



Lecture Eight

Air System Types

اختر نوع نظام الهواء من القائمة المنسدلة Air System Type، وفي حال اختيار نظام الهواء من النوع متغير الحجم VAV أو CAV يخدم عدة مناطق عندها يجب إدخال عدد المناطق التي تخدم المشروع ضمن الحقل Number of Zones.

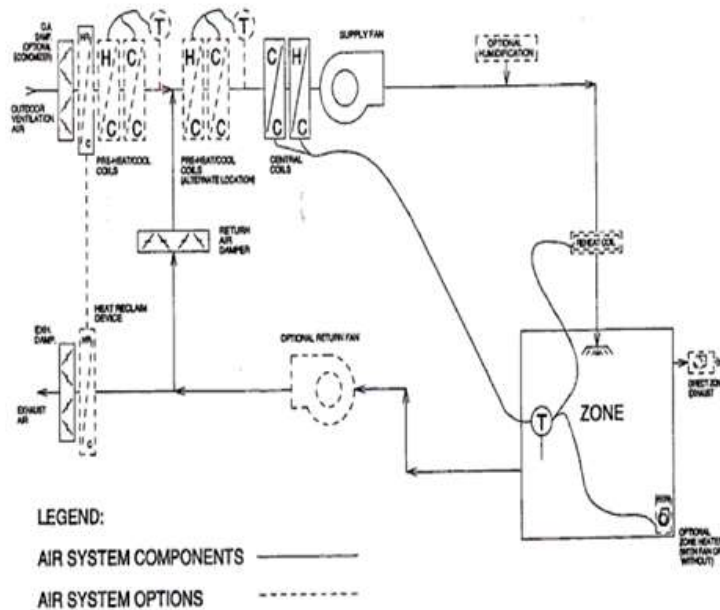
وفي حال كان نوع الجهاز المستخدم Terminal Units عندها يتم اختيار عدد المناطق بالإضافة إلى اختيار طريقة التهوية ولدينا خيارين:

- تهوية مباشرة Direct Ventilation: وفيها يتم تقديم هواء التهوية غير المعالج إلى الوحدة مباشرة عن طريق أي جدار خارجي وذلك لكل وحدة موجودة في المشروع على حدة.
- تهوية مشتركة Common Vent. System: وفيها يتم استخدام وحدة مركزية تقوم بتوزيع الهواء المعالج (عن طريق وحدة تكييف) أو غير المعالج (عن طريق مروحة فقط) إلى جميع الوحدات الموجودة في المشروع. وعند اختيار هذه الطريقة يتفعل التيوب Vent System Components.

ويحتوي الملحق 1 على أنواع أنظمة الهواء التي يمكن اختيارها بواسطة البرنامج بالتفصيل.

CAV Single Zone System

This help topic describes the operating assumptions for a CAV single zone air system. This single-zone system uses a central air handler to provide a constant volume of conditioned air to the zone terminal. Depending on the user's description of the system, operation for cooling and heating in the occupied and unoccupied periods varies, as described in the following sections.

