Table 9.32.3.3.A
Principal Exhaust Fan Ventilation Rate

Number of Bedrooms	**Minimum Ventilation Rate** CFM
1	30
2	45
3	60
4 or more	75

A room is considered a bedroom if it has
1) a window that opens to at least
   a) 15 inches in width or height and
   b) 3.8 sq ft in area,
2) a closet and,
3) an interior door which closes.

All rates at 0.2" w.c. static pressure.
Maximum Ventilation Rate of 110 cfm applies if NAFFVA or Radon present, i.e. if Make-up Air Required for the Principal Fan.

Table 9.32.3.3.B
Bathroom/Kitchen Exhaust Ventilation Rate

Room	Exhaust Rate* CFM	
	Intermittent	Continuous
Kitchen	80	N/A
Bathroom	50	20

Minimum Required Rates @ 0.2" w.c. static pressure

Table 9.32.3.8.

Passive Make-up Air Opening Size		
Max. Ventilation Rate Controlled Automatically or Provided Continuously CFM	**Min. Make-Up Air Duct**	
	Vent Area In^2	**Vent Diameter** Inches Ø
17	7	3
25	10	4
32	13	4
36	15	5
42	18	5
53	22	5
63	26	6
74	31	7
84	35	7
95	39	7
105	44	8
116	48	8
126	52	9

Duct Sizing for Larger Fans

Good Practice Guidelines

Code Table 9.32.3.9. (used to size ducts for exhaust fans) shows a maximum fan rating of only 147 cfm. Contractors need a reference to size duct for both exhaust and make-up air fans which exceed this rather low cfm capacity. This problem is noted on Checklists with the following footnote: "For fan capacities **exceeding** Table 9.32.3.9, follow manufacturer's installation instructions or use good engineering practice to size duct."

- **Following manufacturer's instructions is the preferred way to size ducts for larger fans.** Some fan manufacturer's provide complete installation instructions with their equipment including duct sizing charts. (Dacor and Thermador are examples of manufacturer's who supply such charts.) Check with your supplier regarding literature available for fans they stock.
- **If the fans you purchase do not have duct sizing tables in the manufacturer's literature**, use the table below for sizing smooth duct. If using flex duct, go one size larger.

LARGE MAKE-UP AIR/EXHAUST FAN DUCT SIZING CHART

CFM Range	Smooth Duct Size
148 – 290	7" Ø
291 – 380	8" Ø
381 – 430	9" Ø
431 – 560	10" Ø
561 – 700	11" Ø
701 – 800	12" Ø
801 – 1100	14" Ø

DESIGN CONSIDERATIONS:

The good practice maximum recommended duct velocity in main ducts (for proper fan operation) is 1200 fpm. This chart is based on maximum velocities of 1000 to 1100 fpm—well within the good practice recommendations.

When selecting a make-up air fan, remember to account for all static pressure losses from make-up air system components including:

1) the type of duct and its installed length
2) installed duct heater for air tempering
3) all fittings—including elbows, grills, and outside exhaust hood.

Duct Heater Sizing

The 2006 Code has two tempering requirements for active make-up air fans:

- make-up air delivered to **unoccupied** areas must be tempered to **34°F (1°C)** in all BC locations.
- make-up air delivered to **occupied** areas must be tempered to **54°F (12°C)** in all BC locations.

This means transfer grilles will seldom be used as they require two temperings, the second of which is not particularly practical to achieve.

PROCEDURE: Use Design Temp Chart (pg 20) to find °F winter design temperatures for BC location. Use the following formulae to calculate duct heater sizes depending on application:

1) Make-up air delivered to **unoccupied** areas and tempered to **34°F :**

$$\text{Duct Heater (kw)} = \frac{\text{(Make-up Fan cfm)} \times 1.1 \times (\mathbf{34°\ F} - \text{°F Winter Design Temp your location})}{3413\ \text{BTUH/kw}}$$

2) Make-up air previously tempered to 34°F , delivered to **occupied** area through a transfer grille and further tempered to **54°F:**

$$\text{Duct Heater (kw)} = \frac{\text{(Make-up Fan cfm)} \times 1.1 \times (\mathbf{54°\ F} - 34°\text{F})}{3413\ \text{BTUH/kw}}$$

See Example B, pg 29-A, Step 8 for calculations.

3) Make-up air delivered directly to **occupied** area and tempered to **54°F:**

$$\text{Duct Heater (kw)} = \frac{\text{(Make-up Fan cfm)} \times 1.1 \times (\mathbf{54°\ F} - \text{°F Winter Design Temp your location})}{3413\ \text{BTUH/kw}}$$

See Example C, pg 33-A, Step 10 for calculation.

Remember when subtracting negative numbers: two negatives make a positive!

54°F – (–10°F) = 64°F 34°F – (–6°F) = 40°F