

## ANSI/ASHRAE/IES 90.1–2013 – An Overview of the Energy Standard

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### Summary

This Practice Tip provides an overview of ANSI/ASHRAE/IES 90.1-2013 Energy Standard for Buildings except Low-Rise Residential Buildings (ASHRAE 90.1), and how it is used in conjunction with the 2024 edition of Ontario's Building Code (OBC).

An American National Standards Institute (ANSI) approved standard published by the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) and jointly sponsored by the Illuminating Engineering Society (IES), ASHRAE 90.1 sets the minimum requirements for the energy-efficient design of new buildings and additions to existing buildings other than low-rise residential buildings. In addition to energy conservation, it addresses the use of on-site renewable energy resources in the evaluation of whole-building energy performance.

OBC compliance paths using ASHRAE 90.1 are described in "OBC Supplementary Standard SB-10 Energy Efficiency Requirements, Division 3, Chapter 2 – Additional Requirements to 2013 ANSI/ASHRAE/IES 90.1". SB-10 includes changes and additional requirements to ASHRAE 90.1 to ensure compatibility with Ontario government priorities, including energy availability and construction practices. For example, SB-10 revises the prescriptive enclosure performance tables and the lighting power density tables for both interior and exterior lighting. The SB-10 tables take precedence over the ASHRAE 90.1 published tables. Where there are conflicts between ASHRAE 90.1 and SB-10, SB-10 governs. Where SB-10 is silent on a topic, compliance with ASHRAE 90.1 is required for prescriptive compliance to OBC using SB-10 Division 3, Chapter 2.

### Structure and Content of the Standard

The ASHRAE 90.1-2013 standard is divided into 12 Sections and seven appendices. The sections, each of which includes a description of required submittals, are:

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| <b>FOREWORD</b>  | This summary of the history of the standard includes a description of the continuous maintenance process and discussion of the most significant changes from the previous 2010 edition.   |
| <b>Section 1</b> | <b>Purpose:</b> This section provides a statement of the purpose of the standard.   |
| <b>Section 2</b> | <b>Scope:</b> This section outlines a short description of what is and is not addressed.  |
| <b>Section 3</b> | <b>Definitions, Abbreviations, and Acronyms:</b> Similar to OBC, ASHRAE defines the terms it uses. Generally, these definitions agree with those in SB-10, but there are some small differences. In these instances, OBC SB-10 will govern. Definitions for U, C and F Factors are included.  |
| <b>Section 4</b> | <b>Administration and Enforcement:</b> This section identifies what is covered by ASHRAE 90.1 for enforcement. OBC SB-10 2024 Division 3 Chapter 2 Sentence 1.1.1.2.(1) replaces sections 4.2.1.1. to 4.2.1.3 of ASHRAE 90.1. New buildings are required to conform to ASHRAE 90.1 Sections 5 to 10 or Section 11. Existing buildings with changes of use must conform to OBC Division B Part 10. Renovations must conform to OBC Division B Part 11. |

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| <b>Section 5</b>  | <p><b>Building Envelope:</b> The most developed section in ASHRAE 90.1, it begins with a general discussion of intents and scope followed by definitions of the compliance paths and mandatory requirements, including for airtightness. Subsections address the prescriptive, trade-off, and performance compliance paths. The performance path is the “Energy Cost Budget Method,” the requirements of which are satisfied by whole-building energy modelling as described in Section 11. Following the description of the compliance paths, there are subsections for submittals and minimum products standards.</p> <p>OBC SB-10 Division 3 Chapter 2 Sentence 1.1.1.4.(1) declares compliance with OBC Division B Part 5 will be deemed to satisfy ASHRAE 90.1 Sections 5.4.3.1.3 and 5.4.3.2. OBC SB-10 Division 3 Chapter 2 Sentence 1.1.1.4.(2) replaces the ASHRAE 90.1 envelope requirement tables relevant to Ontario with adjusted tables in a similar format providing requirements for all building envelope elements. Requirements for submittals and minimum product standards remain in effect.</p> |
| <b>Section 6</b>  | <p><b>Heating, Ventilating and Air Conditioning:</b> Procedures for energy efficiency in the design of space conditioning systems are included in this section. Requirements for system controls and control strategies are provided for heating, cooling, and ventilation in the mandatory section. Requirements for piping design and insulation requirements for both heating and cooling systems are provided, along with equipment efficiencies for a range of heating, cooling, and ventilation equipment. Both central plant and distribution equipment are covered.</p> <p>Certificate of practice (CoP) holders commonly use ASHRAE 90.1 because their engineering consultants are familiar with it, and OBC recommends using other ASHRAE standards for other areas requiring engineering design. Early coordination with engineering consultants for building services strategies is strongly recommended.</p>  |
| <b>Section 7</b>  | <p><b>Service Water Heating:</b> This section provides requirements for energy efficiency in the design of water heating systems. A table gives a range of domestic water heating equipment and their minimum efficiencies.</p>  |
| <b>Section 8</b>  | <p><b>Power:</b> Acceptable power system design is demonstrated through compliance with mandatory requirements in this section, including automatic receptacle controls and electrical energy monitoring, plus specified submittals.</p>   |
| <b>Section 9</b>  | <p><b>Lighting:</b> This section provides maximum values for interior and exterior lighting in W/m<sup>2</sup> or W/m (SI editions) using either a building type or space-by-space assessment. OBC SB-10 Division 3 Chapter 2 Article 1.1.1.8. adds mandatory conditions. Article 1.1.1.9. replaces the ASHRAE 90.1 lighting power density and controls tables for interior and exterior lighting used in the prescriptive compliance path.</p> <p>ASHRAE 90.1’s Table 9.4.2-1 Exterior Lighting Zones, which describes the environmental conditions that define exterior lighting zones, remains in effect and is not changed by SB-10.</p>   |
| <b>Section 10</b> | <p><b>Other Equipment:</b> This section includes energy efficiency design requirements for electric motors, booster pumps and elevators.</p>   |
| <b>Section 11</b> | <p><b>Energy Cost Budget Method (ECBM):</b> The ECBM (performance compliance path) is an alternative to the prescriptive provisions of the standard and may be used to evaluate compliance of proposed designs. It may be used when design concepts are being considered that do not meet either prescriptive or simple trade off methods of compliance. A common use for the ECBM is to demonstrate compliance with ASHRAE 90.1 when window-to-wall ratios exceed 40%, or skylight-to-roof ratios exceed 3%, and for some reason the trade-off path is not attractive.</p>  |
| <b>Section 12</b> | <p><b>Normative References:</b> References within this section are necessary parts of the standard not unlike OBC Division B, Part 3, Section 1.3. Referenced Documents and Organizations.</p>   |

