September 2021

Introducing Ceiling Fan Energy Index (CFEI) and Changes to the U.S. Regulation for Large-Diameter Ceiling Fans

An AMCA International White Paper

Air Movement and Control Association
(AMCA) International Inc.
30 W. University Drive
Arlington Heights, IL 60004-1893
USA
www.amca.org

This white paper is available to download at no cost at www.amca.org/whitepapers

Contact: Michael Ivanovich, Senior Director, Global Affairs,
AMCA International, mivanovich@amca.org.

Introducing Ceiling Fan Energy Index (CFEI) and Changes to the U.S. Regulation for Large-Diameter Ceiling Fans

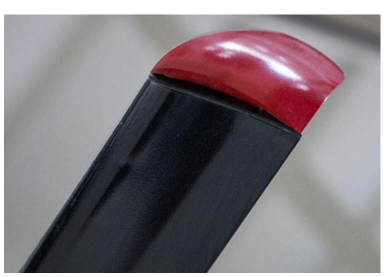
SCOPE

This white paper is of interest to manufacturers, distributors, specifiers, and purchasers of large-diameter ceiling fans made for sale in the United States and Canada and AMCA members in countries that may regulate these products in the future.

INTRODUCTION

In a highly unusual development, a law was passed in 2020 to change the metric used to rate the efficiency of large-diameter ceiling fans (LDCF) made for sale in the United States and Canada, as U.S. Department of Energy (DOE) cubic feet per minute (cfm) per Watt (W) (DOE cfm/W) was replaced with ceiling-fan energy index (CFEI).

Part 1 of this paper provides background on DOE cfm/W and explains why a new metric was needed. Part 2 describes CFEI and how it came to replace DOE cfm/W and explains how to comply with the new CFEI requirements in the U.S. Code of Federal Regulations. Part 3 describes how CFEI is reflected in Air Movement and Control Association (AMCA) International standards, testing, and certification.



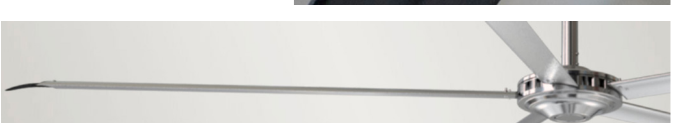


FIGURE 1. "Wing tips" need to be included in measurements of blade span. Photographs courtesy of 4Front Engineered Solutions

PART 1: THE PROBLEMATIC DOE CFM/W METRIC

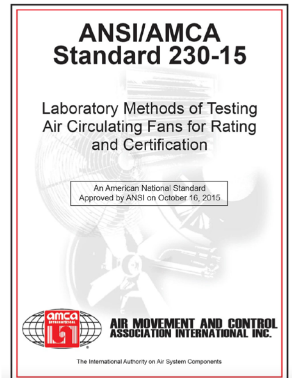
The U.S. DOE defines LDCF as a ceiling fan with a blade span greater than 7 ft. Blade span is fan diameter plus the extent to which fan diameter is enlarged by "wing tips" extending from the blades (Figure 1).

A different test procedure is used for ceiling fans with diameters less than or equal to 7 ft and is not within the scope of this paper.

ANSI/AMCA Standard 230, *Laboratory Methods of Testing Air Circulating Fans for Rating and Certification*, describes how to perform laboratory measurements for LDCF and calculate DOE cfm/W for a given speed, specifying that, for variable-flow LDCF, tests be conducted at five speeds: 20%, 40%, 60%, 80%, and 100%. An average cfm/W is not calculated as part of the ANSI/AMCA Standard 230 procedure.

ANSI/AMCA Standard 230 describes how to uniformly measure and report:

- Thrust (pound-force or newton)
- Airflow rate (cfm or cubic meters per second [m^3/s])
- Power (W)
- Efficacy (cfm/W or m^3/s/W at one speed)
- Efficiency (input power/air power)



ANSI/AMCA Standard 230-15 can be obtained for a nominal cost at www.amca.org/store.

