ENERGY STAR Single-Family New Homes
ENERGY STAR Multifamily New Construction
Local Mechanical Exhaust Airflow Requirements for Kitchens

Guidance on Item 8.1 of the National Rater Field Checklist

Item 8.1 of the National Rater Field Checklist (Rater-F) requires in part that a local mechanical exhaust system be installed in each kitchen that exhausts directly to the outdoors and meets one of the Rater-measured airflow standards in Exhibit 1.

Exhibit 1: Airflow requirements for Item 8.1 of the Rater-F

Location	Continuous Rate	Intermittent Rate
Kitchen	≥ 5 ACH, based on kitchen volume	≥ 100 CFM and, if not integrated with range, also ≥ 5 ACH based on kitchen volume

This document provides further guidance on this Item to ensure that its intent is more consistently met, given the three compliance options available.

Compliance Option 1: Field-measured fan airflow rate

Per the original intent of the checklist requirement, the Rater measures the airflow of the local mechanical exhaust system and ensures that it meets or exceeds the airflow requirements contained in Item 8.1 of the Rater-F.

Compliance Option 2: Prescriptive duct sizing for fans *with* a rated airflow rate

The prescriptive duct sizing requirements in Section 5.4 and Table 5.3 of ASHRAE 62.2-2010 or later are permitted to be used to comply with Item 8.1 of the Rater-F. The table from ASHRAE 62.2-2016 is presented below.

Exhibit 2: Maximum Allowable Duct Length (ft.) [1]

Duct Diameter (inches)	Flex Duct								Smooth Duct							
	Fan Rating (CFM @0.25 IWC)								Fan Rating (CFM @0.25 IWC)							
	50	80	100	125	150	200	250	300	50	80	100	125	150	200	250	300
3	X [2]	X	X	X	X	X	X	X	5	X	X	X	X	X	X	X
4	56	4	X	X	X	X	X	X	114	31	10	X	X	X	X	X
5	NL [3]	81	42	16	2	X	X	X	NL	152	91	51	28	4	X	X
6	NL	NL	158	91	55	18	1	X	NL	NL	NL	168	112	53	25	9
7	NL	NL	NL	NL	161	78	40	19	NL	NL	NL	NL	NL	148	88	54
8 & above	NL	NL	NL	NL	NL	189	111	69	NL	NL	NL	NL	NL	NL	198	133

1. The maximum allowable duct length assumes no elbows. Deduct 15 ft. of max. allowable duct length for each elbow.
2. X = This indicates that the duct diameter is not permitted to be used with the associated rated fan airflow.
3. NL = This indicates 'No Limit' on the duct length for ducts of this diameter.

For this compliance option, the field measurement of airflow is not required. Instead, the Rater verifies that the prescriptive duct sizing requirements from Exhibit 2 have been met, as determined by the rated fan airflow, duct type (i.e., flex or smooth), duct diameter, and maximum allowable duct length. As stated in the table above, 15 ft. should be subtracted from the maximum allowable duct length for each elbow to arrive at the final allowable duct length. When assessing compliance for a system where ducts are not all the same diameter, the Rater shall use the smallest duct diameter.

Example: A contractor selects a kitchen exhaust fan with a rated airflow rate of 62 CFM @ 0.25 IWC and plans to install it using flex duct. Referring to Exhibit 2, no match is found in the Fan Rating header for 62 CFM, so the contractor finds the next *largest* value – 80 CFM. Six rows are included in this column, each one corresponding with a duct diameter between 3 and 8 in.:

- An "X" is listed for the 3 in. diameter; therefore this fan is not permitted to be installed with a 3 in. flex duct.
- A value of 4 ft. is listed for a 4 in. diameter; therefore this fan is permitted to be installed with a 4 in. flex duct if it does not exceed 4 ft.
- A value of 81 ft. is listed for a 5 in. diameter; therefore this fan is permitted to be installed with a 5 in. flex duct if it does not exceed 81 ft.
- A value of "NL" is listed for a 6, 7, and 8 & above in. diameter; therefore this fan is permitted to be installed with a 6, 7, or 8 & above in. flex duct with no restrictions on duct length.

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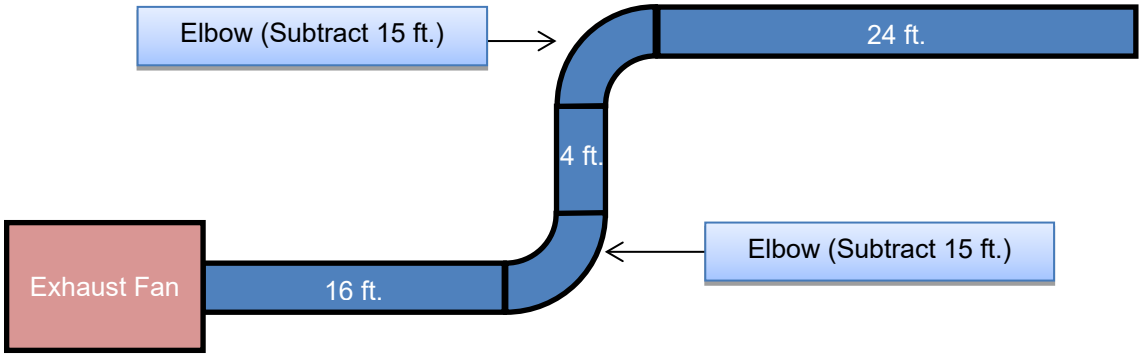
The contractor selects a 5 in. duct diameter, so the maximum allowable duct length is 81 ft. The contractor plans to install the fan and ducts according to the diagram in Exhibit 3. The contractor subtracts 30 ft. from the 81 ft. maximum allowable duct length to account for the two elbows, resulting in a remaining allowable duct length of 51 ft. The straight portions of the duct design add up 44 ft., which is less than the 51 ft. limit. The Rater verifies that fan and ducts have been installed according to the plan, so the design meets the intent of Item 8.1.

Exhibit 3: Sample Duct Layout



Compliance Option 3: Prescriptive duct sizing for fans *without* a rated airflow rate

Similar to Option 2, a prescriptive duct sizing requirement is permitted to be used to comply with Item 8.1 of the Rater-F for fans without a rated airflow rate. However, because the airflow of the fan is not rated, and therefore unknown, the following more restrictive requirements are imposed:

- A smooth round duct with a diameter of 6 in. or greater shall be used, coupled with a rectangular to round duct transition as needed; OR,
- A smooth noncircular duct with an equivalent diameter of 6 in. or greater shall be used, where equivalent diameter is calculated as four times the cross-sectional area divided by the perimeter.

The field measurement of airflow is not required. Instead, the Rater verifies that a smooth round duct with a diameter ≥ 6 in. has been used, with rectangular to round transitions as needed; or that a noncircular duct with an equivalent diameter of ≥ 6 in. has been used.

Example: A contractor selects a kitchen exhaust fan that does not have a rated airflow rate. No table needs to be consulted. This fan must be installed using a smooth round duct of any length with a 6 in. or larger diameter, or using a smooth noncircular duct whose cross-sectional area multiplied by four and divided by its perimeter is at least 6 in., such as a 4 in. x 12 in., 5 in. x 8 in., or 6 in. x 6 in. rectangular duct. Note that a rectangular to round transition can be used if needed, for example if the outlet from the fan is a rectangle.