2024 Vermont Residential Building Energy Standards

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PREFACE

Introduction

The 2024 *Vermont Residential Building Energy Standards* (RBES) is based on the 2020 RBES, which is based on the 2015 *International Energy Conservation Code*® (IECC®). The 2024 RBES also include s 2018, 2021 and 2024 IECC energy efficiency requirements as well as select language updates an d additional, more stringent Vermont energy efficiency requirements.

This comprehensive energy conservation code establishes minimum regulations for energy effi-cient buildings using prescriptive and performance-related provisions. It is founded on broad-base d principles that make possible the use of new materials and new energy efficient designs.

The *International Energy Conservation Code* provisions provide many benefits, among which is the model code development process that offers an international forum for energy professionals to dis-cuss performance and prescriptive code requirements. This model code also encourages interna-tional consistency in the application of provisions.

Development

This 2024 RBES is founded on principles intended to establish provisions consistent with the scope of an energy conservation code that adequately conserves energy; provisions that do not unneces-sarily increase construction costs; provisions that do not restrict the use of new materials, products or methods of construction; and provisions that do not give preferential treatment to particular types or classes of materials, products or methods of construction.

Background

The *Vermont Residential Building Energy Standards* (RBES) was adopted by statute (30 V.S.A. § 51) in 1997. Act 89 of 2013 established a *Stretch Code* defined as a building energy code for residential buildings that achieves greater energy savings than RBES. The *Stretch Code* shall be available for adoption by municipalities under 24 V.S.A. §117 and shall apply in proceedings under 10 V.S.A. §151 (Act 250).

Update Process

The Residential Building Energy Standards statute requires that revisions to RBES are made promptly after the issuance of updated standards under the *International Energy Conservation Code* (IECC). The Department of Public Service (PSD) is required to convene stakeholders that include mortgage lenders, builders, building designers, utility representatives and other persons with expe-rience and expertise prior to the adoption of a revised RBES to provide recommendations.

The 2024 RBES is based on the language in the 2015 edition of the IECC and includes efficienc y improvements included in the 2018, 2021 and 2024 IECC to ensure continued progression in effi-ciency in the Vermont RBES. The 2024 RBES builds on the “Package Plus Points” approach to code compliance, initiated in 2020. (Previous code compliance was achieved through a “prescriptiv e package” approach). The addition of “points” provides builders and designers greater flexibility i n complying with RBES. The 2024 RBES also simplifies the Packages and makes them applicable t o both the *Base Code* and the *Stretch Code,* with the only difference being the number of Points need-ing to be achieved. The 2024 RBES also attempts to better address multifamily construction b y aligning the standards between RBES and the *Vermont Commercial Building Energy Standards* (CBES) so that, regardless of whether the *multifamily building* falls under RBES (up to three stories i n height) or CBES (buildings four stories or higher), the energy standards should be consistent. Th e

Code Collaborative Process undertaken in 2021 allowed for more in-depth discussions with stakeholders on topics, and many of the suggestions are reflected in the 2024 RBES. The Vermont PSD also held a series of stakeholder meetings in 2022 to gather feedback on proposed changes to RBES. The revisions presented in this document were modified based on input received from thes e meetings.

The Vermont RBES, as reproduced in this publication, has been edited to correct clerical and typo-graphical errors. Original rule text is available in the Code of Vermont Rules. See *Vermont Residen-tial Building Energy Standards* (RBES), Code of VT Rules 31 000 004, http://www.lexisnexis.com/hottopics/codeofvtrules.

EFFECTIVE USE OF THE 2024 RESIDENTIAL BUILDING ENERGY STANDARDS

The 2024 *Vermont Residential Building Energy Standards* (RBES) is a code that regulates minimu m energy conservation requirements for new buildings as well as additions, alterations, renovations, and repairs to existing buildings. The 2024 RBES addresses energy conservation requirements for al l aspects of energy uses in residential construction, including heating and ventilating, lighting, wate r heating, and power usage for appliances and building systems.

