



ENERGY STAR® Program Requirements Product Specification for Residential Ventilating Fans

Eligibility Criteria Draft Version 4.1

Following is the Draft Version 4.1 product specification for ENERGY STAR certified residential ventilating fans. A product shall meet all of the identified criteria to earn the ENERGY STAR.

1) Definitions: Below are the definitions of the relevant terms in this document.

- A. **Residential Ventilating Fan:** A fan whose purpose is to actively supply air to or remove air from the inside of a residence. This includes ceiling and wall-mounted fans, or remotely mounted in-line fans, designed to be used in a bathroom or utility room, supply fans designed to provide air to the indoor space, and kitchen range hoods. Supply fans may also be designed to filter incoming air.
- B. **Combination Unit:** A residential ventilating fan that contains a light source for general lighting and/or a night light. The light source is integral to the ventilation fan consisting of lamp(s) and ballasting (as applicable) or LED Light Engine(s) and together with the parts designed to distribute the light, position and protect the lamps, and connect the lamps to the mains. For the purposes of this specification, a night light is any light source that draws less than 4W total or provides 20 lumens or less.
- C. **In-line Ventilating Fan:** A fan designed to be located within the building structure and that requires ductwork on both inlet and outlet. In-line fans with multiple inlet or outlet ports are referred to as "multi-port" in-line fans in this specification; all others are referred to as "single port".
- D. **Product Family:** All fan models of a given type, having the same primary energy source, and which have essentially identical electrical, physical, and functional characteristics that affect energy consumption, or efficiency. Acceptable differences in characteristics include, but are not necessarily limited to: color, finish, and nameplate.
- E. **Inch of Water Gauge (w.g.):** A traditional unit of pressure used to describe both water and gas pressures. The conventional equivalent of one inch of water is 249.0889 pascal, which is 2.490889 millibars, about 0.036127 pounds per square inch (psi) or about 0.073556 inches (1.86832 millimeters) of mercury. The word "gauge" after a pressure reading indicates that the pressure stated is actually the difference between the absolute, or total, pressure and the ambient air pressure at the time of the reading.
- F. **Power Consumption:** The operation of the fan motor consumes electrical power measured in Watts (W).
- G. **Sone:** An internationally recognized unit of loudness, which simplifies reporting of sound output by translating laboratory logarithmic decibel readings into a linear scale that corresponds to the way people sense loudness. A sone is equal in loudness to a pure tone of 1,000 cycles per second at 40 decibels above the listener's threshold of hearing.

- H. Working Speed: The speed that produces 100 CFM, or the lowest speed above 100 CFM that a range hood can produce, when working on the same duct system as the maximum speed test. Two speed range hoods are required to produce at least 90 CFM.

Note: To accommodate the inclusion of supply fans, EPA is proposing updates to the definitions of Residential Ventilating Fan and In-line Ventilating Fan to avoid only specifying exhaust fans. The proposed definition for In-line Ventilating Fan avoids the words “intake” and “exhaust”, using “inlet” and “outlet”, respectively. This change does not alter the intent of the definition in which the fan is connected to both upstream and downstream ducting when installed. The definition also refines the designations for single-port and multi-port in-line fans for reference in this specification. Again, the intent is not altered, but rather the definition is simplified and can now be applied to exhaust and supply fans.

EPA has also clarified its definition of Product Family for consistency with other ENERGY STAR specifications. This clarification allows EPA to remove the definitions for Base Model and Base-Derived Model which were only referenced in the previous definition of Product Family. Though these definitions have been altered, the intent is still the same, and there is no impact on the test requirements in Section 4 of this specification.

2) Scope:

- A. Included Products: Products that meet the definitions of a Residential Ventilating Fan as specified herein and are intended for residential household use only are eligible for ENERGY STAR certification, with the exception of products listed in Section 2.B. The following product types are eligible: range hoods; in-line (single and multi-port), bathroom, and utility room fans, including ducted and direct-discharge models. Ventilating fans with sensors and timers may certify under this specification. Residential ventilating fans that certify under this specification may also be appropriate for some light commercial applications, such as the bathroom of a restaurant.
- B. Excluded Products: The following product types are not eligible for ENERGY STAR: heat/energy recovery ventilation fans ducted to the ventilated space; powered attic ventilators (e.g., gable fans); ventilating fans with heat lamps; ventilating fans with resistance heating; ventilating fans used for cooling (e.g., whole-house fans) or air circulation; and range hoods intended for commercial cooking equipment. This specification does not address passive ventilation of any kind. Ventilating fans that have the following lamp holders are excluded - ANSI lamp holders, G4, GY6.35, GY8.6 and R7S.

