factor of at least 0.9 at indicated voltage.
 (2) Also for use on 34W/48T12/RS and 40W/48T10/RS lamps
 (3) Also for use on 60W/96T12/IS lamps.
 (4) Also for use on 95W/96T12/HO lamps.

Section 10 Other Equipment

10.4 Mandatory Provisions

10.4.1 Electric Motors is replaced with the following:

m₈ 10.4.1 Electric Motors. Where electric motors are regulated by the *Green Energy Act, 2009*, the efficiency levels shall be based on CSA-C390-M. Values shown in Table 10.8 are minimum motor efficiency levels established by the *Green Energy Act, 2009*.

Table 10.8
Minimum Nominal Efficiency for Motors

Motor		Open Motors				Enclosed Motors			
		Speed (RPM)				Speed (RPM)			
		3600	1800	1200	900	3600	1800	1200	900
		Number of Poles				Number of Poles			
kW	(hp)	2	4	6	8	2	4	6	8
0.8	(1)	75.5	82.5	80.0	84.0	75.5	82.5	80.0	74.0
1.1	(1.5)	82.5	84.0	84.0	75.5	82.5	84.0	85.5	77.0
1.5	(2)	84.0	84.0	85.5	85.5	84.0	84.0	86.5	82.5
2.2	(3)	84.0	86.5	86.5	86.5	85.5	87.5	87.5	84.0
3.7	(5)	85.5	87.5	87.5	87.5	87.5	87.5	87.5	85.5
5.6	(7.5)	87.5	88.5	88.5	88.5	88.5	89.5	89.5	85.5
7.5	(10)	88.5	89.5	90.2	89.5	89.5	89.5	89.5	88.5
11.1	(15)	89.5	91.0	90.2	89.5	90.2	91.0	90.2	88.5
14.9	(20)	90.2	91.0	91.0	90.2	90.2	91.0	90.2	89.5
18.7	(25)	91.0	91.7	91.7	90.2	91.0	92.4	91.7	89.5
22.4	(30)	91.0	92.4	92.4	91.0	91.0	92.4	91.7	91.0
29.8	(40)	91.7	93.0	93.0	91.7	91.7	93.0	93.0	91.0
37.3	(50)	92.4	93.0	93.0	91.7	92.4	93.0	93.0	91.7
44.8	(60)	93.0	93.6	93.6	92.4	93.0	93.6	93.6	91.7
56.0	(75)	93.0	94.1	93.6	93.6	93.0	94.1	93.6	93.0
74.6	(100)	93.0	94.1	94.1	93.6	93.6	94.5	94.1	93.0
93.3	(125)	93.6	94.5	94.1	93.6	94.5	94.5	94.1	93.6
111.9	(150)	93.6	95.0	94.5	93.6	94.5	95.0	95.0	93.6
130.6	(175)	94.5	95.0	94.5	93.6	95.0	95.0	95.0	94.1
149.2	(200)	94.5	95.0	94.5	93.6	95.0	95.0	95.0	94.1
Column 1		2	3	4	5	6	7	8	9

Section 11 Energy Cost Budget Method

11.2 Simulation General Requirements

11.2.3 Purchased Energy Rates is replaced with the following:

11.2.3 Purchased Energy Rates. Annual energy costs for purchased energy, such as electricity, gas, oil, propane, steam, and chilled water, shall be determined using actual published rates and costs to the building. Contact local utility for energy rates. For the purposes of a building permit application, because of fluctuations in energy rates, the rates used in a building design are valid if they are published not more than 3 months prior to the date of permit application.

Table 11.3.1 Modeling Requirements for Calculating Design Energy Cost and Energy Cost Budget

Section 5. Building Envelope in Table 11.3.1 is replaced with the following:

No.	Proposed Building Design (Column A) Design Energy Cost (DEC)	Budget Building Design (Column B) Energy Cost Budget (ECB)
5. Building Envelope		
	<p>All Components in the building envelope in the proposed design shall be modeled as shown on architectural drawings or as installed for existing building envelopes. However, there are some default values for infiltration, solar absorbtivity, and shading. Note: default values are to be used unless more appropriate values for the specific building system or equipment are available.</p> <p>When the HVAC system is on, no infiltration shall be assumed to occur. When the HVAC system is off, the infiltration rate for buildings with or without operable windows shall be assumed to be 0.193 L/s-m² (0.038 cfm/ft²) of the gross exterior wall. However, hotels or motels and multi-family buildings shall have infiltration rates of 0.193 L/s-m² (0.038 cfm/ft²) of gross exterior wall area at all times. These are default assumptions for the proposed design.</p> <p>The solar absorptivity of opaque elements of the building envelope shall be assumed to be 70%. The solar absorptivity of ground surfaces shall be assumed to be 80% (20% reflectivity). These are default assumptions for the proposed design</p>	<p>The budget building design shall have identical conditioned floor area and identical exterior dimensions and orientations as the proposed design. The insulation and glazing characteristics of the budget building design shall be determined by using the first selection of the “base case” for the appropriate climate range as defined from the alternate component Tables (ACP), with no assumed overhangs(projection factor of 0.0), shading coefficient of 0.70, and lightweight walls. The overall U-Value of the fenestration is the highest value under the first column under “base case”. The internal load density (ILD) must be calculated based on building wide average values.</p> <p>Same as proposed design. However these are prescribed values and cannot be varied.</p> <p>Same as proposed design. However these are prescribed values and cannot be varied.</p>

<p>No shades is the default assumption. However, if the proposed design includes drapes or blinds, the effect can be modeled to reduce the glass shading coefficient. If blinds are manually operated the reduction can be applied to no more than 50% of the total fenestration area of a zone.</p>	<p>No draperies or blinds are to be modeled. That is, the glass shading coefficient (SC_x) should be unaltered, with no reduction due to internal (or external) shading.</p>
<p>Shading by permanent structures, terrain, and vegetation shall be taken into account for computing energy consumption whether or not these features are located on the building site. A permanent fixture is one that is likely to remain for the life of the proposed design.</p>	<p>Same as proposed design.</p>

Chapter 3 Supplement to MNECB

Part 3 Building Envelope

Part 3 of MNECB is replaced with the following:

3.1. General

3.1.1. Building Envelope

3.1.1.1. Compliance

- (1) The building envelope shall comply with the requirements of Section 5 in Chapter 2 of this Supplementary Standard.

Part 4 Lighting

Section 4.2. Mandatory Provisions

4.2.1. Exterior Lighting Power

4.2.1.2. Entrance and Exit Lighting

Table 4.2.1.2. of MNECB is replaced with the following:

Table 4.2.1.2.
Lighting Power Densities for Building Exteriors

Area Description	Allowance
Uncovered Parking Lots and drives	1.6 W/m ² (0.15 W/ft ²)
Walkways less than 3 m (10 ft) wide	3.3 W/linear m (1.0 W/linear foot)
Walkways 3 m (10 ft) or greater, plaza areas, special feature areas	2.2 W/m ² (0.2 W/ft ²)
Stairways	10.8 W/m ² (1.0 W/ft ²)
Building Main entries	98 W/linear m (30 W/linear ft) of door width
Other doors	66 W/linear m (20 W/linear ft) of door width
Canopies (free standing and attached and overhangs)	13.5 W/m ² (1.25 W/ft ²)
Outdoor Sales Open areas (including vehicle sale lots)	5.4 W/m ² (0.5 W/ft ²)
Street frontage for vehicle sales lots in addition to "open area" allowance	66 W/linear m (20 W/linear foot)
Building Facades	2.2 W/m ² (0.2 W/ft ²) for each illuminated wall or surface or 16.4 W/linear m (5.0 W/linear foot) for each illuminated wall or surface length
Automated teller machines and night depositories	270 W per location plus 90 W per additional ATM per location
Entrances and gatehouse inspection stations at guarded facilities	13.5 W/m ² (1.25 W/ft ²) of uncovered area
Loading areas for law enforcement and emergency service vehicles	5.4 W/m ² (0.5 W/ft ²) of uncovered area
Drive-up windows	400 W per drive-through
Parking near 24-hour retail entrances	800 W per main entry
Column 1	2

4.2.5. Ballasts

4.2.5.1. Fluorescent Light Ballasts

Sentence 4.2.5.1.(3) is replaced with the following:

- (3) Fluorescent ballast efficacy factors shall meet the requirements of Table 9.1.5.1 in Chapter 2 of this Supplementary Standard.

Section 4.3. Prescriptive Compliance

4.3.2. Calculation of Interior Lighting Power Allowance by Building Type

4.3.2.1. Interior Lighting Power Allowance by Building Type

Table 4.3.2.1. of MNECB is replaced with the following:

Table 4.3.2.1.
Lighting Power Densities Using the Building Area Method

Lighting Power Density	
Building Area Type ^a	W/m ² (W/ft ²)
Automotive Facility	10 (0.9)
Convention Center	13 (1.2)
Court House	13 (1.2)
Dining: Bar Lounge/Leisure	14 (1.3)
Dining: Cafeteria/Fast Food	15 (1.4)
Dining: Family	17 (1.6)
Dormitory	11 (1.0)
Exercise Center	11 (1.0)
Gymnasium	12 (1.1)
Health Care-Clinic	11 (1.0)
Hospital	13 (1.2)
Hotel	11 (1.0)
Library	14 (1.3)
Manufacturing Facility	14 (1.3)
Motel	11 (1.0)
Motion Picture Theater	13 (1.2)
Multi-Family	8 (0.7)
Museum	12 (1.1)
Office	11 (1.0)
Parking Garage	3 (0.3)
Penitentiary	11 (1.0)
Performing Arts Theater	17 (1.6)
Police/Fire Station	11 (1.0)
Post Office	12 (1.1)
Religious Building	14 (1.3)
Retail	16 (1.5)
School/University	13 (1.2)
Sports Arena	12 (1.1)
Town Hall	12 (1.1)
Transportation	11 (1.0)
Warehouse	9 (0.8)
Workshop	15 (1.4)
Column 1	2

(a) In cases where both a common space type and a building specific type are listed, the building specific space type shall apply.

4.3.3. Calculation of Interior Lighting Power Allowance by Space Function.

4.3.3.4. Determination of Lighting Power Density by Space Function.

Table 4.3.3.4. of MNECB is replaced with the following:

Table 4.3.3.4.
Lighting Power Densities Using the Space-by-Space Method

Common Space Types ⁽¹⁾	W/m ²	(W/ft ²)	Building Specific Space Types	W/m ²	(W/ft ²)
Office-Enclosed	12	(1.1)	Gymnasium / Exercise Center		
Office-Open Plan	12	(1.1)	Playing Area	15	(1.4)
Conference / Meeting / Multipurpose	14	(1.3)	Exercise Area	10	(0.9)
Classroom / Lecture / Training	15	(1.4)	Courthouse / Police Station / Penitentiary		
For Penitentiary	14	(1.3)	Courtroom	20	(1.9)
Lobby	14	(1.3)	Confinement Cells	10	(0.9)
For Hotel	12	(1.1)	Judges Chambers	14	(1.3)
For Performing Arts Theater	36	(3.3)	Fire Stations		
For Motion Picture Theater	12	(1.1)	Fire Station Engine Room	9	(0.8)
Audience / Seating Area	10	(0.9)	Sleeping Quarters	3	(0.3)
For Gymnasium	4	(0.4)	Post Office-Sorting Area	13	(1.2)
For Exercise Center	3	(0.3)	Convention Center-Exhibit Space	14	(1.3)
For Convention Center	8	(0.7)	Library		
For Penitentiary	8	(0.7)	Car File and Cataloging	12	(1.1)
For Religious Buildings	18	(1.7)	Stacks	18	(1.7)
For Sports Arena	4	(0.4)	Reading Area	13	(1.2)
For Performing Arts Theater	28	(2.6)	Hospital		
For Motion Picture Theater	13	(1.2)	Emergency	29	(2.7)
For Transportation	5	(0.5)	Recovery	9	(0.8)
Atrium-First Three Floors	6	(0.6)	Nurse Station	11	(1.0)
Atrium-Each Additional Floor	2	(0.2)	Exam / Treatment	16	(1.5)
Lounge / Recreation	13	(1.2)	Pharmacy	13	(1.2)
For Hospital	9	(0.8)	Patient Room	8	(0.7)
Dining Area	10	(0.9)	Operating Room	24	(2.2)
For Penitentiary	14	(1.3)	Nursery	6	(0.6)
For Hotel	14	(1.3)	Medical Supply	15	(1.4)
For Motel	13	(1.2)	Physical Therapy	10	(0.9)
For Bar Lounge / Leisure Dining	15	(1.4)	Radiology	4	(0.4)
For Family Dining	23	(2.1)	Laundry-Washing	6	(0.6)

Notes to Table 4.3.3.4.:

(1) In cases where both a common space type and a building specific type are listed, the building specific space type shall apply.

Table 4.3.3.4. (Cont'd)
Lighting Power Densities Using the Space-by-Space Method

Common Space Types ⁽¹⁾	W/m ²	(W/ft ²)	Building Specific Space Types	W/m ²	(W/ft ²)
Food Preparation	13	(1.2)	Automotive-Service / Repair	8	(0.7)
Laboratory	15	(1.4)	Manufacturing		
Restrooms	10	(0.9)	Low Bay [<7.6 m (<25 ft)] floor to ceiling height)	13	(1.2)
Dressing / Locker / Fitting Room	6	(0.6)	High Bay [≥7.6 m (≥25 ft)] floor to ceiling height)	18	(1.7)
Corridor / Transition	5	(0.5)	Detailed Manufacturing	23	(2.1)
For Hospital	11	(1.0)	Equipment Room	13	(1.2)
For Manufacturing Facility	5	(0.5)	Control Room	5	(0.5)
Stairs-Active	6	(0.6)	Hotel / Motel Guest Rooms	12	(1.1)
Active Storage	9	(0.8)	Dormitory-Living Quarters	12	(1.1)
For Hospital	10	(0.9)	Museum		
Inactive Storage	3	(0.3)	General Exhibition	11	(1.0)
For Museum	9	(0.8)	Restoration	18	(1.7)
Electrical / Mechanical	16	(1.5)	Bank / Office-Banking Activity Area	16	(1.5)
Workshop	20	(1.9)	Religious Buildings		
			Worship Pulpit, Choir	26	(2.4)
			Fellowship Hall	10	(0.9)
			Retail		
			Sales Area	18	(1.7)
			Mall Concourse	18	(1.7)
			Sports Arena		
			Ring Sports Area	29	(2.7)
			Court Sports Area	25	(2.3)
			Indoor Playing Field Area	15	(1.4)
			Warehouse		
			Fine Material Storage	15	(1.4)
			Medium / Bulky Material Storage	10	(0.9)
			Parking Garage -Garage Area	2	(0.2)
			Transportation		
			Airport-Concourse	6	(0.6)
			Air / Train/Bus-Baggage Area	11	(1.0)
			Terminal-Ticket Counter	16	(1.5)

Notes to Table 4.3.3.4.:

(1) In cases where both a common space type and a building specific type are listed, the building specific space type shall apply.

