

Air-Conditioning Systems

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ME 415: Refrigeration & Building Mechanical Systems

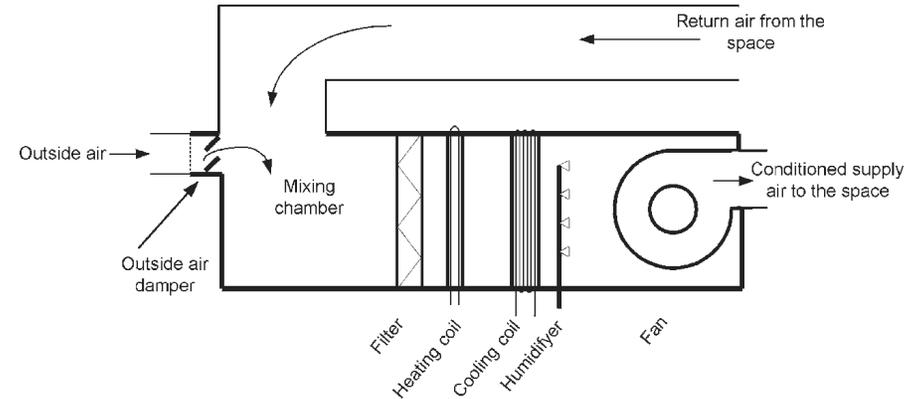


Zoned A/C System

- In many buildings there is a variety of spaces with different users and varying thermal loads. When a system is designed to provide independent control in different spaces, each space is called a **Zone**.
- Zoning leads 4 broad categories of A/C system:
 - Unitary, refrigeration-based systems
 - All-air systems
 - Air-and-water systems
 - All-water systems



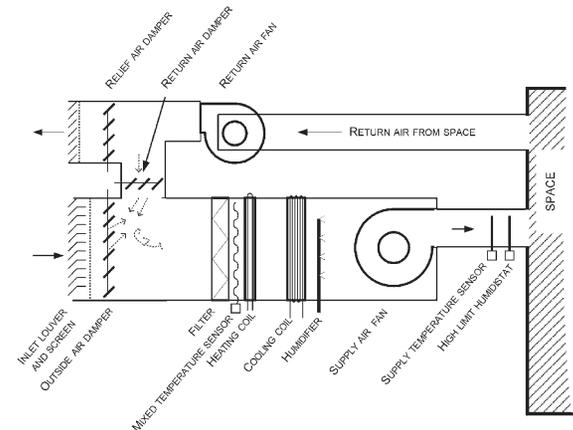
Basic Air-Conditioning System



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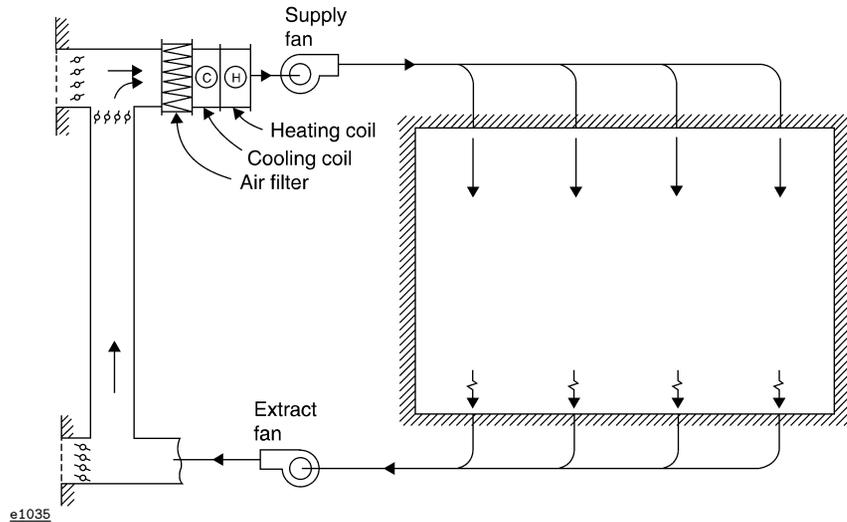
Air Handling Unit (AHU)



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The functions of the air-handler are to draw in outside air and return air, mix them, condition the mixed air, blow the air into the space and exhaust any excess air to outside.



