

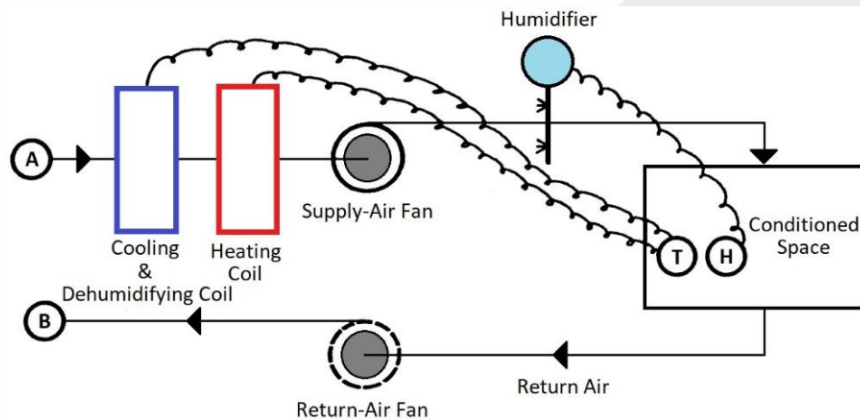


## Classification of HVAC Systems – Part 3

### Types of HVAC Systems – Zone Systems

#### 1. Classic Single-Zone System

The elements of the air-conditioning systems that will provide heating (and humidification) or cooling (and dehumidification) are shown in the figure below.



A subsystem of this and most other air-conditioning systems controls the flow rate of outdoor ventilation air. This subsystem interfaces with the facility shown at points A and B. From point A the air flows to the cooling coil, heating coil, fan, and humidifier toward the conditioned space. In the return-air line a fan is often installed to avoid excessive air pressure in the conditioned space relative to the outside-air pressure. The temperature control is provided by a thermostat regulating the cooling or heating coil, and the humidity is controlled by a humidistat that regulates the humidifier.

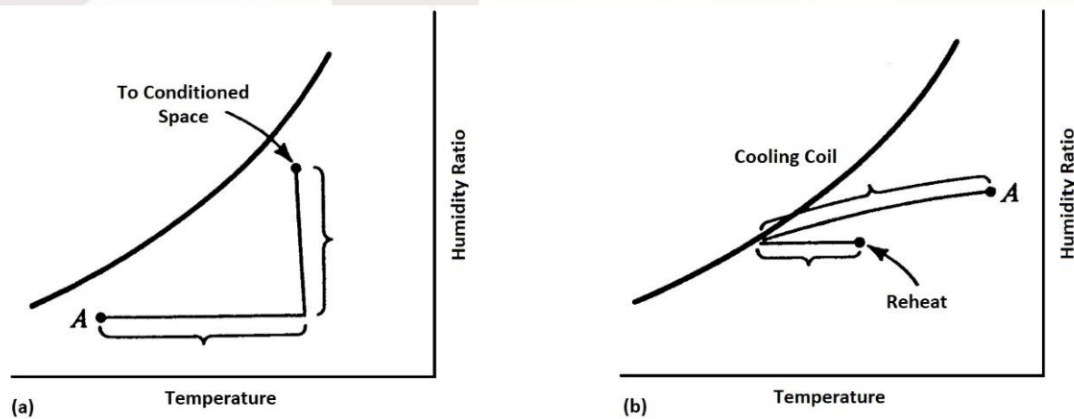
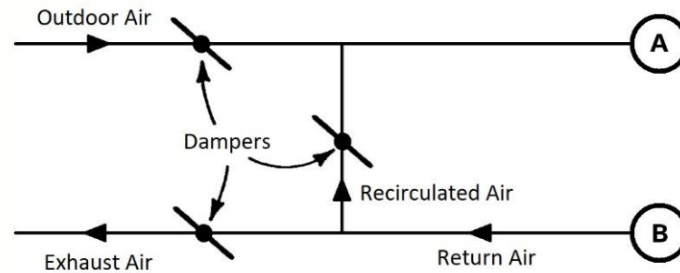


Figure (a) shows a heating and humidification process wherein air at point A having a low temperature is warmed in the heating coil and humidified by the direct admission of steam. In general, the process of humidification by direct admission of steam results in little change in dry-bulb temperature. In Figure (b) the air is cooled, and if the temperature of the metal surface of the coil is below the dew point of the air, moisture will condense. The heating coil may be operated simultaneously with the cooling coil so that the combination of the cooling and reheat processes provides a steep slope between A and the condition entering the space. The combination of reheat with the cooling and dehumidifying process is some-times used in installations where the relative humidity must be kept low or there is an excessive latent load.



Is necessary when the conditioned space is occupied by people. In many comfort air-conditioning installations, the minimum percentage of outdoor ventilation air is between 10 and 20 percent of the total flow rate of supply air. In some special applications, e.g., hospital operating, the supply air may come exclusively from outdoors and be conditioned to maintain the specified space conditions. No return air is recirculated in these installations. The outdoor-air control mechanism is shown in the figure below.



The stream of return air at B flowing back from the zones divides, some exhausting and some re-circulating. The outdoor ventilation air mixes with the recirculated air and flows to the conditioning unit at A. Dampers in the outdoor-, exhaust-, and recirculated-air lines regulate the flow rates. The dampers in the outdoor- and exhaust-air lines open and close in unison and in the direction opposite the motion of the recirculated-air dampers. A standard outdoor-air control plan attempts to maintain the mixed-air temperature at point A at approximately 13 to 14°C since the basic function of the air-conditioning system is to provide cooling. Another requirement of the outdoor-air control is to assure that the minimum percentage of outdoor air is maintained. At a high outdoor temperature, the dampers provide the minimum flow rate of outdoor air. At an outdoor air temperature lower than about 24°C (or whatever the return-air temperature is) it is more economical in cooling energy to use 100 percent outdoor air.