

FACT SHEET

CALIFORNIA ENERGY COMMISSION

RESIDENTIAL ZONAL CONTROL SYSTEMS *2013 California Energy Efficiency Building Standards*

Zonal control involves dividing a dwelling into separately controlled heating or cooling zones by installing multiple HVAC systems that condition a specific part of the building, or by installing one HVAC system with a specially designed distribution system that permits zonal control.

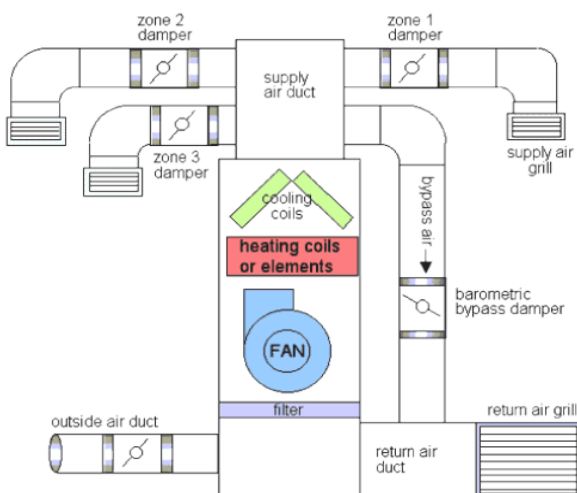
Zoned systems (multiple zones served by a single air handler with motorized zone dampers), with or without bypass dampers, usually do not meet the airflow and fan efficacy requirements when fewer than all zones are calling for cooling. The energy penalty that results from this configuration is greater than the benefit of having zonal control. Therefore, zonal control is no longer assumed to be "better than minimum." Thus, there are special compliance requirements to help make a system efficient.

Zonally controlled central forced-air cooling system information is available in the *2013 Residential Compliance Manual* (Chapter 4). Compliance requirements are addressed for HVAC systems and serve as a single source of information for mechanical system designers and installers, as well as energy consultants, HERS raters, and enforcement personnel. The mandatory measures listed below apply to "new" duct systems or completely replaced duct systems. Partially replaced duct systems may fall under different requirements. See the *2013 Energy Efficiency Building Standards*, Section 150.2 (b), 1, D, ii. (<http://www.energy.ca.gov/title24/2013standards>)

Zonally controlled central forced-air cooling systems produce lower airflow through return ducts, thus lowering the efficiency of HVAC equipment. There are two primary methods by which the common multizoned dampered system lowers airflow: additional restriction of zoning dampers and recirculation through the air conditioner from a bypass duct.

MANDATORY MEASURES for Zonal Control Cooling System (Figure 1)

- Mandatory air flow testing (350 cfm/Ton) and fan watt draw testing (0.58W/cfm) (referred to as AF/FE) are to be performed in each cooling zone of the home. An alternative to return duct and filter sizing is not allowed.
- Airflow and fan watt draw must be HERS-verified.



SINGLE-SPEED COMPRESSOR

To avoid the efficiency problem, zonally controlled central forced air cooling systems using single-speed compressors must simultaneously meet all of the following criteria:

1. In every zonal control mode, the system shall provide airflow through the return grilles that is equal to or greater than 350 CFM per ton of nominal cooling capacity.
2. In every zonal control mode, the fan watt draw must be less than or equal to 0.58 watts per CFM.
3. The airflow and fan watt draw must be HERS verified.
4. Bypass ducts are not permitted. (Note: Bypass ducts are permitted if modeled and reported on the CF-1R form.)

Figure 1

MULTISPEED COMPRESSOR

Zonally controlled central forced-air cooling systems with **multispeed or variable speed compressors** only need to be verified to meet the air flow and fan watt draw (AF/FE) testing criteria referred to above, (350 CFM per nominal ton and 0.58 watts per CFM) with the compressor on high speed and with all zones calling for cooling. Bypass ducts are not allowed unless they are part of new construction and are modeled and reported on the CF-1R form.

Multispeed compressors alleviate the detrimental effects of not meeting the AF/FE criteria when fewer than all zones are calling for cooling and are given special consideration when used in zoned systems. They are assumed to offset the negative effects of zoned systems. Airflow and fan efficacy testing is only required to be performed on the highest speed with all zones calling for cooling. Zoned systems with single-speed compressors, however, must be tested and pass in all operating modes.

Because zoned systems, with or without bypass dampers, are less likely to meet the AF/FE requirements when fewer than all zones are calling, the performance compliance option allows the penalty, as well as permitting the use of zone dampers. Other energy features will need to be incorporated to offset the penalty. In the performance compliance software, if the system is modeled as a zoned system with a single-speed compressor, the default airflow drops to 150 CFM/ton. (Note: The standard dwelling is assumed to have an airflow measure of 350 CFM/ton, so there is a penalty unless the user specifies a value of 350 or higher. Entering a value between 150 and 350 can lessen the penalty.)

Zonally Controlled Central Forced Air Cooling Systems (for Multiple Zones off a Single Air Handler) (p. 4-40 of Compliance Manual)			
Compressor Type	Mandatory Requirements for Airflow and Fan Efficacy (1)	Performance Compliance (2)	
		Proposed House Defaults (3)	Modeled Improved Airflow and/or Fan Efficacy
Single Speed	Airflow ≥ 350 CFM/ton and Fan Efficacy ≤ 0.58 W/ CFM (For Prescriptive Compliance Method, verification is mandatory in all zonal control modes. For Performance Compliance Method, verification is mandatory using highest capacity with all zones calling)	150 CFM/ton and 0.58 W/CFM	Airflow ≥ 150 CFM/ton and/or Fan Efficacy ≤ 0.58 W/CFM (Verification of better-than-default values required in all zonal control modes. Mandatory requirement of 350 CFM/ton and 0.58 W/CFM still applies for all zones calling)
Two Speed or Variable Speed	Airflow ≥ 350 CFM/ton and Fan Efficacy ≤ 0.58 W/ CFM (Verification Required Only on Highest Capacity and with All Zones Calling)	350 CFM/ton and 0.58 W/CFM	Airflow ≥ 350 CFM/ton and/or Fan Efficacy ≤ 0.58 W/CFM (Verification of modeled improved values required only on Highest Capacity and with All Zones Calling)

1 For the Prescriptive Compliance Method, all mandatory requirements for airflow and fan efficacy must be met, and use of a bypass duct is not allowed.
 2 For the Performance Compliance Method, all mandatory requirements for airflow and fan efficacy must be met, and use of a bypass duct may be specified in the compliance software input for the zoned system type.
 3 The standard default values for all cases are 350 CFM/ton and 0.58 W/CFM.

The California Energy Commission’s Building Standards Hotline can be reached at, 800-772-3300, (toll-free in California), and at 916-654-5106 (outside California), or by e-mail at T24@energy.ca.gov.