The 2024 RBES is a design document. For example, before constructing a building, the designe r must determine the minimum insulation *R*-values and fenestration *U*-factors for the building exte-rior envelope. RBES sets forth minimum requirements for exterior envelope insulation, window and door *U*-factors and SHGC ratings, duct insulation, lighting and power efficiency, mechanical ventila-tion, and water distribution insulation.

Arrangement and Format of the 2024 RBES

The 2024 RBES, like other codes published by the International Code Council® (ICC®), is arranged and organized to follow sequential steps that generally occur during a plan review or inspection . The 2024 RBES is divided into six different parts:

Chapters	Subjects
1-2	Scope, administration and definitions
3	General requirements
4	Residential energy efficiency
5	Existing buildings
6	Referenced standards

The following is a chapter-by-chapter synopsis of the scope and intent of the provisions of the 2024 *Vermont Residential Building Energy Standards* (RBES):

Chapter 1 Scope and Administration. This chapter contains provisions for the application, enforcement and administration of subsequent requirements of the code. In addition to establishing the scope of the code, Chapter 1 identifies which buildings and structures come under its purview. Chapter 1 is largely concerned with maintaining “due process of law” in enforcing the energy conservation criteria contained in the body of this code. Only through careful observation of the administrative provisions can the code official or authority having jurisdiction, where one exists, reasonably expect to demonstrate that “equal protection under the law” has been provided.

Chapter 2 Definitions. Chapter 2 is the repository of the definitions of terms used in the body of the code. Codes are technical documents and every word, term and punctuation mark can impact the meaning of the code text and the intended results. The code often uses terms that have a unique meaning in the code and the code meaning can differ substantially from the ordinarily understood meaning of the term as used outside of the code.

The terms defined in Chapter 2 are deemed to be of prime importance in establishing the meaning and intent of the code text. The user of the code should be familiar with and consult this chapter because the definitions are essential to the correct interpretation of the code and the user may not be aware that a term is defined.

Where understanding of a term’s definition is especially key to or necessary for understanding of a particular code provision, the term is shown in *italics* wherever it appears in the code. This is true only for those terms that have a meaning that is unique to the code. In other words, the generally understood meaning of a term or phrase might not be sufficient or consistent with the meaning prescribed by the code; therefore, it is essential that the code-defined meaning be known.

Guidance regarding tense, gender and plurality of defined terms as well as guidance regarding terms not defined in this code is provided.

Chapter 3 General Requirements. Chapter 3 provides interior design conditions that are used as a basis for assumptions in heating and cooling load calculations, and provides basic material requirements for insulation materials and fenestration materials, and provides standards for residential mechanical ventilation and combustion safety.

Chapter 4 Residential Energy Efficiency. Chapter 4 contains the energy-efficiency-related requirements for the design and construction of residential buildings regulated under this code. It should be noted that the definition of a *residential building* in this code is unique for this code. In this code, a *residential building* is an R-2, R-3 or R-4 building three stories or less in height. All other R-1 buildings, including residential buildings greater than three stories in height, are regulated by the energy conservation requirements in the *Vermont Commercial Building Energy Standards* (CBES). The applicable portions of a residential building must comply with the provisions within this chapter for energy efficiency. This chapter defines requirements for the portions of the building and building systems that impact energy use in new residential construction and promotes the effective use of energy. The provisions within the chapter promote energy efficiency in the building envelope, the heating and cooling system, lighting and the service water heating system of the building. Vermont has adopted a two-tiered code structure with a "*Base Code*" that applies statewide, and a "*Stretch Code*" that is more stringent. The *Stretch Code* applies to all Act 250 development projects and is also available for municipalities that choose to adopt a higher energy standard.

Chapter 5 Existing Buildings. Chapter 5 of each set of provisions contains the technical energy efficiency requirements for existing buildings. Chapter 5 provisions address the maintenance of buildings in compliance with the code as well as how additions, alterations, repairs and changes of occupancy need to be addressed from the standpoint of energy efficiency. Specific provisions are provided for historic buildings.

