

Appliance Standards Awareness Project  
Natural Resources Defense Council  
American Council for an Energy-Efficient Economy

September 28, 2018

California Energy Commission  
Docket Unit, MS-4  
1516 Ninth Street  
Sacramento, CA 95814-5512

**RE: Docket No. 17-AAER-06: Commercial and Industrial Fans and Blowers**

This letter constitutes the comments of the Appliance Standards Awareness Project (ASAP), Natural Resources Defense Council (NRDC), and American Council for an Energy-Efficient Economy (ACEEE) on the California Energy Commission's Draft Staff Report for commercial and industrial fans and blowers. These comments address embedded fans. We have submitted separate joint comments with the Air Movement and Control Association International (AMCA) on stand-alone fans. We appreciate the opportunity to provide input to the Commission.

**Overview**

We recommend that the Energy Commission pursue a two-phase rulemaking for fans. For the first phase, we recommend adding certain additional embedded fan equipment types to the list of exclusions, which we outline below. We further recommend that the Energy Commission pursue establishing standards for these additional embedded fan types in the second phase of the rulemaking. We believe that this approach will allow the first phase to move forward expeditiously while still providing the opportunity to achieve significant additional savings in the second phase. As part of the second phase of the rulemaking, we encourage the Energy Commission to consider alternative approaches to achieving equal or greater savings including raising equipment efficiency levels.

Below we provide our recommendations on scope, definitions, test methods, marking, and representations for embedded fans. In the Appendix we have provided our specific suggested edits to the proposed regulatory language. These edits include the edits we have submitted in our joint comments with AMCA as well as additional edits related to embedded fans.

**Scope**

We believe that it is important to maintain the current structure of the proposed regulatory language regarding scope (Section 1601). Specifically, we believe that it is important that the regulation be structured such that all fans are covered unless they are specifically excluded. This structure should help prevent loopholes and assist in enforcement efforts.

As described above, we are recommending that for the first phase of the rulemaking, certain additional embedded fan equipment types be added to the list of exclusions. Specifically, we recommend adding as exclusions:

- Fans embedded in air-cooled water-chilling packages

- Return and exhaust fans embedded in air-cooled commercial package air-conditioning and heating equipment with cooling capacity greater than or equal to 65,000 Btu/h and less than 760,000 Btu/h
- Fans embedded in air-cooled commercial package air-conditioning and heating equipment with cooling capacity greater than or equal to 760,000 Btu/h
- Fans embedded in air compressors
- Fans embedded in commercial packaged boilers
- Fans embedded in commercial water heaters
- Fans embedded in dedicated outdoor air systems
- Fans embedded in energy recovery ventilators
- Fans embedded in room fan-coils
- Fans embedded in pool heaters
- Fans embedded in water-cooled and evaporatively-cooled commercial package air-conditioning and heating equipment with cooling capacity greater than 760,000 Btu/h

We also note that fans embedded in computer room air conditioners should be added to the list of exclusions (for both phase one and phase two) to reflect the ASRAC term sheet.

We recommend that the Energy Commission pursue standards for fans embedded in the equipment types listed above as part of a second phase of the rulemaking. This second phase could achieve significant additional cost-effective savings for California. At the Staff Workshop on July 11, Ingersoll Rand noted that an alternative way to achieving equal or greater savings in equipment with embedded fans would be to increase the equipment efficiency levels, for example through Title 24.<sup>1</sup> There may also be opportunities for certain equipment types to treat the entire piece of equipment (e.g. a room fan-coil) as the “fan,” which could allow for capturing additional energy savings. As part of our recommended second phase of the rulemaking, we encourage the Energy Commission to consider alternative approaches, including increases in equipment efficiency through Title 24 (or potentially Title 20), to achieve equal or greater savings.

### **Definitions**

In the Appendix we have provided preliminary suggested definitions for the equipment types listed above that were not previously defined. We have also added definitions for heat rejection equipment based on the ASRAC term sheet.

### **Test Methods**

We encourage the Energy Commission to clarify that for embedded fans, the fan should be tested as a stand-alone fan outside of the equipment. We also recommend specifying in the test procedure that if necessary, non-impeller components of the fan that are geometrically similar to those used by the fan as embedded in the larger piece of equipment shall be used to complete the fan testable configuration. This second clarification would address fans where the housing is part of the equipment, for example. Finally, we recommend that when calculating the FEI for fans in fan arrays in air handling units, the testing method included in Annex C of AMCA 208 should be used. As explained in Annex C, treating fan

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<sup>1</sup> Transcript of 07/11/2018 Staff Workshop on Appliance Efficiency Regulations for Commercial and Industrial Fans and Blowers. pp. 74-81.

arrays in air handling units as a single fan ensures a consistent calculation of FEI regardless of the number of fans used. The Appendix includes our suggested language for these clarifications.

