



ENERGY STAR® Program Requirements for Residential Ventilating Fans

DRAFT 2 – Eligibility Criteria (Version 2.0)

Below is the **DRAFT 2** product specification (Version 2.0) for ENERGY STAR qualified residential ventilating fans. A product must meet all of the identified criteria to earn the ENERGY STAR.

- 1) **Definitions:** Below is a brief description of a residential ventilating fan and other terms as relevant to ENERGY STAR.
 - A. **Residential Ventilating Fan:** A ceiling or wall-mounted 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. Residential ventilating fans used for cooling (e.g., whole-house fans) or air circulation are excluded. Residential ventilating in-line fans (including radon eliminating fans), multi-port fans, heat/energy recovery ventilation fans ducted to the ventilated space, and powered attic ventilators (e.g., gable fans) are excluded, but may be considered in a future version of this specification. Residential multi-port fans, heat/energy recovery ventilation fans ducted to the ventilated space, and powered attic ventilators (e.g., gable fans) are excluded, but may be considered in a future version of this specification. Residential ventilating fans with electric resistance heating elements, fans with heat lamps, and fans with lamp sockets that accept incandescent lamps for general lighting are excluded from this specification. This specification does not address passive ventilation of any kind.

Note: Residential ventilating fans with electric resistance heating elements or heat lamps, previously included under Version 1.0, are now excluded under Version 2.0. The intent of this change is to encourage manufacturers to use or develop heating technologies that have fewer environmental impacts than electric resistance heating elements or heat lamps. Equally important is the intent by EPA to minimize customer misperceptions that the heat source in these units is also ENERGY STAR qualified. Two existing ENERGY STAR qualified models will be affected by this change. **EPA has received a number of comments from stakeholders further supporting the decision to exclude these products in the Version 2.0 specification.**

Several manufacturers provided comments to EPA expressing a strong preference to include single port in-line fans in this Version 2.0 specification. EPA has been following the development of a standard HVI-approved test method for single port in-line fan sound levels; however, it has since been discovered that HVI abandoned the effort due to technical complexity. In the absence of a sound level measurement, HVI recommended including installation requirements to minimize the potential negative effects of poor installation on sound levels. These restrictions could include mandatory use of insulated flex duct or the use of a sound attenuator (metal airflow muffler). The precedent for such measures has been set in the 1991 Washington State Ventilation and IAQ Code, as well as the 2003 draft of ASHRAE Standard 62.2. While there is continued interest in this product type, it is not EPA's intention to delay this specification revision to complete the research needed to determine the appropriate performance requirements for this product category. **However, EPA would like to gauge manufacturer interest and preliminary thoughts as to how to incorporate this product type into future versions of this specification.**

- B. **Combination Unit:** A residential ventilating fan that contains a light source for general lighting and/or a night light.

- C. HVI 915, "HVI (Home Ventilating Institute) Procedure for Loudness Rating of Residential Fan Products": Procedure used for testing and rating ventilation fan products for sound. This test procedure includes laboratory requirements and methods for obtaining sound pressure, sound power, and sone values.
- D. HVI 916, "HVI Airflow Test Standards": Airflow test standard that establishes uniform methods for laboratory testing of powered residential ventilating equipment for airflow rate. This publication covers the test equipment, tests of specific HVI classification groups, test reports, and policies for maintaining the standard.
- E. HVI 920, "HVI Product Performance Certification Procedure Including Verification and Challenge": Publication that defines and specifies certain aspects of the procedures, covering such points as the actual testing, the certification process, challenge procedures, and the use of HVI trademark and labels.
- F. 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 pascals, 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.
- G. Light Source: The lighting portion of a combination unit or a range hood. For units using a compact fluorescent or fluorescent lamp, the light source includes the lamp and the ballast.
- H. Power Consumption: The operation of the fan motor consumes electrical power measured in Watts (W). Under this specification, power used for lights, sensors, heaters, timers, or night lights is not included in the determination of power consumption.
- 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 lowest speed above 100 CFM for a two speed fan and a low setting above 90 CFM for a multi-speed fan.