Part 5 Heating, Ventilating and Air-Conditioning Systems

Section 5.2. Mandatory Provisions

5.2.13. Equipment Efficiency

5.2.13.1. Unit and Packaged Equipment

Table 5.2.13.1. of MNECB is replaced with Tables 6.8.1.A to 6.8.1.G in Chapter 2 of this Supplementary Standard.

Part 6 Service Water Heating Systems

Section 6.2. Mandatory Provisions

6.2.2. Storage Vessels and Heating Equipment

6.2.2.1. Equipment Efficiency

Table 6.2.2.1. of MNECB is replaced with Table 7.8 in Chapter 2 of this Supplementary Standard.

Part 7 Electrical Power

Section 7.2. Mandatory Requirements

Subsection 7.2.4. is replaced with the following:

7.2.4. Electric Motors

7.2.4.1. Nominal Efficiency

(1) The minimum nominal efficiency for electric motors shall meet the requirements of Table 10.8 in Chapter 2 of this Supplementary Standard.

m₁₄ Division 3

Energy Efficiency Design After December 31, 2011 (Applies to construction for which a permit has been applied for after December 31, 2011)

Chapter 1	General
Section 1.1.	General
1.1.1.	Scope
1.1.2.	Energy Efficiency
1.1.3.	Chapter 2
Section 1.2.	Application
1.2.1.	Application of ANSI/ASHRAE/IESNA Standard 90.1 and MNECB
Section 1.3.	Additional Referenced Documents
1.3.1.	Referenced Documents
Section 1.4.	Climatic Zones
1.4.1.	Climatic Zone Numbers
Chapter 2	Additional Requirements to ANSI/ASHRAE/IESNA Standard 90.1
Section 1.1.	Changes and Additional Requirements
1.1.1.	Changes and Additional Requirements

FOREWORD

This Division contains requirements for the design and construction of buildings for which a permit has been applied for after December 31, 2011. The energy efficiency design of buildings is required to meet one of the following three requirements

- achieve the energy efficiency levels attained by conforming to the ANSI/ASHRAE/IESNA 90.1, “Energy Standard for Buildings Except Low-Rise Residential Buildings” as modified by Chapter 2 of this Division.
- exceed by not less than 5% the energy efficiency levels attained by conforming to the ANSI/ASHRAE/IESNA 90.1, “Energy Standard for Buildings Except Low-Rise Residential Buildings”, or
- exceed by not less than 25% the energy efficiency levels attained by conforming to the CCBFC, “Model National Energy Code for Buildings.”

Division 3 outlines the modifications outlined above. These modifications enhance the building envelope provisions of ANSI/ASHRAE/IESNA Standard 90.1-2010 and enables the use of Canadian testing procedures for HVAC and service water heating equipment.

Certain buildings and parts of buildings are exempted from the energy efficiency provisions in this Division.

Compliance with this Division does not necessarily ensure that the actual annual energy cost of a building is less than or equal to the theoretical values arrived at using the building energy cost budget method of ANSI/ASHRAE/IESNA Standard 90.1 or building energy performance compliance of MNECB. Factors such as workmanship, depreciation of the thermal resistance of building materials, occupant/user lifestyle, building operation and maintenance impact on the actual energy consumption of a building.

Summary of the Contents of Division 3

Chapter 1: General

This Chapter contains the application, energy efficiency design requirements and exemptions to ANSI/ASHRAE/IESNA Standard 90.1. It also contains climatic zones applicable to Ontario locations..

Chapter 2: Additional Requirements to ANSI/ASHRAE/IESNA Standard 90.1

This Chapter contains additions and/or substitutions to ANSI/ASHRAE/IESNA Standard 90.1

Recommended Resource Material: ANSI/ASHRAE/IESNA Standard 90.1-2010 User’s Manual

Chapter 1

General

Section 1.1. General

1.1.1. Scope

1.1.1.1. Scope

- (1) This Division applies to construction for which a permit has been applied for after December 31, 2011.

1.1.2. Energy Efficiency

1.1.2.1. Energy Efficiency Design

- (1) Except as provided in Sentence (2) and Article 1.2.1.1. and except as permitted in Sentence (3), the energy efficiency of all *buildings* shall be designed to
 - (a) exceed by not less than 25% the energy efficiency levels attained by conforming to the CCBFC, “Model National Energy Code for Buildings.”
 - (b) exceed by not less than 5% the energy efficiency levels attained by conforming to the ANSI/ASHRAE/IESNA 90.1, “Energy Standard for Buildings Except Low-Rise Residential Buildings”, or
 - (c) achieve the energy efficiency levels attained by conforming to the ANSI/ASHRAE/IESNA 90.1, “Energy Standard for Buildings Except Low-Rise Residential Buildings” and Chapter 2.
- (2) The requirements of Clause (1)(b) do not apply to a *building* in which *electric space heating* is used.
- (3) The requirements of Clause (1)(b) are permitted to be used in conjunction with Chapter 2.
- (4) Energy efficiency requirements do not apply to *buildings* or parts of *buildings* described in Article 1.2.1.1.

1.1.3. Chapter 2

1.1.3.1. Chapter 2

- (1) Chapter 2 contains additional requirements and changes to the ANSI/ASHRAE/IESNA Standard 90.1, “Energy Standard for Buildings Except Low-Rise Residential Buildings”, and applies where compliance with energy efficiency requirements is achieved in accordance with Clause 1.1.2.1.(1)(c).
- (2) Where compliance with energy efficiency requirements is achieved in accordance with Clause 1.1.2.1.(1)(b), energy efficiency of the *building* or part of the *building* is permitted to conform to the respective requirements of Chapter 2 in lieu of the corresponding requirements in ANSI/ASHRAE/IESNA Standard 90.1. (See Appendix A.)

Section 1.2. Application

1.2.1. Application of ANSI/ASHRAE/IESNA Standard 90.1 and MNECB

1.2.1.1. Exceptions

- (1) The requirements of Article 1.1.2.1 of this Chapter do not apply to
 - (a) a *building* or part of a *building* of *residential occupancy* that is within the scope of Part 9 of Division B of the Building Code,
 - (b) a *heritage building*,
 - (c) any *building* space which uses energy at a rate less than 12 W/m² under peak conditions,
 - (d) temporary structures such as construction trailers, tents, *air-supported structures* and portable classrooms,
 - (e) warehouses and storage rooms where the design indoor temperature does not exceed 10°C, and
 - (f) unheated *storage garages* and unheated storage rooms except as required in Sentence (2).
- (2) *Conditioned spaces* of *buildings* exposed to unheated *storage garages* and unheated storage rooms shall meet the *building* envelope requirements ANSI/ASHRAE/IESNA Standard 90.1 or MNECB.
- (3) Energy consumption of systems and equipment located in a *storage garage* but which do not serve the *storage garage* need not be considered as energy used in the *storage garage* but shall be included as energy used for the rest of the *building*.
- (4) The exceptions listed in Sentence 12.2.1.2.(5) of Division B of the Building Code exempts *buildings* or parts of *buildings* from compliance with energy efficient design requirements where
 - (a) the areas are intended primarily for manufacturing processing, commercial processing or industrial processing, and
 - (b) the environmental condition within the *buildings* or parts of *buildings* are governed by the operation or process within the *building*.
- (5) Table 1.2.1.1. contains some examples of *occupancies* which can be exempted from compliance with ANSI/ASHRAE/IESNA Standard 90.1 and MNECB. The list is not intended to be exhaustive and other exemptions may be made.

Table 1.2.1.1.
Examples of Occupancies Exempt from Compliance with ANSI/ASHRAE/IESNA Standard 90.1 and MNECB
 Forming Part of Sentence 1.2.1.1.(5)

GROUP A, DIVISION 4	GROUP F, DIVISION 1	GROUP F, DIVISION 2	GROUP F, DIVISION 3
Amusement Park Structures (not elsewhere classified) Bleachers Grandstands Reviewing Stands Stadia	Bulk Plants for Flammable Liquids Bulk Storage Warehouses for Hazardous Substances Cereal Mills Chemical Manufacturing or Processing Plants Distilleries Dry Cleaning Plants Feed Mills Flour Mills Grain Elevators Lacquer Factories Paint, Varnish and Pyroxylin Product Factories Rubber Processing Plants Spray Painting Operations Waste Paper Processing Plants	Dry Cleaning Establishments not using flammable or explosive solvents or cleaners Electrical Substations Helicopter Landing Areas on Roofs Laundries, except self-service Planing Mills Printing Plants Repair Garages Woodworking Factories	Creameries Power Plants Open-air Parking Garages Pumping Stations
GROUP C Part 9 Buildings ⁽¹⁾ Camps for Housing Workers (Part 3 and 9 Buildings) Recreational Camps			
Column 1	2	3	4

Notes to Table 1.2.1.1.:

- (1) Part 9 *buildings* are exempt from compliance with ANSI/ASHRAE/IESNA Standard 90.1 or MNECB where the energy efficiency design conforms to Division 4 of this Standard.

Section 1.3. Additional Referenced Documents

1.3.1. Referenced Documents

1.3.1.1. Applicable Editions

- (1)** Where this Supplementary Standard specifies substitutions to referenced documents specified in ANSI/ASHRAE/IESNA Standard 90.1, the referenced documents shall be in the editions designated in Column 2 of Table 1.3.1.1.

Table 1.3.1.1.
Additional Referenced Documents
 Forming Part of Sentence 1.3.1.1.(1)

Issuing Agency	Document Number	Title of Document	Supplementary Standard Reference in Chapter 2
ANSI/ASHRAE/ IESNA	90.1-2010	Energy Standard for Buildings Except Low-Rise Residential Buildings	Chapter 2
CSA	CAN/CGA 2.3 M86	Gas-Fired Central Furnaces	Table 6.4.1.A.2.
CSA	CAN/CGA 2.8-M86 (R1996)	Gas-Fired Duct Furnaces	Table 6.4.1.A.2.
CSA	CAN1-4.3-M85	Circulating Tank, Instantaneous and Large Automatic Storage Type Gas Water Heaters	Table 7.4.2.A..
CSA	CGA 4.9-1969	Gas-fired Steam and Hot Water Boilers	Table 6.4.1.A.2.
CSA	CAN/CSA-A440.2-M04	Energy Performance Evaluation of Windows and Sliding Glass Doors	1.1.1.3.(5)
CSA	CSA-P.2 - 2008	Testing Method for Measuring Annual Fuel Utilization Efficiencies of Residential Furnaces and Boilers	Table 6.4.1.A.2.
CSA	CSA-P.3-2004	Testing Method for Measuring Energy Consumption and Determining Efficiencies of Gas-Fired Storage Water Heaters	Table 7.4.2.A..
CSA	CGA-P.6-1993	Testing Method for Measuring Thermal and Operating Efficiencies of Gas-Fired Pool Heaters	Table 6.4.1.A.2.
CSA	CSA-P.7-2010	Test Method for Measuring Energy Loss of Gas-fired Instantaneous Water Heaters	Table 6.4.1.A.2.
CSA	CGA-P.8-M97	Thermal Efficiencies of Industrial and Commercial Gas-Fired Package Furnaces	Table 6.4.1.A.2.
CSA	CSA-P.11-2008	Testing Method for Measuring Efficiency and Energy Consumption of Gas-Fired Unit Heaters	Table 6.4.1.A.2.
CSA	CSA-B211-00	Energy Efficiency of Oil-Fired Storage Tank Water Heaters	Table 7.4.2.A.
CSA	CSA B212-00	Seasonal Energy Utilization Efficiencies of Oil-Fired Furnaces and Boilers	Table 6.4.1.A.2.
CSA	CSA B140.4-1974 (R1991)	Oil-Fired Warm Air Furnaces	Table 6.4.1.A.2.
CSA	CSA B140.7.2-1967 (R2001)	Oil-Fired Steam and Hot-Water Boilers for Commercial and Industrial Use	Table 6.4.1.A.2.
CSA	CSA B140.12 - 2003	Oil-Burning Equipment: Service Water Heaters for Domestic Hot Water, Space Heating, and Swimming Pools	Table 6.4.1.A.2.
CSA	CAN/CSA C368.1-M90	Performance Standard for Room Air-Conditioners	Table 6.4.1.A.2.
CSA	CAN/CSA-C390-98	Energy Efficiency Test Methods for Three-Phase Induction Motors	1.1.1.6.(1)
CSA	CSA C656-05	Performance Standard for Split-System and Single Package Central Air Conditioners and Heat Pumps	Table 6.4.1.A.2.
CSA	CSA C743-02	Performance Standard for Rating Packaged Water Chillers	Table 6.4.1.A.2.
CSA	ARI 310/380-2004 CSA C744-04	Packaged Terminal Air-Conditioners and Heat Pumps	Table 6.4.1.A.2.
CSA	CSA C745-03	Energy Efficiency of Electric Storage Tank Water Heaters and Heat Pump Water Heaters	Table 7.4.2.A..
CSA	CSA C746-98	Performance Standard for Rating Large Air-Conditioners and Heat Pumps	Table 6.4.1.A.2.
CSA	CAN/CSA-C13256-1-01	Water-Source Heat Pumps —Testing and Rating for Performance — Part 1: Water-to-Air Heat and Brine-to-Air Heat Pumps	Table 6.4.1.A.2.
Column 1	2	3	4

Section 1.4. Climatic Zones

1.4.1. Climatic Zone Numbers

1.4.1.1. Determination of Climatic Zone Numbers

- (1) Climatic zone numbers shall be determined in accordance with Tables 5A and 5B.
- (2) Where a location is not listed in Table 5A, its climatic zone number shall be determined in accordance with Table 5B.