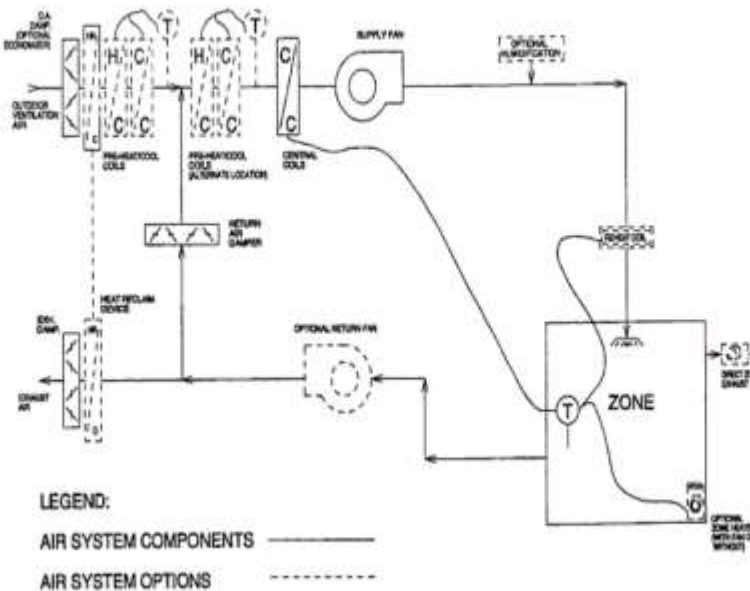


CAV Single Zone System Schematic



CAV Terminal Reheat System

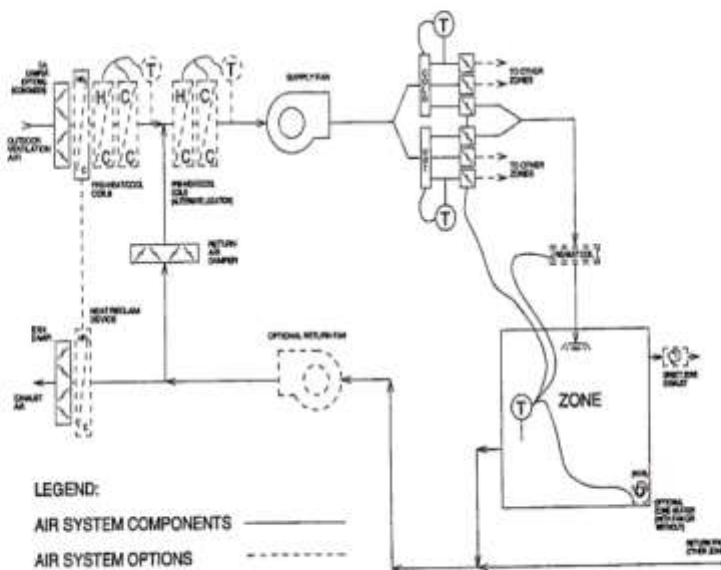
This help topic describes operating assumptions for a CAV Terminal Reheat air system. This multiple-zone system uses a central fan to provide a constant volume of conditioned air to zone terminals. Zone thermostats control the output of terminal heating coils in order to regulate the air temperature delivered to the zone and maintain comfort conditions. Depending on the user's description of the system, cooling and heating operation varies in the occupied and unoccupied periods as described in the following sections.



CAV Terminal Reheat System Schematic

CAV 2-Deck Multizone System

This help topic describes operating assumptions for a 2-Deck Multizone air system. This multiple-zone system uses a central two-deck blow-thru air handler to provide a constant volume of conditioned air to zone terminals. Each zone has its own supply air duct to carry conditioned air from the central air handling unit. The zone thermostat controls the blending of air from the hot and cold decks into its supply air duct to provide air at a temperature sufficient to maintain the zone temperature within comfort conditions. Depending on the user's description of the system, cooling and heating operation varies in the occupied and unoccupied periods as described in the following sections.