Note: EPA received a number of comments from manufacturers on the Draft 1 specification that working speed be used to measure the performance of qualifying range hoods (see Section 3, below). As such, a definition for working speed, provided by HVI, has been added to this Draft 2 specification.

- 2) Qualifying Products: In order to qualify as ENERGY STAR, a residential ventilating fan must meet the definition in Section 1A and the specification requirements provided in Section 3, below. In addition, each qualifying fan model must be HVI certified in accordance with HVI Standard 920. For the purposes of this specification, residential ventilating fans include the following product types: range hoods, and bathroom and utility room; including ducted and direct-discharge models. Residential ventilating fans with lights, including those with night lights, must meet the requirements outlined in Table 2, provided in Section 3, below. Ventilating fans with sensors and timers may qualify under this specification. Residential ventilating fans qualifying under this specification can also be used in small commercial applications (i.e., bathroom of a restaurant).

Note: EPA received several comments from manufacturers suggesting that ENERGY STAR qualified ventilation fans be required to have HVI certification, in accordance with HVI Standard 920. Including this requirement will ensure third-party verification and accurate reporting of product performance. It is EPA's understanding that this will not require manufacturers to test their fans through HVI's private labs.

- 3) ENERGY STAR Specification Requirements for Qualifying Products: Only those products described in Section 2 that meet the energy-efficiency criteria outlined in Table 1, below, may qualify for the ENERGY STAR. In addition to these requirements, all qualifying residential ventilating fans must also meet those requirements listed in Sections A-C, as appropriate.

Table 1 Draft 2 Criteria for ENERGY STAR Qualified Residential Ventilating Fans – Minimum Efficacy Levels	
Airflow (cfm)	Minimum Efficacy Level (cfm/W)*
Range Hoods – up to 500 cfm (max)	2.8**
Bathroom and Utility Room Fans – 1 to 75 cfm	1.4
Bathroom and Utility Room Fans – 76 to 130 cfm	2.8
Bathroom and Utility Room Fans – 131 to 250 cfm (max)	2.8

*Based on measured airflow at 0.1 in. w.g. static pressure

**Tested at working speed.

Note: As a result of comments submitted by several manufacturers on the Draft 1 specification, EPA divided the field of qualified products into three tiers and placed airflow limitations on the largest capacity fan categories: 500 cfm for Range Hoods, and 250 cfm for bathroom and utility room applications to avoid over ventilating. These new tiers primarily affect the maximum allowable sound levels for moderate to high capacity fans (See revised Table 3 for details).

In this Draft 2 specification, EPA is proposing that manufacturers be allowed to test minimum efficacy and maximum sound ratings for Range Hoods at “Working Speed”, instead of Maximum speed, since it is widely recognized that working speed is the more common operating condition. EPA recognizes that there is little published information on efficacy and sound ratings of range hoods operating at working speed. However, EPA has also received feedback from HVI that using working speed for efficacy and sound criteria will enable manufacturers to qualify a greater number of range hood models – closer to the 25% of the total market target. **Manufacturers are encouraged to provide comments or concerns to EPA regarding this three-tiered approach and requiring range hoods to now be tested at “Working Speed”, as opposed to Maximum speed, under this Version 2.0 specification.**

A. Lighting Requirements:

1. Starting October 1, 2003, the following products may qualify as ENERGY STAR:
 - a. Residential ventilating fans with no light source
 - b. Combination unit residential ventilating fans having a light source that is an ENERGY STAR qualified light fixture or meeting performance criteria listed in Table 2, below.

Light sources that have lamp sockets that accept incandescent lamps are excluded.