The initial DOE test procedure requires the same five speeds, but additionally requires that power consumption be measured while a fan is idle. In calculations of DOE cfm/W, the five operating speeds are equally weighted by time (2.4 hr, for a total of 12 operating hours per day) and averaged. Standby-power time is estimated to be 12 hr per day.

$$\textit{Ceiling Fan Efficiency (CFM/W)} = \frac{\Sigma_i(\mathrm{CFM}_i \times OH_i)}{W_{Sb} \times OH_{Sb} + \Sigma_i(\mathrm{W}_i \times OH_i)}$$

Where:
CFM_i = airflow at speed
OH_i = operating hours at speed
W_i = power consumption at speed
OH_{sb} = operating hours in standby mode, and
W_{sb} = power consumption in standby mode

Cfm/W vs. CFEI

Table 1 compares DOE cfm/W and CFEI.

Because of the relationship between power and airflow defined in the fan laws, DOE cfm/W can be gamed more easily than can CFEI. Figure 2 shows airflow vs. power for five different 24-ft-diameter fans. For a given airflow,

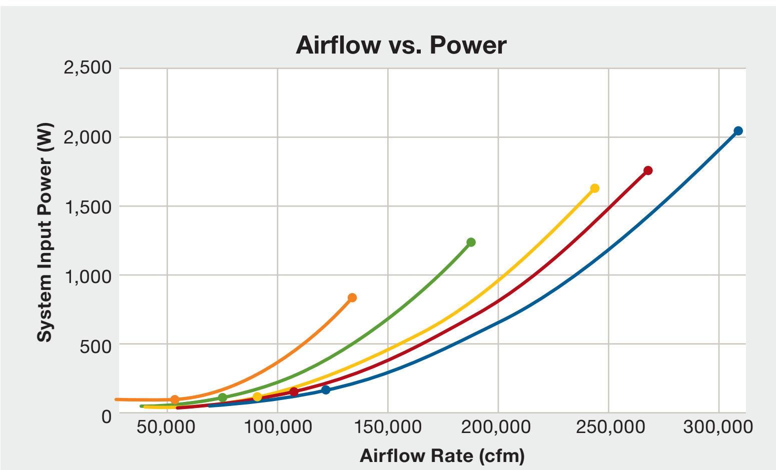
Parameter	DOE cfm/W	CFEI
Effective date	Jan. 19, 2017	May 27, 2021
Referenced test standard	10 CFR Part 430, Appendix U	10 CFR Part 430, Appendix U (corrected*)
Rating calculation standard	10 CFR Part 430, Subpart B, Appendix U	ANSI/AMCA Standard 208, *Calculation of the Fan Energy Index*, with the following modifications: (1) use of an airflow constant (Q_0) of 26,500 cfm, (2) use of a pressure constant (P_0) of 0.0027 in. w.g., and (3) use of a fan-efficiency constant (η_0) of 42 percent
Test speeds	20%, 40%, 60%, 80%, 100% weighted by operating hours at speed	100% and 40%, or the speed closest to, but not less than, 40%
Standby power	Included in calculation based on 12 hr of standby per day	Not included in calculation
Mathematical function	Linear	Polynomial
Compliance shortcuts	Easy. Slowing an inefficient fan can make the fan compliant.	Difficult. CFEI ratings are more uniform across airflow ranges.
Benefits	Familiar	Allows evolution to greater utility (higher airflow for a given fan diameter) at conservative power. Only two test speeds needed for regulation. LDCF requirements can be tightened without the baseline changing.
Penalties	High-airflow (for a given diameter) fans have difficulty complying, which impedes their evolution. Conversely, low-airflow fans can be paired with inefficient motors, drives, etc. and still easily comply, which enables low-efficiency models to remain in the market. Does not adequately address “outlier” very low-flow products, resulting in exceedingly high ratings. Makes rebates and green codes difficult.	Coefficients for LDCF were developed to supplement ANSI/AMCA Standard 208, which was not designed to handle LDCF. Coefficients were developed using high-volume, low-speed fans. LDCF class includes “outlier” very low-flow (for a given diameter) products that subsequently entered the market. Not well-known; market awareness and education needed.

