

Air Balance

Air Balance has to do with the proper distribution of air (volume) to various rooms and/or spaces served by a modern forced air air-conditioning system; this type of system is used in detached single family homes and townhomes as well.

House Structure

For heating and cooling, the typical three level townhome is very similar to the three level single family home. It is however very different from a traditional ranch style or rambler style home which usually has all of the living space on one floor (bedrooms, baths, living room, dining room, kitchen & family rooms etc.).

HVAC System Operation

The nature of a forced air heating, ventilating and air-conditioning system [HVAC] is such that in order for it to work properly, the system **must move air at all times**. Unlike radiant types of heating systems which can store and hold heating energy in room radiators, the minute the air flow is stopped in a forced air system, heating and/or air-conditioning stops, it is that simple. On a hot summer day, the top floor of any multilevel home will start to heat-up immediately when the cooling source is stopped. The furnace fan or "air handler" typically located in the lower level of a house provides the motive force to "move" the air throughout the house via the distribution system [ductwork]. The room registers [supply air] and return grills provide a complete path for air to "travel" throughout the house in a complete (and continuous) circuit powered by the air handler. In a properly designed system, the ductwork, registers and returns are sized to provide the proper amount (air volume) to each space for heating and cooling.

Heating Cooling Source(s)

Gas Furnace

For heating only, condensing unit (outside) still works in conjunction with an evaporator coil in the air handler (inside) to provide cooling.

Heat Pump

For heating *and* cooling; condensing unit (outside) works in conjunction with an evaporator coil in the air handler (inside). In the heating mode the system actually reverses its operation taking heat from outside and "pumping" it into the house through the coil in the air handler.

Stratification

Is the separation of air into various bands or levels within a space. By nature, hot air rises and cold air falls [fact]. Summer and winter, the air handler is always battling Physics and Nature by keeping the air moving to bring heated or cooled air to the rooms of a house. The minute the air handler is stopped stratification sets in and cooling and/or heating stops!

Airflow Controls

There are two ways to control the flow of air to the floors and rooms of a multilevel house; not all homes feature both options.

1. **Fan "On-Auto" switch**

Located on the thermostat, controls the running of the air handler [fan]. In active heating and cooling seasons this switch should be in the "On" position because the constant running of the fan will eliminate the problem of stratification. The real electrical energy required to run the fan [motor] is minimal compared to the energy of starting it many times a day.

2. **Summer Winter Damper Control**

Located on the main supply ducts to the main and/or upper floors, controls the amount [volume] of air distributed to upper and lower floors of the house. In the summer time more air needs to be supplied to the top floor and the reverse in the winter time. **This is a seasonal adjustment!**

Temperature Controls

A thermostat controls *when* the heating or cooling source comes on. Do not confuse setting the thermostat (for temperature) with the controlling the fan (for mode of operation). In the "Auto" position the fan [or air handler] will **only** come on [run] when the thermostat calls (demands) for heat or cooling from the heat pump unit (outside). The minute the system is satisfied for **temperate** in the "Auto" position, *the fan shuts down and stratification starts.*

Seasonal Adjustments

See Summer Winter Damper Control

Passive heating and cooling controls

- § **Storm windows** - Should be closed in both winter and summer except for ventilation.
- § **Shades & blinds** - Can either block heat entry in the summer or allow it in during the winter.

- § **Ceiling Fans** - Will solve a stratification problem within a room or open space especially one [room or space] with a very high ceiling. The movement of air by the fan will make the room feel 3-8 degrees cooler because of the effect of a breeze on skin surfaces.
- § **Ventilation** - Opening windows and doors during mild temperatures aids in temperature control.
- § **Replacement windows** - If you have an extreme exposure with lots of old technology windows you may consider energy saving replacements.
- § **Foliage** - Well thought-out plantings can work to your advantage too!

Special Considerations

Return Air Path(s)

Most modern home HVAC systems have supply registers (floor, wall or ceiling) for individual rooms but rely on a common return grill, usually located in a hall or open area. This type of installation relies on the "undercut" of the doors to the rooms to allow air to return [flow out of] when the doors are closed. If the undercut of the doors is not sufficient to allow for return air, the rooms will become very "stuffy" with the doors closed. This writer recommends a minimum 1/2 inch undercut on all room doors where that room does not have an individual return grill. A good test is to close the door and see if you can insert and move your fingers along the space at the bottom of the door. If the door is flush to the carpet or flooring then this room may suffer from poor air flow and become stuffy. If you are satisfied with leaving the door partially open to alleviate the problem then that's OK, but remember, even your closest friends or relatives might want a little privacy when sleeping in this room.

Below Grade Basements

If **any part** of the lower level of your home (single family or townhouse) is below grade [in-ground] then that space will always be colder than any other level of the house and consequently will require heating to be comfortable in the colder seasons. The good news is that in the summer months this level is almost always the coldest spot in the house.

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