Table 5A
Climatic Zone Numbers for Ontario Locations
 (This Table is to be used in conjunction with Tables SB5.5-5 to SB5.5-7)

No.	Location	No.	Location	No.	Location	No.	Location
6	Ailsa Craig	6	Cobourg	6	Guelph	6	Markdale
6	Ajax	7	Cochrane	6	Guthrie	6	Markham
6	Alexandria	6	Colborne	7	Haileybury	7	Martin
6	Alliston	6	Collingwood	5	Haldimand-Caledonia	7	Matheson
6	Almonte	6	Cornwall	6	Haldimand-Hagersville	7	Mattawa
7	Armstrong	5	Corunna	6	Haliburton	6	Midland
6	Arnprior	7	Deep River	6	Halton Hills	6	Milton
7	Atikokan	6	Deseronto	5	Hamilton	6	Milverton
6	Aurora	6	Dorchester	6	Hanover	6	Minden
6	Bancroft	7	Dorion	6	Hastings	5	Mississauga
6	Barrie	5	Dresden	6	Hawkesbury	6	Mitchell
6	Barriefield	7	Dryden	7	Hearst	7	Moosonee
6	Beaverton	5	Dunnville	6	Honey Harbour	6	Morrisburg
6	Belleville	6	Durham	7	Hornepayne	6	Mount Forest
6	Belmont	5	Dutton	6	Huntsville	6	Muskoka
7	Big Trout Lake	7	Earlton	6	Ingersoll	7	Nakina
6	Bordon CFB	7	Edison	7	Iroquois Falls	5	Nanticoke
6	Bracebridge	7	Elliot Lake	7	Jellicoe	6	Napanee
6	Bradford	6	Elmvale	7	Kapusking	6	Newcastle
6	Brampton	6	Embro	6	Kemptville	7	New Liskeard
5	Brantford	7	Englehart	7	Kenora	6	Newmarket
6	Brighton	7	Espanola	7	Killaloe	5	Niagara Falls
6	Brockville	6	Exeter	6	Kincardine	7	North Bay
7	Burks Falls	6	Fenelon Falls	6	Kingston	6	Norwood
5	Burlington	6	Fergus	6	Kinmount	5	Oakville
6	Cambridge	5	Forest	7	Kirkland Lake	6	Orangeville
6	Campbellford	5	Fort Erie	6	Kitchener	6	Orillia
6	Cannington	7	Fort Frances	6	Lakefield	6	Oshawa
6	Carleton Place	6	Gananoque	7	Lansdowne House	6	Ottawa
6	Cavan	7	Geraldton	5	Leamington	6	Owen Sound
6	Centralia	5	Glencoe	6	Lindsay	7	Pagwa River
7	Chapleau	6	Goderich	6	Lion's Head	6	Paris
5	Chatham	6	Gore Bay	6	Listowel	6	Parkhill
6	Chesley	7	Graham	6	London	6	Parry Sound
6	Clinton	6	Gravenhurst	6	Lucan	5	Pelham
6	Coboconk	5	Grimsby	6	Maitland	7	Pembroke

Table 5A (Cont'd)
Climatic Zone Numbers for Ontario Locations
 (This Table is to be used in conjunction with Tables SB5.5-5 to SB5.5-7)

No	Location	No.	Location	No.	Location	No.	Location
6	Penetanguishene	7	Rayside-Balfour	6	St. Thomas	7	Trout Creek
6	Perth	7	Red Lake	6	Stirling	6	Uxbridge
7	Petawawa	6	Renfrew	6	Stratford	6	Vaughan
6	Peterborough	6	Richmond Hill	5	Strathroy	5	Vittoria
5	Petrolia	6	Rockland	7	Sturgeon Falls	6	Walkerton
6	Pickering	5	Sarnia	7	Sudbury	5	Wallaceburg
6	Picton	7	Sault Ste.Marie	7	Sundridge	6	Waterloo
6	Plattsville	7	Schreiber	6	Tavistock	5	Watford
7	Point Alexander	6	Seaforth	7	Temagami	7	Wawa
6	Port Burwell	6	Simcoe	6	Thamesford	5	Welling
5	Port Colborne	7	Sioux Lookout	5	Theford	5	West Lorne
6	Port Elgin	6	Smiths Falls	7	Thunder Bay	6	Whitby
6	Port Hope	5	Smithville	6	Tilsonburg	7	White River
6	Port Perry	7	Smooth Rock Falls	7	Timmins	6	Warton
6	Port Stanley	6	Southampton	6	Toronto/ Metropolitan Etobicoke North York Scarborough	5	Windsor
6	Prescott	7	South River			6	Wingham
6	Princeton	5	St. Catharines			6	Woodstock
7	Raith	6	St. Marys	6	Trenton	5	Wyoming

Table 5B
Climate Zone Definitions for Ontario
 (This Table is to be used in conjunction with Tables SB5.5-5 to SB5.5-7)

Zone Number	Thermal Criteria
Zone 5	HDD18 < 4000°C
Zone 6	4000°C ≤ HDD18 < 5000°C
Zone 7	HDD18 ≥ 5000°C
Column 1	2

Chapter 2

Additional Requirements to ANSI/ASHRAE/IESNA Standard 90.1

Section 1.1. Changes and Additional Requirements

1.1.1. Changes and Additional Requirements

1.1.1.1. Application of Chapter 2

- (1) Where compliance with energy efficiency requirements is achieved in accordance with Clause 1.1.2.1.(1)(c) of Chapter 1, energy efficiency of the *building* is required to conform to Chapter 2 of this Division.
- (2) Where compliance with energy efficiency requirements is achieved in accordance with Clause 1.1.2.1.(1)(b) of Chapter 1, energy efficiency of the *building* is permitted to conform to Chapter 2 or parts of Chapter 2 of this Division.

1.1.1.2. Section 4 “Administration and Compliance” of ANSI/ASHRAE/IESNA Standard 90.1

- (1) Sections 4.2.1.1 to 4.2.1.3. of ANSI/ASHRAE/IESNA Standard 90.1 are replaced with the following:
 - 4.2.1.1 New Buildings.** New buildings and additions to existing buildings shall comply with provisions of either Sections 5 to 10 or Section 11.
 - 4.2.1.2** Reserved.
 - 4.2.1.3 Existing Buildings.** Change of use of existing buildings shall conform to Part 10 of Division B of the Building Code and renovation of existing buildings shall conform to Part 11 of Division B of the Building Code.

1.1.1.3. Section 5 “Building Envelope” of ANSI/ASHRAE/IESNA Standard 90.1

- (1) Article 5.4.3.1.A. shall be added to Section 5.4.3. “Air Leakage” of ANSI/ASHRAE/IESNA Standard 90.1.
 - 5.4.3.1.A. Air Barrier Materials, Assemblies and Systems**
 - (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.
- (2) Sections 5.5.1 and 5.5.2 shall be replaced with Sections 5.5.1 (1) through 5.5.1.(7) and Sections 5.5.3.5.1., 5.5.3.5.2, 5.5.3.7., and 5.5.3.8. shall be added to Section 5.5 of ANSI/ASHRAE/IESNA Standard 90.1.

5.5.1 Exterior Building Envelope

- (1) Where electric space heating is used, the building envelope shall comply with the requirements of Table SB5.5-7 of this Supplementary Standard, regardless of its climatic location.
- (2) For the purpose of Sentence (1), any reference to Tables 5.5-5. through 5.5-7. of ANSI/ASHRAE/IESNA Standard 90.1 shall be deemed to be a reference to Tables SB5.5-5 to SB5.5-7 of this Supplementary Standard.
- (3) Tables SB5.5-5 to SB5.5-7 shall supersede the requirements of Tables 5.5-5 to 5.5-7 of the ANSI/ASHRAE/IESNA Standard 90.1
- (4) Tables 5.5-1 to 5.5-8 of ANSI/ASHRAE/IESNA Standard 90.1 shall not be used.
- (5) For a conditioned space, the exterior building envelope shall comply with either the “nonresidential” or “residential” requirements in Tables SB5.5-5 through SB5.5-7 of this Supplementary Standard for the appropriate climate.
- (6) If a building contains any semiheated space or unconditioned space, then the semi-exterior building envelope shall comply with the requirements for semiheated space in Tables SB5.5-5 through SB5.5-7 of this Supplementary Standard for the appropriate climate.
- (7) Notwithstanding the requirements of Tables SB5.5-5 to SB5.5-7, exposed frame floors need not be insulated to more than
 - (a) RSI of 6.69 (R38) where the framing depth is more than 254 mm (10 in.), and
 - (b) RSI of 5.28 (R30) where the framing depth is 254 mm (10 in.) or less, and

5.5.2. Reserved

5.5.3.5.1 Slabs. Insulation continuity shall be maintained in the design of slab edge insulation systems. Continuity shall be maintained from the wall insulation through the slab/wall/footing intersection to the body of the slab edge insulation. Several representative configurations are illustrated in Figure 5-1.

5.5.3.5.2 Where insulative continuity is impossible because of structural constraints, a minimum overlapping of insulation is acceptable. The insulation must overlap by a distance equal to (or greater than) four times the minimum insulation separation, as shown in Figure 5-2.

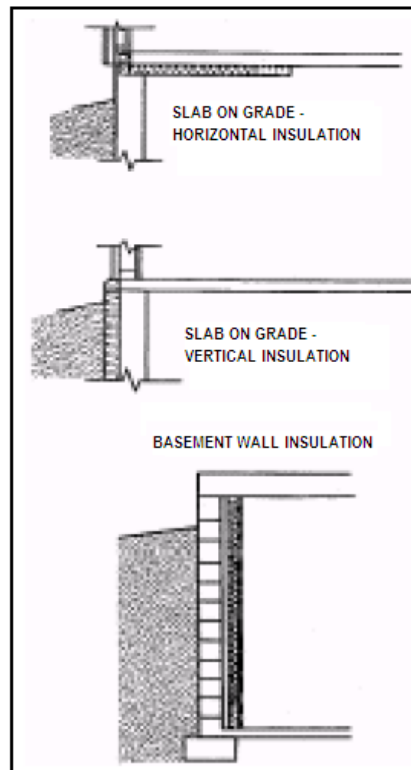


Figure 5-1 Continuity of Insulation on or Below Grade

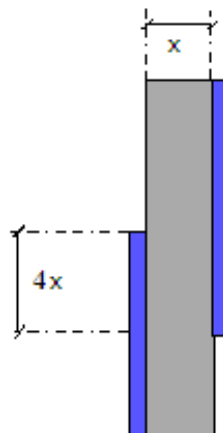


Figure 5-2 Minimum Permissible Insulation Overlap

5.5.3.7 For the purposes of Section 5, the effects of thermal bridging are waived for:

- (a) intermediate structural connections of continuous steel shelf angles (or similar structural element) used to support the building facade provided there is a thermal break between the remaining contact surface of the supporting element and the building structure. This provision is intended to substantially reduce thermal bridging effects caused by the continuous bearing between structural elements supporting building facade and the building frame (ie. steel shelf angle attached to perimeter floor slab to support brick veneer), or
- (b) structural connections of load bearing elements where a thermal break cannot be achieved.

5.5.3.8 In addition to the exceptions permitted above, the effects of thermal bridging are also waived for:

- (a) exposed structural projections of buildings where the total cross-sectional area of the exposed element does not exceed 2% of the exterior building envelope area and the cross-sectional area of the exposed structural element is measured where it penetrates the insulation component of the building envelope. (For example, if the total cross-sectional area of cantilevered concrete balconies and other projections penetrating the insulation component of the building envelope does not exceed 2% of the exterior building envelope area, their thermal bridging effects need not be taken into account)
- (b) ties in masonry construction,
- (c) flashing, and
- (d) top exposed portion of foundation walls provided the exposure does not exceed 200 mm measured from the top of the foundation wall to the top of exterior wall insulation which meets the minimum insulation RSI-Value for wall below grade stipulated in the appropriate Tables. (See Figure 5-3)

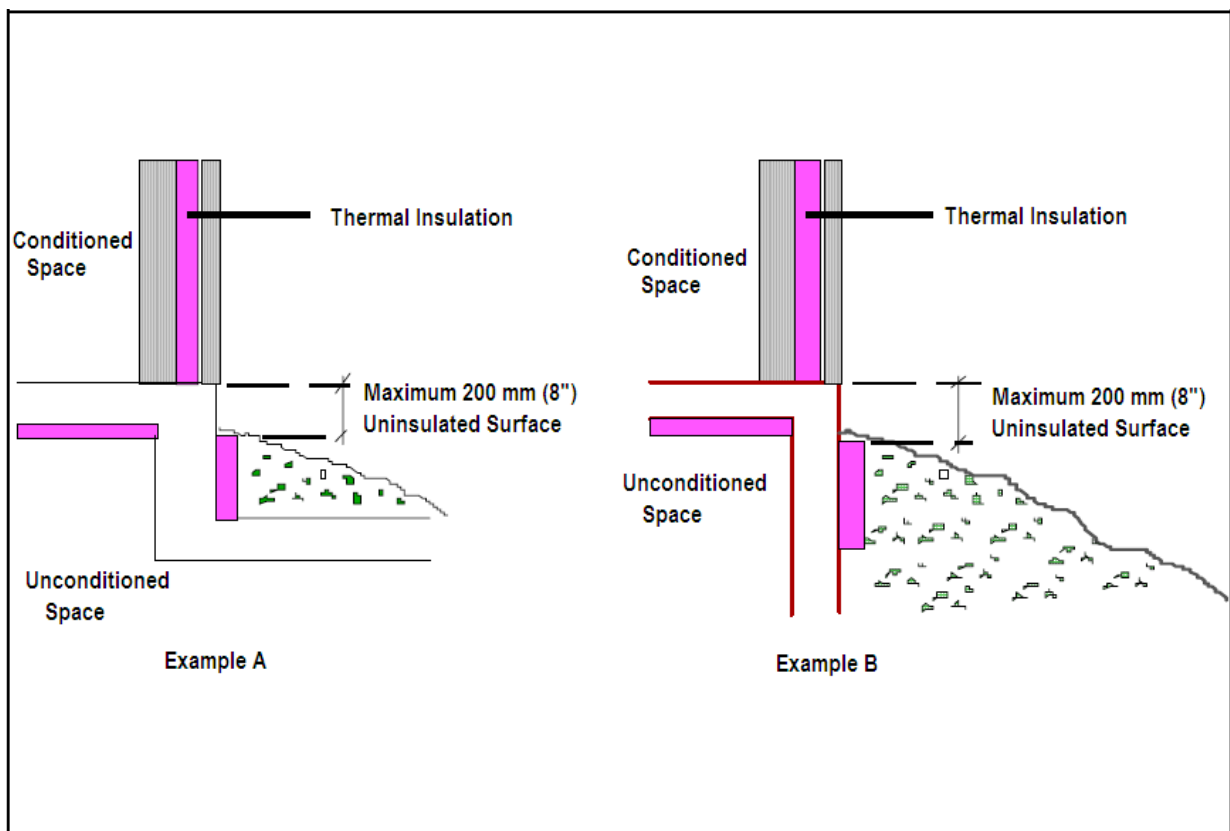


Figure 5-3 Maximum Uninsulated Surface of Foundation Wall

TABLE SB5.5-5 (See Appendix A.)
(Supersedes Table 5.5-5 in ANSI/ASHRAE/IESNA Standard 90.1)
Building Envelope Requirements for Climate Zone 5 (A, B, C) (SI)