*An erratum to ANSI/AMCA Standard 230-15 was published on May 6, 2021. The erratum is included as Appendix 1 of this paper.

TABLE 1. Comparison of DOE cfm/W and CFEI.

the lower a curve on the chart, the more efficient (less power) the fan. Despite differences in true operating efficiency at any common duty point, each of the five fans has a rating of 234 cfm/W. In contrast, CFEI ratings at high speed are dramatically different. The most efficient fan (lowest power for a given airflow) is Fan 1, which has a CFEI rating of 1.72. The least efficient fan (highest power for a given airflow) is Fan 5, which has a CFEI rating of 0.63. While both Fan 1 and Fan 5 would comply with the DOE cfm/W minimum-efficiency requirement, Fan 1 would significantly exceed the DOE minimum-efficiency requirement of 1.00 at high speed, while Fan 5 would be non-compliant, as its CFEI is less than 1.00. Table 2 summarizes the CFEI and DOE cfm/W ratings for each of the fans in Figure 2. As illustrated by this example, CFEI provides a better representation of how efficiently a LDCF performs.

As previously discussed, the relationship between power and airflow dictated by the fan laws provides an inequitable efficiency requirement for LDCF. Fan 3 is representative of a current high-efficiency LDCF product. Fan 1 represents a high-airflow (for the given diameter) LDCF with the same DOE cfm/W as Fan 3. Note that, despite increasing the airfoil efficiency by 10% (no small task) and the drive efficiency to 99%, the motor would have to increase its efficiency by 18% for Fan 1 to comply with the cfm/W requirements. This essentially makes Fan 1 impossible to manufacture. On the other hand, Fan 5 represents a low-airflow (for the given diameter) LDCF with the same DOE cfm/W as Fan 3. Note that, even though both fans have the same DOE cfm/W rating, Fan 5 has a 10%-less-efficient airfoil, a 15%-less-efficient motor, and a 4%-less-efficient drive. This gives Fan 5 a free pass on efficiency compliance that leaves a lot of potential energy savings on the table. It should be noted that Fan 5 would have to be made roughly 27% more efficient to comply with CFEI requirements at high speed.



Fan model	Color	CFEI_{100} (≥ 1.00)	DOE cfm/W
Fan #1	Blue	1.72	234
Fan #2	Red	1.38	234
Fan #3	Yellow	1.18	234
Fan #4	Green	0.85	234
Fan #5	Orange	0.63	234

FIGURE 2. Input power vs. airflow at five test speeds for five 24-ft fans with average DOE cfm/W and CFEI at high speed shown in legend.

Fan model	Max. cfm	CFEI_{100} (≥ 1.00)	DOE cfm/W	Airfoil eff.	Trans. eff.	Motor eff.	Drive eff.
Fan 1	307,395	1.72	234	57.0%	100%	108.0%	99.0%
Fan 2	267,300	1.38	234	52.0%	100%	95.0%	97.0%
Fan 3	243,000	1.18	234	47.0%	100%	90.0%	95.0%
Fan 4	187,110	0.85	234	42.0%	100%	70.0%	93.0%
Fan 5	133,650	0.63	234	37.0%	100%	55.0%	91.0%

TABLE 2. Relative component efficiencies required to achieve 234 cfm/W at various airflows, 24-ft-diameter fan.

CFEI was developed to make inefficient fans less likely to comply through the use of slower speeds, such as those used to game the DOE cfm/W metric, and to remove the unintentional barrier to compliance for high-performing high-utility fans.

