



ENERGY STAR® Program Requirements Product Specification for Residential Ventilating Fans

Eligibility Criteria Draft 1 Version 4.0

Following is the **Draft 1 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.

Note: The Working Speed definition has been revised per the definition in the latest 2013 version of the HVI 916 *Airflow Test Procedure*. Stakeholders are encouraged to provide feedback on this new definition, particularly if the new definition will inadvertently exclude any of their products.

2) Scope:

- A. **Included Products:** Products that meet the definitions of a Residential Ventilating Fan as specified herein 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; and ventilating fans used for cooling (e.g., whole-house fans) or air circulation. 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: With the consideration to include ENERGY STAR certified Lamps as an option for meeting the Ventilating Fan Lighting requirement, the following lamp holders are removed from the excluded products list – E11, E26 and GX5.3. These lamp holders are among the allowable bases in the ENERGY STAR Lamps specification.

3) Qualification Criteria:

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

Table 1: Criteria for ENERGY STAR Certified Residential Ventilating Fans – Efficacy and Sound Levels

Product Type	Airflow (CFM) Range	Minimum Efficacy Level (CFM/W) ¹	Maximum Allowable Sound Level (Sones) ¹
Range Hoods	up to 600 CFM max speed and up to 200 CFM working speed	2.8	2.0
Bathroom and Utility Room Fans	50 to 89 CFM	2.8	2.0
Bathroom and Utility Room Fans	90 to 200 CFM	3.5	2.0
Bathroom and Utility Room Fans	201 to 500 CFM (max speed)	4.0	3.0
In-Line (Single-port & Multi-port) Fans	N/A	3.8	N/A

Notes: 1. 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 efficacy and sound requirements of this specification 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: The current Version 3.2 ENERGY STAR Ventilating Fans specification has been in effect since April 12, 2012; the performance requirements were last changed in 2003, Version 2.0. EPA is revising the specification due to 1) the high percentage of available products that meet ENERGY STAR requirements for some product types; 2) availability of products in the marketplace that offer higher efficiencies and significant savings over the current ENERGY STAR levels, and 3) high market penetration of ENERGY STAR ventilating fans, 70% in 2012. The following revisions are intended to recognize the top performers with regards to energy efficiency and more closely align with current product offerings and industry standards.

Airflow: There is some confusion about whether the airflow limit on range hoods was applicable to the working speed or the maximum speed of the product. EPA has clarified that the maximum airflow limit applies to the maximum speed. Manufacturers have argued that eliminating this limit would allow advanced energy saving features to enter the range hood market faster, as the price increase would not be so shocking on an already high priced, top of the line (and therefore high CFM) fan. EPA recognizes this market dynamic as a familiar way for high efficiency technologies to enter the market. On the other hand, high CFM hoods may be installed without attention to makeup air, creating dangerous back drafting, and also even efficient fans will use more total power while delivering high flow rate. EPA proposes to balance these considerations with a higher limit on maximum speed, combined with a new maximum working speed, under the assumption that most hoods operate at working speed most of the time.

For bathroom fans, EPA proposes to revise the existing airflow bins from 10 to 89 CFM and 90 to 500 CFM to: 50 to 89 CFM; 90 to 200 CFM; and 201 to 500 CFM. EPA believes that these new bins more closely align with current product offerings and allow for separate efficacy requirements to be proposed that represent the top performers within each bin. Fans with maximum speeds less than 50 CFM are excluded from the scope, as these fans are not prevalent in the marketplace and deliver insufficient airflow for even small bathrooms.

Efficacy: Though the overall market penetration for ENERGY STAR certified ventilating fans (which includes bathroom fans, inline fans, and range hoods) was at 70% in 2012, discussions with stakeholders revealed that the market penetration of range hoods specifically continues to be low (i.e., likely less than 25%). In addition, based on models listed in the HVI directory as of December 2013, less than 15% of range hoods are ENERGY STAR certified. Thus, EPA proposes to maintain the current ENERGY STAR Version 3.2 range hood efficacy criteria.