Opaque Elements	Nonresidential		Residential		Semiheated	
	Assembly Max. U	Insulation ^e Min. RSI-Value	Assembly Max. U	Insulation ^e Min. RSI-Value	Assembly Max. U	Insulation ^e Min. RSI-Value
<i>Roofs</i>						
Insulation Entirely above Deck	U-0.22	4.4 ci	U-0.22	4.4 ci	U-0.53	1.8 ci
Metal Building	U-0.20	3.3 + 1.9 Ls	U-0.20	3.3 + 1.9 Ls	U-0.39	2.3 + 3.3
Attic and Other	U-0.12	8.6	U-0.12	8.6	U-0.19	5.3
<i>Walls, Above Grade</i>						
Mass	U-0.45	2.3 ci	U-0.40	2.7 ci	U-0.70	1.3 ci
Metal Building	U-0.30	2.3 + 2.3 ci	U-0.30	2.3 + 2.3 ci	U-0.45	2.3 + 1.1 ci
Steel Framed	U-0.31	2.3 + 1.8 ci	U-0.31	2.3 + 1.8 ci	U-0.48	2.3 + 0.7 ci
Wood Framed and Other	U-0.29	2.3 + 1.3 ci	U-0.26	2.3 + 1.8 ci	U-0.36	2.3 + 0.7 ci
<i>Wall, Below Grade</i>						
Below Grade Wall	C-0.52	1.8 ci	C-0.52	1.8 ci	C-0.68	1.3 ci
<i>Floors</i>						
Mass	U-0.36	2.2 ci	U-0.32	2.6 ci	U-0.61	1.1 ci
Steel Joist ^d	U-0.18	6.7	U-0.18	6.7	U-0.21	5.3
Wood Framed and Other ^d	U-0.15	5.3 + 1.3 ci	U-0.15	5.3 + 1.3 ci	U-0.19	5.3
<i>Slab-On-Grade Floors</i>						
Unheated	F-0.93	1.8 for 600 mm	F-0.90	2.6 for 600 mm	F-0.93	1.8 for 600 mm
Heated	F-0.76	2.6 for 900 mm + 0.9 ci below	F-0.76	2.6 for 900 mm + 0.9 ci below	F-1.56	1.8 for 600 mm
<i>Opaque Doors</i>						
Swinging	U-2.27		U-2.27		U-3.41	
Non-Swinging	U-2.27		U-2.27		U-2.84	
Fenestration						
	Assembly Max. U	Assembly Max. SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Max. U	Assembly Max. SHGC
<i>Vertical Fenestration, 0% - 40% of Wall</i>						
Nonmetal framing: all ^b	U-1.42	0.35	U-1.42	0.40	U-3.12	NR
Metal framing: curtainwall / storefront ^c	U-1.99		U-1.99		U-3.41	
Metal framing: entrance door ^c	U-3.97		U-3.97		U-4.54	
Metal framing: all other ^c	U-2.56		U-2.56		U-3.69	
<i>Skylight with Curb, Glass, % of Roof</i>						
0% - 5.0%	U-3.80	0.36	U-3.80	0.36	U-11.24	NR
<i>Skylight with Curb, Plastic, % of Roof</i>						
0% - 5.0%	U-3.92	0.34	U-3.92	0.34	U-10.79	NR
<i>Skylight without Curb, All, % of Roof</i>						
0% - 5.0%	U-2.56	0.36	U-2.56	0.36	U-7.72	NR

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The following definitions apply: ci = continuous insulation, Ls = liner system, NR = no (insulation) requirement.

^a Mass walls with a heat capacity greater than 245 kJ/m²-K which are unfinished or finished only on the interior do not need to be insulated.

^b Nonmetal framing includes framing materials other than metal with or without metal reinforcing or cladding.

^c Metal framing includes metal framing with or without thermal break. The all other subcategory includes operable windows, fixed windows, and non-entrance doors.

^d See Section 5.5.1.(7) under Sentence 1.1.1.3.(2) of Chapter 2 of this Division.

^e Alternative combinations of insulation R-values are permitted provided the combinations are designed in accordance with "Normative Appendix A" of ANSI/ASHRAE/IESNA 90.1.

TABLE SB5.5-6 (See Appendix A.)
(Supersedes Table 5.5-6 in ANSI/ASHRAE/IESNA Standard 90.1)
Building Envelope Requirements for Climate Zone 6 (A, B) (SI)

Opaque Elements	Nonresidential		Residential		Semiheated	
	Assembly Max. U	Insulation ^e Min. RSI-Value	Assembly Max. U	Insulation ^e Min. RSI-Value	Assembly Max. U	Insulation ^e Min. RSI-Value
<i>Roofs</i>						
Insulation Entirely above Deck	U-0.18	5.3 ci	U-0.18	5.3 ci	U-0.36	2.6 ci
Metal Building	U-0.18	4.4 + 1.9 Ls	U-0.18	4.4 + 1.9 Ls	U-0.39	2.3 + 3.3
Attic and Other	U-0.12	8.6	U-0.12	8.6	U-0.15	6.7
<i>Walls, Above Grade</i>						
Mass	U-0.40	2.7 ci	U-0.34	3.5 ci	U-0.59	1.7 ci
Metal Building	U-0.30	2.3 + 2.3 ci	U-0.30	2.3 + 2.3 ci	U-0.45	2.3 + 1.1 ci
Steel Framed	U-0.31	2.3 + 1.8 ci	U-0.31	2.3 + 1.8 ci	U-0.48	2.3 + 0.7 ci
Wood Framed and Other	U-0.26	2.3 + 1.8 ci	U-0.26	2.3 + 1.8 ci	U-0.36	2.3 + 0.7 ci
<i>Wall, Below Grade</i>						
Below Grade Wall	C-0.52	1.8 ci	C-0.52	1.8 ci	C-0.68	1.3 ci
<i>Floors</i>						
Mass	U-0.32	2.6 ci	U-0.29	2.9 ci	U-0.61	1.1 ci
Steel Joist ^d	U-0.18	6.7	U-0.13	6.7 + 2.2 ci	U-0.21	5.3
Wood Framed and Other ^d	U-0.15	5.3 + 1.3 ci	U-0.15	5.3 + 1.3 ci	U-0.19	5.3
<i>Slab-On-Grade Floors</i>						
Unheated	F-0.90	2.6 for 600 mm	F-0.88	3.5 for 600 mm	F-0.93	1.8 for 600 mm
Heated	F-0.76	2.6 for 900 mm + 0.9 ci below	F-0.76	2.6 for 900 mm + 0.9 ci below	F-1.56	1.8 for 600 mm
<i>Opaque Doors</i>						
Swinging	U-2.27		U-2.27		U-3.41	
Non-Swinging	U-2.27		U-2.27		U-2.84	
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Max. U	Assembly Max. SHGC
<i>Vertical Fenestration, 0% - 40% of Wall</i>						
Nonmetal framing: all ^b	U-1.42	0.40	U-1.42	0.40	U-2.56	NR
Metal framing: curtainwall / storefront ^c	U-1.99		U-1.99		U-2.84	
Metal framing: entrance door ^c	U-3.97		U-3.97		U-4.54	
Metal framing: all other ^c	U-2.56		U-2.56		U-3.12	
<i>Skylight with Curb, Glass, % of Roof</i>						
0% - 5.0%	U-3.80	0.46	U-3.80	0.46	U-11.24	NR
<i>Skylight with Curb, Plastic, % of Roof</i>						
0% - 5.0%	U-3.92	0.49	U-3.92	0.49	U-10.79	NR
<i>Skylight without Curb, All, % of Roof</i>						
0% - 5.0%	U-2.56	0.46	U-2.56	0.39	U-7.72	NR

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The following definitions apply: ci = continuous insulation, Ls = liner system, NR = no (insulation) requirement.

^a Mass walls with a heat capacity greater than 245 kJ/m²·K which are unfinished or finished only on the interior do not need to be insulated.

^b Nonmetal framing includes framing materials other than metal with or without metal reinforcing or cladding.

^c Metal framing includes metal framing with or without thermal break. The all other subcategory includes operable windows, fixed windows, and non-entrance doors.

^d See Section 5.5.1.(7) under Sentence 1.1.1.3.(2) of Chapter 2 of this Division.

^e Alternative combinations of insulation R-values are permitted provided the combinations are designed in accordance with "Normative Appendix A" of ANSI/ASHRAE/IESNA 90.1.

TABLE SB5.5-7 (See Appendix A.)
(Supersedes Table 5.5-7 in ANSI/ASHRAE/IESNA Standard 90.1)
Building Envelope Requirements for Climate Zone 7 (SI)

Opaque Elements	Nonresidential		Residential		Semiheated	
	Assembly Max. U	Insulation ^e Min. RSI-Value	Assembly Max. U	Insulation ^e Min. RSI-Value	Assembly Max. U	Insulation ^e Min. RSI-Value
<i>Roofs</i>						
Insulation Entirely above Deck	U-0.16	6.2 ci	U-0.16	6.2 ci	U-0.36	2.6 ci
Metal Building	U-0.16	5.3 + 1.9 Ls	U-0.16	5.3 + 1.9 Ls	U-0.39	2.3 + 3.3
Attic and Other	U-0.10	10.6	U-0.10	10.6	U-0.15	6.7
<i>Walls, Above Grade</i>						
Mass	U-0.34	3.5 ci	U-0.34	3.5 ci	U-0.51	2.0 ci
Metal Building	U-0.30	2.3 + 2.3 ci	U-0.22	2.3 + 3.4 ci	U-0.45	2.3 + 1.1 ci
Steel Framed	U-0.31	2.3 + 1.8 ci	U-0.21	2.3 + 3.3 ci	U-0.48	2.3 + 0.7 ci
Wood Framed and Other	U-0.26	2.3 + 1.8 ci	U-0.26	2.3 + 1.8 ci	U-0.36	2.3 + 0.7 ci
<i>Wall, Below Grade</i>						
Below Grade Wall	C-0.52	1.8 ci	C-0.42	2.2 ci	C-0.68	1.3 ci
<i>Floors</i>						
Mass	U-0.25	3.5 ci	U-0.25	3.5 ci	U-0.50	1.5 ci
Steel Joist ^d	U-0.18	6.7	U-0.13	6.7 + 2.2 ci	U-0.21	5.3
Wood Framed and Other ^d	U-0.15	5.3 + 1.3 ci	U-0.15	5.3 + 1.3 ci	U-0.19	5.3
<i>Slab-On-Grade Floors</i>						
Unheated	F-0.52	2.6 for 600 mm + 0.9 ci below	F-0.52	2.6 for 600 mm + 0.9 ci below	F-0.93	1.8 for 600 mm
Heated	F-0.65	3.5 for 900 mm + 0.9 ci below	F-0.65	3.5 for 900 mm + 0.9 ci below	F-1.19	3.5 for 1200 mm
<i>Opaque Doors</i>						
Swinging	U-2.27		U-2.27		U-3.41	
Non-Swinging	U-2.27		U-2.27		U-2.84	
<i>Fenestration</i>						
	Assembly Max. U	Assembly Max. SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Max. U	Assembly Max. SHGC
<i>Vertical Fenestration, 0% - 40% of Wall</i>						
Nonmetal framing: all ^b	U-1.42	0.45	U-1.42	NR	U-2.56	NR
Metal framing: curtainwall / storefront ^c	U-1.70		U-1.70		U-2.84	
Metal framing: entrance door ^c	U-3.97		U-3.97		U-4.54	
Metal framing: all other ^c	U-1.99		U-1.99		U-3.12	
<i>Skylight with Curb, Glass, % of Roof</i>						
0% - 5.0%	U-3.80	0.46	U-3.80	0.46	U-11.24	NR
<i>Skylight with Curb, Plastic, % of Roof</i>						
0% - 5.0%	U-3.92	0.50	U-3.92	0.50	U-10.79	NR
<i>Skylight without Curb, All, % of Roof</i>						
0% - 5.0%	U-2.56	0.46	U-2.56	0.46	U-7.72	NR

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The following definitions apply: ci = continuous insulation, Ls = liner system, NR = no (insulation) requirement.

^a Mass walls with a heat capacity greater than 245 kJ/m²·K which are unfinished or finished only on the interior do not need to be insulated.

^b Nonmetal framing includes framing materials other than metal with or without metal reinforcing or cladding.

^c Metal framing includes metal framing with or without thermal break. The all other subcategory includes operable windows, fixed windows, and non-entrance doors.

^d See Section 5.5.1.(7) under Sentence 1.1.1.3.(2) of Chapter 2 of this Division.

^e Alternative combinations of insulation R-values are permitted provided the combinations are designed in accordance with "Normative Appendix A" of ANSI/ASHRAE/IESNA 90.1.

