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6450-01-P

DEPARTMENT OF ENERGY

Office of Energy Efficiency and Renewable Energy

EERE-2017-BT-DET-0046

**Final Determination Regarding Energy Efficiency Improvements in
ANSI/ASHRAE/IES Standard 90.1-2016: Energy Standard for Buildings, Except
Low-Rise Residential Buildings**

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Notice of order.

SUMMARY: After receiving and reviewing public comments, the U.S. Department of Energy (DOE) issues this Order finalizing DOE's determination that the 2016 edition of the ANSI/ASHRAE/IES Standard 90.1: Energy Standard for Buildings, Except Low-Rise Residential Buildings improves overall energy efficiency in buildings subject to the code compared to the 2013 edition of Standard 90.1.

DATES: This Order is effective on **[INSERT DATE OF FEDERAL REGISTER PUBLICATION.]**

ADDRESSES: A copy of the final analysis is available at
<https://www.energycodes.gov/development/determinations>.

FOR FURTHER INFORMATION CONTACT:

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SUPPLEMENTARY INFORMATION:

I. Background

Title III of the Energy Conservation and Production Act, as amended (ECPA), establishes requirements for building energy conservation standards, administered by the DOE Building Energy Codes Program. (42 U.S.C. 6831 et seq.) Section 304(b), of ECPA, as amended, provides that whenever the ANSI/ASHRAE/IESNA Standard 90.1-1989 (Standard 90.1-1989 or 1989 edition), or any successor to that code, is revised, the Secretary of Energy (Secretary) must make a determination, not later than 12 months after such revision, whether the revised code would improve energy efficiency in commercial buildings required to meet the standard, and must publish notice of such determination in the *Federal Register*. (42 U.S.C. 6833(b)(2)(A)) If the Secretary makes an affirmative determination, within two years of the publication of the determination, each State is required to certify that it has reviewed and updated the provisions of its commercial building code regarding energy efficiency with respect to the revised or successor code and include in its certification a demonstration that the provisions of its commercial building code, regarding energy efficiency, meet or exceed the revised Standard. (42 U.S.C. 6833(b)(2)(B)(i))

Standard 90.1-2016, the most recent edition, was published by ASHRAE in October 2016, triggering the statutorily-required DOE review process. The Standard is developed under ANSI-approved consensus procedures, and is under continuous maintenance by an ASHRAE Standing Standard Project Committee (commonly referenced as SSPC 90.1). ASHRAE has an established program for regular publication of addenda, or revisions, including procedures for timely, documented, consensus action on requested changes to the Standard. More information on the consensus process and ANSI/ASHRAE/IES Standard 90.1–2016 is available at:

<https://www.ashrae.org/resources--publications/bookstore/standard-90-1>.

To meet the statutory requirement, DOE conducted a preliminary analysis to quantify the expected energy savings associated with Standard 90.1-2016 relative to the previous 2013 version. The preliminary analysis is available at:

<https://www.regulations.gov/document?D=EERE-2014-BT-DET-0009-0001>.

Standard 90.1-2016 includes several paths for compliance in order to provide flexibility to users of the Standard. The prescriptive path, which is widely considered the most traditional, establishes criteria for energy-related characteristics of individual building components such as minimum insulation levels, maximum lighting power, and controls for lighting and HVAC&R systems. Some of those requirements are considered “mandatory”, meaning that they must be met even when one of the other optional paths

are utilized (e.g., performance path). These other optional paths are further described below.

In addition to the prescriptive path, Standard 90.1 includes two optional whole building performance paths. The first, known as the *Energy Cost Budget* (ECB) method, provides flexibility in allowing a designer to “trade-off” compliance. This effectively allows a designer to not meet a given prescriptive requirement if the impact on energy cost is offset by exceeding other prescriptive requirements, as demonstrated through established energy modeling protocols. A building is deemed in compliance when the annual energy cost of the proposed design is no greater than the annual energy cost of the reference building design (baseline). In addition, Standard 90.1-2016 includes a second performance approach, Appendix G, the *Performance Rating Method*. In previous editions of Standard 90.1 (i.e., prior to the current 2016 edition), Appendix G has been used to rate the performance of buildings that exceed the requirements of Standard 90.1 for “beyond code” programs, including the LEED Rating System, ASHRAE Standard 189.1, the International Green Construction Code (IgCC), and other above-code programs. Beginning with the 2016 edition of Standard 90.1, Appendix G also adds the capability to demonstrate minimum energy code compliance.

II. Public Participation and Error Correction

In a July 25, 2017, *Federal Register* notice, DOE requested public comments on the preliminary analysis. (82 FR 34513) DOE received four public comments, all of

which DOE considered (*see* Appendix A to this Order.). In addition, a DOE review of the simulation analysis identified a mistake in how much outdoor ventilation air was being introduced in two prototypes. Correction of this mistake resulted in savings increasing from .6% to 4.9% in Large Office and an increase of less than 1% in Mid-rise Apartment. Overall savings from the standard increased from 6.7% to 6.8%. These corrections were incorporated into the final analysis document but did not impact the determination ruling. DOE has now issued the final analysis of the expected energy savings associated with Standard 90.1-2016 as compared to Standard 90.1-2013. The final analysis is available at: <https://www.energycodes.gov/development/determinations>.

III. Order

Based on the requirements of Section 304(b) of ECPA, as amended, and DOE's final analysis prepared after consideration of comments on the preliminary analysis and correction of the simulation analysis describe above, I have determined that the 2016 edition of the ANSI/ASHRAE/IES Standard 90.1: Energy Standard for Buildings, Except Low-Rise Residential Buildings would improve overall energy efficiency in buildings subject to the code compared to the 2013 edition of Standard 90.1.

