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Acknowledgments

The Building Energy Efficiency Standards (Energy Standards) were first adopted and put into effect in 1978 and have been updated periodically in the intervening years. The Energy Standards are a unique California asset that have placed the State on the forefront of energy efficiency, sustainability, energy independence, and climate change issues, and have provided a template for national standards within the United States as well as for other countries around the globe. They have benefitted from the conscientious involvement and enduring commitment to the public good of many persons and organizations along the way. The 2016 Energy Standards development and adoption process continues a long-standing practice of maintaining the Standards with technical rigor, challenging but achievable design and construction practices, public engagement, and full consideration of the views of stakeholders.

2016 is a major step towards meeting the Zero Net Energy (ZNE) goal by the year 2020 and is the second of three updates to move California toward achieving that goal, building on the 2013 Energy Standards and setting the stage for the upcoming 2019 update.

The 2016 Energy Standards revision and the supporting documents were conceptualized, evaluated and justified through the excellent work of Energy Commission staff and consultants working under contract to the Energy Commission, supported by the utility-organized Codes and Standards Enhancement (CASE) Initiative, and shaped by the participation of over 150 stakeholders and the contribution of over 1000 formal public comments. We would like to acknowledge Commissioner Andrew McAllister and his adviser, Patrick Saxton, P.E. for their unwavering leadership throughout the standards development. Maziar Shirakh, P.E., who served as the project manager and senior engineer; Bill Pennington, Special Advisor to the Efficiency Division, who provided overall guidance and contributed to the technical content of the Standards documents; Eurlyne Geiszler, who served as the Manager for the Buildings Standards Office; Peter Strait, who served as the supervisor for the Standards Development Unit; Pippin Brehler and Galen Lemei, who provided legal counsel; and technical staff contributors of the Building Standards office including Mark Alatorre, P.E.; Payam Bozorgchami, P.E.; Todd Ferris; Hilary Fiese; Larry Froess, P.E.; Simon Lee P.E.; Jeff Miller, P.E.; Farakh Nasim; Adrian Ownby; Dee Anne Ross; Michael Shewmaker; Alexis Smith; Danny Tam; Gabriel Taylor, P.E.; RJ Wichert. The Standards Implementation office which includes Andrea Bailey; Randy Brumley; Suzie Chan; Tav Commins; Paula David; Gary Fabian; James Haile; Joe Loyer; Rashid Mir, P.E.; Javier Perez; Alex Pineda; Heriberto Rosales; Alex Wan; Courtney Ward; Daniel Wong; Nelson Peña; Energy Commission editors including Carol Robinson and Gaylene Cooper, and the Energy Commission Hotline staff and Web Team. Key Energy Commission and CASE consultants included NORESO, Bruce Wilcox, Taylor Engineering, Proctor Engineering, Benya Lighting Design, Chitwood Energy Management, Davis Energy Group, EnerComp, McHugh Energy, Energy Solutions, E3, RASANT Solutions LLC, L'Monte Information Services, and TRC Solutions. The CASE Initiative is supported by a consortium of California utility providers which includes the Pacific Gas and Electric Company, Southern California Edison Company, San Diego Gas and Electric Company, Southern California Gas Company, the Sacramento Metropolitan Utility District, and the Los Angeles Department of Water and Power.

Abstract

The Building Energy Efficiency Standards were first adopted in 1976 and have been updated periodically since then as directed by statute. In 1975 the Department of Housing and Community Development adopted rudimentary energy conservation standards under their State Housing Law authority that were a precursor to the first generation of the Standards. However, the Warren-Alquist Act was passed one year earlier with explicit direction to the Energy Commission (formally titled the State Energy Resources Conservation and Development Commission) to adopt and implement the Standards. The Energy Commission's statute created separate authority and specific direction regarding what the Standards are to address, what criteria are to be met in developing the Standards, and what implementation tools, aids, and technical assistance are to be provided.

The Standards contain energy and water efficiency requirements (and indoor air quality requirements) for newly constructed buildings, additions to existing buildings, and alterations to existing buildings. Public Resources Code Sections 25402 subdivisions (a)-(b) and 25402.1 emphasize the importance of building design and construction flexibility by requiring the Energy Commission to establish performance standards, in the form of an "energy budget" in terms of the energy consumption per square foot of floor space. For this reason, the Standards include both a prescriptive option, allowing builders to comply by using methods known to be efficient, and a performance option, allowing builders complete freedom in their designs provided the building achieves the same overall efficiency as an equivalent building using the prescriptive option. Reference Appendices are adopted along with the Standards that contain data and other information that helps builders comply with the Standards.

The 2016 update to the Building Energy Efficiency Standards focuses on several key areas to improve the energy efficiency of newly constructed buildings and additions and alterations to existing buildings. The most significant efficiency improvements to the residential Standards include improvements for attics, walls, water heating, and lighting. The most significant efficiency improvements to the nonresidential Standards include alignment with the ASHRAE 90.1 2013 national standards. New efficiency requirements for elevators and direct digital controls are included in the nonresidential Standards. The 2016 Standards also include changes made throughout all of its sections to improve the clarity, consistency, and readability of the regulatory language.

Public Resources Code Section 25402.1 also requires the Energy Commission to support the performance standards with compliance tools for builders and building designers. The Alternative Calculation Method (ACM) Approval Manual adopted by regulation as an appendix of the Standards establishes requirements for input, output and calculational uniformity in the computer programs used to demonstrate compliance with the Standards. From this, the Energy Commission develops and makes publicly available free, public domain building modeling software in order to enable compliance based on modeling of building efficiency and performance. The ACM Approval Manual also includes provisions for private firms seeking to develop compliance software for approval by the Energy Commission, which further encourages flexibility and innovation.

The Standards are divided into three basic sets. First, there is a basic set of mandatory requirements that apply to all buildings. Second, there is a set of performance standards – the energy budgets – that vary by climate zone (of which there are 16 in California) and building type; thus the Standards are tailored to local conditions. Finally, the third set constitutes an alternative to the performance standards, which is a set of prescriptive packages that are basically a recipe or a checklist compliance approach.

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2016 Building Energy
Efficiency Standards

Residential

Nonresidential

Newly Constructed

Additions and Alterations
to Existing Buildings

Mandatory

Prescriptive

Performance

Time Dependent

Valuation

TDV

Ducts in conditioned
Spaces

High Performance Attics

High Performance Walls

High Efficacy Lighting

Water Heating

Windows

Envelope Insulation

HVAC

Building Commissioning

Process Load

Refrigeration

Data Center

Exhaust

Compressed Air

Acceptance Testing

Data Collection

Cool Roof

On-site Renewable