

4101:8-15-01 Exhaust systems.

[Comment: When a reference is made within this rule to a federal statutory provision, an industry consensus standard, or any other technical publication, the specific date and title of the publication as well as the name and address of the promulgating agency are listed in rule 4101:8-44-01 of the Administrative Code. The application of the referenced standards shall be limited and as prescribed in section 102.5 of rule 4101:8-1-01 of the Administrative Code.]

SECTION 1501
GENERAL

1501.1 Outdoor discharge. The air removed by every mechanical exhaust system shall be discharged to the outdoors in accordance with Section 1504.3. Air shall not be exhausted into an attic, soffit, ridge vent or crawl space.

Exception: Whole-house ventilation-type attic fans that discharge into the attic space of dwelling units having private attics shall be permitted.

SECTION 1502
CLOTHES DRYER EXHAUST

1502.1 General. Clothes dryers shall be exhausted in accordance with the manufacturer's instructions.

1502.2 Independent exhaust systems. Dryer exhaust systems shall be independent of all other systems and shall convey the moisture to the outdoors.

Exception: This section shall not apply to listed and labeled condensing (ductless) clothes dryers.

1502.3 Duct termination. Exhaust ducts shall terminate on the outside of the building. Exhaust duct terminations shall be in accordance with the dryer manufacturer's installation instructions. If the manufacturer's instructions do not specify a termination location, the exhaust duct shall terminate not less than 3 feet (914 mm) in any direction from openings into buildings. Exhaust duct terminations shall be equipped with a backdraft damper. Screens shall not be installed at the duct termination.

1502.3.1 Exhaust termination outlet and passageway size. The passageway of dryer exhaust duct terminals shall be undiminished in size and shall provide an open area of not less than 12.5 square inches (8065 mm²).

1502.4 Dryer exhaust ducts. Dryer exhaust ducts shall conform to the requirements of Sections 1502.4.1 through 1502.4.7.

1502.4.1 Material and size. Exhaust ducts shall have a smooth interior finish and shall be constructed of metal not less than 0.0157 inch (0.3950 mm) in thickness (No. 28 gage). The duct shall be 4 inches (102 mm) nominal in diameter.

1502.4.2 Duct installation. Exhaust ducts shall be supported at intervals not to exceed 12 feet (3658 mm) and shall be secured in place. The insert end of the duct shall extend into the adjoining duct or fitting in the direction of airflow. Exhaust duct joints shall be sealed in accordance with Section 1601.4.1 and shall be mechanically fastened. Ducts shall not be joined with screws or similar fasteners that protrude more than $\frac{1}{8}$ -inch (3.2 mm) into the inside of the duct. Where dryer exhaust ducts are enclosed in wall or ceiling cavities, such cavities shall allow the installation of the duct without deformation.

1502.4.3 Transition duct. Transition ducts used to connect the dryer to the exhaust duct system shall be a single length that is listed and labeled in accordance with UL 2158A. Transition ducts shall be not greater than 8 feet (2438 mm) in length. Transition ducts shall not be concealed within construction.

1502.4.4 Dryer exhaust duct power ventilators. Domestic dryer exhaust duct power ventilators shall conform to UL 705 for use in dryer exhaust duct systems. The dryer exhaust duct power ventilator shall be installed in accordance with the manufacturer's instructions.

1502.4.5 Duct length. The maximum allowable exhaust duct length shall be determined by one of the methods specified in Sections 1502.4.5.1 through 1502.4.5.3.

1502.4.5.1 Specified length. The maximum length of the exhaust duct shall be 35 feet (10 668 mm) from the connection to the transition duct from the dryer to the outlet terminal. Where fittings are used, the maximum length of the exhaust duct shall be reduced in accordance with Table 1502.4.5.1. The maximum length of the exhaust duct does not include the transition duct.