Issued in Washington, DC, on February 15, 2018



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APPENDIX A

DOE received comments on the preliminary analysis from the American Chemistry Council (ACC) Plastics Division, the ACC Foam Sheathing Committee, the Responsible Energy Codes Alliance (RECA), and the Edison Electric Institute (EEI). The comments are summarized below and are available at:

<https://www.regulations.gov/docket?D=EERE-2014-BT-DET-0009>.

Addenda Scope

Comment: The ACC Plastics Division commented that DOE's analysis is too conservative because it fails to consider the impact of addenda only affecting existing buildings. ACC's Foam Sheathing Committee expressed the same concern. ACC recommended that DOE analyze provisions affecting existing buildings for consistency with statutory requirements and to provide critical guidance to states.

DOE response: DOE notes that only one addendum (addendum e) in the prescriptive and mandatory requirements was applicable to existing buildings only and, therefore, was excluded from the quantitative analysis. In addition, this addendum was determined to decrease energy use through the qualitative analysis, which was presented in the preliminary determination. The majority of addenda apply to new buildings and the impact of these addenda was captured in the analysis. The goal of the determination is to evaluate whether the latest edition of Standard 90.1 improves energy efficiency of buildings relative to the previous edition, and DOE believes that the current methodology is sufficient to make such a determination.

Comment: The Responsible Energy Codes Alliance (RECA) recommended that the magnitude of the impact of requirements for existing buildings in the Standard taken as a whole should be evaluated.

DOE response: The impact of individual addenda impacting existing buildings are considered as part of DOE's qualitative analysis. However, baseline conditions for existing building can vary significantly depending upon a wide variety of factors, including the age of the building, baseline systems and components, and past renovations. While these requirements are part of the Standard and do impact energy efficiency in commercial buildings, they cannot be adequately represented by the quantitative analysis.

Analyzing Compliance Paths

Comment: The ACC Plastics Division stated that DOE's analysis is too conservative because it fails to consider the impact of addenda affecting the performance paths for compliance in Standard 90.1.

DOE response: DOE notes that evaluating the prescriptive and mandatory requirements effectively captures the impact of all compliance paths within Standard 90.1-2016. The performance paths within Standard 90.1-2016 are intended to provide equivalent performance to the prescriptive path. As the energy efficiency stringency of the prescriptive path is increased, the performance path rules and targets are changed to mirror that increase. Using the prescriptive and mandatory requirements therefore effectively represents changes to the entire standard. Additionally, the purpose of the performance paths is to give designers and builders flexibility by allowing an almost

unlimited number of trade-off combinations which will comply with the Standard.

Analytically, it is not practical or possible to model all of these design combinations.

Comment: RECA also recommended that DOE make a separate determination for each of the compliance paths in Standard 90.1: prescriptive path, Energy Cost Budget, and performance path.

DOE response: DOE believes that evaluating the prescriptive and mandatory requirements effectively captures the impact of all compliance paths within Standard 90.1-2016 and is satisfactory for the purpose of determining whether the new edition of Standard 90.1 will save energy in commercial buildings relative to the previous edition. The performance paths within Standard 90.1-2016 are intended to provide equivalent performance to the prescriptive path. As the energy efficiency stringency of the prescriptive path is increased, the performance path rules and targets are changed to mirror that increase. Thus evaluating the performance paths separately, even in simplified form, would provide no additional information. The performance paths provide designers and builders flexibility by allowing trade-offs between prescriptive requirements and makes the Standard easier to comply with—a benefit for states looking to adopt the new Standard.

Site vs. Source Energy

Comment: EEI's first comment on this topic was that DOE should only use site energy and energy cost results in its determination and that source energy results should not be used.

DOE response: DOE notes that EEI submitted a similar comment on the Notice of Preliminary Determination for Standards 90.1-2010 and 2013. DOE continues to believe that source energy estimates are of interest to many stakeholders and are important to the discussion of global resources and environmental issues. However, DOE realizes that site energy is the energy that typically appears on utility bills and that is seen by the consumer, and that energy cost (as shown on energy bills) is a metric also important to many consumers. It is for these reasons that DOE provides all three metrics—site energy, source energy, and energy cost—in its determinations.

Comment: EEI also stated that the value associated with source energy for electricity overstates losses and does not appropriately characterize the significant improvements in the overall efficiency of the electricity sector because: (1) DOE considered only commercial customers; (2) the U.S. Energy Information Administration (EIA) fossil fuel heat rate assigned to renewable energy is too high; (3) estimates of primary energy values should look forward not backward; and (4) estimates of primary energy values should account for regional differences in electricity generation and renewable portfolio standards.

DOE response: DOE notes that EEI submitted a similar comment on the Notice of Preliminary Determination for Standards 90.1-2010 and 2013. DOE continues to

believe that its use of EIA data, conversion factors, and treatment of renewable energy is appropriate and remains consistent with past determinations and DOE's Appliance and Equipment Standards Program (AESP) analyses. While it is true that the site-to-source conversion factor used in this analysis is derived from EIA data for commercial sector energy use, analyzing the data from all sectors results in the same conversion factor. The determination methodology does not calculate the future impact of the new Standard, and thus DOE believes that using conversion factors from the year of publication of the Standard is appropriate. DOE notes that it makes analyses available for states on the future impact of energy codes, which are beneficial for determining the long-term benefits of new code adoption. Finally, the use of the conversion factor from 2016 in this analysis also mitigates the impact of using the fossil fuel equivalency approach to determine the conversion factor for electricity because the proportion of renewable sources in the overall fuel mix was very small in 2016.