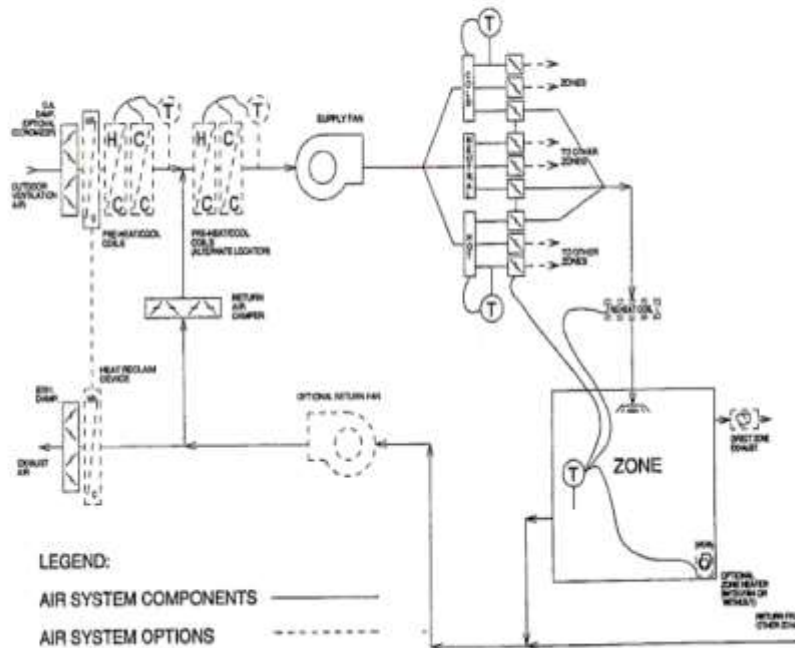


CAV 2-Deck Multizone System Schematic



CAV 3-Deck Multizone System

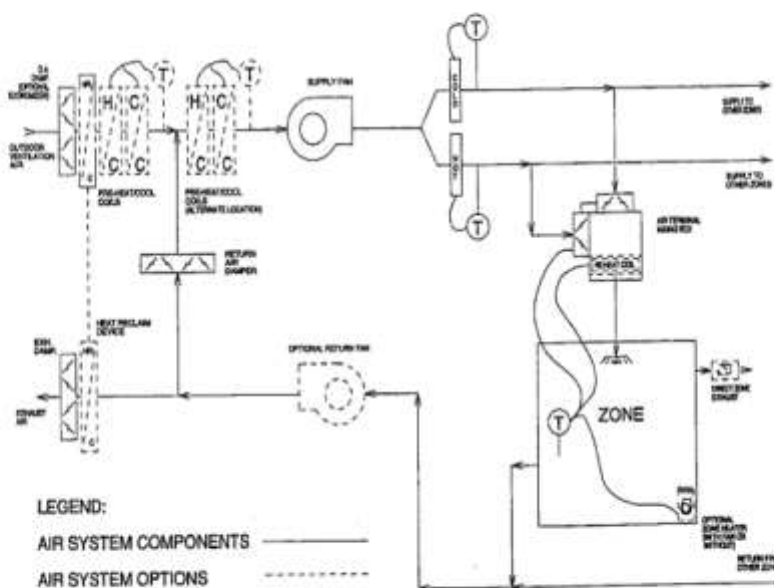
This help topic describes the operating assumptions for a CAV 3-Deck Multizone air system. This multiple-zone system uses a central three-deck blow-thru air handler to provide a constant volume of conditioned air to zone terminals. Each zone has its own supply air duct to carry conditioned air from the central air handling unit. The zone thermostat controls the blending of air from the neutral deck with air from the hot or cold deck, to provide air at a temperature sufficient to maintain zone comfort conditions. Depending on the user's description of the system, cooling and heating operation varies in the occupied and unoccupied periods as described in the following sections.



CAV 3-Deck Multizone System Schematic

CAV Dual Duct System

This help topic describes the operating assumptions for a CAV Dual Duct air system. This multiple-zone system uses a central two-deck blow-thru air handler to provide a constant volume of conditioned air to zone terminals. Air is distributed to the terminals through two parallel main ducts. The hot deck supply duct carries warm air to the zones; the cold deck supply duct carries cold air to the zones. The zone thermostat controls the mixing of air from the hot and cold supply ducts to provide air at a temperature sufficient to maintain zone comfort conditions. Depending on the user's description of the system, cooling and heating operation varies in the occupied and unoccupied periods as described in the following sections.