### **Marking**

In the Appendix we have provided a few edits to the proposed marking requirements for embedded fans. The table below shows our suggested marking requirements. We believe that either the serial number or the date manufactured should be included on the label, but it is not necessary for both items to be included. (This is also consistent with the ASRAC term sheet.) We are also suggesting that design pressure not be included on the label. Since the pressure provided by the fan when tested stand-alone is different than the pressure at the outlet of the equipment, we believe that for embedded fans it is more appropriate to define the operating point based on air flow and operating speed.

|   |
|---|
| <u>Model Number</u>                       |
| <u>Serial number or date manufactured</u> |
| <u>Design air flow (CFM)</u>              |
| <u>Design operating speed (RPM)</u>       |
| <u>FEI at design point</u>                |

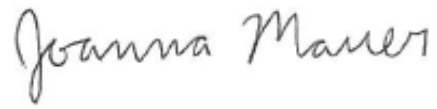
We also believe that it may make sense to provide an option for labeling embedded fans for the case where the design point may be unknown, similar to the option for stand-alone fans. The table below lists the information that could be required for marking an embedded fan for the case where the design point is unknown.

|   |
|---|
| <u>Model Number</u>                       |
| <u>Serial number or date manufactured</u> |
| <u>Maximum rated speed (RPM)</u>          |

### **Representations**

In our joint comments with AMCA we have recommended that the Energy Commission establish requirements regarding representations (e.g., marketing materials, selection software) in order to help ensure that purchasers are selecting fans that meet the standard at their design point. We encourage the Energy Commission to also specify that for equipment containing fans that are included in the scope of coverage, if the OEM advertises information about the operating range of the equipment, the advertised operating range would need to be restricted to those points where the fan is compliant. (Compliant operating points for the equipment would correspond to the compliant operating points of the fan based on CFM and RPM.)

Thank you for considering these comments.



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## APPENDIX: Suggested Edits to the Proposed Regulatory Language

# CHAPTER 10: Proposed Regulatory Language

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The proposed changes to the Title 20 standards are provided below. Changes to the standards are marked with underline for new language relevant to commercial and industrial fans and blowers and ~~strike-out~~ to delete existing language. Three dots or “...” represent the substance of the regulations that exists between the proposed language and current language.

The proposed regulations will:

1. Expand the scope of the regulations to include commercial and industrial fans and blowers.
2. Define the test methods to measure the efficiency of commercial and industrial fans and blowers.
3. Establish a minimum Fan Energy Index (FEI) of 1.0 for commercial and industrial fans and blowers.
4. Establish manufacturer data submittal requirements for the certification of commercial and industrial fans and blowers.
5. Establish marking requirements for commercial and industrial fans and blowers.

The efficiency standards for commercial and industrial fans and blowers would apply to fans manufactured on or after January 1, 2020, or at least one year from the adoption of this regulation.

## Section 1601. Scope

...

(d) Spot air conditioners, evaporative coolers, residential furnaces, ceiling fans, ceiling fan light kits, whole house fans, residential exhaust fans, ~~and~~ dehumidifiers, and commercial and industrial fans and blowers.

- 1) Commercial and industrial fans and blowers do not include:
  - a) Radial housed unshrouded fans with diameter less than 30 inches ~~and~~ a blade width of less than 3 inches;
  - b) Safety fans;
  - c) Ceiling fans;
  - ~~a~~d) Circulating fans;
  - ~~b~~e) Induced flow fans;
  - ~~e~~f) Jet fans;

d)g) Cross-flow fans;

e)h) Fans embedded in central air conditioners and central air-conditioning heat pumps as defined at 10 CFR 430.2;