Table 2 – Light Source Criteria	
Performance Characteristic	ENERGY STAR Specification
System Efficacy per lamp ballast combination (see notes at end of table)	<p>≥ 46 lumens per Watt for all light sources that are < 30 listed lamp Watts.</p> <p>≥ 60 lumens per Watt for all light sources that are ≤ 24 inches and ≥ 30 listed lamp Watts.</p> <p>≥ 70 lumens per Watt for all light sources that are ≥ 24 inches and > 30 listed lamp Watts.</p>
Lamp Start Time	<p>The time needed after switching on the lamp to start continuously and remain lighted must be an average of one second or less.</p> <p>For manufacturers using magnetic ballasts and lamps with integrated electronic starting chips, lamps <u>must</u> be included with the residential ventilating fan when shipped from the factory.</p>
Lamp Life	<p>For residential ventilating fans that are shipped with a lamp, the average rated life of the lamp must be ≥ 10,000 hours.</p> <p>For residential ventilating fans that are not shipped with lamps, a list of lamp types must be provided that would result in the lighting source complying with the specification. This list must be clearly visible to the consumer on the residential ventilating fan packaging. Manufacturers are not required to provide specific lamp manufacturer names and model numbers on the packaging. Rather, generic lamp listings, such as the NEMA or ANSI generic descriptions will suffice.</p>
Color Rendering Index	<p>≥ 80 for compact fluorescent lamps.</p> <p>≥ 70 for linear lamps.</p>

Correlated Color Temperature	<p>For residential ventilating fans that are shipped with a lamp and do not have a <i>rated</i> color temperature of 2,700 Kelvin (K) or 3,000 K (actual measured CCT of 2,700 to 3,000K \pm 200K), the packaging should clearly describe the color of the product (cool or warm) and state its intended use.</p> <p>For residential ventilating fans that are not shipped with a lamp, a list of lamp types must be provided that would result in the light source complying with the specification. This list must be clearly visible to the consumer on the residential ventilating fan packaging. Manufacturers are not required to provide specific lamp manufacturer names and model numbers on the packaging. Rather, generic lamp listings such as the NEMA or ANSI generic descriptions will suffice.</p>
Noise	Class A sound rating for electromagnetic ballasts. Not to exceed a measured level of 24 dBA when measured in a room with ambient noise no greater than 20dBA.
Maximum Total Lamp Wattage (excluding night lights)	\leq 50 Watts. Lamp sockets cannot accept incandescent lamps.
Maximum Night Light Wattage	\leq 4 Watts.

Notes:

- Light Source efficacy shall be determined by the following equation:

$$\text{Light Source efficacy [Lumens per Watt]} = \frac{\text{Measured Lamp Lumens [Lumens]}}{\text{Measured Input Power [Watts]}}$$

- Lamp Lumens: Lamp lumens must be measured using the lamp and ballast that are shipped with the residential ventilating fan.
- Light Source Input Power: Light Source input power must be measured using the lamp and ballast that are shipped with the residential ventilating fan.
- For residential ventilating fans shipped without lamps, efficacy shall be determined by testing at least one of the lamp types listed on the fixture package.

Note: EPA's intent of excluding models that can accept incandescent lamps for general lighting under this Version 2.0 specification is to ensure the long term energy savings associated with using compact fluorescent and other energy-efficient light sources. This requirement also ensures that the consumer cannot replace the lamp with an incandescent bulb, thus guaranteeing these long-term savings. Information on lamps and ballasts may be supported by independent testing or from industry-accepted lists such as the NEMA/ALA Lamp and Ballast Platform Matrix.

These lighting requirements are consistent with ENERGY STAR's residential lighting fixture specification with the exception of the maximum total lamp wattage and the maximum night light wattage. The lamp and night light wattages are based on current products being used and available technologies. For example, most units are currently using 7-Watt night lights while the 4-Watt night light lamps are readily available and fit the same sockets. **This Draft 2 version proposes an effective date of October 1, 2003. EPA hopes to finalize this Version 2.0 specification by May 2003 which would allow partners approximately 6 months to qualify products with lighting. Manufacturers with any comments or concerns with this proposed effective date are encouraged to provide feedback to EPA.**

- B. Quality Assurance Requirements: To assure the quality of ENERGY STAR qualified residential ventilating fans, the following quality assurance requirements must be met for a fan to earn the ENERGY STAR:

Note: In developing ENERGY STAR specifications, EPA strives to set energy-efficiency performance levels that achieve energy savings without sacrificing performance and quality. The Draft 1 specification identified three primary attributes that affect perceived and actual product quality for residential ventilating fans: early product failure rate, fan sound levels, and installed fan performance. By specifying minimum requirements in these three specific areas, EPA believes that actual and perceived product quality will be assured for residential ventilating fans that earn the ENERGY STAR, without undue burden to participating manufacturers.