For bathroom fans, about half of the active products in the HVI directory (as of December 2013) meet the requirements of the Version 3.2 specification, and a broad range of higher efficiency fans are available. In addition, discussions with stakeholders revealed that of the products included in the Ventilating Fan specification, sales of ENERGY STAR certified bathroom fans have grown fastest; thus, most of the high market penetration in 2012 was probably due to bathroom fans.

Note (cont.) Thus, EPA proposes to raise the efficacy levels across all bins: 50 to 89 CFM, to 2.8 CFM/W; 90 to 200 cfm, to 3.5 CFM/W; and 201 to 500 CFM, to 4.0 CFM/W. EPA was not able to establish any correlation between efficacy and cost at these levels; in addition, some of the lower CFM fans that will no longer be able to qualify for ENERGY STAR use shaded pole motors, which in addition to being less efficient also have a shorter life. Thus EPA is confident that fans meeting the proposed level are a good value for consumers. For inline fans, EPA proposes raising the efficacy from 2.8 to 3.8 CFM/W as there are significant savings available from high efficiency designs now offered in the marketplace with desirable paybacks. According to the HVI directory, approximately 23% of the products listed would meet this proposed level, while offering a wide selection of brands and models for consumer choice.

EPA is also taking this opportunity to clarify in note 3.A.b. that bathroom and inline fans with more than one speed must be tested and meet the efficacy requirements at each speed, and that range hoods must be tested in each possible configuration.

Sound: EPA has aligned the CFM break points in the noise level requirements with those for efficacy requirements, for simplicity, with the effect of tightening the requirements for fans 140 to 200 CFM. Analysis of active models in the HVI directory (as of December 2013) reveals that this does not unduly restrict the range of qualifying models available to consumers.

Some stakeholders claimed that sound requirements at 0.25 in.w.g would be a better indicator of noise level experienced by consumers than those at 0.1 in w.g. as currently used. While we have not proposed this in the current draft, EPA considers this as a valid point and is interested in further stakeholder feedback on the possibility of requiring ENERGY STAR efficacy and sound at 0.25 in.w.g instead of 0.1 in.w.g. static pressure. In particular, EPA is interested in whether sound levels generally go up or down with higher static pressure, and by how much.

Stakeholders are encouraged to submit feedback and/or data in response to the requirements proposed.

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 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. Ventilating fan lighting shall be exempt from the Packaging Requirements in the Lamps specification. ENERGY STAR lamps used in ventilating fans shall be safety rated for damp locations and, if appropriate, 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.

Note: EPA has recently released a Version 1.0 Lamps specification that will go into effect on September 30, 2014. The scope of the Lamps specification includes threaded-base lamp types intended to replace incandescent lamps, unlike the Luminaires specification that includes pin-based bulbs only. EPA is proposing to allow manufacturers to include an ENERGY STAR Lamp as an alternative requirement. Under this proposal, manufacturers may choose any lamp on the ENERGY STAR QPL that meets the needs of the fixture, for purposes of certification of the ventilating fan. Should suppliers or available lamps change, the manufacturer may replace the lamp used for certification during the production and

Note (cont.,) distribution of the certified ventilating fan with any lamp on the current ENERGY STAR QPL that meets the requirements of the fixture. Manufacturers would be responsible for tracking that the bulb they ship with does not become disqualified, and that if the Lamps specification is revised that their selected lamp meets the new specification.

Currently, ventilating fan lighting performance, as per the Luminaires specification, is included on the ventilating fans qualified product list. Going forward, we can continue to require such detailed information for all ventilating fans, which would mean that manufacturers would have to specify the lamps for their vent fans very tightly (e.g. including color temperature, etc.). Alternately, we could simplify lighting performance parameters shown on the QPL. EPA would like to understand if the inclusion of lighting performance on the vent fans QPL is in fact useful to stakeholders.

Stakeholders are encouraged to submit feedback on this proposal. In particular, please share any concerns with the lighting performance of ENERGY STAR Lamps at high temperatures or humidity in bathroom fans or range hoods.