- fi) Fans embedded in sSmall commercial packaged air-conditioning and heating equipment as defined at 10 CFR 431.92 with cooling capacity less than 65,000 Btu/h.
- g) Fans embedded in fFurnaces as defined at 10 CFR 430.2;
- h)k) Fans embedded in tTransport refrigeration and fans exclusively powered by internal combustion engines;
- i)l) Fans embedded in vVacuums;
- j)m) Fans embedded in hHeat rejection equipment;
- k)n) Fans embedded in aAir curtain units;
- l)o) ~~Supply and condenser f~~Fans embedded in air-cooled commercial package air-conditioning and heating equipment as defined at 10 CFR 431.92 with cooling capacity greater than or equal to 65,000 Btu/h ~~and less than 760,000 Btu/h;~~
- m)p) Fans embedded in water-cooled and evaporative-cooled commercial package air conditioning and heating equipment as defined at 10 CFR 431.92 ~~with cooling capacity less than 760,000 Btu/h;~~
- n)q) Fans embedded in water-source heat pumps as defined at 10 CFR 431.92 with cooling capacity less than 135,000 Btu/h;
- o)r) Fans embedded in single-package vertical air conditioners and single-package vertical heat pumps as defined at 10 CFR 431.92 with cooling capacity less than 240,000 Btu/h;
- s) Fans embedded in packaged terminal air conditioners and packaged terminal heat pumps as defined at 10 CFR 431.92 ~~with cooling capacity less than 760,000 Btu/h; or~~
- t) Fans embedded in computer room air conditioners as defined at 10 CFR 431.92 with cooling capacity less than 760,000 Btu/h;
- p)—
- u) Fans embedded in variable refrigerant flow multisplit air conditioners and variable refrigerant flow multisplit heat pumps as defined at 10 CFR 431.92 with cooling capacity less than 760,000 Btu/h.
- v) Fans embedded in air-cooled water-chilling packages;
- w) Fans embedded in air compressors as defined at 10 CFR 431.342;
- x) Fans embedded in commercial packaged boilers as defined at 10 CFR 431.82;
- y) Fans embedded in commercial water heaters as defined at 10 CFR 431.102;
- z) Fans embedded in dedicated outdoor air system units;
- aa) Fans embedded in energy recovery ventilators;
- bb) Fans embedded in room fan-coils; or
- c)cc) Fans embedded in pool heaters as defined at 10 CFR 430.2

## Section 1602. Definitions

...

(d) Spot Air Conditioners, Evaporative Coolers, Ceiling fans, Ceiling Fan Light Kits, Whole House Fans, Residential Exhaust Fans, ~~and~~ Dehumidifiers, and Commercial and Industrial Fans and Blowers.

...

“Air cooled steam condenser” means a device for rejecting heat to the atmosphere through the indirect condensing of steam inside air-cooled finned tubes.

“Air-cooled water-chilling package” means a factory-made and prefabricated assembly (not necessarily shipped as one package) of one (1) or more compressors, condensers and evaporators, with interconnections and accessories including controls, designed for the purpose of cooling water. It is a machine specifically designed to make use of a vapor compression refrigeration cycle to transfer heat from a cold water fluid circulating system to the air.

“Air Curtain unit” means equipment providing a directionally-controlled stream of air moving across the entire height and width of an opening that reduces the infiltration or transfer of air from one side of the opening to the other and/or inhibits the passage of insects, dust or debris.

“Axial-inline fan” means a fan with an axial impeller and a cylindrical housing with or without turning vanes. Inlets and outlets can optionally be ducted.

“Axial-panel fan” means a fan with an axial impeller mounted in a short housing that can be a panel, ring, or orifice plate. The housing is typically mounted to a wall separating two spaces and the fans are used to increase the pressure across this wall. Inlets and outlets are not ducted.



~~“Axial power roof ventilator (PRV) means a fan with an axial impeller and a cylindrical housing as well as a housing to prevent precipitation from entering the building with or without turning vanes used to exhaust air from a building. Inlets and outlets can optionally be ducted.~~

...  
“Basic model” of a commercial and industrial fan and blower means a catalogued product that is engineered and offered for sale with no modification necessary, typically consisting of a product and size; and, in addition:

- (1) All blade pitches of a certain size adjustable-pitch axial fan may be considered a single basic model; and
- (2) All impeller widths and impeller diameters of a certain size centrifugal fan may be considered a single basic model.

“Centrifugal housed fan” means a fan with a centrifugal impeller in which airflow exits into a housing that is generally scroll-shaped to direct the air through a single fan outlet. Inlets and outlets can optionally be ducted.

“Centrifugal inline fan” means a fan with a centrifugal impeller in which airflow enters axially at the fan inlet and the housing redirects radial airflow from the impeller to exit the fan in an axial direction. Inlets and outlets can optionally be ducted.

~~“Centrifugal power roof ventilator (PRV) exhaust” means a PRV with a centrifugal impeller that exhausts air from a building. Inlets are typically ducted, but outlets are not ducted.~~

“Centrifugal power roof ventilator (PRV) supply fan” means a PRV with a centrifugal impeller that supplies air to a building. Inlets are not ducted and outlets are typically ducted.

“Centrifugal unhoused fan” means a fan with a centrifugal impeller in which airflow enters through a panel and discharges into free space. ~~Inlets and o~~Outlets are not ducted. This fan type also includes fans designed for use in fan arrays that have partition walls separating the fan from other fans in the array.

“Circulating fan” means a fan ~~that is not a ceiling fan that is~~ used to move air within a space that has no provision for connection to ducting or separation of the fan inlet from its outlet, designed to be used for the general circulation of air.