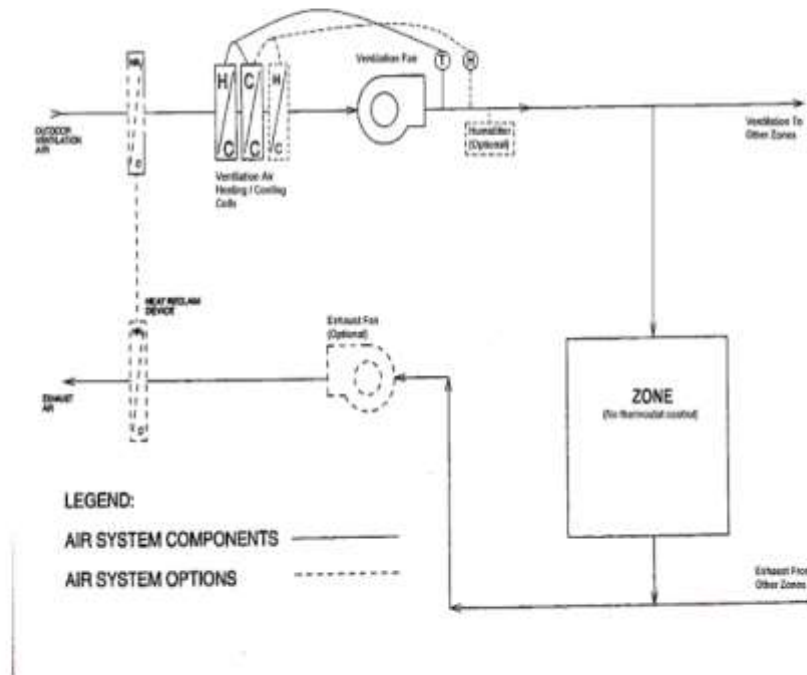


CAV Dual Duct System Schematic



CAV Tempering Ventilation System

This help topic describes the operating assumptions for a CAV Tempering Ventilation air system. This system provides tempered ventilation air to a region of the building, but does not provide conditioning to control the space air temperature. That is, the zone served by the system does not have a thermostat. This system model should be used for applications such as factories, warehouses or gymnasiums which are supplied with tempered outdoor air but are not heated or air-conditioned to control the space temperature. Depending on the user's description of the system, system operation in the occupied and unoccupied periods varies as described below.



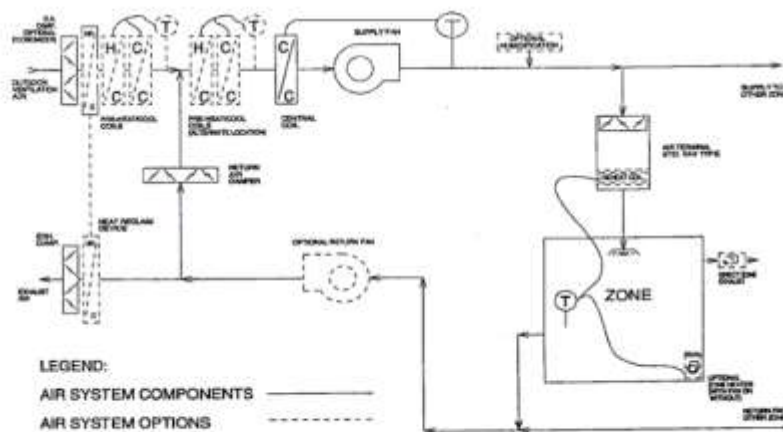
CAV Tempering Ventilation System Schematic

VAV System

This help topic describes the operating assumptions for single-duct VAV systems. This multiple-zone system uses a central supply fan to provide a variable volume of conditioned air to zone terminals. Zone thermostats control the supply terminal equipment to regulate the flow of air into each zone and maintain zone comfort conditions. In a VAV system, any of the following supply terminal devices can be used, either one type exclusively for all zones, or a mixture of types among the various zones served by the system.

1. VAV boxes.
2. VAV boxes with terminal reheat.
3. Series fan powered mixing boxes with terminal reheat.
4. Parallel fan powered mixing boxes with terminal reheat.

Cooling and heating operation of the system varies in the occupied and unoccupied periods as described in the following sections.