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 and range hood models, when measured by industry standard testing procedures at 0.25 in. w.g. static pressure, shall deliver a rated airflow (CFM) equal to or greater than 70% of rated airflow delivered at 0.1 in. w.g. static pressure for that particular model.

Note: EPA proposes to set the minimum rated airflow requirement at 0.25 in. w.g. static pressure to 70% of tested airflow delivered at 0.1 in. w.g. static pressure for all bathroom fans. This tightens the requirement for fans 89 CFM max airflow and below. EPA expects that products meeting the new efficacy requirements will not have difficulty meeting this requirement.

Stakeholders are encouraged to submit feedback on this proposal.

E. Significant Digits and Rounding:

- a. All calculations shall be carried out with directly measured (unrounded) values, except as specified in F.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 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, the base model shall serve as the representative model.

- 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 HVI 916-13 <i>Airflow Test Procedure</i> .
Sound Rating (sone) ³	HVI 915-13 <i>Procedure for Loudness Rating of Residential Fan Products</i> 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.

Note: The test method reference for lighting requirements has been revised to note the option of using an ENERGY STAR lamp. During verification of products using this option, the included bulb must have been on the certified product list for lamps at the manufacture date of the ventilating fan. Also, the references to the HVI 916 and 915 test procedures have been updated to refer to the latest 2013 versions of the documents. There are no major changes in the 2013 version of the HVI 915 and 916 test procedures that would impact currently ENERGY STAR certified products.

- 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 920, *HVI Product Performance Certification Procedure Including Verification and Challenge* 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.

- 281 c. Direct discharge (non-ducted) products shall be tested at 0.03 in. w.g. static pressure
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283 d. In-line ventilating fans shall be tested at 0.20 in. w.g. static pressure (wattage and CFM only)
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285 **5) Inclusion of Installation Instructions and Consumer Recommendations:** Picture diagram-type
286 installation instructions shall be included with each certified ventilating fan. The instructions shall
287 indicate the following:
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- 289 • How to properly seal the fan with caulk or other similar material to inhibit air leakage to the exterior
290 of the thermal envelope of the building.
291 • Recommended ductwork types, elbows (including radii), terminations, sealants, and lengths that
292 will minimize static pressure losses and promote adequate airflow.
293 • Proper installation of vibration deadening materials such as short pieces of flexible duct.
294 • Proper installation of insulation around the fan to minimize building heat loss and gain.
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296 **In-Line Fan (Additional) Installation Instructions:** Manufacturers shall include the following
297 information on the in-line product or in product literature:
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299 To ensure quiet operation of ENERGY STAR certified in-line and remote fans, each fan shall be
300 installed using sound attenuation techniques appropriate for the installation. For bathroom and general
301 ventilation applications, at least 8 feet of insulated flexible duct shall be installed between the exhaust
302 or supply grille(s) and the fan. For kitchen range hood remote ventilation applications, where metal duct
303 is generally required by code, a metal sound attenuator shall be installed between the range hood and
304 the fan.
305

306 **6) Effective Date:** The ENERGY STAR Ventilating Fan Version 4.0 specification shall take effect on
307 **TBD.** To certify as ENERGY STAR, a product model shall meet the ENERGY STAR specification in
308 effect on the model's date of manufacture. The date of manufacture is specific to each unit and is the
309 date on which a unit is considered to be completely assembled.
310

311 **Note:** EPA expects to finalize the Version 4.0 Ventilating Fan specification by fall 2014. Prior to finalizing,
312 EPA will communicate an effective date that provides sufficient lead time for manufacturers to update
313 product literature and other marketing materials for those products that no longer meet ENERGY STAR
314 requirements. Stakeholders are encouraged to share with EPA information on manufacturing cycles or
315 other factors that affect product movement through the market.

316 **7) Future Specification Revisions:** EPA reserves the right to change the specification should
317 technological and/or market changes affect its usefulness to consumers, industry, or the environment.
318 In keeping with current policy, revisions to the specification are arrived at through industry discussions.
319 In the event of a specification revision, please note that the ENERGY STAR certification is not
320 automatically granted for the life of a product model.
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