



ENERGY STAR® Program Requirements Product Specification for Residential Ventilating Fans

Eligibility Criteria Final Draft Version 4.0

Following is the Final **Draft Version 4.0** 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 ceiling, wall-mounted, or remotely mounted in-line fan designed to be used in a bathroom or utility room, or a kitchen range hood, whose purpose is to move objectionable air from inside the building to the outdoors.
- 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.
- C. In-line Ventilating Fan: A fan designed to be located within the building structure and that requires ductwork on both intake and exhaust. Those in-line fans with only one intake are referred to as "single port" in-line fans, while those with multiple intake ports are referred to as "multi-port" in-line fans in this specification.
- D. Base Model: A fan model from which other models may be derived.
- E. Base-Derived Model: A fan model derived from another fan model such that differences between the two models are limited to those that do not adversely affect product performance. Examples of acceptable differences include, but are not limited to: color, finish, and nameplate.
- F. Product Family: A Base model and all associated Base-Derived Models.
- G. 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.
- H. Power Consumption: The operation of the fan motor consumes electrical power measured in Watts (W).
- I. 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.
- J. 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.

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: A clarification has been added that only range hoods intended for residential household use are included in the scope of the program. Range hoods that are designed and intended for use with commercial cooking equipment are excluded.

3) Qualification Criteria:

- A. **Efficacy and Fan Sound Requirements:**

Table 1: Criteria for ENERGY STAR Certified Residential Range Hoods¹

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

Notes: 1. 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) ¹	Maximum Allowable Sound Level (Sones) ¹
Bathroom and Utility Room 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) Fans	N/A	3.8	N/A

Notes: 1. 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 more than one speed must be tested and meet the performance criteria at each speed. Fans of this type that have 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 minimum and maximum speeds, and at a speed half-way between them. For example, a fan with minimum speed of 60 cfm, intermediate of 110 cfm and max of 250 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:

Range Hoods: Based on stakeholder request to remove the maximum airflow limit, EPA has revised the scope of the range hoods that could qualify for ENERGY STAR by replacing the maximum airflow limit of 500 CFM with a 75 W input power limit at working speed. By adopting this change, EPA encourages ENERGY STAR qualification of high end range hoods with energy efficient technologies, without compromising on total energy used by high cfm fans under common working conditions.

Bathroom and In-Line Fans: Stakeholders have commented that the efficacy requirements proposed for bathroom and in-line fans in the Draft 1 specification are too aggressive and recommended a phased-in tiered approach. Stakeholders also commented that the HVI directory was not a true indication of the actual number of models available in the market as one base model could be marketed under different brand names and that base models available through retail stores to consumers are far fewer.

EPA has investigated the prevalence of ENERGY STAR labeled models at retail stores and on line, and further analyzed the HVI directory to determine if multiple model numbers for similar fans are more prevalent for high efficiency fans. After thorough investigation, EPA could not justify stakeholder claims and expects there will be a sufficient variety of ENERGY STAR models available to consumers at the originally proposed efficacy levels. Therefore, EPA has retained the efficacy levels as proposed in the Draft 1 specification.

EPA has revised the rated airflow range for small bathroom fans from 50 to 89 CFM to 10 to 89 CFM. This change was made to address multi-speed fans with speeds below 50 CFM, such that the fan can meet ENERGY STAR at all speeds.

Also, EPA has revised language in Section A.b. to clarify that bathroom and in-line fans shall meet their respective ENERGY STAR performance criteria at each speed. The language in Draft 1 incorrectly included sound requirements for in-line fans.

- B. **Lighting Requirements:** To certify for ENERGY STAR, residential ventilating fans that include lighting shall **either**:

(1) meet the *ENERGY STAR® Program Requirements, Product Specification for Luminaires - Eligibility Criteria* for non-directional luminaires that is in effect at the time of certification of the ventilating fan to this Version 4.0. Ventilating fan lighting shall be exempt from the Product Labeling and Packaging Requirements in the Luminaires specification. Night lights shall be exempt from the total light output requirement as well. **or**

(2) ship with a bulb in the vent fan package that has been certified to the *ENERGY STAR® Program Requirements, Product Specification for Lamps (Light Bulbs)* that is in effect at the time of manufacture of the ventilating fan. ENERGY STAR lamps used in ventilating fans shall be rated for enclosed fixtures or recessed fixtures. Product literature (such as a parts list) shall specify use of an ENERGY STAR lamp appropriate for the fixture. For bathroom and utility ventilating fans, lamps shall have efficacy of 65 lumens/W or greater. Lamps are expected to include consumer packaging as required by the lamps specification, unless they ship already installed into the vent fan.

