Types of Fan Coils

VERTICAL STACK

The Vertical Stack unit consists of a blower and motor capable of supplying up to 1200 cfm to the space, a cooling/heating water coil, a drain pan for coil condensation and large amount of accessories to reduce installation times and cost.

The purpose of the Vertical Stack Fan Coil is to provide cooling and heating to single or dual room spaces in response to a control signal from a single room thermostat. The unit is typically mounted in the room walls forming part of the conditioned area.

There are four types of Vertical Stack units to meet various water distribution designs.

- Model VSR (Vertical Stack Stand Alone) vertical mounted unit with wall mounted return air/access panel and discharge grilles normally have the water distribution risers as an integral part of the unit to facilitate the unit installation and reduce cost and time in the field
- Model VSRM (Vertical Stack Remote Master) as per the model VSR, however the risers are manufactured with various alternatives of connections for field connection to a remote Drone (VSRS) unit
- Model VSRS (Vertical Stack Remote Drone) as per the VSR unit, however the unit does not have risers and pipe connections are manufactured ready for connection to a remote Master (VSRM) unit
- Model VSM/S (Vertical Stack Master/Drone) twin pack unit, pre-piped at the factory, sharing a single set of risers and typically used when conditioning similar space areas such as hotel rooms

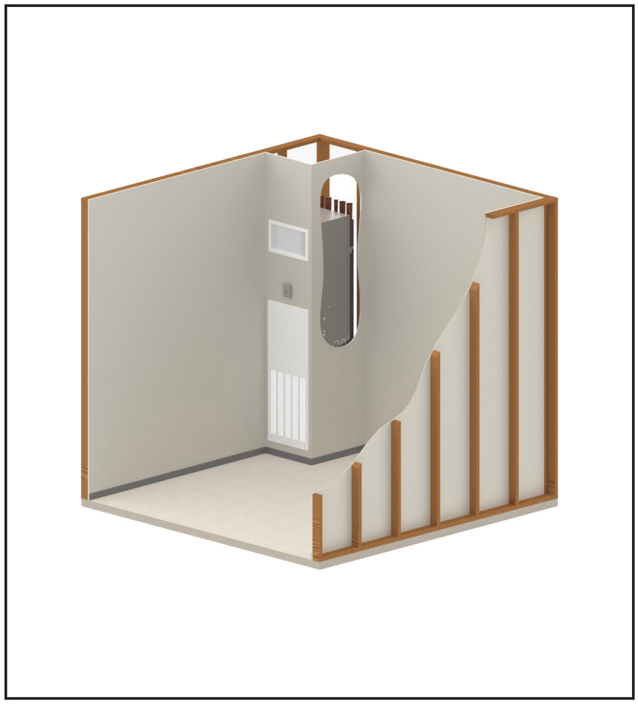
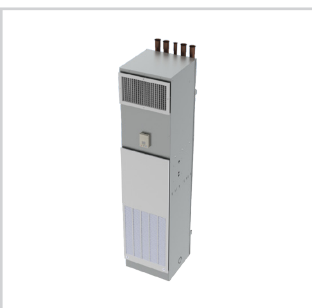


Figure 110. Typical Vertical Stack Application



VSR

VSRM

VSRS

VSM/VSS

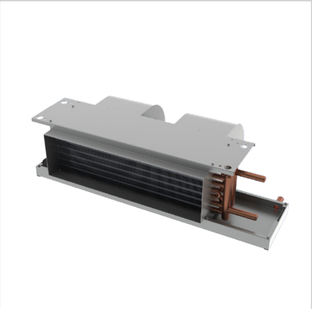
HORIZONTAL BASIC

The Horizontal Basic unit consists of a blower and motor capable of supplying up to 1200 cfm to the space, a cooling / heating water coil and a drain pan for coil condensation. The purpose of the Horizontal Basic Fan Coil unit is to provide cooling and heating to a single room space in response to a control signal from the room thermostat. The unit is typically mounted above the space ceiling in a ceiling drop or soffit to maximize the usable floor space in the conditioned area.

There are four types of Horizontal Basic units to meet various structural requirements.

- Model HBC (Horizontal Basic Concealed) mounts in the ceiling plenum and is ducted to a high sidewall air outlet. The HBC is an economical source of supplying warm or cool air to a room in response to the room thermostat.
- Model HBP (Horizontal Basic Plenum) is the same unit as the HBC with the fan and blower housed inside an insulated plenum. The plenum provides sound absorption for the fan noise and a housing to mount an optional plenum air filter.
- Model HBR (Horizontal Basic Recessed) is mounted with the face exposed to the room on the ceiling. The face of the unit houses the return air inlet for inducing room air directly back to the unit for re-circulation. The face is painted.
- Model HBE (Horizontal Basic Exposed) is mounted below the ceiling line with the entire unit under the ceiling line. This unit is commonly used in high bay open areas.

Figure 111. Typical Horizontal Basic Application



HBC

HBE

HBP

HBR

VERTICAL BASIC

The Vertical Basic unit consists of a blower and motor capable of supplying up to 1200 cfm to the space, a cooling/heating water coil and a drain pan for coil condensation. The purpose of the Vertical Basic Fan Coil unit is to provide cooling and heating to a single room space in response to a control signal from the thermostat. The thermostat could be located on the unit or on the wall. The unit is typically mounted beneath the window to be located in the area of the maximum load in the conditioned area.

There are four types of Vertical Basic units to meet various structural requirements.