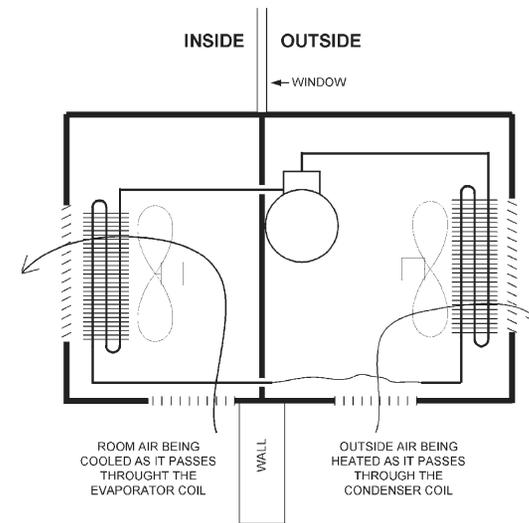


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Central AHU



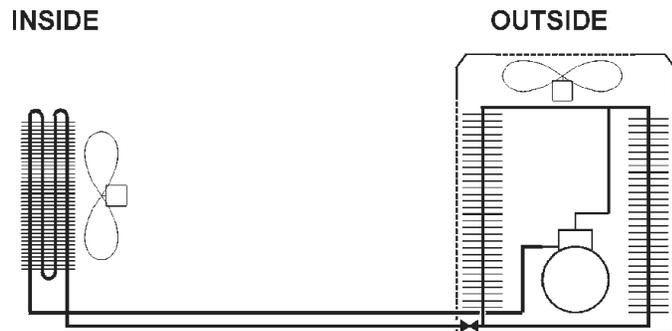
Window Air-Conditioner



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Split System

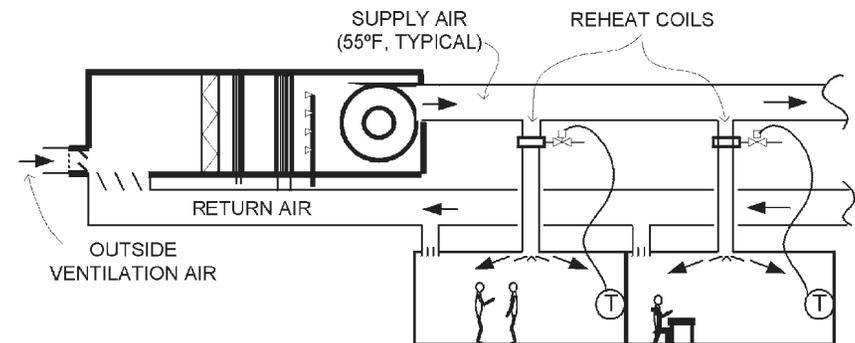


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Compressor/condenser part of the refrigeration system separate from the evaporator coil and connected by the refrigerant lines to the air system, which includes the evaporator. It allows the AHU to be indoors, where it is easier to maintain and does not need to be weatherproofed. The noise of the compressor is outside and can be located at some distance from the AHU.



All-Air System with Reheat

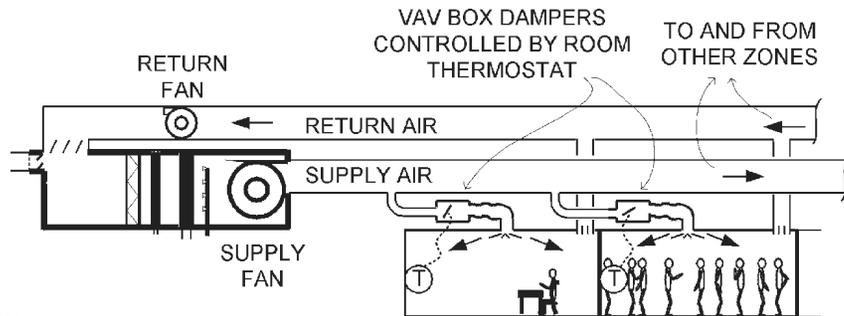


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Reheat is the simplest system, known for both its reliability and the down side, its high energy wastage.



