

## OBC SB-10 Energy Efficiency Requirements – Prescriptive Compliance

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### Summary

This Practice Tip focuses on the prescriptive paths and trade-off options for compliance to the energy efficiency requirements for Part 3 Buildings and for Part 9 Non-residential buildings in the 2024 edition of the Ontario Building Code (OBC).

To determine the appropriate compliance path, the pertinent project information must first be gathered.

1. Assemble project geometry. Information gathered will vary with the intentions of the analysis. For demonstrating compliance with SB-10, the information that needs to be reported must follow the requirements of the standard being applied:
  - gross roof area;
  - gross skylight area;
  - gross wall area by elevation;
  - gross window and door area by elevation (record doors separately);
  - gross wall area below grade;
  - gross slab on grade area (airtightness); and
  - gross area within 1.2 m of the foundation perimeter (heat loss).
2. Identify the relevant climate zone for the project location. Review SB-10 Division 3 Chapter 1 Article 1.3.1.1. for instructions on identifying the correct climate zone. Note that OBC SB-10 requires using the enclosure thermal values for Climate Zone 7 when buildings are heated by electricity, including air-source heat pumps.

For the prescriptive compliance path, the performance values of each element identified above must meet or exceed the reference values. Where they do not, the trade-off path must be used. In some cases, elements are permitted to be less thermally effective than the reference value if the area of those elements is below a threshold. In general, the analysis should start with the following suggested procedure:

- Confirm the client requirements and objectives.
- Review the energy efficiency standard the project is implementing paying attention to mandatory conditions.
- Identify the reference conditions and requirements for roofs, walls, windows and doors, exposed floors, foundation walls, and slabs on grade.
- Review the standard with consultants to identify project performance targets and the representation of the reference building in the energy efficiency standard selected.
- Align the approach to the building envelope with the assumptions of the mechanical and electrical consultants. Begin coordination at the outline specification or design brief stage. This alignment will pay specific attention to equipment controls.
- Identify the appropriate compliance path for the project. Identify where trade-off approaches may be needed.

# Background

The requirements of SB-10 address:

- new buildings and additions to existing buildings within the scope of OBC Part 3; and
- non-residential building within the scope of Part 9.

The energy efficiency requirements for renovations in existing buildings are covered in OBC Parts 10 & 11.

As of January 01, 2025 designers have three reference standards with which to demonstrate compliance for Part 3 buildings:

<ul style="list-style-type: none"><li>• American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) 90.1-2013 , Energy Standard for Buildings except Low-Rise Residential Buildings + OBC SB-10 Division 3, Chapter 2</li></ul>	prescriptive, trade-off, and performance options
<ul style="list-style-type: none"><li>• 2015 National Energy Code for Buildings (NECB) + OBC SB-10 Division 3, Chapter 3</li></ul>	prescriptive, trade-off, and performance options
<ul style="list-style-type: none"><li>• ASHRAE 189.1-2014, Standard for the Design of High Performance, Green Buildings, as modified by OBC SB-10 Division 3 Chapter 1 article 1.1.2.1.(1)(c).</li></ul>	prescriptive and performance options

- For non-residential buildings within the scope of Part 9, Division 5 offers a prescriptive path similar to Division 3's Chapters 2 and 3.
- Greenhouse gas (GHG) emissions in the form of carbon dioxide equivalents (CO<sub>2e</sub>) are regulated by SB-10. Buildings complying with the prescriptive requirements of SB-10 will meet these requirements.

OBC SB-10 includes specific changes and additional requirements to the commonly used energy efficiency codes and standards to reflect the priorities of the Ontario government. It names three standards with which to demonstrate compliance to OBC 2024, but focuses on ASHRAE 90.1-2013 and the 2015 NECB.

ASHRAE 189.1 was developed to set certification requirements for the Leadership in Energy and Environmental Design (LEED) building rating program in code-enforceable language. Not commonly employed, it remains available for those wanting to use it, such as those pursuing LEED certification. Review SB-10 Division 3, Chapter 1 clause 1.1.2.1.(1)(c) for the limitations on ASHRAE 189.1-2014.

Certificate of practice (CoP) holders will naturally focus on the building envelope provisions of SB-10, but they should be conversant with the mechanical and electrical requirements for their design. Consultants will be required to comment on:

- the prescriptive code compliance of lighting and lighting controls;
- mechanical system mandatory requirements and equipment efficiencies;
- the mandatory requirements and equipment efficiency of domestic hot water supply systems; and
- the mandatory requirements of electrical power systems and equipment.

Discussions of strategies for compliance should be started at the outline specification or design brief stage. Consultants should be asked to complete the parts of the SB-10 submission relevant to their disciplines.