...  
“Commercial and industrial fan and blower” means a rotary-bladed machine used to convert power to air power, ~~with a specific work limited to 25 kJ/kg or less, consisting of an impeller, a shaft, bearings, and a structure or housing; and includes any transmissions, driver, and/or controls if integrated, assembled, or packaged by the manufacturer at the time of sale; and with rated shaft input power greater than or equal to 1 horsepower, or, for fans without a rated shaft input power, electrical input power greater than or equal to 1 kW, and fan airpower less than or equal to 150 horsepower with a brake horsepower greater than or equal to either 1 kW or 1 horsepower, and an air horsepower less than or equal to 150.~~

“Cross-flow fan” means a fan with a housing that creates an airflow path through the impeller in a direction at right angles to the axis of rotation and with airflow both entering and exiting the impeller at the periphery. Inlets and outlets can optionally be ducted.

...

“Dedicated outdoor air system unit” means a type of air-cooled, water-cooled, or water source factory assembled product which dehumidifies 100% Outdoor Air to a low dew point, and includes reheat that is capable of controlling the supply dry-bulb temperature of the dehumidified air to the designed supply air temperature. This conditioned outdoor air is then delivered directly or indirectly to the Conditioned Space(s). It may pre-condition Outdoor Air by containing an enthalpy wheel, sensible wheel, desiccant wheel, plate heat exchanger, heat pipes, or other heat or mass transfer apparatus.

“Dual-use fan” means a fan having two operating modes as to serve long-term ventilation purposes as well as short-time emergency duty at higher speed for fire or smoke extraction.

“Embedded fan” means a fan that is set or fixed firmly inside or attached to a surrounding piece of equipment whose purpose exceeds that of a fan or is different than that of a stand-alone fan. This equipment may have safety or energy efficiency requirements of its own. Examples of embedded fans include supply fans in air-handling

units, condenser fans in heat rejection equipment, tangential blowers in air curtain units, and induced or forced draft combustion blowers in boilers or furnaces.

...

“Energy recovery ventilator” means an assembly of fan(s), controls, and energy recovery elements used to exhaust air from the interior space, bring in air from outdoors, and transfer thermal energy between the two isolated air streams.

“Erosion-resistant fan” means a fan designed with features intended to reduce erosion by particles or liquids passing through the fan, thereby extending its useful life. Such features may include wear plates, deflector vanes, and/or thick coatings of erosion resistant material, and will reduce the efficiency of the fan.

“Evaporative field erected closed circuit cooling tower” means a structure which rejects heat to the atmosphere through the indirect cooling of a process fluid stream to a lower temperature by partial evaporation of an external recirculating water flow.

“Evaporative field erected open circuit cooling tower” means a structure which rejects heat to the atmosphere through the direct cooling of a water stream to a lower temperature by partial evaporation.

“Fan air power” means the fan output power as determined in accordance with the test procedure specified in Table D-1 of Section 1604(d).

“Fan Energy Index or FEI” means the ratio of a reference fan electrical input power over actual fan electrical input power as calculated under the test method in Section 1604(d).

“Fan Electrical Power or FEP” means the fan electrical power associated with a given fan duty point, in terms of airflow and pressure, as it is calculated under the test method in Section 1604(d).

“Field erected air cooled (dry) cooler” means a structure which rejects heat to the atmosphere from a fluid, either liquid, gas or mixture thereof, flowing through an air-cooled internal coil.

“Field erected evaporative condenser” means a structure which rejects heat to the atmosphere through the indirect condensing of a refrigerant in an internal coil by partial evaporation of an external recirculating water flow.

“Heat rejection equipment” means a packaged evaporative open circuit cooling tower, evaporative field erected open circuit cooling tower, packaged evaporative closed circuit cooling tower, evaporative field erected closed circuit cooling tower, packaged evaporative condenser, field erected evaporative condenser, packaged air cooled (dry) cooler, field erected air cooled (dry) cooler, air cooled steam condenser, or hybrid (water saving) versions of any of the above listed equipment that contains both evaporative and air cooled heat exchange sections.

...

“Induced-flow fan” means a housed fan with a nozzle and windband whose outlet airflow is greater than the inlet airflow due to induced airflow. All the flow entering the inlet will exit through the nozzle. The flow exiting the windband will include the nozzle flow plus the induced flow.

“Inline mixed-flow fan” means a fan with a mixed-flow impeller in which airflow enters axially at the fan inlet, and the housing redirects radial airflow from the impeller to exit the fan in an axial direction. Inlets and outlets can optionally be ducted.

“Jet fan” means a fan used for producing a high-velocity flow of air in a space. The typical function is to add momentum to the air within a tunnel. Inlets and outlets are not ducted.

...

“Maximum rated air flow” means the manufacturer-declared maximum air flow (in CFM) at which at least one duty point is compliant.

“Maximum rated pressure” means the manufacturer-declared maximum pressure (in in. wg) at which at least one duty point is compliant.

“Maximum rated speed” means the manufacturer-declared maximum operating speed (in RPM) at which at least one duty point is compliant.