All-Air System with Variable Air Volume (VAV)

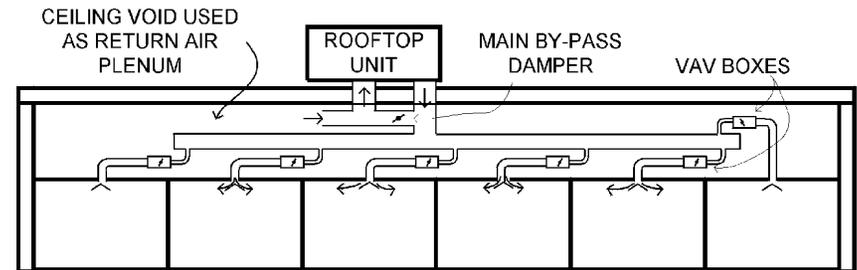


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More energy efficient than reheat, VAV is a very flexible system with many virtues. When there is a low load, however, it does offer challenges for maintaining adequate ventilation air and good room air distribution.



All-Air System with Bypass

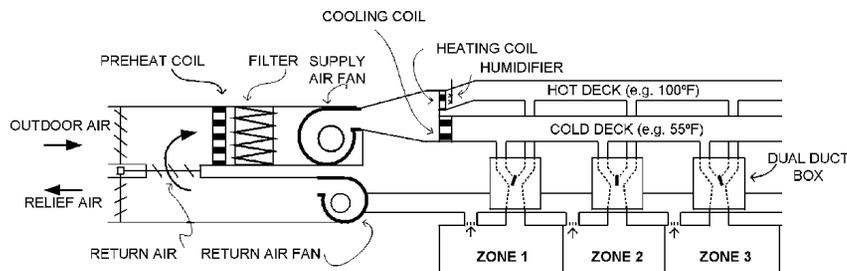


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A variation on the VAV system, the bypass system, is suitable for providing good control in smaller systems, and for constant flow over a direct-expansion cooling coil.



All-Air System with Dual-Duct System



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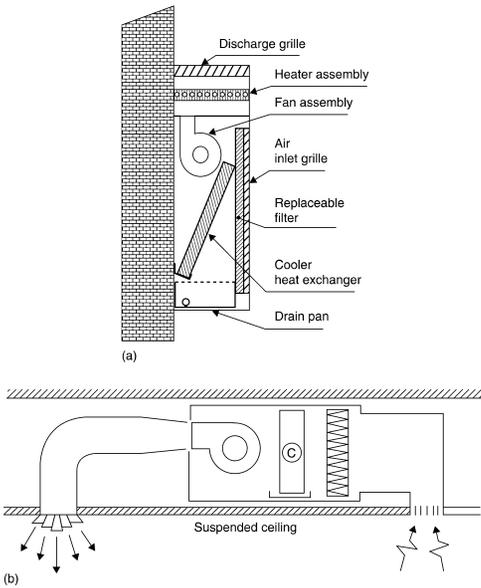
System provides full airflow when the system is on, but, like the reheat system, suffers from the energy penalty of simultaneous heating and cooling. A very attractive feature of the dual-duct system is that there are no reheat coils near the zones, so the problems of leaking hot water coils is avoided.



All-Water (Hydronic) System

- When ventilation is provided through natural ventilation by opening windows, or other means, there is no need to duct ventilation air to zones from central plant.
- In all-water system, all processes other than ventilation is provided by local equipments, FCUs, supplied with hot or chilled water from a central plant.
- Fan Coil units (FCU) consist of a fan and a coil. These can be used for just heating or for both heating and cooling.





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Air-Water System

- In this system all the primary ventilation air is from a central system, but local units provide additional conditioning.
- The local units are usually supplied with hot or chilled water.
- These systems are particularly effective in perimeter spaces where high heating and cooling loads occurs.