Note: EPA has removed supply fans from Section 2B - Excluded Products.

3) Certification Criteria:

- A. Efficacy and Fan Sound Requirements:

Table 1: Criteria for ENERGY STAR Certified Residential Range Hoods*

Input Power (W)	Minimum Efficacy Level (CFM/W)	Maximum Allowable Sound Level (Sones)
≤75	2.8	2.0

* **Note:** At working speed, based on static pressure reference measurement as specified in Section 4.C. of this specification.

Table 2: Criteria for ENERGY STAR Certified Residential Bathroom and In-Line (Single-port and Multi-port) Fans

Product Type	Rated Airflow (CFM) Range	Minimum Efficacy Level (CFM/W)*	Maximum Allowable Sound Level (Sones)*
Bathroom and Utility Room Exhaust Fans	10 to 89 CFM	2.8	2.0
	90 to 200 CFM	3.5	2.0
	201 to 500 CFM (max speed)	4.0	3.0
In-Line (Single-Port and Multi-Port) Exhaust and Supply Fans	N/A	3.8	N/A
In-Line (Single-Port and Multi-Port) Fans tested with a filter in place	N/A	3.7	N/A

* **Note:** Products will meet requirements at all speeds, based on static pressure reference measurement as specified in Section 4.C. of this specification.

- a. Efficacy shall be calculated by using airflow and fan motor electrical power values as tested per the requirements of this specification. Fan motor electrical usage is the only energy consumption considered for the efficacy calculation. Energy used for other fan auxiliaries (e.g., lights, sensors, heaters, timers, or night lights) is not included in the determination of fan efficacy.
- b. Bathroom and utility room fans, and in-line fans, with three or fewer speeds must be tested and meet the performance criteria at each speed. Fans of this type that have more than three speeds or a rotary speed dial, or similar mechanism that allows for a theoretically infinite number of speeds, must be tested and meet the applicable efficacy and sound requirements of this specification at their maximum and minimum speeds, and at a speed half-way between them. For example, a fan with a maximum speed of 250 CFM, intermediate of 110 CFM, and minimum of 60 CFM would need to have efficacy at or above 4.0 CFM/W and sound at or below 3.0 Sones at maximum speed, efficacy at or above 3.5 CFM/W and sound at or below 2.0 Sones at intermediate speed, and efficacy at or above 2.8 CFM/W and sound at or below 2.0 Sones at minimum speed.
- c. Range hoods must be tested and meet the efficacy and sound requirements of this specification in each possible configuration (e.g., vertical, horizontal) at working speed. The Partner shall report to EPA the efficacy and sound level at each configuration.

Note: Section 3 – Certification Criteria have been updated to provide minimum efficacy requirements for supply fans. Supply fans must meet the requirements specified for in-line fans. Stakeholders shared that supply fans are often designed and sold with a filter to remove particulates from the air before introducing it into a home. If a supply fan is tested and sold without a filter, it must provide an efficacy of 3.8 cfm/W to be certified. If the supply fan is tested and sold with a filter in place, EPA proposes a less stringent efficacy requirement of 3.7 cfm/W. This is an effort to accommodate the expected reduction in airflow due to the filter, compared to the same fan with no filter in place.

In the absence of data showing the effect of a filter on efficacy, EPA researched the expected pressure drop and reduction in airflow of a supply fan with a MERV 6 filter (the minimum in the ASHRAE 62.2 Standard), compared to one without a filter. EPA estimates that 3.7 cfm/W is a reasonable efficacy to expect of a permanent split capacitor motor driven fan tested with a MERV 6 filter. EPA welcomes feedback on this approach and on the resulting requirement.

- B. **Lighting Requirements:** All newly-certified residential ventilating fans that include lighting shall meet the *ENERGY STAR® Program Requirements, Product Specification for Luminaires - Eligibility Criteria* in effect at the time of certification of the ventilating fan. Ventilating fan lighting shall be exempt from the Product Labeling and Packaging Requirements in the Luminaires specification. Night lights providing 20 lumens or less shall be exempt from the total light output requirement as well.