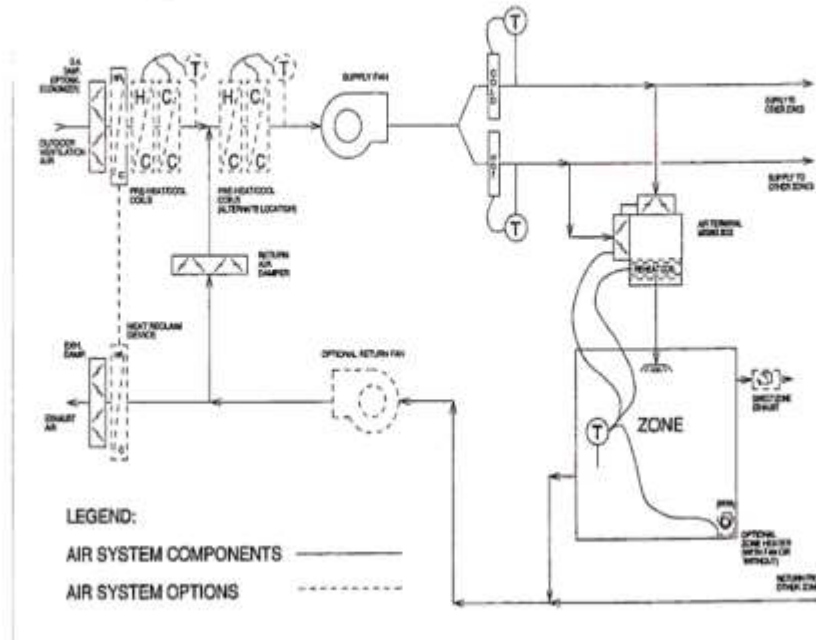


Schematic for VAV System with VAV Reheat Terminals



VAV 1-Fan Dual Duct System

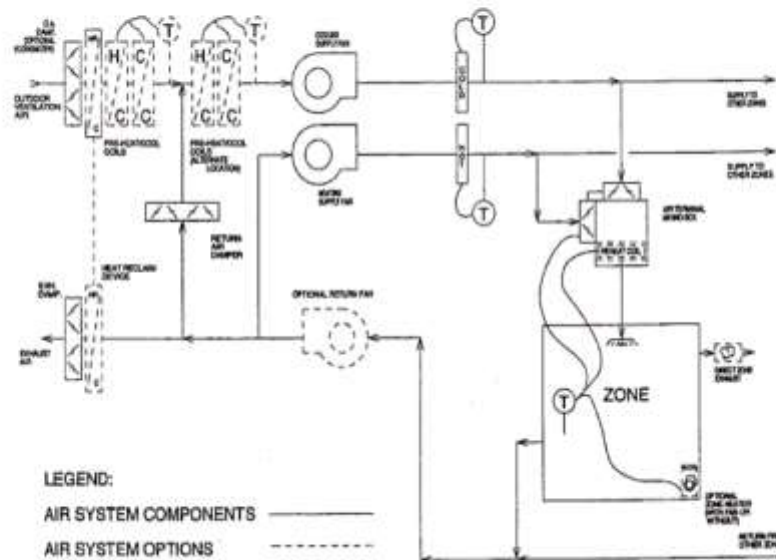
This help topic describes the operating assumptions for a VAV 1-Fan Dual Duct air system. This multiple-zone system uses a central two-deck blow-thru air handler to provide a variable volume of conditioned air to zone terminals. Air is distributed to the terminals through two parallel main ducts. The hot deck supply duct carries warm air to the zones; the cold deck supply duct carries cold air to the zones. The zone terminals mix air from the hot and cold supply ducts providing air to the zones at a temperature sufficient to maintain comfort conditions. Depending on the user's description of the system, cooling and heating operation varies in the occupied and unoccupied periods as described in the following sections.



VAV 1-Fan Dual Duct System Schematic

VAV 2-Fan Dual Duct System

This help topic describes the operating assumptions for a VAV 2-Fan Dual Duct air system. This multiple-zone system uses a central two-deck, two-fan air handler which provides a variable volume of conditioned air to zone terminals. Air is distributed to the terminals through two parallel main ducts. The hot deck has its own VAV fan which supplies warm return air to the zones. A heating coil in the hot deck operates whenever the warm return air is insufficient to meet zone demand. The cold deck has its own VAV fan and cooling coil, and supplies cold air to the zones. The zone terminals mix air from the hot and cold supply ducts, providing air to the zones at a temperature sufficient to maintain comfort conditions. Depending on the user's description of the system, cooling and heating operation varies in the occupied and unoccupied periods as described in the following sections.