Note: EPA received several comments on the lighting requirement changes in the interim proposal released October 27. Commenters mentioned that vent fans on the HVI directory must pass the UL 507 spray test, that most building codes require fans that have passed the test, and felt that requiring lamps safety rated for damp locations was duplicative. After learning more about the UL test, and the prevalence of its use in industry, EPA agrees and has removed the requirement that lamps are safety tested for damp locations. Upon further consideration of the interaction of lamp and fixture requirements, EPA has concluded that temperature testing fixtures for products shipping with ENERGY STAR certified lamps will not contribute significantly to the satisfaction of the purchaser. Thus, this requirement has also been removed.

- C. Warranty: Partner shall provide a minimum one-year warranty for a product to certify for the ENERGY STAR. The warranty shall cover lighting as well.
- D. Installed Fan Performance: All certifying ventilating fan models, with the exception of in-line, direct discharge fans 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) equal to or greater than 70% of 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.

Note: EPA has clarified that for multi-speed fans, the installed fan performance requirement applies to only the highest speed. Because ducts are designed for the fan's high speed airflow, high static pressure is not expected to be an issue at lower speeds.

E. Significant Digits and Rounding:

- a. All calculations shall be carried out with directly measured (unrounded) values, except as specified in E.d., below.
- b. 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 standardized air (as defined in AMCA 210-07) and as tested watts.

4) Test Requirements:

- A. Representative Models shall be selected for testing per the following requirements:
- a. For qualification 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 qualification 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.

Note: The Representative Model section has been updated to be consistent with the language in other ENERGY STAR specifications.

- B. When testing residential ventilating fans, the following test methods shall be used to determine ENERGY STAR certification:

Table 2: Test Methods for ENERGY STAR Certification

ENERGY STAR Requirements	Test Method Reference
Airflow Rating (CFM) ^{1,2}	ANSI/AMCA 210-07 <i>Laboratory Methods of Testing Fans for Aerodynamic Performance Rating</i> OR <i>HVI Publication 916 Airflow Test Procedure</i> © (2013)
Sound Rating (sone) ³	<i>HVI Publication 915 Procedure for Loudness Rating of Residential Fan Products</i> © (2013) OR ANSI/AMCA Standard 300-08 <i>Reverberant Room Method for Sound Testing of Fans</i> and AMCA Publication 311-05 <i>Certified Ratings Program - Product Rating Manual for Fan Sound Performance</i> (spherical sones method only)
Lighting Requirements ⁴	See <i>ENERGY STAR Program Requirements, Product Specification for Luminaires - Eligibility Criteria</i>

- Note:** 1. Airflow certification cannot be performed for geometrically similar fans tested at other speeds or sizes.
 2. Fan testing setup shall conform to HVI 916-13 Section 6, Test Setups and Diagrams.
 3. Fan testing setup shall conform to HVI 915-13 Section 8, Test Setups.
 4. This test method only applies to products certified as ENERGY STAR Luminaires. Those products that ship with an ENERGY STAR certified lamp instead shall be verified by examination of the product and its listing in the ENERGY STAR Certified Product List for Lamps. The lamp must be listed in the certified list as of the manufacturing date of the Ventilating Fan.

- 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*© (2013) rating points. The static pressure reference measurements are listed below for each certifying fan type:
- a. Ducted products (products with one duct such as bathroom and utility room fans): 0.1 in. w.g. static pressure
 - 1. Products shall be tested at 0.25 in. w.g. static pressure for airflow (CFM).
 - 2. Sound levels and wattage do not need to be tested at 0.25 in. w.g. static pressure
 - b. Ducted range hoods shall be tested at working speed as defined in HVI 916.
 - c. Direct discharge (non-ducted) products shall be tested at 0.03 in. w.g. static pressure
 - d. In-line ventilating fans shall be tested at 0.20 in. w.g. static pressure (wattage and CFM only)

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.
- 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:

“The ducting from this fan to the outside of the building 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’s discussions with stakeholders before and after the release of the interim proposal for vent fans confirmed that there is considerable opportunity to improve installation, but further discussion will be needed to settle on the easiest and most effective way to address it. EPA looks forward to continuing discussions with stakeholders about opportunities for change. In the meantime, for the purposes of this version, EPA has settled on relatively simple requirements.

The quoted text is intended to convey information common to all fan installations. Other information that varies from product to product (e.g. duct size, how insulation should be installed) is required but cannot be captured by a common statement. EPA will work with stakeholders in the future to develop more comprehensive common advice, for instance about duct sealing.

6) Effective Date: The ENERGY STAR Ventilating Fan Version 4.0 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.

Note: The proposed effective date reflects EPA’s plan to finalize the Version 4.0 specification in late December 2014.

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.