Note: Products with lighting selected for verification testing will be verified against the specification version to which they were originally certified.

Note: The Lighting Requirements section has been updated in recognition of the fact that the option to ship with an ENERGY STAR certified bulb is now included in the eligibility requirements for Luminaires. This change does not affect products previously certified to Version 4.0. As noted, for products selected for verification testing, product performance will be verified against the specification version to which they were originally certified.

The definition of a night light has been updated in recognition that LEDs for general illumination may use as little as 4W. The lumen level is based on a 4W incandescent.

- C. **Warranty:** Partner shall provide a minimum one-year warranty for a product to certify for ENERGY STAR.
- D. **Installed Fan Performance:** All certifying ventilating fan models, with the exception of in-line, direct discharge, and range hood models, when measured by industry standard testing procedures at 0.25 in. w.g. static pressure, shall deliver a tested airflow (CFM) greater than or equal to 70% of the tested airflow delivered at 0.1 in. w.g. static pressure for that particular model. For fans with two or more speeds, this requirement applies to high speed only.
- E. **Reporting Requirements:** The following shall be reported for ENERGY STAR certification:

Table 3: Efficacy and Fan Sound Reporting Requirements

Product Type	Reporting Requirement	Static Pressure Reference Measurements
Range Hoods	Efficacy Level	0.1 in w.g.
	Sound Level (Sones)	
Bathroom and Utility Room Exhaust Fans	Sound Level (Sones)	0.25 in w.g.

Note: EPA has added reporting requirements for efficacy and sound level at 0.1 in w.g. for range hoods and for sound level at 0.25 in w.g. for bathroom and utility room exhaust fans. EPA is requesting that these be reported in an effort to understand how products function in poor installations where static pressure measurements may be higher than is currently specified by industry test methods. In addition, some manufacturers are interested in aligning conditions for the ENERGY STAR specification with those for ASHRAE 62.2 and CEC requirements. Currently-certified products do not need to report these values, but are encouraged to do so, to give EPA a more complete picture.

- F. **Significant Digits and Rounding:**
- All calculations shall be carried out with directly measured (unrounded) values, except as specified in Section 3F.d., below.
 - Unless otherwise specified below, compliance with specification limits shall be evaluated using directly measured or calculated values without any benefit from rounding.

- c. Directly measured or calculated values that are submitted for reporting on the ENERGY STAR website shall be rounded to the nearest significant digit as expressed in the corresponding specification limit.
- d. When calculating efficacy for ENERGY STAR certification, fan CFM shall be rounded down to the nearest whole CFM and fan motor electrical power shall be rounded up to three significant digits when wattage is greater than 10 Watts, (e.g., 51.6 Watts, 516 Watts), or two significant digits when wattage is less than 10 Watts (e.g., 5.2 Watts). Watt readings should assume standard air (as defined in AMCA 210-16) and as tested Watts.

4) Test Requirements:

- A. Representative models shall be selected for testing per the following requirements:
 - a. For certification of an individual product model, the representative product shall be equivalent to that which is intended to be marketed and labeled as ENERGY STAR.
 - b. For certification of a Product Family, any model within that Product Family can be tested and serve as the representative model. When submitting Product Families, manufacturers continue to be held accountable for any efficiency claims made about their products, including those not tested or for which data was not reported.
- B. When testing residential ventilating fans, the following test methods shall be used to determine ENERGY STAR certification:

Table 4: Test Methods for ENERGY STAR Certification

ENERGY STAR Requirements	Test Method Reference
Airflow Rating (CFM) ^{1,2}	ANSI/AMCA 210-16 <i>Laboratory Methods of Testing Fans for Aerodynamic Performance Rating</i> OR HVI Publication 916 <i>Airflow Test Procedure</i> © (2015)
Sound Rating (Sone) ³	ANSI/AMCA Standard 300-14 <i>Reverberant Room Method for Sound Testing of Fans</i> and AMCA Publication 311-16 <i>Certified Ratings Program - Product Rating Manual for Fan Sound Performance</i> (spherical sones method only) OR HVI Publication 915 <i>Procedure for Loudness Rating of Residential Fan Products</i> © (2015)
Lighting Requirements	See <i>ENERGY STAR Program Requirements, Product Specification for Luminaires - Eligibility Criteria</i>

Notes:

1. Airflow certification cannot be performed for geometrically similar fans tested at other speeds or sizes.
 2. Fan testing setup shall conform to HVI 916-15 Section 6, Test Setups and Diagrams.
 3. Fan testing setup shall conform to HVI 915-15 Section 8, Test Setups.
- C. Static Pressure Reference Measurements: Ventilating fan performance characteristics such as motor wattage, CFM, and Sones shall be collected at specific static pressures. These reference measurements vary depending upon the fan type and follow *HVI Publication 920 Product Performance Certification Procedure Including Verification and Challenge*© (2015) rating points. The static pressure reference measurements are listed below for each certifying fan type:

Table 5: Static Pressure Reference Measurements

Product Description	Static Pressure Reference Measurements
Products with one duct (e.g. Bathroom and Utility Room Exhaust Fans)	0.1 in w.g.
	0.25 in w.g. for installed fan CFM measurement and sound reporting requirement (not applicable to wattage)
Ducted Range Hoods	Tested at working speed as defined in HVI 916
	0.1 in w.g. for reporting requirement at working speed
Direct discharge (non-ducted) products	0.03 in w.g.
In-Line (Single-Port and Multi-Port) Exhaust and Supply Fans	0.20 in w.g. (CFM and wattage only)

Note: EPA has updated the test method references to the most recent version of each test method. Based on discussions with the test method bodies, EPA believes that these updates should have no impact on product ratings.

EPA has also updated the formatting of section 4C. The static pressure reference measurements are displayed in Table 5 rather than a bulleted list, as before, to provide ease of reading. The static pressure reference measurements have not changed, and still align with HVI Publication 920.

5) Inclusion of Installation Instructions and Consumer Recommendations: Picture diagram-type installation instructions shall be included with each certified ventilating fan. The instructions shall include the following:

- How to properly seal the fan, ducts, and penetrations with caulk or other similar material to create an air-tight path from the ventilated space to the building exterior, or vice versa.
- How to properly install insulation around the fan and/or ducts, as appropriate to fan design, to minimize building heat loss and gain and reduce the potential for condensation.
- Recommended duct size and type.
- The following statement:

“Ducting has a strong effect on the air flow, noise and energy use of the fan. Use the shortest, straightest duct routing possible for best performance, and avoid installing the fan with smaller ducts than recommended. Insulation around the ducts can reduce energy loss and inhibit mold growth. Fans installed with existing ducts may not achieve their rated air flow.”

Note: EPA has made a small change to the statement directly above. The first sentence of the statement has been shortened from “The ducting from this fan to the outside of the building has a strong effect on...”, to “Ducting has a strong effect on...” This statement makes sense for both exhaust and supply fans certifying to the program. To avoid unnecessary updates to product literature, manufacturers with literature for currently-certified products may continue to use the statement found in Version 4.0. EPA notes that the statement found in this document should be applied to all supply fans.

6) Effective Date: The ENERGY STAR Ventilating Fan specification shall take effect on **October 1, 2015**. To certify as ENERGY STAR, a product model shall meet the ENERGY STAR specification in effect on the model’s date of manufacture. The date of manufacture is specific to each unit and is the date on which a unit is considered to be completely assembled.

7) Future Specification Revisions: EPA reserves the right to change the specification should technological and/or market changes affect its usefulness to consumers, industry, or the environment. In keeping with current policy, revisions to the specification are arrived at through industry

discussions. In the event of a specification revision, please note that the ENERGY STAR certification is not automatically granted for the life of a product model. EPA is planning to further investigate the following topics in future revisions:

- A. EPA is interested in pursuing rated efficacy requirements at higher external static pressure. It is EPA's understanding that the ASHRAE 62.2 Standard has higher static pressure requirements than the current ENERGY STAR specification. To ensure better alignment with industry best practices, EPA will consider pursuing updated static pressure requirements in a future specification revision.
- B. EPA continues to be interested in sound performance at higher external static pressure. EPA is aware of the argument that products installed with six inch diameter ducting are unlikely to face those higher pressures.
- C. EPA will consider capture efficiency as the performance metric for kitchen range hoods in a future specification revision.

Note: EPA will continue to work with industry and stakeholders to specify static pressure requirements that are more in line with best practices and that reflect real-world performance. As performance data for range hood capture efficiency becomes more widely available, EPA will consider adopting the metric to distinguish range hood efficacy.