The OBC 2024 version of Supplementary Standard SB-10 has not been changed from the version in effect as of January 1, 2017, except for the removal of references to construction prior to December 31, 2016. Its modifications apply to the prescriptive paths of ASHRAE 90.1 and 2015 NECB with the mandatory conditions of those documents remaining in effect unless explicitly identified and modified. For projects that cannot or do not wish to follow the prescriptive paths of the documents referenced, the trade-off and performance paths remain available.

SB-10 focuses on the changes and additional requirements to ASHRAE 90.1 and 2015 NECB and does not present the entire content of those documents. For example, for identifying the allowable level of exterior lighting power SB-10 provides definitions of allowable building and landscape lighting power densities but

does not change or present the lighting zones used to determine the general exterior lighting allowances. Users need to be familiar with the efficiency standard they are using to complete the SB-10 calculations.

## Organization of SB-10

Like other OBC Supplementary Standards, SB-10 is organized in Divisions and Chapters:

Division 1 General

Division 2 Reserved

Division 3 Energy Efficiency Design

- Chapter 1 General
- Chapter 2 Additional Requirements to 2013 ANSI/ASHRAE/IES 90.1
- Chapter 3 Additional Requirements to the 2015 NECB

Division 4 Reserved

Division 5 Buildings of Non-Residential Occupancy within the Scope of Part 9

### Division 3, Chapter 2: Additional Requirements to 2013 ANSI/ASHRAE/IES 90.1

Since its first publication in 1975, ASHRAE 90.1 has been the most widely used energy conservation standard in North America. Ontario began referencing the standard in the 1990's. In 2011, the province introduced SB-10 to define requirements for building energy efficiency.

To use the prescriptive compliance option:

- Review ASHRAE 90.1-2013. General guidance on using ASHRAE 90.1 is in Chapters 1 to 4. Chapter 5, Building Envelope, contains the requirements for envelope compliance including the mandatory provisions. It is largely for this chapter that SB-10 Division 3, Chapter 2 includes changes and additional requirements to suit Ontario's priorities. Section 5.6 and Appendix C describe the method for trading between building elements.
- ASHRAE 90.1 limits use of the prescriptive compliance path to projects with fenestration-and-door-to-wall ratio less than or equal to 40% of the vertical envelope area. The amount of glazing may be increased by using higher performance glazing provided the product of the Area and U value in the design building is less than that of the code compliant building, or by using the ASHRAE 90.1 trade-off path described in Section 5.6 as modified by the requirements of OBC SB-10.
- COMCheck is accepted as a tool to demonstrate envelope, lighting, and mechanical system trade-off compliance, and may have some credibility advantages over a simple spreadsheet. It was developed by the US Dept. of Energy Pacific Northwest National Laboratory, and has incorporated OBC SB-10 post 2017, which is current in SB-10 2024. It includes the weather sites presented in OBC 2024 Supplementary Standard SB-1. It is available to use free of charge as a desktop download or a web tool. Inputs to COMCheck for the Mechanical and Lighting sections should be verified by the appropriate consultants.
- Building orientation is an important and at times restrictive consideration. ASHRAE 90.1 limits the amount of glazing on each of the west & east facades to 25% of the total fenestration. There are several exemptions to the orientation restrictions, notably shading from nearby structures and landscape, which may affect your project. Neither SB-10 nor ASHRAE 90.1 include caveats regarding the orientation of the main entrance. Review ASHRAE 90.1 Sub-Section 5.5.4.
- Select the requirements for building envelope components from tables SB5.5-5-2017 to SB5.5-7-2017 appropriate to the space conditioning category - Non-residential, Residential and Semi-heated. You may use either U, C, and F values for complete assemblies or RSI (R) nominal values of the insulation within an assembly with RSI<sub>ci</sub> for continuous insulation.

- SB-10 does not require reporting of all thermal bridges. Thermal bridging arising from brick ties and flashing are not reported. Intermediate structural connections for shelf angles or structural projections through the continuous insulation are not reported if less than 2% of the wall or roof area. Refer to SB-10 Division 3, Chapter 2, Article 1.1.1.4. which adds 5.5.3.7. & 5.5.3.8. to ASHRAE 90.1.
- The maximum permissible U-values for fenestration are for the complete assembly. The thermal conductivity may be higher through the frames than through the centre of the glass (CoG). This results, especially with aluminum framing, in a higher system U-value than is represented by the CoG value only. It is the system U-value that is used to assess code compliance. The maximum solar heat gain coefficient (SHGC) for fenestration is listed in the SB-10 tables. SHGC is affected by frame profile and the whole window SHGC will be less than the CoG value. Consult with the manufacturer to determine the system SHGC value. Shading devices or overhangs can significantly reduce SHGC. To determine the reduction, ASHRAE 90.1 provides tables in Appendix A.
- The minimum visible light transmission (VT) to SHGC ratio for fenestration is included in the tables. This requirement recognizes the value of daylighting to energy conservation.
- ASHRAE 90.1 permits simple weighted averaging for multiple assemblies within a single *class of construction*, within the same *space conditioning category*. For example, you may use the weighted average U-value for steel-framed walls and compensate for higher U-values in curtain wall spandrels by decreasing the U-value of other steel framed walls. ASHRAE 90.1 requires the use of energy modelling software to determine the trade-off values.
- Record the U, C, F or RSI-values for all opaque envelope elements and the U, SHGC and VT/SHGC ratio for fenestration. It is recommended these values be shared with all members of the project team.
- Note that SB-10 Division 3 Chapter 2 1.1.5.(1) requires buildings with electric space heating (including air source heat pumps) to use the enclosure requirements given in Table SB 5.5-6-2017 for Climate Zone 7.
- Refer to Practice Tip PT.19 ANSI/ASHRAE/IES 90.1-2013 – An Overview of the Energy Standard.