PART 2: CFEI AND THE 2020 CEILING FAN IMPROVEMENT ACT

How CFEI Was Developed

LDCF always are tested as completely assembled units. Because they are measured in free air, without cages or other flow appurtenances, they are considered "total pressure" fans, rather than "static pressure" fans (such as centrifugal fans). As such, in the search for a metric to replace DOE cfm/W, the relatively new fan energy index (FEI) was considered.

A wire-to-air metric with separate equations for static pressure (P_s) and total pressure (P_t), FEI is defined in ANSI/AMCA Standard 208, *Calculation of the Fan Energy Index*, as "a ratio of the electrical input power of a reference fan to the electrical input power of the actual fan for which the FEI is calculated, both calculated at the same duty point, *i*, which is characterized by a value of airflow (Q_i) and pressure ($P_{t,i}$ or $P_{s,i}$)":

$$FEI_{t,i} \text{ or } FEI_{s,i} = \frac{\text{Reference Fan Electrical Input Power}}{\text{Actual Fan Electrical Input Power}} = \frac{FEP_{ref,i}}{FEP_{act,i}}$$

A reference fan is "a conceptual fan used to relate all fans to a common baseline." A reference fan can produce the airflow and fan pressure required at a specified electrical input power, which translates to a fan system's design condition.

"Conceptual" means the reference fan does not represent a specific fan type, such as axial or centrifugal. It is configured as having a transmission and a four-pole, 60-Hz IE3 (premium efficiency) motor.

ANSI/AMCA Standard 208 contains an equation for calculating FEI that utilizes coefficients derived from test data for fans rated using total pressure. Because LDCF were not in the data pool, FEI is not effective for rating LDCF. To remedy that, laboratory measurements of more than 100 LDCF models were used to develop coefficients strictly for LDCF. Thus, CFEI was born.

To calculate CFEI, use the FEI equation for total pressure found in ANSI/AMCA Standard 208 and substitute coefficients as follows:

- Airflow constant: Q_0 = 26,500 cfm (12.507 m^3/s)
- Pressure constant: P_0 = 0.0027 in. w.g. (0.6719 pascals)
- Fan-efficiency constant: h_0 = 42%

To show why these coefficients were needed, Table 3 compares CFEI and FEI values for five LDCF tested by AMCA International at its laboratory in Arlington Heights, Ill.

How CFEI Replaced DOE cfm/W

Because the DOE regulation already was published as a final rule, the only course of action for changing the regulatory metric was legislation.

AMCA member companies, working with consultants, developed a bill explaining the need for a change in metric and how a change could be made using CFEI. The bill, which became known as the Ceiling Fan Improvement Act of 2020 (H.R. 5758), was combined with the Energy Act of 2020 (Public Law 116-260), which was signed into law on Dec. 27, 2020, as part of the omnibus spending bill (Table 4). The language of the Ceiling Fan Improvement Act of 2020 is provided as Appendix 2.

Passage of the law led to the DOE having to administer a rulemaking changing the language in the Code of Federal Regulations (CFR). The codification was published and became enforceable on May 27, 2021.