“Packaged air cooled (dry) cooler” means a device which rejects heat to the atmosphere from a fluid, either liquid, gas or mixture thereof, flowing through an air-cooled internal coil.

“Packaged evaporative closed circuit cooling tower” means a device which rejects heat to the atmosphere through the indirect cooling of a process fluid stream in an internal coil to a lower temperature by partial evaporation of an external recirculating water flow.

“Packaged evaporative condenser” means a device which rejects heat to the atmosphere through the indirect condensing of a refrigerant in an internal coil by partial evaporation of an external recirculating water flow.

“Packaged evaporative open circuit cooling tower” means a device which rejects heat to the atmosphere through the direct cooling of a water stream to a lower temperature by partial evaporation.

“Power roof/wall ventilator (PRV)” means a fan with an internal driver and a housing to prevent precipitation from entering the building and with a base designed to fit, usually by means of a roof curb, over a roof or wall opening.

...

“Radial -housed fan” means a fan with a radial impeller in which airflow exits into a housing that is generally scroll-shaped to direct the air through a single fan outlet. Inlets and outlets can optionally be ducted.

“Radial housed unshrouded fan” means a radial housed fan where the impeller does not contain a shroud.

“Room fan-coil” means a factory-made assembly which provides the functions of cooling, heating, or cooling and heating, but which does not include the source of cooling or heating. This device is designed for free-delivery of air into a room, but may be applied with minimal duct work having a static resistance generally not exceeding 0.25 in H<sub>2</sub>O [0.062 kPa]. These devices may be designed for furred-in application, or with an enclosure for application within the conditioned space.

“Safety fan” means:

- (1) A fan that is designed, marketed, and labeled to operate only at or above 482 degrees F (250 degrees C);
- (2) A reversible axial fan in cylindrical housing that is designed and marketed for use in ducted tunnel ventilation and labeled as a fan that will reverse operations under emergency ventilation conditions;
- (3) A fan bearing a UL or ETL listing for “Power Ventilators for Smoke Control Systems”;
- (4) An open discharge exhaust fan with integral discharge nozzles which develop or maintain a minimum discharge velocity of 3000 FPM;
- (5) A fan labeled as, and constructed in accordance with, AMCA type A or B spark resistant construction as defined in AMCA Standard 99-16;
- (6) A fan designed and marketed for use in explosive atmospheres and tested and marked according to EN 13463-1:2001; or
- (7) An electric-motor-driven Positive Pressure Ventilator as defined in AMCA Standard 240-15.

“Shroud” means a plate located on the front side of an impeller used to aerodynamically increase fan efficiency.

...

“Stand-alone fan” means a fan in at least a minimum testable configuration, as defined in Section 4.1 of AMCA 208, including any motor, transmission, or motor controller if included in the rated fan, as well as any attachments included in the rated fan, excluding the impact of any surrounding equipment whose purpose exceeds or is different than that of the fan. Stand-alone fans do not include provisions for air conditioning, air filtration, air mixing, air treatment, or heating. Examples include power

roof ventilators, side-wall exhaust fans, ~~whole-house plenum~~ fans, inline fans, ~~ceiling-centrifugal supply~~ fans, ~~jet tunnel~~ fans, and ~~induced-flow~~ laboratory exhaust fans.

...

## Section 1604. Test Methods

...

(d) Spot Air Conditioners, Evaporative Coolers, Ceiling Fans, Ceiling Fan Light Kits, Whole House Fans, Residential Exhaust Fans, ~~and~~ Dehumidifiers, and Commercial and Industrial Fans and Blowers.

The test methods for spot air conditioners, evaporative coolers, ceiling fans, ceiling fan light kits, whole house fans, residential exhaust fans, ~~and~~ dehumidifiers, and commercial and industrial fans and blowers are shown in Table D-1.

Table D-1

**Spot Air Conditioners, Ceiling Fan, Ceiling Fan Light Kit, Evaporative Cooler, Whole House Fan, Residential Exhaust Fan, Commercial and Industrial Fans and Blowers, and Dehumidifier Test Methods**

| Appliance   | Test Method   |
|---|---|
| Spot Air Conditioners                             | ANSI/ASHRAE 128-2001  |
| Ceiling Fans, Except Low-Profile Ceiling Fans     | 10 C.F.R. section 430.23(w) (Appendix U to Subpart B of part 430)   |
| Ceiling Fan Light Kits                            | 10 C.F.R section 430.23(x) (Appendix V to Subpart B of part 430)  |
| Evaporative Coolers                               | ANSI/ASHRAE 133-2008 for packaged direct evaporative coolers and packaged indirect/direct evaporative coolers; ANSI/ASHRAE 143-2007 for packaged indirect evaporative coolers |
| Whole House Fans                                  | HVI-916, tested with manufacturer-provided louvers in place (2009)  |
| Dehumidifiers                                     | 10 C.F.R. section 430.23(z) (Appendix X to Subpart B of part 430, active mode portion only)   |
| Residential Exhaust Fans                          | HVI-916 (2009)  |
| Residential Furnace Fans                          | 10 C.F.R. section 430.23(cc) (Appendix AA to Subpart B of part 430)   |
| <u>Commercial and Industrial Fans and Blowers</u> | <u>ANSI/AMCA Standard 208-18 Calculation of the Fan Energy Index</u>  |