VAV 2-Fan Dual Duct System Schematic



Variable Volume / Temperature (VVT) System

This help topic describes the operating assumptions for a VVT air system. VVT stands for "Variable Volume/Variable Temperature". VVT is essentially a time-sharing system in which the same set of equipment and controls alternately provides cooling and heating as required by the zones it serves. During operation, for example, the system may provide cooling to one group of zones for part of an hour, heating to another group of zones for another part of the hour, and ventilation air to all zones for the remainder of the hour. VVT system operation is similar in both the occupied and unoccupied periods. Operation in both periods is described below.

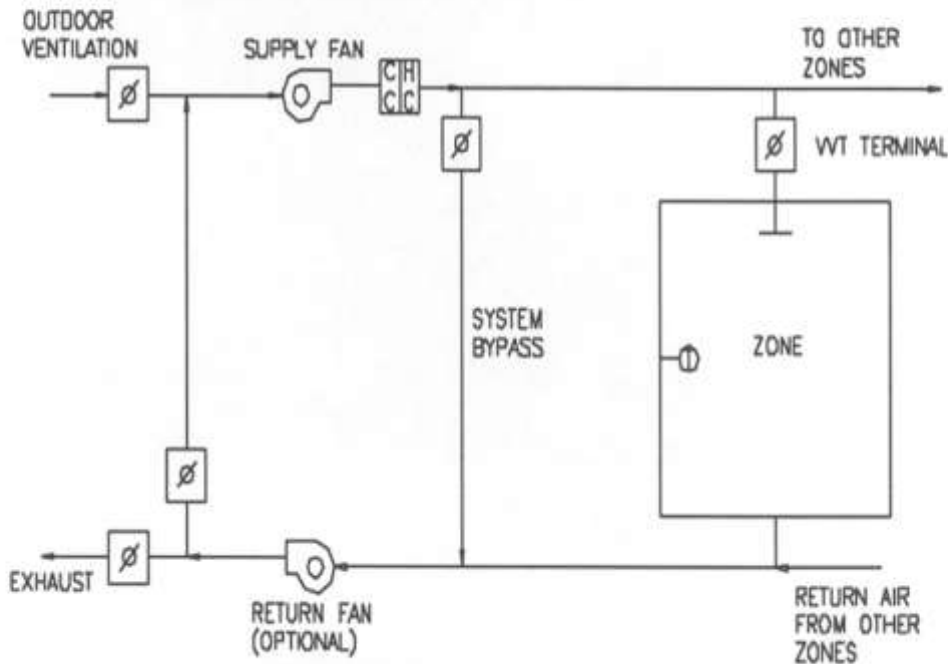


Figure 13.16 VVT System

Terminal Unit Systems

This topic describes the operating assumptions for the following terminal HVAC systems:

- Packaged DX Fan Coils
- Split DX Fan Coils
- Variable Refrigerant Flow
- 2-Pipe Fan Coils
- 4-Pipe Fan Coils
- Water Source Heat Pumps
- Groundwater Source Heat Pumps
- Ground Source Heat Pumps

Air side operation of all eight types of equipment is the same. The terminal unit is a single-zone constant air volume unit providing conditioned air to the zone. Ventilation air may be provided to the terminal unit directly from outdoors as shown in Figure 1. As an alternative, unconditioned or pre-conditioned outdoor ventilation air can be provided by a centrally located ventilation air handler. When used, it is assumed air from the central ventilation unit is ducted to the inlet of each terminal unit in the system. This arrangement is shown in Figure 2.

Operating assumptions for the terminal units and the central ventilation unit are described separately below.