EPA received conflicting feedback from stakeholders on this approach to assuring quality of ENERGY STAR qualified fan models. In particular, minimum product warranty period continues to be a divisive issue. While EPA appreciates the arguments for longer minimum product warranties, it must also balance the goal of achieving high product quality with the equally important goal of reaching a significant portion of the market. ENERGY STAR product specifications are typically set with a target of 25% initial market penetration. If the bar is set too high, few models will qualify for ENERGY STAR, and progress in transforming the market will be slow. This has been the case for the existing Version 1.0 ventilating fan specification. By relaxing the product warranty period requirement to one year, EPA will remove a major hurdle for some manufacturers, without compromising on the minimum efficacy and maximum sound levels specified in this Version 2.0 specification. **Stakeholders that disagree with this approach are encouraged to provide to EPA suggestions for achieving high product quality standards while reaching a greater portion of the market with this specification.**

1. Early Product Failure Rate

Partner shall provide at a minimum, a comprehensive one-year warranty for a product to qualify for the ENERGY STAR.

Note: The Tier I warranty requirement in the existing (Version 1.0) specification is two years. A three-year warranty was scheduled to go into effect in July 2002 under Tier II; however, this effective date was delayed due to this specification revision process.

Initial or early product failure due to faulty workmanship is the first indicator of poor product quality. Such failures should be rare in ENERGY STAR qualified products and backed by warranty. EPA still believes that a one-year minimum warranty is sufficient to protect consumers from these early failures. While some manufacturers and retailers have requested a longer warranty, EPA still has not found sufficient evidence to justify the need for a longer warranty in an industry where one year is the minimum standard. As such, a one-year minimum warranty continues to be a requirement of this Version 2.0 specification. However, EPA also believes that this warranty should be comprehensive and standardized with regard to minimum coverage. Currently, warranty practices vary relatively widely among manufacturers. For example, some manufacturers replace entire fans while others perform repairs to the existing fan, and should cover more than just the fan motor (a common practice in the industry). **EPA intends to define the requirements of this comprehensive warranty in the final Version 2.0 specification; as such, manufacturers are encouraged to provide suggestions as to what this warranty should and should not cover.**

2. Fan Sound Levels:

For most ventilating fan products, fan noise is the most obvious indicator of product quality to the

consumer. Table 3, below, provides maximum noise levels allowed for residential ventilating fans to earn the ENERGY STAR.

Table 3 Draft 2 Criteria for ENERGY STAR Qualified Residential Ventilating Fans – Maximum Allowable Sound Levels	
Airflow (cfm)	Maximum Allowable Sound Level (Sones)*
Range Hoods – up to 500 cfm (max)	3.0**
Bathroom and Utility Room Fans – 1 to 75 cfm	1.5
Bathroom and Utility Room Fans – 76 to 130 cfm	2.0
Bathroom and Utility Room Fans – 131 to 250 cfm (max)	3.0

*Based on rated airflow, measured at 0.1 in. w.g. static pressure

** Tested at working speed.

Note: Although the inclusion of sound level requirements has met some resistance, EPA continues to believe that product noise is the most prevalent indicator of quality in residential ventilating fans. Furthermore, based on discussions with industry members and comments provided to EPA on the Draft 1 specification, there is overall industry support of including sound as a performance requirement in this specification.