Each fan category shall be tested according to the pressure basis and installation type outlined in the following table:

| <u>Fan Category</u>  | <u>Pressure Basis</u> | <u>Installation Type</u> |
|--|-----------------------|--------------------------|
| <u>Axial inline fans</u>                                       | <u>Total</u>          | <u>D or B</u>            |
| <u>Axial panel fans</u>  | <u>Static</u>         | <u>A</u>                 |
| <u>Centrifugal housed fans and centrifugal PRV supply fans</u> | <u>Total</u>          | <u>D or B</u>            |
| <u>Centrifugal unhoused fans</u>                               | <u>Static</u>         | <u>A</u>                 |
| <u>Centrifugal inline fans and inline mixed flow fans</u>      | <u>Total</u>          | <u>D or B</u>            |
| <u>Radial housed fans</u>                                      | <u>Total</u>          | <u>D</u>                 |

|  |               |          |
|--|---------------|----------|
| <u>Power roof/wall ventilators (excluding centrifugal PRV supply fans)</u> | <u>Static</u> | <u>A</u> |
|--|---------------|----------|

Dual-use fans shall be tested in their long-term, non-emergency ventilation mode.

Erosion-resistant fans shall be tested prior to being modified for erosion resistance.

The fan laws, as defined in ANSI/AMCA 99-16, may be used to calculate the performance ratings of fans from tests of geometrically-similar fans tested at other speeds and/or smaller sizes.

Embedded fans shall be tested outside of the equipment in which they are ultimately installed in a stand-alone fan testable configuration, as defined in Section 4.1 of AMCA 208. If necessary, non-impeller components of the fan that are geometrically similar to the ones used by the fan as embedded in the larger piece of equipment shall be used to complete the fan testable configuration.

When calculating the FEI for fans in fan arrays in air handling units, the testing method included in Annex C of AMCA 208 shall be used.

## **Section 1605.1. Federal and State Standards for Federally Regulated Appliances**

...

(d) Spot Air Conditioners, Evaporative Coolers, Ceiling Fans, Ceiling Fan Light Kits, Whole House Fans, Residential Exhaust Fans, ~~and~~ Dehumidifiers, and Commercial and Industrial Fans and Blowers.

...

(4) See Section 1605.3(d) for energy efficiency standards for commercial and industrial fans and blowers.



(5) There are no energy efficiency standards or energy design standards for spot air conditioners, evaporative coolers, whole house fans, or residential exhaust fans. There are no efficiency standards for ceiling fans and ceiling fan light kits.

...

## **Section 1605.2. State Standards for Federally Regulated Appliances.**

...

(d) Spot Air Conditioners, Evaporative Coolers, Ceiling Fans, Ceiling Fan Light Kits, Whole House Fans, Residential Exhaust Fans, ~~and~~ Dehumidifiers, and Commercial and Industrial Fans and Blowers.

...

(3) See Section 1605.3(d) for energy efficiency standards for commercial and industrial fans and blowers.

(4) There are no energy efficiency standards or energy design standards for spot air conditioners, evaporative coolers, whole house fans, or residential exhaust fans. There are no efficiency standards for ceiling fans and ceiling fan light kits.

...

## **Section 1605.3. State Standards for Non-Federally-Regulated Appliances**

...

(d) Spot Air Conditioners, Evaporative Coolers, Ceiling Fans, Ceiling Fan Light Kits, Whole House Fans, Residential Exhaust Fans, ~~and~~ Dehumidifiers, and Commercial and Industrial Fans and Blowers.

(1) See Section 1605.1(d) for energy design standards for ceiling fans and ceiling fan light kits.

(2) See Section 1605.1(d) for energy efficiency standards for dehumidifiers.

(3) Commercial and Industrial Fans and Blowers. The FEI of commercial and industrial fans and blowers manufactured on or after January 1, 2020, shall be at least 1.0 or higher at all duty points offered for sale.

(4) There are no energy efficiency standards or energy design standards for spot air conditioners, evaporative coolers, whole house fans, or residential exhaust fans. There are no efficiency standards for ceiling fans and ceiling fan light kits.