TABLE 1502.4.5.1

DRYER EXHAUST DUCT FITTING EQUIVALENT LENGTH

| <u>DRYER EXHAUST DUCT FITTING TYPE</u> | <u>EQUIVALENT LENGTH</u> |
|---|---------------------------------|
|---|---------------------------------|

| | |
|--|------------------------|
| <u>4-inch radius mitered 45-degree elbow</u> | <u>2 feet 6 inches</u> |
| <u>4-inch radius mitered 90-degree elbow</u> | <u>5 feet</u> |
| <u>6-inch radius smooth 45-degree elbow</u> | <u>1 foot</u> |
| <u>6-inch radius smooth 90-degree elbow</u> | <u>1 foot 9 inches</u> |
| <u>8-inch radius smooth 45-degree elbow</u> | <u>1 foot</u> |
| <u>8-inch radius smooth 90-degree elbow</u> | <u>1 foot 7 inches</u> |
| <u>10-inch radius smooth 45-degree elbow</u> | <u>9 inches</u> |
| <u>10-inch radius smooth 90-degree elbow</u> | <u>1 foot 6 inches</u> |

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 degree = 0.0175 rad.

1502.4.5.2 Manufacturer's instructions. The size and maximum length of the exhaust duct shall be determined by the dryer manufacturer's installation instructions. The *building* official shall be provided with a copy of the installation instructions for the make and model of the dryer at the concealment inspection. In the absence of fitting equivalent length calculations from the clothes dryer manufacturer, Table 1502.4.5.1 shall be used.

1502.4.5.3 Dryer exhaust duct power ventilator. The maximum length of the exhaust duct shall be determined in accordance with the manufacturer's instructions for the dryer exhaust duct power ventilator.

1502.4.6 Length identification. Where the exhaust duct equivalent length exceeds 35 feet (10 668 mm), the equivalent length of the exhaust duct shall be identified on a permanent label or tag. The label or tag shall be located within 6 feet (1829 mm) of the exhaust duct connection.

1502.4.7 Exhaust duct required. Where space for a clothes dryer is provided, an exhaust duct system shall be installed. Where the clothes dryer is not installed at the time of occupancy the exhaust duct shall be capped or plugged in the space in which it originates and identified and marked "future use."

Exception: Where a listed condensing clothes dryer is installed prior to occupancy of the structure.

1502.5 Protection required. Protective shield plates shall be placed where nails or screws from finish or other work are likely to penetrate the clothes dryer exhaust duct. Shield plates shall be placed on the finished face of framing members where there is less than 1¹/₄ -inches (32 mm) between the duct and the finished face of the framing member. Protective shield plates shall be constructed of steel, shall have a minimum thickness of 0.062 inch (1.6 mm) and shall extend not less than 2 inches (51 mm) above sole plates and below top plates.

SECTION 1503
DOMESTIC COOKING EXHAUST EQUIPMENT

1503.1 General. Domestic cooking exhaust equipment shall comply with the requirements of this section.

1503.2 Domestic cooking exhaust. Where domestic cooking exhaust equipment is provided, it shall comply with one of the following:

1. The fan for overhead range hoods and downdraft exhaust equipment not integral with the cooking appliance shall be listed and labeled in accordance with UL 507.
2. Overhead range hoods and downdraft exhaust equipment with integral fans shall comply with UL 507.
3. Domestic cooking appliances with integral downdraft exhaust equipment shall be listed and labeled in accordance with ANSI Z21.1 or UL 858.
4. Microwave ovens with integral exhaust for installation over the cooking surface shall be listed and labeled in accordance with UL 923.

1503.2.1 Open-top broiler exhaust. Domestic open-top broiler units shall be provided with a metal exhaust hood having a thickness of not less than 0.0157 inch (0.3950 mm) (No. 28 gage). Such hoods shall be installed with a clearance of not less than 1/4 -inch (6.4 mm) between the hood and the underside of combustible material and cabinets. A clearance of not less than 24 inches (610 mm) shall be maintained between the cooking surface and combustible material and cabinets. The hood width shall be not less than the width of the broiler unit and shall extend over the entire unit.

Exception: Broiler units that incorporate an integral exhaust system, and that are listed and labeled for use without an exhaust hood, shall not be required to have an exhaust hood.

1503.3 Exhaust discharge. Domestic cooking exhaust equipment shall discharge to the outdoors through a duct. The duct shall have a smooth interior surface, shall be air tight, shall be equipped with a backdraft damper and shall be independent of all other exhaust systems. Ducts serving domestic cooking exhaust equipment shall not terminate in an attic or crawl space or areas inside the building.