TABLE SB5.5-5 (See Appendix A.)
(Supersedes Table 5.5-5 in ANSI/ASHRAE/IESNA Standard 90.1)
Building Envelope Requirements for Climate Zone 5 (A, B, C) (I-P)

Opaque Elements	Nonresidential		Residential		Semiheated	
	Assembly Max. U	Insulation ^e Min. R-Value	Assembly Max. U	Insulation ^e Min. R-Value	Assembly Max. U	Insulation ^e Min. R-Value
<i>Roofs</i>						
Insulation Entirely above Deck	U-0.039	R-25.0 ci	U-0.039	R-25.0 ci	U-0.093	R-10.0 ci
Metal Building	U-0.035	R-19.0 + R-11.0 Ls	U-0.035	R-19.0 + R-11.0 Ls	U-0.068	R-13.0 + R-19.0
Attic and Other	U-0.021	R-49.0	U-0.021	R-49.0	U-0.034	R-30.0
<i>Walls, Above Grade</i>						
Mass	U-0.080	R-13.3 ci	U-0.071	R-15.2 ci	U-0.123	R-7.6 ci
Metal Building	U-0.052	R-13.0 + R-13.0 ci	U-0.052	R-13.0 + R-13.0 ci	U-0.079	R-13.0 + R-6.5 ci
Steel Framed	U-0.055	R-13.0 + R-10.0 ci	U-0.055	R-13.0 + R-10.0 ci	U-0.084	R-13.0 + R-3.8 ci
Wood Framed and Other	U-0.051	R-13.0 + R-7.5 ci	U-0.045	R-13.0 + R-10.0 ci	U-0.064	R-13.0 + R-3.8 ci
<i>Wall, Below Grade</i>						
Below Grade Wall	C-0.092	R-10.0 ci	C-0.092	R-10.0 ci	C-0.119	R-7.5 ci
<i>Floors</i>						
Mass	U-0.064	R-12.5 ci	U-0.057	R-14.6 ci	U-0.107	R-6.3 ci
Steel Joist ^d	U-0.032	R-38.0	U-0.032	R-38.0	U-0.038	R-30.0
Wood Framed and Other ^d	U-0.026	R-30.0 + R-7.5 ci	U-0.026	R-30.0 + R-7.5 ci	U-0.033	R-30.0
<i>Slab-On-Grade Floors</i>						
Unheated	F-0.540	R-10.0 for 24 in.	F-0.520	R-15.0 for 24 in.	F-0.540	R-10.0 for 24 in.
Heated	F-0.440	R-15.0 for 36 in. + R-5.0 ci below	F-0.440	R-15.0 for 36 in. + R-5.0 ci below	F-0.900	R-10.0 for 24 in.
<i>Opaque Doors</i>						
Swinging	U-0.400		U-0.400		U-0.600	
Non-Swinging	U-0.400		U-0.400		U-0.500	
Fenestration						
	Assembly Max. U	Assembly Max. SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Max. U	Assembly Max. SHGC
<i>Vertical Fenestration, 0% - 40% of Wall</i>						
Nonmetal framing: all ^b	U-0.25	0.35	U-0.25	0.40	U-0.55	NR
Metal framing: curtainwall / storefront ^c	U-0.35		U-0.35		U-0.60	
Metal framing: entrance door ^c	U-0.70		U-0.70		U-0.80	
Metal framing: all other ^c	U-0.45		U-0.45		U-0.65	
<i>Skylight with Curb, Glass, % of Roof</i>						
0% - 5.0%	U-0.67	0.36	U-0.67	0.36	U-1.98	NR
<i>Skylight with Curb, Plastic, % of Roof</i>						
0% - 5.0%	U-0.69	0.34	U-0.69	0.34	U-1.90	NR
<i>Skylight without Curb, All, % of Roof</i>						
0% - 5.0%	U-0.45	0.36	U-0.45	0.36	U-1.36	NR

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The following definitions apply: ci = continuous insulation, Ls = liner system, NR = no (insulation) requirement.

^a Mass walls with a heat capacity greater than 12 Btu/ft²·°F which are unfinished or finished only on the interior do not need to be insulated.

^b Nonmetal framing includes framing materials other than metal with or without metal reinforcing or cladding.

^c Metal framing includes metal framing with or without thermal break. The all other subcategory includes operable windows, fixed windows, and non-entrance doors.

^d See Section 5.5.1.(7) under Sentence 1.1.1.3.(2) of Chapter 2 of this Division.

^e Alternative combinations of insulation R-values are permitted provided the combinations are designed in accordance with "Normative Appendix A" of ANSI/ASHRAE/IESNA 90.1.

TABLE SB5.5-6 (See Appendix A.)
(Supersedes Table 5.5-6 in ANSI/ASHRAE/IESNA Standard 90.1)
Building Envelope Requirements for Climate Zone 6 (A, B) (I-P)

Opaque Elements	Nonresidential		Residential		Semiheated	
	Assembly Max. U	Insulation ^a ation Min. R-Value	Assembly Max. U	Insulation ^e Min. R-Value	Assembly Max. U	Insulation ^e Min. R-Value
<i>Roofs</i>						
Insulation Entirely above Deck	U-0.032	R-30.0 ci	U-0.032	R-30.0 ci	U-0.063	R-15.0 ci
Metal Building	U-0.031	R-25.0 + R-11.0 Ls	U-0.031	R-25.0 + R-11.0 Ls	U-0.068	R-13.0 + R- 19.0
Attic and Other	U-0.021	R-49.0	U-0.021	R-49.0	U-0.027	R-38.0
<i>Walls, Above Grade</i>						
Mass	U-0.071	R-15.2 ci	U-0.060	R-20.0 ci	U-0.104	R-9.5 ci
Metal Building	U-0.052	R-13.0 + R-13.0 ci	U-0.052	R-13.0 + R-13.0 ci	U-0.079	R-13.0 + R-6.5 ci
Steel Framed	U-0.055	R-13.0 + R-10.0 ci	U-0.055	R-13.0 + R-10.0 ci	U-0.084	R-13.0 + R-3.8 ci
Wood Framed and Other	U-0.045	R-13.0 + R-10.0 ci	U-0.045	R-13.0 + R-10.0 ci	U-0.064	R-13.0 + R-3.8 ci
<i>Wall, Below Grade</i>						
Below Grade Wall	C-0.092	R-10.0 ci	C-0.092	R-10.0 ci	C-0.119	R-7.5 ci
<i>Floors</i>						
Mass	U-0.057	R-14.6 ci	U-0.051	R-16.7 ci	U-0.107	R-6.3 ci
Steel Joist ^d	U-0.032	R-38.0	U-0.023	R-38.0 + R-12.5 ci	U-0.038	R-30.0
Wood Framed and Other ^d	U-0.026	R-30.0 + R-7.5 ci	U-0.026	R-30.0 + R-7.5 ci	U-0.033	R-30.0
<i>Slab-On-Grade Floors</i>						
Unheated	F-0.520	R-15.0 for 24 in.	F-0.510	R-20 for 24 in.	F-0.540	R-10.0 for 24 in.
Heated	F-0.440	R-15.0 for 36 in. + R-5.0 ci below	F-0.440	R-15.0 for 36 in. + R-5.0 ci below	F-0.900	R-10.0 for 24 in.
<i>Opaque Doors</i>						
Swinging	U-0.400		U-0.400		U-0.600	
Non-Swinging	U-0.400		U-0.400		U-0.500	
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Max. U	Assembly Max. SHGC
<i>Vertical Fenestration, 0% - 40% of Wall</i>						
Nonmetal framing: all ^b	U-0.25	0.40	U-0.25	0.40	U-0.45	NR
Metal framing: curtainwall / storefront ^c	U-0.35		U-0.35		U-0.50	
Metal framing: entrance door ^c	U-0.70		U-0.70		U-0.80	
Metal framing: all other ^c	U-0.45		U-0.45		U-0.55	
<i>Skylight with Curb, Glass, % of Roof</i>						
0% - 5.0%	U-0.67	0.46	U-0.67	0.46	U-1.98	NR
<i>Skylight with Curb, Plastic, % of Roof</i>						
0% - 5.0%	U-0.69	0.49	U-0.69	0.49	U-1.90	NR
<i>Skylight without Curb, All, % of Roof</i>						
0% - 5.0%	U-0.45	0.46	U-0.45	0.39	U-1.36	NR

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^a Mass walls with a heat capacity greater than 12 Btu/ft²·°F which are unfinished or finished only on the interior do not need to be insulated.

^b Nonmetal framing includes framing materials other than metal with or without metal reinforcing or cladding.

^c Metal framing includes metal framing with or without thermal break. The all other subcategory includes operable windows, fixed windows, and non-entrance doors.

^d See Section 5.5.1.(7) under Sentence 1.1.1.3.(2) of Chapter 2 of this Division.

^e Alternative combinations of insulation R-values are permitted provided the combinations are designed in accordance with "Normative Appendix A" of ANSI/ASHRAE/IESNA 90.1.

TABLE SB5.5-7 (See Appendix A.)
(Supersedes Table 5.5-7 in ANSI/ASHRAE/IESNA Standard 90.1)
Building Envelope Requirements for Climate Zone 7 (I-P)

Opaque Elements	Nonresidential		Residential		Semiheated	
	Assembly Max. U	Insulation ^e Min. R-Value	Assembly Max. U	Insulation ^e Min. R-Value	Assembly Max U	Insulation ^e Min. R-Value
<i>Roofs</i>						
Insulation Entirely above Deck	U-0.028	R-35.0 ci	U-0.028	R-35.0 ci	U-0.063	R-15.0 ci
Metal Building	U-0.029	R-30.0 + R-11.0 Ls	U-0.029	R-30.0 + R-11.0 Ls	U-0.068	R-13.0 + R-19.0
Attic and Other	U-0.017	R-60.0	U-0.017	R-60.0	U-0.027	R-38.0
<i>Walls, Above Grade</i>						
Mass	U-0.060	R-20.0 ci	U-0.060	R-20.0 ci	U-0.090	R-11.4 ci
Metal Building	U-0.052	R-13.0 + R-13.0 ci	U-0.039	R-13.0 + R-19.5 ci	U-0.079	R-13.0 + R-6.5 ci
Steel Framed	U-0.055	R-13.0 + R-10.0 ci	U-0.037	R-13.0 + R-18.8 ci	U-0.084	R-13.0 + R-3.8 ci
Wood Framed and Other	U-0.045	R-13.0 + R-10.0 ci	U-0.045	R-13.0 + R-10.0 ci	U-0.064	R-13.0 + R-3.8 ci
<i>Wall, Below Grade</i>						
Below Grade Wall	C-0.092	R-10.0 ci	C-0.075	R-12.5 ci	C-0.119	R-7.5 ci
<i>Floors</i>						
Mass	U-0.043	R-20.0 ci	U-0.043	R-20.0 ci	U-0.087	R-8.3 ci
Steel Joist ^d	U-0.032	R-38.0	U-0.023	R-38.0 + R-12.5 ci	U-0.038	R-30.0
Wood Framed and Other ^d	U-0.026	R-30.0 + R-7.5 ci	U-0.026	R-30.0 + R-7.5 ci	U-0.033	R-30.0
<i>Slab-On-Grade Floors</i>						
Unheated	F-0.300	R-15.0 for 24 in. + R-5.0 ci below	F-0.300	R-15.0 for 24 in. + R-5.0 ci below	F-0.540	R-10.0 for 24 in.
Heated	F-0.373	R-20.0 for 36 in. + R-5.0 ci below	F-0.373	R-20.0 for 36 in. + R-5.0 ci below	F-0.688	R-20.0 for 48 in.
<i>Opaque Doors</i>						
Swinging	U-0.400		U-0.400		U-0.600	
Non-Swinging	U-0.400		U-0.400		U-0.500	
Fenestration						
	Assembly Max. U	Assembly Max. SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Max. U	Assembly Max. SHGC
<i>Vertical Fenestration, 0% - 40% of Wall</i>						
Nonmetal framing: all ^b	U-0.25	0.45	U-0.25	NR	U-0.45	NR
Metal framing: curtainwall / storefront ^c	U-0.30		U-0.30		U-0.50	
Metal framing: entrance door ^c	U-0.70		U-0.70		U-0.80	
Metal framing: all other ^c	U-0.35		U-0.35		U-0.55	
<i>Skylight with Curb, Glass, % of Roof</i>						
0% - 5.0%	U-0.67	0.46	U-0.67	0.46	U-1.98	NR
<i>Skylight with Curb, Plastic, % of Roof</i>						
0% - 5.0%	U-0.69	0.50	U-0.69	0.50	U-1.90	NR
<i>Skylight without Curb, All, % of Roof</i>						
0% - 5.0%	U-0.45	0.46	U-0.45	0.46	U-1.36	NR

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The following definitions apply: ci = continuous insulation, Ls = liner system, NR = no (insulation) requirement.

^a Mass walls with a heat capacity greater than 12 Btu/ft²·°F which are unfinished or finished only on the interior do not need to be insulated.

^b Nonmetal framing includes framing materials other than metal with or without metal reinforcing or cladding.

^c Metal framing includes metal framing with or without thermal break. The all other subcategory includes operable windows, fixed windows, and non-entrance doors.

^d See Section 5.5.1.(7) under Sentence 1.1.1.3.(2) of Chapter 2 of this Division.

^e Alternative combinations of insulation R-values are permitted provided the combinations are designed in accordance with "Normative Appendix A" of ANSI/ASHRAE/IESNA 90.1.

(4) The *building* envelope trade-off option in Section 5.6 of ANSI/ASHRAE/IESNA Standard 90.1 shall not apply unless the procedure incorporates the modifications made to ANSI/ASHRAE/IESNA Standard 90.1 through this Chapter.

(5) Article 5.8.2.4.A. shall be added to Section 5.4.3. “Air Leakage” of ANSI/ASHRAE/IESNA Standard 90.1.

5.8.2.4.A. Alternative Standards to determine U-factor

(1) U-factors are permitted to be determined in accordance with CAN/CSA-A440.2 “Energy Performance Evaluation of Windows and Sliding Glass Doors.”

1.1.1.4. Heating Ventilation and Air Conditioning Equipment -Test Procedures

(1) Article 6.4.1.A. shall be added to Section 6 “Heating Ventilation and Air Conditioning Equipment” of ANSI/ASHRAE/IESNA Standard 90.1.

6.4.1.A. Testing procedures for Minimum Equipment Efficiency - Ontario Regulations

(1) Where the test procedure of equipment listed in Tables 6.8.1A to 6.8.1G of is regulated by an Ontario Regulation, compliance with the applicable test procedure listed in Column 5 of 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.