However, EPA has received comments on revising the current sound levels to better represent existing product performance. In the Draft 1 specification, EPA raised the maximum sone level from 1.5 to 3.0 for fans with an airflow of 76 cfm or greater in an attempt to enlarge the pool of eligible bathroom and utility fans within this airflow range. However, a number of manufacturers voiced concerned with this increase and claimed that a number of moderate capacity fans (76 to 130 cfm) could actually meet a 2.0 sone level. It was suggested that the sone requirements for the larger fan category be divided into two different size categories. The category previously used to capture all fans greater than 76 cfm is now separated into moderate and high capacity fan categories: 76 to 130 cfm and 131 to 250 cfm. According to manufacturers, this should open the market to a better percentage of existing models. It is EPA's hope that this new three-tiered approach will encourage manufacturers to produce more models that meet both efficacy and sound. Similar to Table 1, EPA set limitations on the largest fan capacity categories; 500 cfm for range hoods and 250 cfm for bathroom and utility room applications to avoid over ventilating. **Manufacturers with comments or concerns regarding the new size categories and maximum sone requirements are encouraged to provide feedback to EPA.**

3. Installed Fan Performance

All qualifying ventilating fan models, when measured by industry standard testing procedures at 0.25 in. w.g. static pressure, shall deliver a rated airflow (cfm) of at least 75% of the rated airflow delivered at 0.1 in. w.g. static pressure for that particular model.

Note: It is important that an ENERGY STAR qualified ventilating fan meet consumer's performance expectations. The inability of a fan to deliver close to its rated airflow when installed can raise quality concerns. In the Draft 1 specification EPA proposed that ENERGY STAR qualified ventilating fans be required to have a measured airflow at 0.25 in. w.g. static pressure that is no less than 75% of the minimum rated airflow for the fan at 0.1 in. w.g. static pressure. This proposed limit was based on discussions with HVI regarding typical residential ventilating fan curves.

EPA received a number of comments supporting the new installed performance requirement proposed by EPA in the Draft 1 specification. Overall, industry members recognize the difference between a fan's performance at 0.1 in. w.g. and 0.25 in. w.g. static pressures and agree that it is a good measure of product quality. Therefore, installed fan performance continues to be a requirement in this Draft 2 specification.

C. Inclusion of Installation Instructions: Picture diagram-type installation instructions shall be included with each qualified ventilating fan. The instructions shall indicate the following:

1. How to properly seal the fan with caulk or other similar material to inhibit air leakage to the exterior of the thermal envelope of the building.
2. Recommended ductwork types, elbows (including radii), terminations, sealants, and lengths that will minimize static pressure losses and promote adequate airflow.
3. Proper installation of vibration deadening materials such as short pieces of flexible duct.
4. Proper installation of insulation around the fan to minimize building heat loss and gain.

Note: EPA has heard from a number of stakeholders that inclusion of installation instructions with residential ventilating fans is commonplace, and that proper installation is critical to maintain efficiency and quality. The intent of requiring picture diagram-type installation instructions is to reach those contractors or end-users that ordinarily do not or cannot read text-only installation instructions. **EPA has received minimal input on this requirement which was presented in the Draft 1 specification; this requirement continues to be included in this Draft 2 version. Stakeholders are encouraged to provide any comments or concerns to EPA prior to the finalization of the Version 2.0 specification.**

4) Product Testing: Manufacturers are required to perform tests, according to the requirements included in this Version 2.0 specification, then submit qualifying model information to EPA for approval. **Each qualifying model must be tested and certified by HVI in accordance with HVI Standards 915, 916, and 920.** The test results must be reported using the Residential Ventilating Fan Qualified Product Information (QPI) Form. Manufacturers are required to report fan performance information on the QPI Form using the following units of measure:

- A. Airflow Rating (cfm): The airflow of a residential ventilating fan shall be measured in cubic feet per minute (cfm). The cfm values shall be certified by HVI and measured by the method described in HVI Standard 916.
- B. Efficacy (cfm/W): The efficacy of the residential ventilating fan shall be expressed in cubic feet per minute per Watt (cfm/W). Manufacturers shall calculate efficacy by using the airflow and fan motor electrical power values certified by HVI and described in HVI Standard 916. Fan motor electrical usage will be the only energy consumption considered for the efficacy calculation. Energy used for other fan auxiliaries, such as lights, is not included in the determination of fan efficacy.