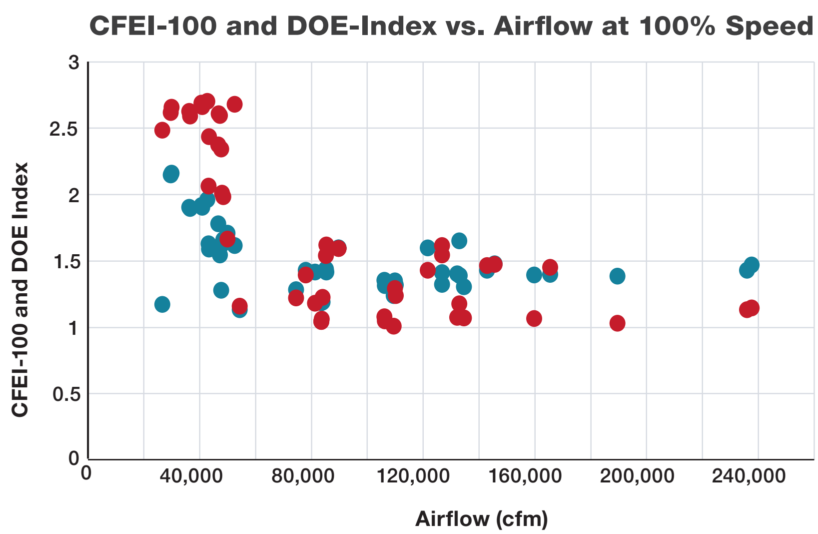


FIGURE 3. Data and calculated values for 49 AMCA-certified LDCF from a variety of manufacturers. CFEI at 100% speed is compared with an index of DOE cfm/W divided by the minimum DOE cfm/W requirement.

Tested fan	Impeller dia. (ft)	Drive type	Airflow (cfm)	$CFEI_{100}$	FEI
1	14	Direct	85,428	1.41	11.40
2	14	Direct	85,262	1.44	11.63
3	14	Gear	47,251	1.54	21.70
4	14	Gear	46,931	1.56	22.10
5	14	Direct	89,768	1.59	12.13

TABLE 3. Comparison of CFEI and FEI values for five LDCF tested at high speed by AMCA.

The codification changed most of the regulatory language for LDCF. Following are annotated CFR provisions for LDCF:

Establishment of the LDCF Product Class: (no change)

- *(*10 *CFR 430.2 – Definitions). The term "ceiling fan" means a nonportable device that is suspended from a ceiling for circulating air via the rotation of fan blades.*
- *(10 CFR 430, Appendix U to Subpart B (1.11)). Large-diameter ceiling fan means a ceiling fan that is greater than seven feet in diameter.*
- *…*

Establishment of the LDCF Test Procedure: (no change)

- *(10 CFR 430, Appendix U to Subpart B (3.4)). The test apparatus and instructions for testing large-diameter ceiling fans must conform to the requirements specified in sections 3 through 7 of AMCA 230-15 … with the following modifications:*
  - *3.4.1. The test procedure is applicable to large-diameter ceiling fans up to 24 feet in diameter.*
  - *Etc.*

Establishment of Energy Standard (Efficiency Requirement)

- *(*10 *CFR 430.32(s)(2)). Large-diameter ceiling fans manufactured on or after January 21, 2020, shall have a CFEI greater than or equal to*

  (A) 1.00 at high speed; and

  (B) 1.31 at 40 percent speed or the nearest speed that is not less than 40 percent speed.[1]

Establishment of Energy Standard (Efficiency Requirement)

- *430.32(s)(2)(ii). 5. Calculation of Ceiling Fan Energy Index (CFEI) From the Test Results for Large-Diameter Ceiling Fans:*
  - *Calculate CFEI, which is the FEI for large-diameter ceiling fans, at the speeds specified in section 3.5 of this appendix according to ANSI/AMCA 208-18, (incorporated by reference, see § 430.3), with the following modifications:*
  - *(1) Using an Airflow Constant (Q_0) of 26,500 cubic feet per minute;*
  - *(2) Using a Pressure Constant (P_0) of 0.0027 inches water gauge; and*
  - *(3) Using a Fan Efficiency Constant (η_0) of 42 percent.*

To date, no changes to the filing of certification data have been made; however, on Aug. 6, 2021, the DOE published a Notice of Proposed Rulemaking suggesting new LDCF parameters that must be filed. The DOE is proposing to add blade span (inches) and CFEI at high speed and at 40% speed, or the speed closest to 40% without being less than 40%.

With the CFEI codification in effect, manufacturers must change their published DOE cfm/W ratings to CFEI ratings and determine if their products comply with the CFEI minimum efficiencies. It is possible that some fans that complied with the DOE cfm/W requirement may not comply with the CFEI requirement and vice versa. Therefore, manufacturers need to examine their filings in the DOE Compliance Certification Management System (CCMS) online database. Products that no longer are compliant must be removed from the market. Likewise, their compliance filing must be removed. Products that did not comply with the DOE cfm/W requirement but comply with the CFEI requirement can be filed as compliant and returned to the market.

