Supply & Balanced Ventilation Strategies

Put in terms of good, better, best, ventilation strategies are exhaust, supply, balanced, respectively. The following table illustrates the pros and cons of each type. Supply ventilation can be accomplished by use of a ***through-the-wall supply fan*** in several places in the house. Another supply strategy is a ***central-fan-integrated (CFI) system***, which uses the central air handler and a damper-controlled supply duct to bring in fresh air intermittently throughout the day and distribute it throughout the existing ductwork. Balanced ventilation is best accomplished using ***HRVs*** and ***ERVs*** – dedicated appliances that have built-in fans to exhaust air from the house and supply fresh air from outside at the same rate. These systems have the added benefit of tempering the incoming outside air through a heat exchanger that reduces heating and cooling demand associated with the incoming outside air. Besides the use of HRV and ERV systems, balanced ventilation can be accomplished through the use of supply and exhaust fans in tandem.

COMPARISON OF VENTILATION TYPES			
	Exhaust	Supply	Balanced
Cost	Low	Low +	High
Air Quality	Low	High	High
Distribution of Air	Low	Medium (through wall) to High (CFI)	High
Pressure in the House	Negative	Positive	Neutral
Energy Use	Low	Low	Medium

CABEC is very focused on energy use, so let's address that here. Exhaust fans typically are very low-wattage. Panasonic's WhisperGreen Select, for instance, uses 3 watts at 50 cfm, which is truly amazing. At 26 kWh per year, operating this exhaust fan will cost the homeowner about $4.00. Their WhisperSupply fan brings in filtered air from controlled locations and uses 8 watts at 40 cfm, which means 70 kWh per year and about $10.00 cost to operate. The exhaust and supply fans are very low energy use, but they draw in air from uncontrolled sources and can create negative or positive pressure.

Turning to the improved air quality options, CFI and HRVs, we trade increased energy use for improved indoor air quality. A ***CFI*** system operating in supply mode uses the central furnace fan to bring in fresh air and distribute it through the ductwork, as shown in Figure 1.

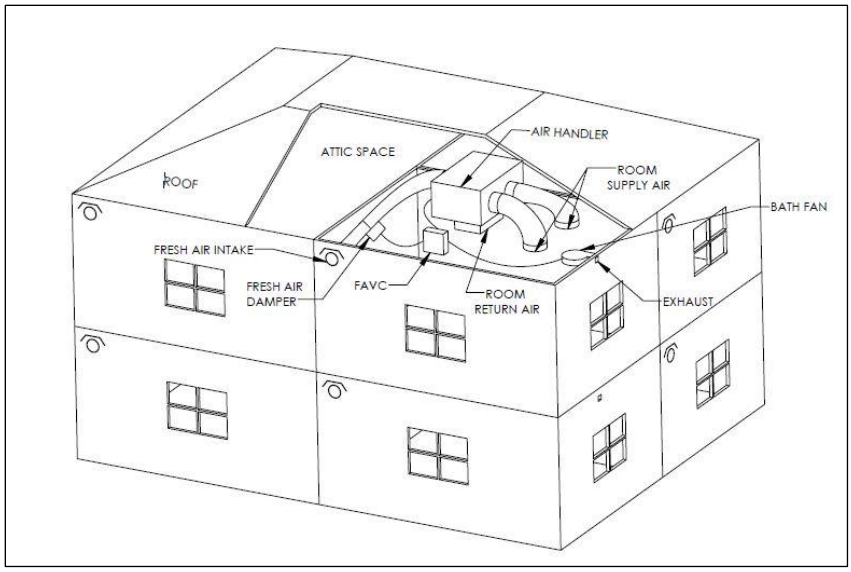

FIGURE 1: Multi-family Balanced Ventilation Using Field Controls FAVC

These systems are typically operated on an intermittent schedule, such as 10 minutes on and 20 minutes off. Plus, they monitor the heating and cooling cycles and open the damper during those cycles whenever possible to save the extra fan energy. Thus they operate an incremental 1/3 of the time as a maximum, but they use the full wattage of the central fan, so they have higher energy usage than smaller exhaust and supply fans. Studies show a typical home may use 500-1,000 kWh with a CFI system[1] or $75-$150 per year, similar to a standard refrigerator. This may be a small price to pay for a family concerned about indoor air quality and health. Note that the Title 24 software does not penalize compliance for adding a CFI system to the model. The software does not currently support (2016 code) CFI mechanical ventilation, so it is modeled as default and the installing contractor does the CF-2R form and the HERS rater verifies the cfm on the CF-3R form. All intermittent mechanical ventilation systems must be listed on the CEC's list maintained here http://www.energy.ca.gov/title24/equipment_cert/imv/IMV_Certified_List.xls.

HRVs and ERVs improve on CFI ventilation by recovering the heat from the exhausted air to temper the incoming air. They have dedicated fans with lower energy usage than central air handlers, so the energy penalty is lower than a CFI system. In many climate zones in California, HRVs can produce compliance credit, as the energy savings from the heat recovery function exceeds the energy penalty for the fan energy, and the fan efficiency exceeds that of the standard reference house. Energy usage from Field Controls FC95HRV is 89 watts at 60 cfm (0.5 static pressure drop), or 780 kWh per year or $120 to operate, offset by the avoided space conditioning energy from the heat recovery function. The modeling software puts an HRV in the reference standard home when you put one in your model, with the same heat recovery effectiveness and 1.2 W/cfm, so if you can specify a unit that is more efficient than this, you can achieve

[1] Sherman, M. and Walker, I. 2007. "Energy Impact of Residential Ventilation Standards in California," LBNL 61282. Lawrence Berkeley National Laboratory, Berkeley, CA. Study found impact of typical central air handler ventilation systems to be over 750 kwh/yr.

compliance credit. Note that HRVs can be installed as stand-alone ventilation appliances with exhaust and supply ducts spread out throughout the home or can be ducted into the central ductwork as a supplemental system to the central air handler.