

# HVAC002-R - Residential Fans

## Development Notes/Status

- New language for residential

## Code Language

---

Modify Table R403.6.1 as follows:

**TABLE R403.6.1  
WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM FAN EFFICACY<sup>a</sup>**

FAN LOCATION	AIR FLOW RATE MINIMUM (CFM)	MINIMUM EFFICACY (CFM/WATT)	AIR FLOW RATE MAXIMUM (CFM)
HRV or ERV	Any	1.2 cfm/watt	Any
Range hoods	Any	2.8 cfm/watt	Any
In-line fan	Any	<del>2.8</del> 3.8 cfm/watt	Any
Bathroom, utility room	10	<del>1.4</del> 2.8 cfm/watt	< 90
Bathroom, utility room	90	<del>2.8</del> 3.5 cfm/watt	Any

For SI: 1 cfm = 28.3 L/min.

a. When tested in accordance with HVI Standard 916.

## Reason Statements:

---

Whole-house ventilation fan efficacies were introduced in the code in 2012 for low-rise residential buildings and have not been updated since. The current residential fan efficacies are from an older version of Energy Star.

This proposal will update the requirements to the latest Energy Star requirement Version 4.0. The fan efficacy values are very conservative based on what is currently on the market. Although they are substantially better than current requirements, they are still lower than the average efficiency of fans in the Home Ventilating Institute's fan database. It sets the efficiency requirement at a level that can reasonably be met by a large number of products available on the market. According to the HVI database of fans, the average efficiency of bath fans is around 7 CFM/W, and the average efficiency of in-line fans is 3.1. This proposal, therefore, places the requirement far below the market average efficiency for bath fans and close to the market average for in-line fans, making this a reasonable requirement.

A proposal will need to be submitted to add similar requirements to similar low-capacity fans in the commercial section of the code.

## Cost:

The proposal could increase the cost of construction. Cost for the kinds of fans covered by this requirement are not driven solely by efficacy. Cost is also a function of flow rate, finishes, design and noise and whether they include other features like lights, sensors, or heaters. In some cases, fans that meet this requirement can be obtained for less other fans that do not. Nevertheless, a comparison of the low-cost exhaust fans shows that this proposal can result in no incremental first costs or short simple paybacks where incremental costs are incurred.

For example, no-frills bath fans from major manufacturers moving a minimum of 50 to ~100 cfm at 0.25" w.c. have an immediate payback (i.e., no cost premium) or a simple payback estimated at  $\leq 6$  years where there is a cost premium (see Tables 1 and 2). The 2021 IRC requires exhaust fans to be rated at a static pressure of 0.25" w.c., which is widely recognized as a typical installed static pressure found in bath fan exhaust ducts.

Table 1. Lowest cost exhaust fans for major manufacturers having a flow rate  $\geq 50$  cfm and  $< 90$  cfm at 0.25" w.c.:

Fan	Efficacy at 0.1" w.c.	Flow at 0.25" w.c.	Price Premium by Manufacturer	Simple Payback (years)
AirKing BFQ75 (compliant with proposal)	3.0	70	--	N/A
AirKing AS70 (entry-level at 0.25" w.c.)	1.4	62	\$11.02	6
Broan AE80B (compliant with proposal)	3.0	60	--	N/A
Broan A70L (entry-level at 0.25" w.c.)	1.7	60	\$1.61	1
DeltaBreeze SLM70 (entry-level at 0.25" w.c. is compliant with proposal)	4.7	54	--	immediate

\*Simple payback assumes \$0.1178/kWh (DOE EIA national average for residential and commercial), 1-hour of operation per day. Pricing sourced from homedepot.com on 1/9/2019. For Delta, the lowest price fan having at flow rate  $\geq 50$  cfm and  $< 90$  cfm at 0.25" w.c. also had a fan efficacy meeting the proposed value, so there is no price premium associated with the manufacturer's lowest cost product, and payback is "immediate".

Table 2. Lowest cost exhaust fans for major manufacturers having a flow rate  $\geq 90$  cfm at 0.25" w.c.:

Fan	Efficacy at 0.1" w.c.	Flow at 0.25" w.c.	Price Premium by Manufacturer	Simple Payback (years)
AirKing BFQ140 (entry-level at 0.25" w.c.)	1.6	109	--	N/A
AirKing AK110LS (compliant with proposal)	3.9	90	\$48.32	6
Broan AN110 (entry-level at 0.25" w.c.)	2.3	102	--	N/A
Broan AEN110 (compliant with proposal)	4.7	92	\$41.09	6
DeltaBreeze VFB25AEH (entry-level at 0.25" w.c. is compliant with proposal)	5.9	105	--	immediate

Panasonic FV-08-11VF5 (entry-level at 0.25" w.c. is compliant with proposal)	4.2	104	--	immediate
--	-----	-----	----	-----------

\*Simple payback assumes \$0.1178/kWh (DOE EIA national average for residential and commercial), 4-hours of operation per day (higher run time associated with assumption that higher flow rate bath fans are more likely to be installed in commercial bathrooms which are more likely to run continuously or at longer run times than a typical 1-hour residential assumption). Pricing sourced from homedepot.com on 1/9/2019. For some manufacturers, such as Delta and Panasonic, the lowest price fan having at flow rate  $\geq 50$  cfm and  $< 90$  cfm at 0.25" w.c. also had a fan efficacy meeting the proposed value, so there is no price premium associated with the manufacturer's lowest cost product, and payback is "immediate".