Other types of circulating fans, such as air-circulating fan heads (Figure 4), which can be ceiling-mounted, possibly are covered by the ceiling-fan regulation. The DOE is evaluating responses to a notice of proposed rulemaking from September 2019 that seeks to clarify coverage of air-circulating fan heads. Because these types of fans have blade spans of less than 7 ft, they cannot be tested to ANSI/AMCA Standard 230 for energy efficiency for fans sold in the USA; however, they still have to meet the DOE design requirements (see sidebar "DOE Design Requirements").

Date	Regulatory Event
07-24-2016	Test procedure published
01-23-2017	Test procedure takes effect
01-19-2019	Energy standard published
01-21-2020	Energy-standard enforcement begins
02-05-2020	H.R. 5758 (Ceiling Fan Improvement Act of 2020) introduced
12-27-2020	Omnibus bill signed by president
05-27-2021	Changes to Code of Federal Regulations published in *Federal Register*
05-27-2021	CFEI becomes enforceable metric for LDCF

TABLE 4. Simplified chronology of events leading to legislative replacement of DOE cfm/W with CFEI.

PART 3: AMCA LDCF TESTING AND CERTIFICATION

AMCA Testing

AMCA International tests LDCF at its headquarters laboratory in Arlington Heights, Ill., using 10 CFR 430—that is, the DOE test procedure—for fans sold in the United States; otherwise, the lab uses ANSI/AMCA Standard 230-15 as the method of test. The AMCA laboratory is certified by A2LA to ISO/IEC 17025, *General Requirements for the Competence of Testing and Calibration Laboratories*, which "enables laboratories to demonstrate that they operate competently and generate valid results, thereby promoting confidence in their work both nationally and around the world."

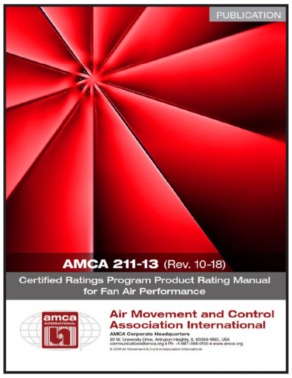
AMCA International can test LDCF with blade spans to 18 ft (5.5 m) at its headquarters laboratory. Fans with blade spans over 18 ft and up to 24 ft (7.3 m) are tested at NOW Arena in nearby Hoffman Estates, Ill.

Ratings calculations for CFEI are performed per U.S. DOE requirements, as described in this paper and included in AMCA laboratory test reports. Because Canadian efficiency regulations are based on DOE regulations but have not yet been updated to include CFEI ratings, DOE cfm/W ratings will continue to be included in AMCA laboratory test reports. Although not used in CFEI ratings, standby-power measurements still are required by the DOE test procedure and, thus, will continue to be included in AMCA laboratory test reports.

An error in ANSI/AMCA Standard 230-15 recently was discovered, leading to the publication of an erratum (Appendix 1 to this paper) on May 6, 2021. The erratum corrected a problem whereby measurements of input electrical power needed to be converted from ambient air to standard air. Left uncorrected, ratings could be different based on the elevation and consequent air density of the testing location.

Apart from the 2021 erratum, ANSI/AMCA Standard 230 last was updated in 2015. It is scheduled for a revision in 2022. As part of the revision, the 2021 erratum will be incorporated, the CFEI calculation will be added, and the terminology will be made consistent with the DOE regulatory language.

FIGURE 4. Air-circulating fan head mounted to a ceiling beam.



AMCA Publication 211 can be obtained free of charge at www.amca.org/store*.*

AMCA Certification

The AMCA Certified Ratings Program (CRP) was instituted to provide assurance that manufacturers' product ratings are accurate and enable comparisons of like products across manufacturers. The AMCA CRP currently covers more than 4,000 product lines worldwide.