Four normative appendices are considered integral parts of the mandatory requirements of ASHRAE 90.1:

- Normative Appendix A: Rated R-Value of Insulation and Assembly Factor U-Factor, C-Factor, and F-Factor Determinations:** This Appendix has useful tables for converting assembly component insulation thermal resistance RSI(R)-values to overall assembly thermal transmittance U-values that account for parallel path losses, but do not account for whole assembly thermal bridges as window and door installation thermal bridges, interior and exterior corners, slab edges, and parapets.
- Normative Appendix B: Building Envelope Climate Criteria:** OBC SB-10 Chapter 2 Sentence 1.1.1.3.(1) replaces this appendix directing users to Section 1.3 of OBC SB-10 Chapter 1.
- Normative Appendix C: Methodology for Building Envelope Trade-Off Option in Subsection 5.6.** Appendix C details the procedures for the building envelope trade-off option. The method permits trade-offs between building elements but is very complicated. Software such as COMcheck offers an easier way to do trade-offs.
- Normative Appendix D: Climatic Data:** This appendix is not used for Canadian locations. See discussion under Normative Appendix B.

Three informative appendixes contain additional information and are not mandatory or part of ASHRAE 90.1:

- Informative Appendix E: Informative References:** This appendix contains informative references for the convenience of ASHRAE 90.1 users, and acknowledges source documents when appropriate. Although generally not necessary parts of the standard, some Section 12 Normative References are included here as well.
- Informative Appendix F: Addenda Description Information:** The more than 100 addenda to 90.1 are summarized in this appendix.
- Informative Appendix G: Performance Rating Method:** The Energy Cost Budget Method presented in Section 11 is the ASHRAE 90.1 “performance compliance path” with the objective of demonstrating compliance to the standard. Rules for representing systems and equipment in the comparison are presented primarily in Section 11, Table 11.5.1, with more general rules for the systems and equipment in the Budget Building presented in Section 11, Figure 11.5.2 and Tables 11.5.2-1 through 4.
- Informative Appendix G provides a modified set of rules for representing the budget and design buildings where the comparison is intended to demonstrate superior performance of the design building. Differences between the ECBM and Appendix G are subtle and require attention from the energy modelling team.
- OBC SB-10 Division 3, Chapter 2 refers only to the rules presented in Section 11 and is silent regarding the Appendix G rule set. Energy models for LEED applications follow Appendix G. Funding agencies may also accept energy models based on Appendix G. Practitioners may want to have their staff or energy modelling consultants confirm the acceptability of the modelling rule sets with the appropriate municipal authorities or funding agencies.

## Suggested Procedure

- Review the entire standard with particular attention to the mandatory conditions in Subsection 5.4.
- Assemble the ASHRAE 90.1 compliance forms where applications are being made using the prescriptive path.
- Confirm the client requirements and objectives and coordinate with the other disciplines in the design team to select the compliance path appropriate for the project. Analysis and co-ordination among the consultants are critical to selecting the compliance method appropriate for the project.
- Assign the responses to the relevant sections to the appropriate consultant using the ASHRAE 90.1 compliance forms.
- Refer to the OBC Supplementary Standard SB-10 Energy Efficiency Requirements, Practice Tip PT.36.2 OBC SB-10 Energy Efficiency Requirements – Prescriptive Compliance and PT.36.1 Energy Modelling for details on how to apply ASHRAE 90.1 prescriptive or performance compliance to the design.

## References

1. ASHRAE 90.1-2013 Energy Standard for Sites and Buildings Except Low-Rise Residential Buildings
2. Ontario Building Code, Volume 1 Division B, Part 12 Resource Conservation and Environmental Integrity
3. OBC, Volume 2 Supplementary Standard SB-1 Climatic and Seismic Data
4. OBC, Volume 2 Supplementary Standard SB-10 Energy Efficiency Requirements
5. Practice Tip PT.36.1 Energy Modelling
6. Practice Tip PT.36.2 OBC SB-10 Energy Efficiency Requirements – Prescriptive

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