INSPECTION GUIDELINES:  
MAKEUP AIR

INSPECTION CODE: 220

SCOPE: RESIDENTIAL

CODES ENFORCED: 2016 CBC, CRC, CPC, CMC, CEC, CALGreen, CEnC, and PAMC

The information provided in this document is general and intended as a guide only. Each project is unique and additional requirements may be enforced as deemed appropriate.

BACKGROUND
Most homes have several appliances with exhaust fans that remove air. Therefore, makeup air is the air that “makes up” for the air that is removed by exhaust fans operating individually or concurrently (from bathrooms, clothes dryers, kitchen range hoods, to name a few).

Without makeup air, a negative pressure condition could exist from the operation of one or more exhaust fans, and possibly affect the operation of fuel burning appliances and life safety of occupants if appliances are back-drafted or plumbing trap seals defeated.

ASHRAE Standard 62.2 requires that the vent system for combustion appliances be properly installed, as specified by the instructions from the appliance manufacturer and by the California Building Code. ASHRAE Standard 62.2 includes a provision intended to prevent backdrafting where one or more large exhaust fans are installed in a home with atmospherically vented or solid fuel appliances. If the two largest exhaust fans have a combined capacity that exceeds 15 CFM/100 square feet of floor area, then makeup air must be provided (see the example in the following page from the 2016 California Residential Compliance Manual).

This provision applies only when the atmospherically vented appliance is inside the pressure boundary of the house and does not include a summer cooling fan that is designed to be operated with the windows open. Direct-vent appliances are not considered “atmospherically vented.” The two largest exhaust fans are normally the kitchen range hood and the clothes dryer (if located inside the dwelling unit pressure boundary). Large-range hoods, particularly downdraft range hoods, can have capacities of 1,000 CMF or more. A problem with this requirement can be solved in one of three ways:

1. All atmospherically vented combustion appliances can be moved outside the pressure boundary of the house (to the garage or other similar space).
2. The flow rate of one or more of the fans can be reduced so that the combined flow is less than 15 CFM/100 square feet.
3. Makeup air can be provided to offset the net exhaust rate.
EXAMPLE
Question:
A 3600 square feet custom home has four bedrooms. The kitchen will have a high-end range hood that has three speeds, nominally 1000 CMF, 1400 CMF and 1600 CMF. The house will be heated with an atmospherically vented gas furnace located in the basement. If I am using a central exhaust fan for the whole-building ventilation of 75 CMF, and there is a clothes dryer installed, how much makeup air is needed?

Answer:
You must use the high speed value for the range hood of 1600 CMF. The clothes dryer will have a flow that is assumed to be 150 CFM for sizing purposes. These two flows must be added together for a total exhaust capacity of 1750 CFM. Since the whole-building ventilation fan is not one of the two largest exhaust fans, it does not figure into the makeup air calculation. Using the equation in the last page, there must be at least 1750 CMF of makeup air provided.

\[
15 \text{ CMF (3600SF/100SF)} = 1210 \text{ CMF} < 1750 \text{ CMF} \quad \therefore \text{Makeup air is required}
\]

INSPECTION
EXHAUST FANS
☐ Verify that an exhaust fan has been installed at each kitchen and bathroom, and each shall be either one of the following two (ASHRAE 62.2 – 2013 5.1, CMC Table 403.7):
   o A demand-controlled mechanical exhaust system meeting the exhaust airflow rates of Table 5.1
     ▪ Designed to be operated as needed by the occupant
   o A continuous mechanical exhaust system meeting the exhaust airflow rates of Table 5.1
     ▪ Designed and installed to operate without occupant intervention
MAKEUP AIR

☐ When installed in a closet, clothes dryers shall have an opening of not less than 100 square inches in the door or other approved means. (CMC 504.4.1)

☐ Makeup air shall be provided to replenish air exhausted by the ventilation system and air intakes shall be located as to avoid recirculation of contaminated air within enclosures. (CMC 505.5)

☐ Where exhaust fans, clothes dryers, and kitchen ventilation systems interfere with the operation of appliances, makeup air shall be provided. (CMC 701.3)

☐ Air inlets shall be located a minimum of 10’ from known sources of contamination such as a stack, vent, exhaust hood, or vehicle exhaust. The intake shall be placed so that entering air is not obstructed by plantings or other material. Forced air inlets shall be provided with rodent/insect screens (mesh not larger than 1/2”). (ASHRAE 62.2 – 2013 6.8)

☐ Two ways to avoid makeup air:
  - Install a residential-size range with an exhaust fan rated at 100 CFM – 200 CFM
  - Perform the calculation and determine if the sum of the two largest exhaust fans does not exceed 15 CFM/100 square feet

☐ There are two common methods to providing makeup air:
  - Add makeup air to your HVAC system by outdoor air being ducted to the return duct of a forced-air furnace (FAU) (see Figure CPA 057).
  - Install an air intake duct that brings outdoor air into the conditioned airspace.
  - Note: This duct is required to have an electronically-controlled damper that opens when then the kitchen hood is turned on, providing compensating outdoor airflow that balances the pressure in the conditioned space. Typically the diameter size of the makeup air duct is the same as the kitchen hood duct.

![Figure CPA 057 – Makeup Air](image-url)