AMCA certifies LDCF ratings per AMCA Publication 211-13 (Rev. 10-18), *Certified Ratings Program Product Rating Manual for Fan Air Performance*. An update to the publication to include CFEI is undergoing final approval, with publication expected in late 2021. The current edition of AMCA Publication 211 certifies these LDCF parameters:

- *Volumetric airflow rate*
- *DOE cfm/W*
- *Fan-system input power, phase, voltage, and frequency*
- *Efficacy (volumetric airflow rate/electrical input power)*
- *Nominal impeller speed*
- *Direction of* operation

To find AMCA-certified LDCF product lines, visit *www.amca.org/certify* and search by product type for "Large Diameter Ceiling Fan." Click on any of the resulting manufacturers to obtain links to catalogs of certified LDCF models.

DOE Design Requirements

DOE "design requirements" specify features and capabilities contained within the definition of a covered product that must be included in a design. Products that cannot be tested to the federal test procedure are not held to the energy standard, but must comply with design requirements.

The design requirements for ceiling fans were published with the first ceiling-fan regulation in 2006:

> *42 U.S.C. 6295(ff) Ceiling fans and ceiling fan light kits*
>
> *(A) All ceiling fans manufactured on or after January 1, 2007, shall have the following features:*
>
> > *(i) Fan speed controls separate from any lighting controls.*
> >
> > *(ii) Adjustable speed controls (either more than 1 speed or variable speed).*
> >
> > *(iii) The capability of reversible fan action, except for—*
> >
> > > *(I) fans sold for industrial applications;*
> > >
> > > *(II) fans sold for outdoor applications; and*
> > >
> > > *(III) cases in which safety standards would be violated by the use of the reversible mode.*

Based on feedback from specifying engineers, AMCA simplified its guideline specifications for LDCF. Engineers are encouraged to incorporate this new and more efficient language into their specifications:

> *All large-diameter ceiling fans shall be tested and rated in accordance with AMCA Publication 211 for air performance.*

This white paper will be updated to include CFEI in the specification language when the new edition of AMCA Publication 211 is published.

Note

1) The requirement is for the LDCF to comply with both test speeds.

References

AMCA. (2018). *Calculation of the fan energy index*. ANSI/AMCA Standard 208-18. Arlington Heights, IL: AMCA International.

AMCA. (2015). *Laboratory methods of testing air circulating fans for rating and certification*. ANSI/AMCA Standard 230-15. Arlington Heights, IL: AMCA International.

Uniform test method for measuring the energy consumption of ceiling fans. 10 CFR Appendix U to Subpart B of Part 430. (2017). Washington, DC: National Archives and Records Administration, Office of the Federal Register.

EERE. (2019, September 30). *Energy conservation program: Test procedure for ceiling fans; notice of proposed rulemaking and request for comment*. Available at https://bit.ly/CF_test

AMCA. (2018). *Certified ratings program product rating manual for fan air performance*. AMCA 211-13 (Rev. 10-18). Arlington Heights, IL: AMCA International.

DOE. (2021, August 6). *Notice of proposed rulemaking and request for comment: Energy conservation program for appliance standards: Certification for ceiling fan light kits, general service incandescent lamps, incandescent reflector lamps, ceiling fans, consumer furnaces and boilers, consumer water heaters, dishwashers, commercial clothes washers, battery chargers, and dedicated-purpose pool pumps*. Federal Register. Available at https://bit.ly/FR_08062021

Ceiling-Fan-Regulation Resources

- **AMCA LDCF advocacy Web page:** www.amca.org/ldcf
- **U.S. DOE Appliance and Equipment Standards Program:** https://bit.ly/appliance_equipment
- **U.S. DOE ceiling-fan regulations and listserver signup:** https://bit.ly/DOE_CeilingFans
- **Test procedure:** https://bit.ly/Electronic_CFR
- **Energy standard:** https://bit.ly/e-CFR_standard
- **Compliance database for ceiling fans:** https://bit.ly/CF_compliance
- **Canadian ceiling-fan-efficiency regulation:** https://bit.ly/Canada_CF

Appendix 1

TECHNICAL ERRATA SHEET FOR ANSI/AMCA STANDARD 230-15

Density Corrections

May 6, 2021

The corrections listed in this errata sheet apply to all copies of ANSI/AMCA Standard 230-15, *Laboratory Methods of Testing Air Circulating Fans for Rating and Certification*. The corrections are not part of the approved, published document because they did not undergo the rigorous process of consensus development required by the American National Standards Institute (ANSI).