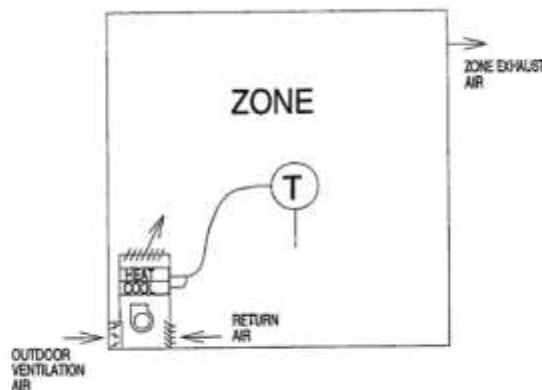


Figure 1. Terminal Unit Schematic (Direct Ventilation Air Case)

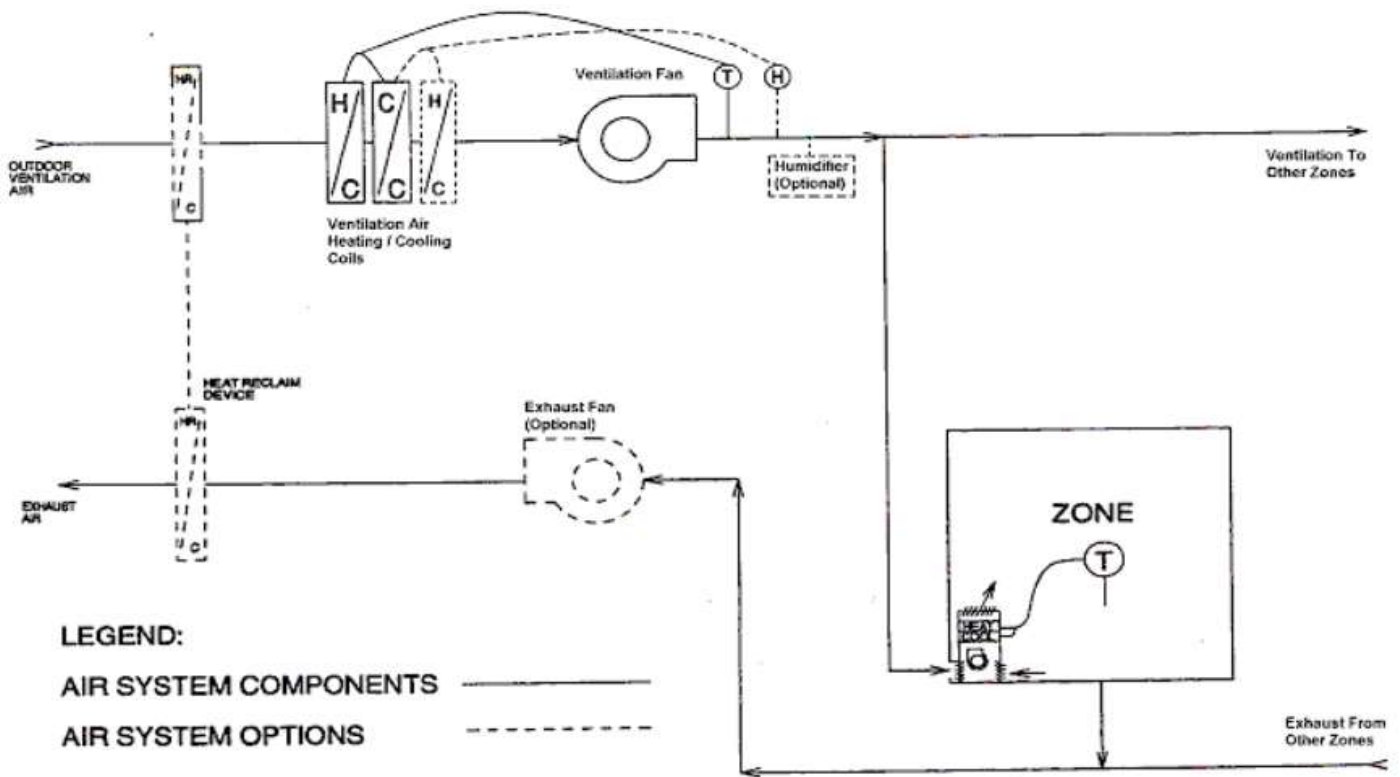


Figure 2. Terminal Unit Schematic (Common Ventilation Unit Case)

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