

in accordance with § 431.444 of this subpart, or by application of an alternative efficiency determination method (AEDM) that meets the requirements of paragraphs (a)(2) and (3) of this section, provided, however, that an AEDM may be used to determine the average full-load efficiency of one or more of a manufacturer's basic models only if the average full-load efficiency of at least five of its other basic models is determined through testing.

(2) *Alternative efficiency determination method.* An AEDM applied to a basic model must be:

(i) Derived from a mathematical model that represents the mechanical and electrical characteristics of that basic model, and

(ii) Based on engineering or statistical analysis, computer simulation or modeling, or other analytic evaluation of performance data.

(3) *Substantiation of an alternative efficiency determination method.* Before an AEDM is used, its accuracy and reliability must be substantiated as follows:

(i) The AEDM must be applied to at least five basic models that have been tested in accordance with § 431.444; and

(ii) The predicted total power loss for each such basic model, calculated by applying the AEDM, must be within plus or minus 10 percent of the mean total power loss determined from the testing of that basic model.

(4) *Subsequent verification of an AEDM.* (i) Each manufacturer that has used an AEDM under this section shall have available for inspection by the Department of Energy records showing the method or methods used; the mathematical model, the engineering or statistical analysis, computer simulation or modeling, and other analytic evaluation of performance data on which the AEDM is based; complete test data, product information, and related information that the manufacturer has generated or acquired pursuant to paragraph (a)(3) of this section; and the calculations used to determine the efficiency and total power losses of each basic model to which the AEDM was applied.

(ii) If requested by the Department, the manufacturer shall conduct simulations to predict the performance of

particular basic models of small electric motors specified by the Department, analyses of previous simulations conducted by the manufacturer, sample testing of basic models selected by the Department, or a combination of the foregoing.

(c) *Additional testing requirements—(1) Selection of basic models for testing if an AEDM is to be applied.*

(i) A manufacturer must select basic models for testing in accordance with the criteria that follow:

(A) Two of the basic models must be among the five basic models with the highest unit volumes of production by the manufacturer in the prior year, or during the prior 12-month period before the effective date of the energy efficiency standard, whichever is later, and in identifying these five basic models, any small electric motor that does not comply with § 431.446 shall be excluded from consideration;

(B) The basic models should be of different horsepower ratings without duplication;

(C) At least one basic model should be selected from each of the frame number series for the designs of small electric motors for which the AEDM is to be used; and

(D) Each basic model should have the lowest nominal full-load efficiency among the basic models with the same rating ("rating" as used here has the same meaning as it has in the definition of "basic model").

(ii) If it is impossible for a manufacturer to select basic models for testing in accordance with all of these criteria, the criteria shall be given priority in the order in which they are listed. Within the limits imposed by the criteria, basic models shall be selected randomly.

(2) [Reserved]

ENERGY CONSERVATION STANDARDS

**§ 431.446 Small electric motors energy conservation standards and their effective dates.**

(a) Each small electric motor manufactured (alone or as a component of another piece of non-covered equipment) after March 9, 2015, or in the

**Department of Energy**

**§ 433.2**

case of a small electric motor which requires listing or certification by a nationally recognized safety testing laboratory, after March 9, 2017, shall have an average full load efficiency of not less than the following:

Motor horsepower/standard kilowatt equivalent	Average full load efficiency		
	Polyphase		
	Open motors (number of poles)		
	6	4	2
0.25/0.18 .....	67.5	69.5	65.6
0.33/0.25 .....	71.4	73.4	69.5
0.5/0.37 .....	75.3	78.2	73.4
0.75/0.55 .....	81.7	81.1	76.8
1/0.75 .....	82.5	83.5	77.0
1.5/1.1 .....	83.8	86.5	84.0
2/1.5 .....	N/A	86.5	85.5
3/2.2 .....	N/A	86.9	85.5

  

Motor horsepower/standard kilowatt equivalent	Average full load efficiency		
	Capacitor-start capacitor-run and capacitor-start induction-run		
	Open motors (number of poles)		
	6	4	2
0.25/0.18 .....	62.2	68.5	66.6
0.33/0.25 .....	66.6	72.4	70.5
0.5/0.37 .....	76.2	76.2	72.4
0.75/0.55 .....	80.2	81.8	76.2
1/0.75 .....	81.1	82.6	80.4
1.5/1.1 .....	N/A	83.8	81.5
2/1.5 .....	N/A	84.5	82.9
3/2.2 .....	N/A	N/A	84.1

(b) For purposes of determining the required minimum average full load efficiency of an electric motor that has a horsepower or kilowatt rating between two horsepower or two kilowatt ratings listed in any table of efficiency standards in paragraph (a) of this section, each such motor shall be deemed to have a listed horsepower or kilowatt rating, determined as follows:

(1) A horsepower at or above the midpoint between the two consecutive horsepower ratings shall be rounded up to the higher of the two horsepower ratings;

(2) A horsepower below the midpoint between the two consecutive horsepower ratings shall be rounded down to the lower of the two horsepower ratings; or

(3) A kilowatt rating shall be directly converted from kilowatts to horsepower using the formula 1 kilowatt = (1/0.746) hp, without calculating beyond three significant decimal places, and the resulting horsepower shall be rounded in accordance with paragraphs

(b)(1) or (b)(2) of this section, whichever applies.

[75 FR 10947, Mar. 9, 2010; 75 FR 17036, Apr. 5, 2010]

**PART 433—ENERGY EFFICIENCY STANDARDS FOR NEW FEDERAL COMMERCIAL AND MULTI-FAMILY HIGH-RISE RESIDENTIAL BUILDINGS**

- Sec.
- 433.1 Purpose and scope.
- 433.2 Definitions.
- 433.3 Materials incorporated by reference.
- 433.4 Energy efficiency performance standard.
- 433.5 Performance level determination.
- 433.6 Sustainable principles for siting, design and construction. [Reserved]
- 433.7 Water used to achieve energy efficiency. [Reserved]
- 433.8 Life-cycle costing.

AUTHORITY: 42 U.S.C. 6831–6832, 6834–6835; 42 U.S.C. 7101 *et seq.*

SOURCE: 71 FR 70281, Dec. 4, 2006, unless otherwise noted.

**§ 433.1 Purpose and scope.**

This part establishes an energy efficiency performance standard for the new Federal commercial and multi-family high-rise buildings, for which design for construction began on or after January 3, 2007, as required by section 305(a) of the Energy Conservation and Production Act, as amended (42 U.S.C. 6834(a)).

**§ 433.2 Definitions.**

For purposes of this part, the following terms, phrases and words are defined as follows:

*ANSI* means the American National Standards Institute.

*ASHRAE* means the American Society of Heating, Refrigerating and Air-Conditioning Engineers.

*ASHRAE Baseline Building 2004* means a building that is otherwise identical to the proposed building but is designed to meet, but not exceed, the energy efficiency specifications in ANSI/ASHRAE/IESNA Standard 90.1–2004, Energy Standard for Buildings Except Low-Rise Residential Buildings, January 2004 (incorporated by reference, see § 433.3).