### **Division 3, Chapter 3: Additional Requirements to the 2015 NECB**

NECB 2015 + Chapter 3 performance requirements are generally higher than ASHRAE 90.1 2013 + Chapter 2. NECB does not include sub-classes of construction. Walls, roofs, floors and fenestration within a zone each have the same required value. NECB does not distinguish between space conditioning categories although some reduction in the requirements for semi-heated spaces is offered by reducing the HDD18 to HDD15. NECB + Chapter 3 offers a much simpler trade-off option than ASHRAE 90.1 + Chapter 2.

To use the prescriptive compliance option, the procedure is similar to the process for ASHRAE 90.1 + Chapter 2:

- Select the appropriate building envelope component values for your zone from the tables in SB-10 Division 3, Chapter 3. OBC SB-10 requires reduced thermal transmittance where electric heat is used. SHGC of fenestration is included to be more in line with SB-10 Division 3, Chapter 2 requirements.
- With the prescriptive path, glazing is limited to a maximum of 40% for locations with HDD18 < 4000. The allowable area decreases linearly to 20% with increased HDD18.
- NECB Part 3 allows simple area weighted averaging within envelope elements. Unlike ASHRAE 90.1 NECB offers two straight-forward trade off paths—simple and detailed.
- The simple trade-off permits trading within vertical elements and within horizontal elements. You cannot trade between vertical and horizontal elements. With this method, the designer may increase

the FDWR above 40% by using higher-performance windows and lower U-values for the walls. Similarly, the area of skylights may be increased provided that the U-value of the roof is decreased.

- The detailed trade-off path permits trading between vertical and horizontal elements, provided the total energy loss through the envelope of the proposed building is less than that through the reference building. You can increase the window area by decreasing the U-value of the roof.
- Note that SB-10 Division 3 Chapter 3, Sentence 1.1.6.(1) requires buildings with electric space heating (including air-source heat pumps) to use the enclosure requirements for Climate Zone 7A and B from Table SB 3.2.2.2.

### **Division 5: Buildings of Non-Residential Occupancy within the Scope of Part 9**

Division 5 provides a prescriptive compliance path for Non-Residential buildings within the scope of Part 9, that do not use electric space heating. Where the building is excluded from Division 5, Division 3 applies. The procedures in Division 5 are much like those in Division 3.

- Determine the number of HDD18 for your building's location from OBC Volume 2, SB-1 Climatic and Seismic Data for Locations in Ontario. Division 5 does not use the ASHRAE zones but uses two zones: Zone 1 for less than 5000 HDD18 and Zone 2 for 5000 or more HDD18.
- Table 1.1.1.2. lists the performance requirements of envelope elements for the two zones.
- Record the U, C, or RSI (R) values for all opaque envelope elements and the U and SHGC for fenestration.

### **Division 3, Chapter 1, Article 1.1.2.2: Carbon Dioxide Equivalents (CO<sub>2e</sub>)**

Buildings complying with the prescriptive requirements of SB-10 are deemed to satisfy the OBC CO<sub>2e</sub> limits and recording the CO<sub>2e</sub> is not required. If you are using the performance path (energy modelling), the design buildings' emissions must be less than or equal to that of the same building designed in accordance with the prescriptive requirements.

### **References**

1. ASHRAE 90.1-2013 Energy Standard for Sites and Buildings Except Low-Rise Residential Buildings
2. ASHRAE 189.1-2014 Standard for the Design of High Performance, Green Buildings
3. National Energy Code of Canada for Buildings (NECB) 2015
4. OBC Volume 1 Division B, Part 12 Resource Conservation and Environmental Integrity
5. OBC Volume 2 Supplementary Standard SB-1 Climatic and Seismic Data
6. OBC Volume 2 Supplementary Standard SB-10- Energy Efficiency Requirements
7. Practice Tip PT.36 Building Energy Performance Series
8. Practice Tip PT.19 ANSI/ASHRAE/IES 90.1-2013 – An Overview of the Energy Standard

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