Table 6.4.1.A.2.
Acceptable Test Standards and Procedures for Heating, Ventilating and Air-Conditioning Equipment

Unitary Air Conditioners and Condensing Units, Electrically Operated				
Equipment Type	Size Category, Btu/h	Sub-Category or Rating Condition	Test Procedure U.S.	Test Procedure Ontario
Air Conditioners, Air Cooled	< 65,000	Split System and Single Package	AHRI 210 / 240	CSA C656
	≥ 65,000		AHRI 340 / 360	CSA C746
Through-the-Wall, Air Cooled	≤ 30,000	Split System and Single Package	AHRI 210 / 240	CSA C656
Small-Duct High-Velocity, Air Cooled	< 65,000	Split System	AHRI 210 / 240	CSA C656
Air Conditioners, Water and Evaporatively Cooled	≥ 65,000 and < 135,000	Split System and Single Package	AHRI 210 / 240	CSA C746
	≥ 135,000	Split System and Single Package	AHRI 340 / 360	CSA C746
Condensing Units, Air, Water or Evaporatively Cooled	≥ 135,000	N/A	AHRI 365	CSA C746
Unitary and Applied Heat Pumps, Electrically Operated				
Air Cooled, (Cooling Mode)	< 65,000	Split System and Single Package	AHRI 210 / 240	CSA C656
	≥ 65,000 and < 240,000		AHRI 340 / 360	CSA C746
Through-the-Wall (Air Cooled, Cooling Mode)	≤ 30,000	Split System and Single Package	AHRI 210 / 240	CSA C656
Small-Duct High-Velocity (Air Cooled, Cooling Mode)	< 65,000	Split System	AHRI 210 / 240	CSA C656
Water-Source (Cooling Mode)	< 17,000 and < 135,000	86°F Entering Water	ISO-13256-1	CAN/CSA-C13256-1
Groundwater Source (Cooling Mode)	< 135,000	59°F Entering Water	ISO-13256-1	CAN/CSA-C13256-1
Ground Source (Cooling Mode)	< 135,000	77°F Entering Water	ISO-13256-2	CAN/CSA-C13256-1
Air Cooled, (Heating Mode)	< 65,000 (Cooling Capacity)	Split System and Single Package	AHRI 210 / 240	CSA C656
	≥ 65,000 (Cooling Capacity)	47°F db/43°F wb (Outdoor Air)	AHRI 340 / 360	CSA C746
		17°F db/15°F wb (Outdoor Air)	AHRI 340 / 360	CSA C746
Through-the-Wall (Air Cooled, Heating Mode)	≤ 30,000 (Cooling Capacity)	Split System and Single Package	AHRI 210 / 240	CSA C656
Small-Duct High-Velocity (Air Cooled, Heating Mode)	< 65,000 (Cooling Capacity)	Split System	AHRI 210 / 240	CSA C656
Water-Source (Heating Mode)	< 135,000 (Cooling Capacity)	68°F Entering Water	ISO-13256-1	CAN/CSA-C13256-1
Groundwater Source (Heating Mode)	< 135,000 (Cooling Capacity)	50°F Entering Water	ISO-13256-1	CAN/CSA-C13256-1
Ground Source (Heating Mode)	< 135,000 (Cooling Capacity)	32°F Entering Water	ISO-13256-1	CAN/CSA-C13256-1
Column 1	2	3	4	5

Table 6.4.1.A.2. (Cont'd)
Acceptable Test Standards and Procedures for Heating, Ventilating and Air-Conditioning Equipment

Water Chilling Packages				
Equipment Type	Size Category, Btu/h	Sub-Category or Rating Condition	Test Procedure U.S.	Test Procedure Ontario
Air Cooled, With or Without Condenser, Electrically Operated	All Capacities	N/A	AHRI 550 / 590	CSA C743
Water Cooled, Electrically Operated, Positive Displacement (Reciprocating, Centrifugal, Rotary Screw and Scroll)	All Capacities	N/A	AHRI 550 / 590	CSA C743
Single Effect Absorption Air Cooled and Water Cooled	All Capacities	N/A	AHRI 560	CSA C743
Double Effect Absorption Indirect-Fired and Direct Fired	All Capacities	N/A	AHRI 560	CSA C743
Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Single-Package Vertical Air Conditioners, Single-Package Vertical Heat Pumps, Room Air Conditioners and Room Air Conditioner Heat Pumps, Electrically Operated				
PTAC (Cooling Mode) Standard Size and Non-standard Size	All Capacities	95°F db Outdoor Air	AHRI 310/380	CSA C744
PTHP (Cooling Mode) Standard Size and Non-standard Size	All Capacities	95°F db Outdoor Air	AHRI 310/380	CSA C744
PTHP (Heating Mode) Standard Size and Non-standard Size	All Capacities	N/A	AHRI 310/380	CSA C744
SPVAC / SPVHP (Cooling Mode)	All Capacities	95°F db/75°F wb Outdoor Air	AHRI 390	CSA C746
SPVHP (Heating Mode)	All Capacities	47°F db/ 43°F wb Outdoor Air	AHRI 390	CSA C746
Room Air Conditioners, With Louvered Sides	All Capacities	N/A	ANSI/AHAM RAC-1	CAN/CSA -C368.1 (C368.1 only applies to equip. < 36,000 Btu/h)
Room Air Conditioners, With Louvered Sides	≥ 14,000	N/A	ANSI/AHAM RAC-1	CAN/CSA -C368.1 (C368.1 only applies to equip. < 36,000 Btu/h)
Room Air Conditioners, Without Louvered Sides	All Capacities	N/A	ANSI/AHAM RAC-1	CAN/CSA -C368.1
Room Air Conditioner Heat Pumps With or Without Louvered Sides	All Capacities	N/A	ANSI/AHAM RAC-1	CAN/CSA -C368.1
Room Air Conditioner, Casement Only or Casement-Slider	All Capacities	N/A	ANSI/AHAM RAC-1	N/A
Column 1	2	3	4	5

Table 6.4.1.A.2. (Cont'd)
Acceptable Test Standards and Procedures for Heating, Ventilating and Air-Conditioning Equipment

Warm Air Furnaces and Combination Warm Air Furnaces/Air-Conditioning Units, Warm Air Duct Furnaces and Units Heaters				
Equipment Type	Size Category, Btu/h	Sub-Category or Rating Condition	Test Procedure U.S.	Test Procedure Ontario
Warm Air Furnace, Gas-Fired	< 225,000 (65.95 kW)	N/A	DOE 10 CFR Part 430 or ANSI Z21.47	CSA-P.2
	≥ 225,000 and < 400,000 (≥ 65.95 and < 117 kW)	Maximum Capacity	ANSI Z21.47	CAN/CGA-2.3
	≥ 400,000 (≥ 117 kW)	Maximum Capacity	ANSI Z21.47	CSA-P.8
Warm Air Furnace, Oil-Fired	< 225,000 (< 65.95 kW)	N/A	DOE 10 CFR Part 430 or UL 727	CAN/CSA-B212
	≥ 225,000	Maximum Capacity	UL 727	CSA B140.4
Warm Air Duct Furnaces, Gas-Fired	All Capacities	Maximum Capacity	ANSI Z83.9	CAN/CGA-2.8
Warm Air Unit Heaters, Gas-Fired	All Capacities	Maximum Capacity	ANSI Z83.8	CSA-P.11
Unit Heaters, Oil-Fired	All Capacities	Maximum Capacity	UL 731	CSA B140.4
Gas- and Oil-Fired Boilers				
Boilers, Gas-Fired	< 300,000	Hot Water Steam	DOE 10 CFR Part 430	CGA P.2
	≥ 300,000 and ≤ 2,500,000	Maximum Capacity	DOE 10 CFR Part 431	CGA 4.9
	> 2,500,000	Hot Water Steam	DOE 10 CFR Part 430	CGA 4.9
Boilers, Oil-Fired	< 300,000		DOE 10 CFR Part 430	CSA B212
	≥ 300,000 and ≤ 2,500,000	Maximum Capacity	DOE 10 CFR Part 431	CSA B140.7.2
	> 2,500,000	Hot Water Steam	DOE 10 CFR Part 431	CSA B140.7.2
Boilers, Oil-Fired (Residual)	≥ 300,000 and ≤ 2,500,000	Maximum Capacity	DOE 10 CFR Part 431	CSA B140.7.2
	> 2,500,000	Hot Water Steam	DOE 10 CFR Part 431	CSA B140.7.2
Cooling Towers				
Propeller or Axial Fans	All Capacities	95°/85°F entering/leaving 75°F wb Outdoor Air	CTI ATC-105	N/A
Centrifugal Fans Open-Circuit Cooling Towers	All Capacities	95°/85 °F entering/leaving 75 °F wb Outdoor Air	CTI ATC-105 and CTI STD-201	N/A
Propeller or Axial Fans Closed-Circuit Cooling Towers	All Capacities	102°F/90°F entering/leaving 75°F wb Outdoor Air	CTI ATC-1055 and CTI STD-201	N/A
Centrifugal Fans Closed-Circuit Cooling Towers	All Capacities	102°F/90°F entering/leaving 75°F wb Outdoor Air	CTI ATC-105S and CTI Std-201	N/A
Air Cooled Condensers	All Capacities	125°F Condensing Temp R-22 Test Fluid 190°F Entering Gas Temp 95°F Entering db 15°F Subcooling	AHRI 460	N/A
Column 1	2	3	4	5

Table 6.4.1.A.2. (Cont'd)
Acceptable Test Standards and Procedures for Heating, Ventilating and Air-Conditioning Equipment

Variable Refrigerant Flow Air Conditioners, Electrically Operated				
Equipment Type	Size Category, Btu/h	Sub-Category or Rating Condition	Test Procedure U.S.	Test Procedure Ontario
VRF Air Conditioners, Air Cooled	All Capacities	VRF Multi-Split System	AHRI 1230	N/A
Variable Refrigerant Flow Air-Air and Applied Heat Pumps, Electrically Operated				
VRF Air Cooled (Cooling Mode)	< 65,000	VRF Multi-Split	AHRI 1230	N/A
	All Capacities	VRF Multi-Split With/ Without Heat Recovery	AHRI 1230	N/A
VRF Water Source (Cooling Mode)	All Capacities	VRF Multi-Split With/ Without Heat Recovery 86°F Entering Water	AHRI 1230	N/A
VRF Groundwater Source (Cooling Mode)	All Capacities	VRF Multi-Split With/ Without Heat Recovery 59°F Entering Water	AHRI 1230	N/A
VRF Ground source (Cooling Mode)	All Capacities	VRF Multi-Split With/ Without Heat Recovery 77°F Entering Water	AHRI 1230	N/A
VRF Air Cooled (Heating Mode)	All Capacities	VRF Multi-Split	AHRI 1230	N/A
VRF Water Source (Heating Mode)	All Capacities	VRF Multi-Split 68°F Entering Water	AHRI 1230	N/A
VRF Groundwater Source (Heating Mode)	All Capacities	VRF Multi-Split 50°F Entering Water	AHRI 1230	N/A
VRF Ground Source (Heating Mode)	All Capacities	VRF Multi-Split 32°F Entering Water	AHRI 1230	N/A
Air Conditioners and Condensing Units Serving Computer Rooms				
Air Conditioners, Air Cooled	< 65,000	2.20 / 2.09	ANSI/ASHRAE 127	N/A
	≥ 65,000 and < 240,000	2.10 / 1.99		
	≥ 240,000	1.90 / 1.79		
Air Conditioners, Water Cooled	< 65,000	2.60 / 2.49	ANSI/ASHRAE 127	N/A
	≥ 65,000 and < 240,000	2.50 / 2.39		
	≥ 240,000	2.40 / 2.29		
Air Conditioners, Water Cooled with Fluid Economizer	< 65,000	2.55 / 2.44	ANSI/ASHRAE 127	N/A
	≥ 65,000 and < 240,000	2.45 / 2.34		
	≥ 240,000	2.35 / 2.24		
Air Conditioners, Glycol Cooled (Rated at 40% Propylene Glycol)	< 65,000	2.50 / 2.39	ANSI/ASHRAE 127	N/A
	≥ 65,000 and < 240,000	2.15 / 2.04		
	≥ 240,000	2.10 / 1.99		
Air Conditioners, Glycol Cooled (Rated at 40% Propylene Glycol) with Fluid Economizer	< 65,000	2.45 / 2.34	ANSI/ASHRAE 127	N/A
	≥ 65,000 and < 240,000	2.10 / 1.99		
	≥ 240,000	2.05 / 1.94		
Column 1	2	3	4	5

1.1.1.5. Service Water Heating Equipment - Test Procedures

(1) Article 7.4.2.A. shall be added to Section 7 “Service Water Heating Equipment ” of ANSI/ASHRAE/IESNA Standard 90.1.

7.4.2.A. Testing procedures for Minimum Equipment Efficiency - Ontario Regulations

(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.

Table 7.4.2.A.
Acceptable Test Standards and Procedures for Service Water Heating Equipment

Water Heating Equipment, Performance Requirements				
Equipment Type	Size Category	Sub-Category or Rating Condition	Test Procedure U.S.	Test Procedure Ontario
Electric Storage Water Heaters	≤ 12 kW	Resistance ≥ 20 gal	DOE 10 CFR Part 430	CSA C745
	> 12 kW	Resistance ≥ 20 gal	ANS Z21.10.3	CAN1-4.3
	≤ 24 Amps and ≤ 250 volts	Heat Pump	DOE 10 CFR Part 430	CSA C745
Gas Storage Water Heaters	≤ 75,000 Btu/h	≥ 20 gal (< 100 gal tank for CGA)	DOE 10 CFR Part 430	CSA P.3
	> 75,000 Btu/h	< 4,000 Btu/h/gal	ANSI Z21.10.3	CAN1-4.3
Gas Instantaneous Water Heaters	≤ 50,000 Btu/h and > 200,000 Btu/h	≥ 4,000 Btu/h/gal and > 2 gal	DOE 10 CFR Part 430	CSA P.7
	≥ 200,000 Btu/h	≥ 4,000 Btu/h/gal and ≥ 10 gal	ANSI Z21.10.3	CAN1-4.3
Oil Storage Water Heaters	≤ 105,000 Btu/h	≥ 20 gal	DOE 10 CFR Part 430	CSA B211
	> 105,000 Btu/h	< 4,000 Btu/h/gal	ANSI Z21.10.3	CAN1-4.3
Oil Instantaneous Water Heaters	≤ 210,000 Btu/h	≥ 4,000 Btu/h/gal and ≤ 2 gal	DOE 10 CFR Part 430	CSA B140.12
	> 210,000 Btu/h	≥ 4,000 Btu/h/gal and < 10 gal	ANSI Z21.10.3	CSA B140.12
Hot Water Supply Boilers, Gas and Oil	> 300,000 Btu/h & ≤ 12,500,000 Btu/h	≥ 4,000 Btu/h/gal and < 10 gal	ANSI Z21.10.3	N/A
Hot Water Supply Boilers, Gas or Oil	N/A	≥ 4,000 Btu/h/gal and ≥ 10 gal	ANSI Z21.10.3	N/A
Pool Heaters, Gas	All	N/A	ASHRAE 146	CGA P.6
Pool Heaters, Oil	All	N/A	ASHRAE 146	CSA B140.12
Unfired Storage Tanks	All	N/A	N/A	N/A
Column 1	2	3	4	5

(2) Article 7.4.5.2. of Section 7 “Service Water Heating Equipment” of ANSI/ASHRAE/IESNA Standard 90.1 shall be substituted with the following Article:

7.4.5.2 Pool Covers. Heated exterior public pools and public spas shall be equipped with pool covers.

Exception. Pools deriving over 60% of their energy for heating (computed over an annual operating season) from site-recovered or site-solar energy.