Exception: Where installed in accordance with the manufacturer's instructions and where mechanical or natural ventilation is otherwise provided, listed and labeled ductless range hoods shall not be required to discharge to the outdoors.

1503.4 Duct material. Ducts serving domestic cooking exhaust equipment shall be constructed of galvanized steel, stainless steel or copper.

Exception: Ducts for domestic kitchen cooking appliances equipped with down-draft exhaust systems shall be permitted to be constructed of schedule 40 PVC pipe and fittings provided that the installation complies with all of the following:

1. The duct is installed under a concrete slab poured on grade.
2. The underfloor trench in which the duct is installed is completely backfilled with sand or gravel.
3. The PVC duct extends not more than 1 inch (25 mm) above the indoor concrete floor surface.
4. The PVC duct extends not more than 1 inch (25 mm) above grade outside of the building.
5. The PVC ducts are solvent cemented.

1503.5 Kitchen exhaust rates. Where domestic kitchen cooking appliances are equipped with ducted range hoods or down-draft exhaust systems, the fans shall be sized in accordance with Section 1505.4.4.

1503.6 Makeup air required. Where one or more gas, liquid or solid fuel-burning appliance that is neither direct-vent nor uses a mechanical draft venting system is located within a dwelling unit's air barrier, each exhaust system capable of exhausting in excess of 400 cubic feet per minute (0.19 m³/s) shall be mechanically or passively provided with makeup air at a rate approximately equal to the exhaust air rate. Such makeup air systems shall be equipped with not fewer than one damper complying with Section 1503.6.2.

Exceptions:

1. If an exhaust hood system's manufacturer's instructions and/or specifications differ from this requirement, the system shall be installed per the manufacturer's instructions and/or specifications.
2. Makeup air is not required for exhaust systems installed for the exclusive purpose of space cooling and intended to be operated only when windows or other air inlets are open.

1503.6.1 Location. Kitchen exhaust makeup air shall be discharged into the same room in which the exhaust system is located or into rooms or duct systems that communicate through one or more permanent openings with the room in which such exhaust system is located. Such permanent openings shall have a net cross-sectional area not less than the required area of the makeup air supply openings.

1503.6.2 Makeup air dampers. Where makeup air is required by Section 1503.6, makeup air dampers shall comply with this section. Each damper shall be a gravity damper or an electrically operated damper that automatically opens when the exhaust system operates. Dampers shall be located to allow access for inspection, service, repair and replacement without removing permanent construction or any other ducts not connected to the damper being inspected, serviced, repaired or replaced. Gravity or barometric dampers shall not be used in passive makeup air systems except where the dampers are rated to provide the design makeup airflow at a pressure differential of 0.01 in. w.c. (3 Pa) or less.

SECTION 1504
EXHAUST DUCTS AND EXHAUST OPENINGS

1504.1 Duct construction. Where exhaust duct construction is not specified in this chapter, construction shall comply with Chapter 16.

1504.2 Duct length. The length of exhaust and supply ducts used with ventilating equipment shall not exceed the lengths determined in accordance with Table 1504.2.

Exception: Duct length shall not be limited where the duct system complies with the manufacturer’s design criteria or where the flow rate of the installed ventilating equipment is verified by the installer or approved third party using a flow hood, flow grid or other airflow measuring device.