In Section 9, measured fan thrust is converted to standard air density, but the power does not include a density correction. This technical erratum addresses that omission.

In Table 1, add the following variable:

Symbol	Description	SI Unit	IP Unit
W_0	Measured electrical input power	W	W

In Section 8.2.4, replace “W_E” with “W_0”.

Insert a new section after Section 9.4:

9.4a Power

The electrical input power, W_E, shall be calculated from the measured electrical input power, W_0, using the following equation:

$$W_E = W_0 \left(\frac{\rho_{std}}{\rho_0} \right)$$

In Section 9.5.1, replace all instances of “W_E” with “W_0”, including in Equation 9.7.

In Section 10, include “Measured electrical input power” in “Data at test conditions” and “Electrical input power” in “Calculated values.”

END OF ERRATUM

Appendix 2

Ceiling Fan Improvement Act of 2020 as included in the Energy Act of 2020

SEC. 1008. MODIFICATIONS TO THE CEILING FAN ENERGY CONSERVATION STANDARD.

(a) IN GENERAL.—Section 325(ff)(6) of the Energy Policy and Conservation Act (42 U.S.C. 6295(ff)(6)) is amended by adding at the end the following:

''(C)(i) Large-diameter ceiling fans manufactured on or after January 21, 2020, shall—

''(I) not be required to meet minimum ceiling fan efficiency in terms of ratio of the total airflow to the total power consumption as described in the final rule titled 'Energy Conservation Program: Energy Conservation Standards for Ceiling Fans' (82 Fed. Reg. 6826 (January 19, 2017)); and

''(II) have a CFEI greater than or equal to—

''(aa) 1.00 at high speed; and

''(bb) 1.31 at 40 percent speed or the nearest speed that is not less than 40 percent speed.

''(ii) For purposes of this subparagraph, the term 'CFEI' means the Fan Energy Index for large-diameter ceiling fans, calculated in accordance with ANSI/AMCA Standard 208–18 titled 'Calculation of the Fan Energy Index', with the following modifications:

''(I) Using an Airflow Constant (Q_0) of 26,500 cubic feet per minute.

''(II) Using a Pressure Constant (P_0) of 0.0027 inches water gauge.

''(III) Using a Fan Efficiency Constant (η_0) of 42 percent.''.

(b) REVISION.—For purposes of section 325(m) of the Energy Policy and Conservation Act (42 U.S.C. 6295(m)), the standard established in section 325(ff)(6)(C) of such Act (as added by subsection (a) of this section) shall be treated as if such standard was issued on January 19, 2017.

AMCA Resources

Readers of this white paper may find the following AMCA resources useful when working with LDCF and other air-movement or control products:

- **AMCA International:** www.amca.org
- **AMCA standards and publications:** www.amca.org/publish/
- **AMCA store:** www.amca.org/store
- **AMCA white papers:** https://www.amca.org/educate/#articles-and-technical-papers
- **AMCA webinars (with PDH):** www.amca.org/educate
- **AMCA Certified Ratings Program:** www.amca.org/certify
- **LDCF testing at AMCA laboratory:** www.amca.org/test
- **AMCA FEI microsite:** www.amca.org/fei

AMCA INTERNATIONAL
30 W. UNIVERSITY DRIVE
ARLINGTON HEIGHTS, IL 60004-1893
USA
+1 847-394-0150
publications@amca.org