## Section 1606. Filing by Manufacturers; Listing of Appliances in Database.

(a) Filing of Statements

{Skipping (a)(1)-(3) and sections A-C of Table X}

|   | Appliance   | Required Information  | Permissible Answers   |
|---|---|---|---|
| ...   | ...   | ...   | ...   |
| D   | <u>Commercial and Industrial Fans and Blowers</u> | <u>Manufacturer</u>   |   |
|   |   | <u>Product Line</u>   |   |
|   |   | <u>Model</u>  |   |
|   |   | <u>Fan type</u>   | <u>Centrifugal Housed and Centrifugal PRV Supply, Centrifugal Unhoused, Axial Inline, Centrifugal Inline and Inline Mixed-Flow, Power Roof/Wall Ventilators (excluding PRV Supply), Axial Panel, Radial Housed Embedded Fan</u> |
|   |   | <u>Impeller type</u><br><u>Fan impeller diameter (in.)</u>                                  |   |
|   |   | <u>Motor Manufacturer (if fan is certified with a motor)</u>                                |   |
|   |   | <u>Motor Efficiency</u><br><u>model number (if fan is certified with a motor)</u>           |   |
|   |   | <u>Direct-Drive Transmission</u>  | <u>Belt-Drive or Direct-Drive</u><br><u>Yes, No</u>   |
|   |   | <u>Transmission Efficiency</u>  |   |
|   |   | <u>Controller Manufacturer (if fan is certified with a controller)</u>                      |   |
|   |   | <u>Controller Efficiency</u><br><u>model number (if fan is certified with a controller)</u> |   |
|   |   | <u>Max rated speed (RPM)</u>  |   |
|   |   | <u>Max rated air flow (CFM)</u>   |   |
|   |   | <u>Max rated pressure (in. wg)</u>  |   |
| <u>Max FEI at max rated speed</u>                   |   |   |   |
| <u>Air flow at max FEI at max rated speed (CFM)</u> |   |   |   |

|  |  |
|--|--|
| <u>Pressure at max FEI at max rated speed (in. wg)</u>                                       |  |
| <u>Fan shaft power at max FEI at max rated speed (HP) (unless fan is tested wire-to-air)</u> |  |
| <u>FEP at max FEI at max rated speed (kW)</u>  |  |
| <u>Pressure 1 (P1) (in. wg)</u>  |  |
| <u>Min Air flow at P1 (cfm)</u>  |  |
| <u>Max Air flow at P1 (cfm)</u>  |  |
| <u>Air Density at P1 (lbm/cf)</u>  |  |
| <u>Min FEP actual at P1 (kW)</u>   |  |
| <u>Max FEP actual at P1 (kW)</u>   |  |
| <u>Min fan shaft power at P1 (HP)</u>  |  |
| <u>Max fan shaft power at P1 (HP)</u>  |  |
| <u>Min FEP ref at P1 (kW)</u>  |  |
| <u>Max FEP ref at P1 (kW)</u>  |  |
| <u>FEI at min air flow at P1</u>   |  |
| <u>FEI at max air flow at P1</u>   |  |
| <u>Pressure 2 (P2) (in.wg)</u>   |  |
| <u>Min Air flow at P2 (ft<sup>3</sup> per min)</u>   |  |
| <u>Max Air flow at P2 (ft<sup>3</sup> per min)</u>   |  |
| <u>Air Density at P2 (lbm/ft<sup>3</sup>)</u>  |  |
| <u>Min FEP actual at P2 (kW)</u>   |  |
| <u>Max FEP actual at P2 (kW)</u>   |  |
| <u>Min fan shaft power at P2 (HP)</u>  |  |
| <u>Max fan shaft power at P2 (HP)</u>  |  |
| <u>Min FEP ref at P2 (kW)</u>  |  |
| <u>Max FEP ref at P2 (kW)</u>  |  |
| <u>FEI at min air flow at P2</u>   |  |
| <u>FEI at max air flow at P2</u>   |  |
| <u>Pressure 3 (P3) (in.wg)</u>   |  |
| <u>Min Air flow at P3 (ft<sup>3</sup> per min)</u>   |  |
| <u>Max Air flow at P3 (ft<sup>3</sup> per min)</u>   |  |
| <u>Air Density at P3 (Lbm/ft<sup>3</sup>)</u>  |  |
| <u>Min FEP actual at P3 (kW)</u>   |  |
| <u>Max FEP actual at P3 (kW)</u>   |  |