1.1.1.6. Lighting and Other Equipment

(1) Section 10.4.1.A. shall be added to Section 10 “Other Equipment” of ANSI/ASHRAE/IESNA Standard 90.1.

10.4.1.A Standards for Electric Motors

(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.

(2) 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.

(3) Electric motors shall comply with the appropriate minimum nominal efficiency requirements of Table 10.4.1.A.(a) or Table 10.4.1.A.(b).

Table 10.4.1.A (a)
Minimum Nominal Efficiency for Motors (Premium Efficiency 60 Hz Motors)

Rated Power		Open Motors			Enclosed Motors		
		Number of Poles			Number of Poles		
hp	(kW)	2	4	6	2	4	6
1	(0.75)	77.0	85.5	82.5	77.0	85.5	82.5
1.5	(1.1)	84.0	86.5	86.5	84.0	86.5	87.5
2	(1.5)	85.5	86.5	87.5	85.5	86.5	88.5
3	(2.2)	85.5	89.5	88.5	86.5	89.5	89.5
5	(3.7)	86.5	89.5	89.5	88.5	89.5	89.5
7.5	(5.5)	88.5	91.0	91.0	89.5	91.7	91.0
10	(7.5)	89.5	91.7	91.7	90.2	91.7	91.0
15	(11)	90.2	93.0	91.7	91.0	92.4	91.7
20	(15)	91	93.0	92.4	91.0	93.0	91.7
25	(18.5)	91.7	93.6	93.0	91.7	93.6	93.0
30	(22)	91.7	94.1	93.6	91.7	93.6	93.0
40	(30)	92.4	94.1	94.1	92.4	94.1	94.1
50	(37)	93.0	94.5	94.1	93.0	94.5	94.1
60	(45)	93.6	95.0	94.5	93.6	95.0	94.5
75	(55)	93.6	95.0	94.5	93.6	95.4	94.5
100	(75)	93.6	95.4	95.0	94.1	95.4	95.0
125	(90)	94.1	95.4	95.0	95.0	95.4	95.0
150	(110)	94.1	95.8	95.4	95.0	95.8	95.8
200	(150)	95.0	95.8	95.4	95.4	96.2	95.8
250	(185)	95.0	95.8	95.4	95.8	96.2	95.8
300	(225)	95.4	95.8	95.4	95.8	96.2	95.8
350	(260)	95.4	95.8	95.4	95.8	96.2	95.8
400	(300)	95.8	95.8	95.8	95.8	96.2	95.8
450	(340)	95.8	96.2	96.2	95.8	96.2	95.8
500	(375)	95.8	96.2	96.2	95.8	96.2	95.8
Column 1		2	3	4	5	6	7

Table 10.4.1.A.(b)
Minimum Nominal Efficiency for Motors (Energy Efficient 60 Hz Motors)

Rated Power		Open Motors				Enclosed Motors			
		Number of Poles				Number of Poles			
hp	(kW)	2	4	6	8	2	4	6	8
1	(0.75)	75.5	82.5	80.0	74.0	75.5	82.5	80.0	74
1.5	(1.1)	82.5	84.0	84.0	75.5	82.5	84.0	85.5	77
2	(1.5)	84.0	84.0	85.5	85.5	84.0	84.0	86.5	82.5
3	(2.2)	84.0	86.5	86.5	86.5	85.5	87.5	87.5	84
4	(3)	84.0	86.5	86.5	86.5	85.5	87.5	87.5	84
5	(3.7)	85.5	87.5	87.5	87.5	87.5	87.5	87.5	85.5
5.5	(4)	85.5	87.5	87.5	87.5	87.5	87.5	87.5	85.5
7.5	(5.5)	87.5	88.5	88.5	88.5	88.5	87.5	89.5	85.5
10	(7.5)	88.5	89.5	90.2	89.5	89.5	89.5	89.5	88.5
15	(11)	89.5	91.0	90.2	89.5	90.2	89.5	90.2	88.5
20	(15)	90.2	91.0	91.0	90.2	90.2	91.0	90.2	89.5
25	(18.5)	91.0	91.7	91.7	90.2	91.0	91.0	91.7	89.5
30	(22)	91.0	92.4	92.4	91.0	91.0	92.4	91.7	91
40	(30)	91.7	93.0	93.0	91.0	91.7	92.4	93.0	91
50	(37)	92.4	93.0	93.0	91.7	92.4	93.0	93.0	91.7
60	(45)	93.0	93.6	93.6	92.4	93.0	93.0	93.6	91.7
75	(55)	93.0	94.1	93.6	93.6	93.0	93.6	93.6	93
100	(75)	93.0	94.1	94.1	93.6	93.6	94.1	94.1	93
125	(90)	93.6	94.5	94.1	93.6	94.5	94.5	94.1	93.6
150	(110)	93.6	95.0	94.5	93.6	94.5	94.5	95.0	93.6
175	(132)	94.5	95.0	94.5	93.6	95.0	95.0	95.0	94.1
200	(150)	94.5	95.0	94.5	93.6	95.0	95.0	95.0	94.1
250	(185)	94.5	95.4	95.4	94.5	95.4	95.4	95.0	94.5
300	(225)	95.0	95.4	95.4		95.4	95.4	95.0	
350	(260)	95.0	95.4	95.4		95.4	95.4	95.0	
400	(300)	95.4	95.4			95.4	95.4		
450	(340)	95.8	95.8			95.4	95.4		
500	(375)	95.8	95.8			95.4	95.8		
Column 1		2	3	4	5	6	7	8	9

1.1.1.7. Energy Cost Method

(1) Sentence 11.2.3.A.(1) shall be added to Section 11.2. "Simulation General Requirements" of ANSI/ASHRAE/IESNA Standard 90.1

11.2.3.A. Rates for Energy Supplied Back to the Grid System.

(1) Where energy generated by an on-site renewable energy source is supplied back to the grid system, for the purpose of Section 11, Energy Cost Budget Method, the rates for the energy supplied back to the grid system shall be assumed to be equal to the rates paid for the same type of purchased energy from the grid system.

m₁₄ Division 4

Buildings of Non-Residential Occupancy Within the Scope of Part 9

(Applies to construction for which a permit has been applied for after December 31, 2011)

- Section 1.1. Buildings of Non-Residential Occupancy
- 1.1.1. Buildings of Non-Residential Occupancy

m₁₅ Division 4

Buildings of Non-Residential Occupancy Within the Scope of Part 9

Section 1.1. Buildings of Non-Residential Occupancy

1.1.1. Buildings of Non-Residential Occupancy

1.1.1.1. Application

(1) Except as provided in Sentences 2 and (3), this Division applies to the energy efficiency of *buildings* or parts of *buildings* where the *building*

- (a) is within the scope of Part 9 of Division B of the Building Code,
- (b) does not contain a *residential occupancy*,
- (c) does not use *electric space heating*, and
- (d) is intended for *occupancy* on a continuing basis during the winter months.

(2) Where the ratio of the gross area of fenestration to the gross area of peripheral wall measured from grade to the top of the most upper ceiling exceeds 40%, or the ratio of the gross skylight areas to gross ceiling area exceeds 5%, the *building* envelope shall comply with Article 1.1.2.1. of Chapter 1 of Division 3.

(3) *Buildings* are exempt from compliance with this Division where they meet the exemptions described in Article 1.2.1.1. of Chapter 1 of Division 3.

1.1.1.2. Building Envelope Requirements

(1) Except as permitted in Sentence (2), the exterior *building* envelope shall comply with the requirements of Table 1.1.1.2.

(2) Except for doors, the opaque surfaces shall comply with

- (a) minimum RSI value of the added insulation in framing cavities and continuous insulation required in Table 1.1.1.2., or
- (b) maximum overall thermal transmittance U-value for the entire assembly required in Table 1.1.1.2., where U-value is provided.

(3) Where the top of a *foundation* wall is less than 1 200 mm above the adjoining ground level, those portions of the *foundation* wall that are above ground may be insulated to the level required for the below grade portion of the *foundation* wall.

(4) Except for swinging glass doors, the minimum thermal resistance of doors that separate heated space from unheated space shall be not less than RSI 0.7 (R-4).

Table 1.1.1.2.
 Building Envelope Requirements Based on Degree-Day Zones⁽¹⁾ (SI)
 Forming Part of Sentences 1.1.1.2.(1) and (2)

Opaque Elements	Zone 1 Less Than 5000 Degree-Days		Zone 2 5000 or More Degree-Days	
	Assembly Max. U-Value ⁽¹⁾	Insulation Min. RSI-Value	Assembly Max. U-Value ⁽¹⁾	Insulation Min. RSI-Value
Roofs				
Without Attic Space-Insulation Above Deck	U-0.181	5.28 ci	U-0.158	6.16 ci
With Attic Space and Other	U-0.119	8.8	U-0.096	10.56
Walls, Above Grade				
Above Grade Walls	U-0.312	2.28 + 1.76 ci	U-0.312	2.28 + 1.76 ci
Wall, Below Grade				
Below Grade Wall	C-0.522 ⁽²⁾	1.76 ci	C-0.522 ⁽²⁾	1.76 ci
Exposed Floors				
Lightweight framing	U-0.181	6.69 ⁽³⁾	U-0.181	6.69 ⁽³⁾
Mass	U-0.323	2.57 ci	U-0.244	3.52 ci
Slab-On-Grade Floors (perimeter+below slab)				
Unheated		2.64 for 600 mm		2.64 for 600 mm + 0.88 ci below
Heated		2.64 for 900 mm + 0.88 ci below		3.52 for 900 mm + 0.88 ci below
Fenestration	Assembly Max. U-Value⁽¹⁾	Assembly Max. SHGC	Assembly Max. U-Value⁽¹⁾	Assembly Max. SHGC
Vertical Fenestration, 0% - 40% of Wall				
Windows	U-1.987	0.40	U-1.703	0.45
Skylight with Curb, % of Roof				
0% - 5.0%	U-3.917	0.49	U-3.917	0.50
Skylight without curb, % of Roof				
0% - 5.0%	U-2.555	0.46	U-2.555	0.46

Notes to Table 1.1.1.2.:

The following definitions apply: ci = continuous insulation

- (1) The overall thermal transmittance value of the entire assembly, includes air films.
- (2) C-Value is overall thermal conductance of the assembly but it does not include soil or air films.
- (3) Where the floor framing depth is 254 mm or less, the insulation is permitted to meet a minimum RSI-Value of 5.28.

Table 1.1.1.2.
 Building Envelope Requirements Based on Degree-Day Zones⁽¹⁾ (I-P)
 Forming Part of Sentences 1.1.1.2.(1) and (2)

Opaque Elements	Zone 1 Less Than 5000 Degree-Days		Zone 2 5000 or More Degree-Days	
	Assembly Max. U-Value ⁽¹⁾	Insulation Min. R-Value	Assembly Max. U-Value ⁽¹⁾	Insulation Min. R-Value
Roofs				
Without Attic Space-Insulation Above Deck	U-0.032	R-30.0 ci	U-0.028	R-35.0 ci
With Attic Space and Other	U-0.021	R-50.0	U-0.017	R-60.0
Walls, Above Grade				
Above Grade Walls	U-0.055	R-13.0 + R-10.0 ci	U-0.055	R-13.0 + R-10.0 ci
Wall, Below Grade				
Below Grade Wall	C-0.092 ⁽²⁾	R-10.0 ci	C-0.092 ⁽²⁾	R-10.0 ci
Exposed Floors				
Lightweight framing	U-0.032	R-38.0 ⁽³⁾	U-0.032	R-38.0 ⁽³⁾
Mass	U-0.057	R-14.6 ci	U-0.043	R-20 ci
Slab-On-Grade Floors (perimeter+below slab)				
Unheated		R-15 for 24 in.		R-15 for 24 in. + R-5 ci below
Heated		R-15.0 for 36 in. + R-5 ci below		R-20.0 for 36 in. + R-5 ci below
Fenestration	Assembly Max. U-Value⁽¹⁾	Assembly Max. SHGC	Assembly Max. U-Value⁽¹⁾	Assembly Max. SHGC
Vertical Fenestration, 0%-40% of Wall				
Windows	U-0.35	0.40	U-0.30	0.45
Skylight with Curb, % of Roof				
0%-5.0%	U-0.69	0.49	U-0.69	0.50
Skylight without curb, % of Roof				
0%-5.0%	U-0.45	0.46	U-0.45	0.46

Notes to Table 1.1.1.2.:

The following definitions apply: ci = continuous insulation

- (1) The overall thermal transmittance value of the entire assembly, includes air films.
- (2) C-Value is overall thermal conductance of the assembly but it does not include soil or air films.
- (3) Where the floor framing depth is 10 inches or less, the insulation is permitted to meet a minimum R-Value of R-30.

1.1.1.3. Air Infiltration

(1) Where a *building* component or assembly separates interior conditioned space from exterior space, interior space from ground or environmentally dissimilar interior spaces, the component or assembly shall contain an *air barrier* system conforming to the applicable requirements of Part 5 or Section 9.25. of Division B of the Building Code.

1.1.1.4. Heating, Ventilating and Air-Conditioning

(1) A heating, ventilating and *air-conditioning* system that serves more than one heating, ventilating and *air-conditioning* zone shall conform to Article 1.1.2.1. of Chapter 1 of Division 3 of this Standard.

(2) Sentences (3) to (11) and Article 1.1.1.5. apply to a heating, ventilating and *air-conditioning* system that serves a single heating, ventilating and *air-conditioning* zone.

(3) Heating, ventilating and *air-conditioning* equipment shall conform to the minimum effective values required by Clause 1.1.2.1.(1)(c) of Chapter 1 of Division 3 of this Standard.

(4) An *air-conditioning* system with a cooling capacity of 40 kW or more shall have an economizer,

(a) controlled by appropriate high limit shut-off control, and

(b) equipped with either barometric or powered relief sized to prevent excess pressurization of the *building*.

