

Ceiling Return Air Filter Grilles for Cooling Dominant Regions

Manual T room air device selection procedure sets the design standards for HVAC air devices required in each room of a building. Room air device location, size, type, and sound consideration are all addressed in this design guide. For a cooling dominant region like Florida ducts and air devices are designed for the cooling season air flow rates. The preferred location for both the supply air registers and return air filter grilles is the ceiling or high sidewall (Manual T Sect 7). Central HVAC systems use a forced air duct system that introduces the cool supply air high in the room directed so that the supply air flow pattern is projected just below the ceiling causing mixture of the warmest column of air. This mixed air is then captured by a return air filter grille mounted high in the stagnant area of the room. Most enclosable rooms will require both a supply air register(s) and a return air filter grille, the air device air flow rate is determined by the rooms Manual J heat load demand. The ceiling return air design approach offers the most effective and efficient means for conditioning a building located in a cooling dominant region because the stagnant column of air at the ceiling is removed from the room immediately while the cooler supply air conditions the room. This stagnant air at the ceiling is the warmest column of air in the building and will also contain a larger amount of moisture content, so the capturing of this stagnant air for direct delivery to the cooling coil offers a much better design practice than using a transfer air design practice that simply transfers this stagnant air to the next room.

Transfer air grille systems are commonly seen in Florida “budget tight” construction where extra return air duct is too costly to meet budget. Our mechanical and building codes require some enclosable rooms to achieve balanced return air when the room’s interior undercut door is closed; transfer air grilles are added just above the door to allow the supply air to escape the room. So instead of preferred method of capturing the warm stagnant air high in the room with a ducted ceiling return air filter grille, this warm air is transferred through the transfer air grilles to the adjacent hallway. Although the “transfer air” design approach does meet the mechanical codes for balanced return air, this approach is not the best way to achieve a comfortable home because the warmest column of air will not drop down to captured by the single low wall return air grille, the hvac system will operate for a longer period of time, the warm air displaced by the transfer air grilles often causes comfort problems in the adjacent rooms, the transfer air grilles also transfer sound, and in some cases building damage like mold can occur near the ceiling in the stagnant area.

Transfer air grilles are also utilized in buildings when there is little space for the air handler and two main plenum ducts as is common when mounting the air handler vertically in a small closet. The problem arises when the architect or builder allows a closet too small to house both the air handler and main return plenum riser duct. The required vertical mount air handler and plenum footprint dimension are 30” deep and 48” wide. In many cases the hvac designer is allotted only enough closet space (30”x30”) for a vertically mounted air handler containing a single low wall return air grille with no space for even a small ventilation air duct. This small closet does not allow for a return plenum riser duct that can extend upward into the attic space above allowing for multiple ceiling mounted return air filter grilles as recommended by Manual T room air device selection procedure. So when using this tiny closet and single low wall return air grille, the coolest air column at the floor is being returned to the air handler, this is perfect for heating a home, not so good for cooling a home. When planning a new building the architect should allow enough space for a modern hvac system. For a vertical mounted air handler in a closet allow space for both the supply air plenum and the return air plenum – this requires two roof truss bays above, or 4 feet wide, and 30” deep will be adequate for even the largest 5 ton residential air handler. When using a rear return riser the closet would be 30” wide by 4 feet deep. For garages use an insulated closet with sealed access door so that the air handler is within the buildings thermal envelope and not in the garage – a garage is the worst location for an air handler to mount. For attic mounted air handlers the ducted return air duct and return air filter grilles to each room are no problem, there is plenty of space within the attic for both the air handler and main duct plenums.