

Thermal Zoning for Modern Energy Efficient Homes - 2021

Thermal zoning is a design approach that groups rooms with similar heat load demand patterns into a “thermal zone”. A thermal zone is a room or group of rooms conditioned by a dedicated thermostat. Today’s technology allows for up to 30 thermal zones per hvac unit so that any thermal zone can be conditioned to the desired thermostat set point. Very similar to having a light switch in every room so that the home owner can choose what lights to operate, your hvac system can also give you similar temperature control. And because each thermal zone thermostat reports the room’s needs back to a control panel, the desired airflow is delivered where needed and only when needed.

Typically, when a home owner mentions to me, they want two thermostats, what they really mean is that they want more temperature control. Hvac installing contractors will try to sell multiple a/c units when a duct zoning system is actually what is required, zoning outperforms multiple a/c units and is less expensive to install and operate. Once the home owner is aware that duct zoning is available, they usually choose additional thermostats too – the average duct zoning design contains 4 thermostats. These modern control systems for your home can also communicate with other devices like smart phones should you want to control your homes comfort remotely.

Thermal zoning is the best choice for multilevel homes, so that as a minimum, each level of the home has an independent thermostat controller and main return air grille. This zoning design approach accounts for both the water fall effect (cool air naturally dropping to the lower level) and heat rise (warm air naturally rising to the upper level) that occurs due to naturally occurring building stack effect. In the past hvac contractors often sold an a/c unit per level, forgetting to take into account of the stack effect that will overload the top floor a/c unit during the summer while at the same time overcooling the first level. When duct zoning is used for multilevel homes, the stack effect and waterfall effect is accounted for because all of the equipment capacity can be sent to either level at any time. Also, zoning does not limit the number of thermostats for a typical two-level home or for a single level home served by a single a/c unit; designers can choose control for any thermal zone as desired or required by the adequate exposure diversity calculations, with up to 30 thermostats per hvac unit. For single level homes zoning can provide temperature control that accounts for the heat load demand shift associated with sun position as solar heat load demands change each hour throughout the day as established by the adequate exposure diversity calculations . Zoning can also account for the part load conditions that make up about 85% of the cooling season per year. Zoning solves the problem of entertainment events, with many 4th of July visitors present; I can deliver full cooling capacity to the area of the home where the party is. Zoning design can be used to group night time use and daytime use rooms so that each “time of use” area of the home has a programmable thermostat capable of automatically adjusting the thermal zone temperatures to follow the occupants’ usage pattern. And for that home office, or that mother in laws suite, or that home theater, or even grandma’s room where she likes a different temperature – all achieved with a duct zoning system – you sure can’t do all that when using a multiple a/c unit design approach featuring independent thermostats with no ability to communicate with each other.

Adequate exposure diversity (AED) calculations are performed prior to a Manual J heat load calculation to determine if the home is provided comfort (defined as 75 degrees indoor temperature with up to a 3-degree temperature swing) in every room served by an hvac system. Manual J average load procedure is used If the home has AED , and a single thermostat centrally located will provide comfort once the duct system is air balanced to provide the room air CFM flow values listed on the hvac drawings. Homes that don’t have AED require more than a single thermostat, Manual J peak load procedure is used to determine the room airflow values and Manual ZR is used to group rooms of similar load patterns into thermal zones. There is also a bypass duct damper system designed to balance the duct system when not all thermal zones are operating. A thermal zoning system with a “brain” and air zone dampers is capable of providing the desired comfort everywhere in the building and is a much better choice when compared to installing several hvac systems (one for each thermal zone), zoning provides better comfort at a lower operating and

lower installation cost. Although zoning has been available since the 1960's, few hvac installing contractors ever mention this option to the home owner because installing hvac contractors prefer to sell more equipment in lieu of installing a modern thermal zoning system. The "old way" design approach of using a single thermostat to control a single a/c unit (only capable of controlling the temperature in the one room that contains the thermostat) has become obsolete. Modern homes are made up of many rooms with varying heat load demand patterns; thermal zoning is a design approach that allows control of any room(s) containing a thermostat.

Two zone control system shown below gives day time use "kitchen / living" a dedicated thermostat and allows the night time use bedrooms a second thermostat. Throw a party on a hot day in the living room and divert the cooling equipment's full cooling capacity where the party is. This hvac design is expandable to 3 zones if and additional third thermostat is desired in Bed 2 suite, allowing each sleeper their own perfect temperature.