(5) Outdoor air dampers for economizer use shall be provided with blade and jamb seals.

(6) A heat recovery ventilator with a recovery effectiveness of 50% or more at the outside winter design temperature shall be provided where the quantity of the outdoor air supplied to the air duct distribution system is,

(a) more than 1 400 L/s, and

(b) more than 70% of the supply air quantity of the system.

(7) Where a heat recovery ventilator is installed, the system shall have provisions to bypass or control the heat recovery ventilator to permit operation of the air economizer.

(8) A heating, ventilating and *air-conditioning* system shall be controlled by a manual changeover or dual setpoint thermostat.

(9) Except for a system requiring continuous operation, a heating, ventilating and *air-conditioning* system that has a cooling or heating capacity greater than 4.4 kW and a supply fan motor rated for more than 0.5 kW shall be provided with a time clock that,

(a) is capable of starting and stopping the system under different schedules for seven different day-types per week,

(b) is capable of retaining programming and time setting during a loss of power for a period of 10 hours or more,

(c) includes an accessible manual override that allows temporary operation of the system for up to two hours,

(d) is capable of temperature setback down to 13°C during off-hours, and

(e) is capable of temperature setup to 32°C during off-hours.

(10) Where separate heating and cooling equipment serves the same temperature zone, thermostats shall be interlocked to prevent simultaneous heating and cooling.

(11) A heating, ventilating and *air-conditioning* system with a design supply air capacity greater than 5000 L/s shall have optimum start controls.

1.1.1.5. Ducts, Plenums and Piping

- (1) A duct or a plenum that is not protected by an insulated exterior wall or that is exposed to an unheated space shall be
- sealed to a Class A seal level in accordance with the SMACNA, “HVAC Duct Construction Standards - Metal and Flexible”, to minimize air leakage, and
 - insulated to provide a thermal resistance of not less than RSI 1.4.
- (2) A supply or *exhaust duct* or *plenum* that is located in a *conditioned space* shall be sealed to a Class C seal level in accordance with the SMACNA, “HVAC Duct Construction Standards - Metal and Flexible”, to minimize air leakage.
- (3) Except for piping within prefabricated equipment, piping used for steam, hot water heating or cooling shall be insulated in accordance with Table 1.1.1.5.

Table 1.1.1.5.
Minimum Thickness of Pipe Insulation⁽¹⁾
Forming Part of Sentences 1.1.1.5.(3) and 1.1.1.6.(2)

Use of Pipe	Nominal Pipe Size Not More than 40 mm	Nominal Pipe Size More than 40 mm
	Minimum Pipe Insulation Thickness, mm	Minimum Pipe Insulation Thickness, mm
Steam	40	65
Hot water heating	40	50
Domestic hot water	25	50
Cooling	12	25
Column 1	2	3

Notes to Table 1.1.1.5.:

- (1) Insulation material shall have a thermal conductivity of not more than 0.42 W/ m•°C.
- (4) Insulation exposed to weather shall be protected by a covering such as aluminum, sheet metal, painted canvas or plastic.
- (5) An *exhaust duct* with a design capacity of more than 140 L/s on a heating, ventilating and *air-conditioning* system that does not operate continuously shall be equipped with a gravity or motorized damper that will automatically shut when the system is not in operation.
- (6) An air duct distribution system shall be balanced in the following sequence:
- Minimize throttling losses.
 - If the fan is rated for more than 0.75 kW, adjust the fan speed to meet design flow conditions.
- (7) A hydronic system shall be proportionately balanced to minimize throttling losses.

1.1.1.6. Service Water Heating

- (1) Water heating equipment used solely for heating *potable* water and hot water storage tanks shall meet the minimum efficiency values required by Clause 1.1.2.1.(1)(c) of Chapter 1 of Division 3 of this Standard.

- (2) Domestic hot water heating piping shall be insulated in accordance with Table 1.1.1.5. if it is,
 - (a) recirculating system piping,
 - (b) located within the first 2.5 m of outlet piping in a constant temperature non-recirculating storage system,
 - (c) an inlet pipe located between the storage tank and a heat trap in a non-recirculating storage system, or
 - (d) a pipe that is externally heated by methods such as a heat trace or impedance heating.
- (3) A hot water storage tank shall be provided with a temperature control to permit adjustment of the water storage temperature.
- (4) An automatic time switch or other control that can be set to switch off the usage temperature maintenance system during extended periods when hot water is not required shall be installed in a domestic hot water system that is designed to maintain usage temperatures in hot water pipes such as recirculating hot water systems or heat trace.
- (5) If a recirculating pump is used to maintain storage tank water temperature, the pump shall be equipped with a control to limit its operation to a period from the start of the heating cycle to a maximum of five minutes after the end of the heating cycle.
- (6) In a washroom located in a public facility, a device shall be provided to control the maximum temperature of water delivered from a lavatory faucets to not more than 43°C.
- (7) A vertical pipe riser that serves a storage water heater or a storage tank shall have heat traps on both the inlet and outlet piping as close as practical to the tank if,
 - (a) the riser is in a non-recirculating system, and
 - (b) the storage water heater or the storage tank does not have integral heat traps.
- (8) A system that provides both space heating and domestic water heating shall conform to the minimum efficiency values required by Clause 1.1.2.1.(1)(c) of Chapter 1 of Division 3 of this Standard.

1.1.1.7. Lighting

- (1) Except as provided in Sentence (2), Articles 1.1.1.8. to 1.1.1.11. apply to,
 - (a) interior spaces of a *building*,
 - (b) exterior *building* features, including facades, illuminated roofs, architectural features, entrances, exits, loading docks and illuminated canopies, and
 - (c) exterior *building* ground lighting provided through the *building's* electrical service.
- (2) Articles 1.1.1.8. to 1.1.1.11. do not apply to emergency lighting that is automatically turned off during the normal use of the *building*.
- (3) Except as provided in Sentence (4), luminaires designed for use with one or three linear fluorescent lamps greater than 30 W each shall use two-lamp tandem-wired ballasts in place of single-lamp ballasts when two or more luminaires are in the same space and on the same control device.
- (4) The tandem wiring required by Sentence (3) is not required for,
 - (a) recessed luminaires located more than 3 m apart, measured centre to centre,
 - (b) surface mounted or pendant luminaires that are not continuous,
 - (c) luminaires that use single-lamp high-frequency electronic ballasts,
 - (d) luminaires that use three-lamp high-frequency electronic or three-lamp electromagnetic ballasts, and
 - (e) luminaires on emergency circuits.

1.1.1.8. Interior Lighting

- (1) The interior lighting power allowance for a *building* is the sum of the lighting power allowances, in watts, of all building area types and shall include all permanently installed general, task and furniture lighting systems and luminaires.
- (2) The interior lighting power allowance shall be determined by multiplying the lighting power density given in Table 1.1.1.8. by the gross lighted areas of the building area type.

Table 1.1.1.8.
Interior Lighting Power Densities
Forming Part of Sentence 1.1.1.8.(2)

Building Area Type	Lighting Power Density, W/m ²
Automotive Facility	8.8
Fast Food	10
Dormitory	6.6
Health Care Clinic	9.4
Manufacturing Facility	12
Office	10
Parking Garage	3
Police Station without detention quarters / Fire Station	10
Post Office	9.4
Retail	15
Transportation	8.3
Warehouse	7
Workshop	13
Column 1	2

- (3) The installed interior lighting power shall not exceed the interior lighting power allowance.
- (4) Except as provided in Sentence (5), the installed interior lighting power shall include all power used by luminaires, including lamps, ballasts, current regulators, and control devices.
- (5) The following lighting equipment and applications shall not be considered when determining the installed interior lighting power or the interior lighting power allowance:
- lighting that is integral to equipment or instrumentation and is installed by its manufacturer,
 - lighting specifically designed for use only during medical or dental procedures and lighting integral to medical equipment,
 - lighting that is integral to both open and glass-enclosed refrigerator and freezer cases,
 - lighting that is integral to food warming and food preparation equipment,
 - lighting for plant growth or maintenance,

- (f) lighting in spaces specifically designed for use by visually impaired persons,
 - (g) lighting in retail display windows if the display area is enclosed by ceiling-height partitions,
 - (h) lighting in interior spaces that have been specifically designated as a *heritage building*,
 - (i) lighting that is an integral part of advertising or directional signage,
 - (j) *exit* signs,
 - (k) lighting that is displayed for sale, and
 - (l) educational lighting demonstration systems.
- (6) Trade-offs among *building* area types are permitted provided that the total installed interior lighting power does not exceed the interior lighting power allowance.

1.1.1.9. Interior Lighting Controls

- (1) Except as provided by Sentence (2), interior lighting in a *building* that exceeds 500 m² in *building area* shall be controlled with an automatic control device to shut off *building* lighting in all spaces.
- (2) Sentence (1) does not apply to,
- (a) lighting intended for 24-hour operation,
 - (b) emergency lighting, or
 - (c) lighting for spaces where an automatic shut-off would endanger safety or security.
- (3) The automatic control device required in Sentence (1) shall operate on,
- (a) a scheduled basis using a time-of-day operated control device that turns lighting off at specific programmed times,
 - (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.
- (4) Where the automatic control device conforms to Clause (3)(a), an independent program schedule shall be provided for each floor.
- (5) Each space enclosed by *partitions* that extend to the ceiling shall have at least one control device to independently control the general lighting within the space.
- (6) Each manual operated control device shall be readily accessible and located so the occupants can see the controlled lighting.
- (7) Except as required by Sentences (8) and (9) and except for reasons of safety or security, an individual control device shall,
- (a) be capable of being activated,
 - (i) either manually, or
 - (ii) automatically by sensing an occupant,
 - (b) control a floor area having an area not more than 240 m², and
 - (c) be capable of overriding at any time of-day scheduled shutoff control for not more than 4 h.
- (8) Except in spaces with multi-scene control, a control device that automatically turns lighting off within 30 minutes of all occupants leaving a space shall be provided in,
- (a) conference rooms,
 - (b) meeting rooms, and
 - (c) employee lunch and break rooms.
- (9) A separate control device shall control,
- (a) display lighting,
 - (b) accent lighting,

- (c) case lighting,
- (d) task lighting,
- (e) non-visual lighting, and
- (f) demonstration lighting.

1.1.1.10. Exterior Lighting

- (1) Except as provided in Sentence (2), this Article applies to exterior areas conforming to Sentence 1.1.1.7.(1).
- (2) If the lighting is equipped with a control device independent of the control of other lighting, Sentence (1) does not apply to,
- (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) temporary lighting,
 - (e) lighting for industrial production, material handling, transportation sites, and associated storage areas, and
 - (f) lighting used to highlight features of public monuments and *heritage buildings*.
- (3) The exterior lighting power allowance for the exterior areas appurtenant to a *building* shall be determined by multiplying the lighting power density given in Table 1.1.1.10. by the areas or lengths of lighted exterior spaces.

Table 1.1.1.10.
Exterior Lighting Power Densities
Forming Part of Sentence 1.1.1.10.(3)

Exterior Area	Lighting Power Density
Uncovered parking lots and drives	1.0 W/m ²
Walkways less than 3 m wide	2.6 W/linear m
Walkways 3 m or greater, plaza areas, special feature areas	1.7 W/m ²
Stairways	10.8 W/m ²
Building main entries	98 W/linear m of door width
Other doors	66 W/linear m of door width
Canopies (free standing and attached and overhangs)	8.6 W/m ²
Outdoor sales open areas (including vehicle sale lots)	5.4 W/m ²
Street frontage for vehicle sales lots in addition to "open area" allowance	33 W/linear m
Building facades	1.6 W/m ² for each illuminated wall or surface or 12.3 W/linear m for each illuminated wall or surface length
Automated teller machines and night depositories	270 W per location plus 90 W per additional ATM per location
Entrances and gatehouse inspection stations at guarded facilities	8.0 W/m ² of uncovered area
Loading areas for law enforcement and emergency service vehicles	5.4 W/m ² of uncovered area
Drive-up windows	400 W per drive-through
Parking near 24-hour retail entrances	800 W per main entry
Column 1	2

- (4) The total exterior lighting power allowance for the exterior areas appurtenant to a *building* is the sum of the individual power allowances determined from Sentence (3) plus an additional unrestricted allowance of 5% of that sum.
- (5) The installed exterior lighting power shall not exceed the exterior lighting power allowance.
- (6) All exterior building grounds luminaires that operate at greater than 100 watts shall contain lamps having a minimum efficacy of 60 lm/W unless the luminaire is controlled by a motion sensor.

1.1.1.11. Exterior Lighting Controls

- (1) Except as provided in Sentence (2), lighting for exterior applications shall have automatic controls capable of turning off exterior lighting when,
 - (a) sufficient daylight is available, or
 - (b) the lighting is not required during night time hours.
- (2) Sentence (1) does not apply to,
 - (a) lighting for covered vehicle entrances or exits from a *building*,
 - (b) parking structures, and
 - (c) where required for safety, security, or eye adaptation.
- (3) Lighting designated for dusk-to-dawn operation shall be controlled by a time switch or photosensor.
- (4) Lighting not designated for dusk-to-dawn operation shall be controlled by a time switch.

1.1.1.12. Electric Motors

- (1) Electric motor shall conform to the efficiency levels required in Chapter 2 of Division 3.

Appendix A

Division 3

Chapter 1

A-1.1.3.1.(2) Equipment Tested to Alternative Canadian Standards.

Where the energy efficiency of a building is designed in conformance with Clause 1.1.2.1.(1)(b), the designer is permitted to comply with any provision in Chapter 2 in lieu of the corresponding requirement in ANSI/ASHRAE/IESNA 90.1. For example, equipment tested to only Canadian standards listed in Chapter 2 are permitted to be used in conjunction with Sentence 1.1.2.1.(1)(b).

Chapter 1

A-Tables SB5.5-5 to SB5.5-7

Building envelope Tables 5.5-5 to 5.5-7 in this Chapter are based on building envelope Tables A-5 to A-7 in ANSI/ASHRAE/USGBC/IES Standard 189.1-2009 which supersede building envelope Tables 5.5-5 to 5.5-7 in ANSI/ASHRAE/IESNA 90.1-2010.

Envelope assemblies are required to meet either the maximum U-factor or the contain insulation that meets the minimum R-Values specified in the Tables. Where R-Values or combination of R-Values are specified, alternative R-Value combinations are permitted to address variations in R-Value of insulation products.