|  |  |
|--|--|
| <u>Min fan shaft power at P3 (HP)</u>              |  |
| <u>Max fan shaft power at P3 (HP)</u>              |  |
| <u>Min FEP ref at P3 (kW)</u>                      |  |
| <u>Max FEP ref at P3 (kW)</u>                      |  |
| <u>FEL at min air flow at P3</u>                   |  |
| <u>FEL at max air flow at P3</u>                   |  |
| <u>Pressure 4 (P4) (in.wg)</u>                     |  |
| <u>Min Air flow at P4 (ft<sup>3</sup> per min)</u> |  |
| <u>Max Air flow at P4 (ft<sup>3</sup> per min)</u> |  |
| <u>Air Density at P4 (Lbm/ft<sup>3</sup>)</u>      |  |
| <u>Min FEP actual at P4 (kW)</u>                   |  |
| <u>Max FEP actual at P4 (kW)</u>                   |  |
| <u>Min fan shaft power at P4 (HP)</u>              |  |
| <u>Max fan shaft power at P4 (HP)</u>              |  |
| <u>Min FEP ref at P4 (kW)</u>                      |  |
| <u>Max FEP ref at P4 (kW)</u>                      |  |
| <u>FEL at min air flow at P4</u>                   |  |
| <u>FEL at max air flow at P4</u>                   |  |
| <u>Pressure 5 (P5) (in.wg)</u>                     |  |
| <u>Min Air flow at P5 (ft<sup>3</sup> per min)</u> |  |

|  |  |
|--|--|
| <u>Max Air flow at P5 (ft<sup>3</sup> per min)</u> |  |
| <u>Air Density at P5 (Lbm/ft<sup>3</sup>)</u>      |  |
| <u>Min FEP actual at P5 (kW)</u>                   |  |
| <u>Max FEP actual at P5 (kW)</u>                   |  |
| <u>Min fan shaft power at P5 (HP)</u>              |  |
| <u>Max fan shaft power at P5 (HP)</u>              |  |
| <u>Min FEP ref at P5 (kW)</u>                      |  |
| <u>Max FEP ref at P5 (kW)</u>                      |  |
| <u>FEL at min air flow at P5</u>                   |  |
| <u>FEL at max air flow at P5</u>                   |  |
| <u>Pressure 6 (P6) (in. wg)</u>                    |  |
| <u>Min Air flow at P6 (ft<sup>3</sup> per min)</u> |  |
| <u>Max Air flow at P6 (ft<sup>3</sup> per min)</u> |  |
| <u>Air Density at P6 (Lbm/ft<sup>3</sup>)</u>      |  |
| <u>Min FEP actual at P6 (kW)</u>                   |  |
| <u>Max FEP actual at P6 (kW)</u>                   |  |
| <u>Min fan shaft power at P6 (HP)</u>              |  |
| <u>Max fan shaft power at P6 (HP)</u>              |  |
| <u>Min FEP ref at P6 (kW)</u>                      |  |
| <u>Max FEP ref at P6 (kW)</u>                      |  |
| <u>FEL at min air flow at P6</u>                   |  |
| <u>FEL at max air flow at P6</u>                   |  |
| <u>Maximum rated speed (RPM)</u>                   |  |

...

## Section 1607. Marking of Appliances

...

(d) Energy Performance Information.

...

(14) Commercial and Industrial Fans and Blowers. Each commercial and industrial fan and blower shall be marked with a legible and permanently fixed label, ~~which may be in tabular form (as shown below), or any barcode of a published format:~~

(A) For stand-alone fans ~~designed to a specific operating point~~ for which the design point is known, the fan shall be marked with the following information:

|   |
|---|
| <u>Manufacturer Name, Brand Name, or Brand Code</u>                                   |
| <u>Model number</u>   |
| <u>Serial number <del>and</del> or date manufactured</u>                              |
| <u>Design air flow (CFM)</u>  |
| <u>Design pressure (static or total, in. wg)</u>                                      |
| <u>FEI at design point</u>  |
| <u>Design speed (RPM)</u>   |
| <u><del>Ducted or unducted</del> Public internet link to complete performance map</u> |

(B) For stand-alone fans ~~designed for which the~~ with design point is unknown, the marking shall include:

|   |
|---|
| <u>Manufacturer Name, Brand Name, or Brand Code</u>                                   |
| <u>Model number</u>   |
| <u>Serial number <del>and</del> or date manufactured</u>                              |
| <u>List of pressures fan is compliant under (in. wg)</u>                              |
| <u>List of volumetric flowrate (ft<sup>3</sup>/min)</u>                               |
| <u>Static or total pressure</u> _____   |
| <u>Maximum rated speed (RPM)</u>  |
| <u><del>Ducted or unducted</del> Public internet link to complete performance map</u> |

(C) For embedded fans for which the design point is known, the marking shall be on the exterior of the unit the fan is embedded into and shall include the following information:

|   |
|---|
| <u>Model Number</u>   |
| <u>Serial number <del>or</del> and date manufactured</u>          |
| <u>Design air flow (CFM) <del>and</del> Operating speed (RPM)</u> |
| <u>Design operating speed (RPM)</u>                               |
| <u>FEI at design point</u>  |

Total pressure at design point (in. wg)

(d)For embedded fans for which the design point is unknown, the marking shall be on the exterior of the unit the fan is embedded into and shall include the following information:

Model Number

Serial number or date manufactured

Maximum rated speed (RPM)