- C. Sound Rating (sone): The sound output of a residential ventilating fan is measured in sones. The sound ratings shall be certified by HVI and measured by the method described in HVI Standard 915.
- D. Static Pressure Measurements: Ventilating fan performance characteristics such as motor wattage, cfm, and sones must be reported to EPA at specific static pressures. These measurements vary depending upon the fan type and follow HVI 920 rating points. Measurements shall be certified by HVI and conducted in accordance with HVI Standard 920. The static pressure measurements are listed below.
1. Ducted products (products with one duct such as bathroom fans, utility fans, and kitchen range hoods): 0.1 in. w.g. static pressure
 - a. Partner must also test and report products at 0.25 in. w.g. static pressure for airflow (cfm)
 - b. Partner is not required to test sound levels or wattage at 0.25 in. w.g. static pressure
 2. Direct discharge (non-ducted) products: 0.03 in. w.g. static pressure

Note: EPA received a few suggestions to require noise testing at 0.25 in. w.g., in addition to the existing 0.1 in. w.g. requirement. The 0.25 in. w.g. testing requirement was initially proposed by EPA to address fan airflow performance issues once the product is installed, which according to HVI for some fans could be as low as 20% of rated airflow at 0.1 in. w.g. It is EPA's understanding that up until very recently, common industry practice was to only test sone levels at 0.1 in. w.g. As such, many older fan models were not noise tested at 0.25 in. w.g. initially and would require retesting to qualify. EPA believes this retesting would be burdensome and costly to manufacturers. In addition, sufficient data has not been provided that supports this additional testing requirement.

Manufacturers supporting the 0.25 in. w.g. sone level testing requirement are encouraged to provide data to EPA to review and analyze. Depending on stakeholder interest and available data, EPA may consider including this requirement in future versions of this specification.

- 5) Effective Date: The date that manufacturers may begin to qualify products as ENERGY STAR under the Version 2.0 specification will be defined as the *effective date* of this agreement. The ENERGY STAR Residential Ventilating Fans (Version 2.0) specification shall go into effect on **October 1, 2003**. Any previously executed agreement on the subject of ENERGY STAR qualified vent fans, shall be terminated effective October 1, 2003.

Note: EPA recognizes that manufacturers will need some lead time to: (1) identify the lamp/ballast combinations they are currently using and then select light sources that qualify; (2) make changes to existing units with night lights; and (3) produce new product literature, installation documents, and packaging. According to industry sources, ventilating fans typically remain on the retailer shelves for six to nine months and four to six months in the manufacturer's warehouse. Based on this preliminary information, it has been recommended to EPA that the effective date be at least six to nine months from the time the Version 2.0 specification is finalized to allow sufficient lead time to re-qualify existing products or qualify new products. **It is EPA's hope to finalize this Version 2.0 specification by May 2003; an October 1, 2003 effective date would allow manufacturers approximately six-months to qualify products under the new Version 2.0 specification requirements. All stakeholders are encouraged to provide feedback on this timeline and proposed effective date.**

- A. Qualifying and Labeling Products under the Version 2.0 Specification: All products, including models originally qualified under Version 1.0 with a **date of manufacture** after **October 1, 2003**,

must meet the new Version 2.0 requirements in order to use the ENERGY STAR on the product or in product literature. The date of manufacture is specific to each unit, and is the date (e.g., month and year) of which a unit is considered to be completely assembled.

- B. Elimination of Automatic Grandfathering: EPA does not allow grandfathering under this Version 2.0 specification. **ENERGY STAR qualification under Version 1.0 is not automatically granted for the life of the product model.** Therefore, any product sold, marketed, or identified by the manufacturing partner as ENERGY STAR must meet the current specification in effect at that time.

- 6) Future Specification Revisions: ENERGY STAR reserves the right to revise 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.