TABLE 1504.2
DUCT LENGTH

| <u>DUCT TYPE</u> | <u>FLEX DUCT</u> | | | | | | | | <u>SMOOTH-WALL DUCT</u> | | | | | | | |
|---|---|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|--------------------------------|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| <u>Fan airflow rating (CFM @ 0.25 inch wc^a)</u> | <u>50</u> | <u>80</u> | <u>100</u> | <u>125</u> | <u>150</u> | <u>200</u> | <u>250</u> | <u>300</u> | <u>50</u> | <u>80</u> | <u>100</u> | <u>125</u> | <u>150</u> | <u>200</u> | <u>250</u> | <u>300</u> |
| <u>Diameter^b (inches)</u> | <u>Maximum length^{c, d, e} (feet)</u> | | | | | | | | | | | | | | | |
| <u>3</u> | <u>X</u> | <u>X</u> | <u>X</u> | <u>X</u> | <u>X</u> | <u>X</u> | <u>X</u> | <u>X</u> | <u>5</u> | <u>X</u> | <u>X</u> | <u>X</u> | <u>X</u> | <u>X</u> | <u>X</u> | <u>X</u> |
| <u>4</u> | <u>56</u> | <u>4</u> | <u>X</u> | <u>X</u> | <u>X</u> | <u>X</u> | <u>X</u> | <u>X</u> | <u>114</u> | <u>31</u> | <u>10</u> | <u>X</u> | <u>X</u> | <u>X</u> | <u>X</u> | <u>X</u> |
| <u>5</u> | <u>NL</u> | <u>81</u> | <u>42</u> | <u>16</u> | <u>2</u> | <u>X</u> | <u>X</u> | <u>X</u> | <u>NL</u> | <u>152</u> | <u>91</u> | <u>51</u> | <u>28</u> | <u>4</u> | <u>X</u> | <u>X</u> |
| <u>6</u> | <u>NL</u> | <u>NL</u> | <u>158</u> | <u>91</u> | <u>55</u> | <u>18</u> | <u>1</u> | <u>X</u> | <u>NL</u> | <u>NL</u> | <u>NL</u> | <u>168</u> | <u>112</u> | <u>53</u> | <u>25</u> | <u>9</u> |
| <u>7</u> | <u>NL</u> | <u>NL</u> | <u>NL</u> | <u>NL</u> | <u>161</u> | <u>78</u> | <u>40</u> | <u>19</u> | <u>NL</u> | <u>NL</u> | <u>NL</u> | <u>NL</u> | <u>NL</u> | <u>148</u> | <u>88</u> | <u>54</u> |
| <u>8 and above</u> | <u>NL</u> | <u>NL</u> | <u>NL</u> | <u>NL</u> | <u>NL</u> | <u>189</u> | <u>111</u> | <u>69</u> | <u>NL</u> | <u>NL</u> | <u>NL</u> | <u>NL</u> | <u>NL</u> | <u>NL</u> | <u>198</u> | <u>133</u> |

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- a. Fan airflow rating shall be in accordance with ANSI/AMCA 210-ANSI/ASHRAE 51.
- b. For noncircular ducts, calculate the diameter as four times the cross-sectional area divided by the perimeter.
- c. This table assumes that elbows are not used. Fifteen feet of allowable duct length shall be deducted for each elbow installed in the duct run.
- d. NL = no limit on duct length of this size.
- e. X = not allowed. Any length of duct of this size with assumed turns and fittings will exceed the rated pressure drop.

1504.3 Exhaust openings. Air exhaust openings shall terminate as follows:

1. Not less than 3 feet (914 mm) from property lines.
2. Not less than 3 feet (914 mm) from gravity air intake openings, operable windows and doors.
3. Not less than 10 feet (3048 mm) from mechanical air intake openings except where the exhaust opening is located not less than 3 feet (914 mm) above the air intake opening. Openings shall comply with Sections 303.5.2 and 303.6.

SECTION 1505
MECHANICAL VENTILATION

1505.1 General. Where local exhaust or whole-house mechanical ventilation is provided, the equipment shall be designed in accordance with this section.

1505.2 Recirculation of air. Exhaust air from bathrooms and toilet rooms shall not be recirculated within a residence or circulated to another dwelling unit and shall be exhausted directly to the outdoors. Exhaust air from bathrooms, toilet rooms and kitchens shall not discharge into an attic, crawl space or other areas inside the building. This section shall not prohibit the installation of ductless range hoods in accordance with the exception to Section 1503.3.

1505.3 Exhaust equipment. Exhaust equipment serving single dwelling units shall be listed and labeled as providing the minimum required airflow in accordance with ANSI/AMCA 210-ANSI/ASHRAE 51.

1505.4 Whole-house mechanical ventilation system. Whole-house mechanical ventilation systems shall be designed in accordance with Sections 1505.4.1 through 1505.4.4.

1505.4.1 System design. The whole-house ventilation system shall consist of one or more supply or exhaust fans, or a combination of such, and associated ducts and controls. Local exhaust or supply fans are permitted to serve as such

a system. Outdoor air ducts connected to the return side of an air handler shall be considered as providing supply ventilation.