Chapter 6 Referenced Standards. The code contains numerous references to standards that are used to regulate materials and methods of construction. Chapter 6 contains a comprehensive list of all standards that are referenced in the code. The standards are part of the code to the extent of the reference to the standard. Compliance with the referenced standard is necessary for compliance with this code. By providing specifically adopted standards, the construction and installation requirements necessary for compliance with the code can be readily determined. The basis for code compliance is, therefore, established and available on an equal basis to the code official or authority having jurisdiction, where one exists, contractor, designer and owner.

Chapter 6 is organized in a manner that makes it easy to locate specific standards. It lists all of the referenced standards, alphabetically, by acronym of the promulgating agency of the standard. Each agency's standards are then listed in either alphabetical or numeric order based on the standard identification. The list also contains the title of the standard; the edition (date) of the standard referenced; any addenda included as part of the ICC adoption; and the section or sections of this code that reference the standard.

Italicized Terms

Selected terms set forth in Chapter 2, Definitions, are italicized where they appear in code text. Such terms are not italicized where the definition set forth in Chapter 2 does not impart the intended meaning in the use of the term. The terms selected have definitions that the user should read carefully to facilitate better understanding of the code.

Marginal Markings

Solid vertical lines in the margins within the body of the code indicate Vermont-specific additions and changes from the requirements of the 2015 IECC and the 2018 and 2021 editions. Deletion indicators in the form of an arrow (➡) are provided in the margin where an entire section, paragraph, exception or table has been deleted or an item in a list of items or a table has been deleted.

Abbreviations and Notations

The following is a list of common abbreviations and units of measurement used in this code. Some of the abbreviations are for terms defined in Chapter 2. Others are terms used in various tables and text of the code.

AFUE	Annual fuel utilization efficiency
AWHP	Air-to-water heat pump
bhp	Brake horsepower (fans)
Btu	British thermal unit
Btu/h-ft^2	Btu per hour per square foot
C-factor	See Chapter 2—Definitions
CDD	Cooling degree days
CFA	Conditioned floor area
CFM	Cubic feet per minute
CFM/ft^2	Cubic feet per minute per square foot
ci CO_2e	Continuous insulation
COP	Carbon dioxide equivalent Coefficient
DCV	of performance Demand control
°C	ventilation Degrees Celsius
°F	Degrees Fahrenheit
DWHR	Drain water heat recovery
DX	Direct expansion
E_c	Combustion efficiency
E_v	Ventilation efficiency
E_t ECM	Thermal efficiency
EER EF	Electronically commutated motor
EPD ERI	Energy efficiency ratio
F-factor	Energy factor
FDD	Environmental product declaration
FEG FL	Energy Rating index
ft^2 GPF	See Chapter 2—Definitions
GPM	Fault detection and diagnostics
GSHP	Fan efficiency grade
GWP H/	Full load
ERV	Square foot
HDD	Gallons per flush
	Gallons per minute
	Ground-source heat pump
	Global warming potential
	Heat or energy recovery ventilation
	Heating degree days

HERS	Home Energy Rating System
hp	Horsepower
HSPF	Heating seasonal performance factor
HVAC	Heating, ventilating and air conditioning
IEER	Integrated energy efficiency ratio
IPLV	Integrated Part Load Value
Kg/m^2	Kilograms per square meter
kW	Kilowatt
LPD	Light power density (lighting power allowance)
L/s	Liters per second
Ls	Liner system
m^2	square meters
MERV	Minimum efficiency reporting value
NAECA	National Appliance Energy Conservation Act
NPLV	Nonstandard Part Load Value
Pa	Pascal
PF	Projection factor
PSD	Department of Public Service (Vermont)
psf	Pounds per square foot
PTAC	Packaged terminal air conditioner
PTHP	Packaged terminal heat pump
R-value	See Chapter 2—Definitions
SCOP	Sensible coefficient of performance
SEER	Seasonal energy efficiency ratio
SHGC	Solar Heat Gain Coefficient
SPVAC	Single packaged vertical air conditioner
SPVHP	Single packaged vertical heat pump
SRE	Sensible recovery efficiency
SRI	Solar reflectance index
SWHF	Service water heat recovery factor
U-factor	See Chapter 2—Definitions
VAV	Variable air volume
VRF	Variable refrigerant flow
VT	Visible transmittance
W	Watts
w.c.	Water column
w.g.	Water gauge

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