1505.4.2 System controls. The whole-house mechanical ventilation system shall be provided with controls that enable manual override.

1505.4.3 Mechanical ventilation rate. The whole-house mechanical ventilation system shall provide outdoor air at a continuous rate as determined in accordance with Table 1505.4.3(1) or Equation 15-1.

$$\text{Ventilation rate in cubic feet per minute} = \frac{(0.01 \times \text{total square foot area of house}) + [7.5 \times (\text{number of bedrooms} + 1)]}{\text{Equation 15-1}}$$

Exception: The whole-house mechanical ventilation system is permitted to operate intermittently where the system has controls that enable operation for not less than 25 percent of each 4-hour segment and the ventilation rate prescribed in Table 1505.4.3(1) is multiplied by the factor determined in accordance with Table 1505.4.3(2).

TABLE 1505.4.3(1)
CONTINUOUS WHOLE-HOUSE MECHANICAL VENTILATION
SYSTEM AIRFLOW RATE REQUIREMENTS

| <u>DWELLING UNIT</u> <u>FLOOR AREA</u> <u>(square feet)</u> | <u>NUMBER OF BEDROOMS</u> | | | | |
|--|----------------------------------|---------------------|---------------------|---------------------|----------------------|
| | <u>0 – 1</u> | <u>2 – 3</u> | <u>4 – 5</u> | <u>6 – 7</u> | <u>> 7</u> |
| | <u>Airflow in CFM</u> | | | | |
| <u>< 1,500</u> | <u>30</u> | <u>45</u> | <u>60</u> | <u>75</u> | <u>90</u> |
| <u>1,501 – 3,000</u> | <u>45</u> | <u>60</u> | <u>75</u> | <u>90</u> | <u>105</u> |
| <u>3,001 – 4,500</u> | <u>60</u> | <u>75</u> | <u>90</u> | <u>105</u> | <u>120</u> |
| <u>4,501 – 6,000</u> | <u>75</u> | <u>90</u> | <u>105</u> | <u>120</u> | <u>135</u> |
| <u>6,001 – 7,500</u> | <u>90</u> | <u>105</u> | <u>120</u> | <u>135</u> | <u>150</u> |
| <u>> 7,500</u> | <u>105</u> | <u>120</u> | <u>135</u> | <u>150</u> | <u>165</u> |

For SI: 1 square foot = 0.0929 m², 1 cubic foot per minute = 0.0004719 m³/s.

TABLE 1505.4.3(2)
INTERMITTENT WHOLE-HOUSE MECHANICAL VENTILATION
RATE FACTORS^{a, b}

| <u>RUN-TIME PERCENTAGE IN</u> <u>EACH 4-HOUR SEGMENT</u> | <u>25%</u> | <u>33%</u> | <u>50%</u> | <u>66%</u> | <u>75%</u> | <u>100%</u> |
|---|-------------------|-------------------|-------------------|-------------------|-------------------|--------------------|
| <u>Factor^a</u> | <u>4</u> | <u>3</u> | <u>2</u> | <u>1.5</u> | <u>1.3</u> | <u>1.0</u> |

- a. For ventilation system run time values between those given, the factors are permitted to be determined by interpolation.
- b. Extrapolation beyond the table is prohibited.

1505.4.4 Local exhaust rates. Local exhaust systems shall be designed to have the capacity to exhaust the minimum airflow rate determined in accordance with Table 1505.4.4.

TABLE 1505.4.4
MINIMUM REQUIRED LOCAL EXHAUST RATES FOR
ONE-, TWO-AND THREE FAMILY DWELLINGS

| <u>AREA TO BE EXHAUSTED</u> | <u>EXHAUST RATES</u> |
|------------------------------------|--|
| <u>Kitchens</u> | <u>100 cfm intermittent or 25 cfm continuous</u> |
| <u>Bathrooms-Toilet Rooms</u> | <u>Mechanical exhaust capacity of 50 cfm intermittent or 20 cfm continuous</u> |

For SI: 1 cubic foot per minute = 0.0004719 m³/s.

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