- Model VBC (Vertical Basic Concealed) mounts in an enclosed area on the perimeter beneath or adjacent to the window. The unit is enclosed with material similar to the room walls. A supply grille mounted atop the unit discharges conditioned air vertically into the space.
- Model VBF (Vertical Basic Flat Top) typically mounts on the floor beneath the window but can be located on a wall adjacent to the window. The unit is encased in a painted sheet metal enclosure. An integral supply air grille is located atop the unit for conditioned air to be discharged vertically into the space.
- Model VBA (Vertical Basic Angle Top) typically mounts on the floor beneath the window but can be located on a wall adjacent to the window. The unit is encased in a painted sheet metal enclosure. An integral supply air grille is located on an angled surface atop the unit for conditioned air to be discharged vertically into the space. The angled surface discourages placing items on top of the unit, which blocks the air supply into the space.
- Model VBL (Vertical Basic Low Profile) typically mounts on the floor beneath the window. The unit is encased in a painted sheet metal enclosure. An integral supply air grille is located atop the unit for conditioned air to be discharged vertically into the space. The VBL is mounted in a lower profile cabinet for use with a window, which is mounted closer to the floor. The smaller cabinet limits the maximum airflow to 600 cfm for this model.
- Model VBLC (Vertical Basic Low Profile Concealed Floor) mounts in an enclosed area on the perimeter beneath or adjacent to the window. The unit is enclosed with material similar to the room walls. A supply grille mounted atop the unit discharges conditioned air vertically into the space. The VBLC is mounted in a lower profile cabinet for use with a window, which is mounted closer to the floor. The smaller cabinet limits the maximum airflow to 600 cfm for this model.

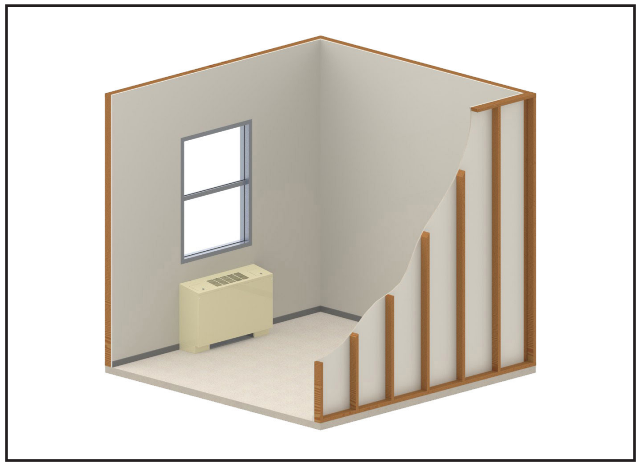


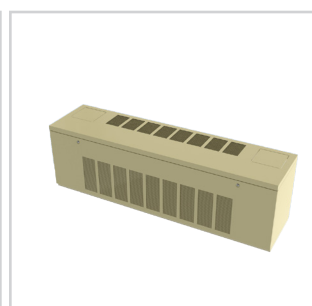
Figure 112. Typical Vertical Basic Application

VBA

VBLC

VBC

VBF



VBL

HIGH OUTPUT SERIES

The High Output Series units consist of a blower and motor capable of supplying up to 2000 cfm to the space, a cooling/heating water coil and a drain pan for coil condensation. The purpose of the High Output Series Fan Coil units is to provide cooling and heating to a multi-room space in response to a control signal from the area thermostat. The unit is typically mounted outside the conditioned area to minimize the noise generated by a larger blower.

There are three Horizontal High Output models and one Vertical High Output model.

- Model HHC (Horizontal High Output Concealed) is typically mounted in a ceiling plenum space above a hallway or non-critical room. Care must be taken to provide access to the unit for service. Ductwork attached to the unit discharge will deliver the conditioned air to the air outlets mounted in the ceiling or high sidewall of the rooms being served. Return air inlets from the room to the ceiling plenum are required for units mounted above a ceiling.

- Model HHP (Horizontal High Output Plenum) is the same unit as the HHC with the fan and blower housed inside an insulated plenum. The plenum provides sound absorption for the fan noise, and a housing to mount an optional plenum air filter. The return air inlets can be ducted directly to the unit plenum.

- Model HHE (Horizontal High Output Exposed) is designed for larger spaces where noise is not critical. The galvanized steel cabinet is typically not painted. The unit is mounted above the conditioned space and can be ducted to multiple air outlets or discharged directly above the space.

- Model VHC (Vertical High Output Cabinet) is designed for larger spaces where ease of maintenance is desired. The unit is typically located in a closet where a door from the occupied space opens for easy access.

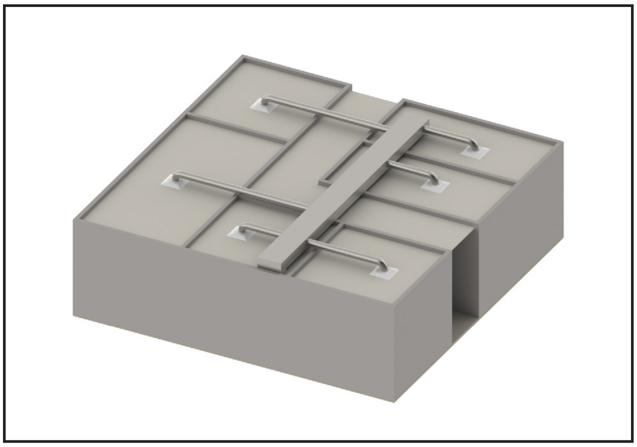


Figure 113. Typical Horizontal High Output Application

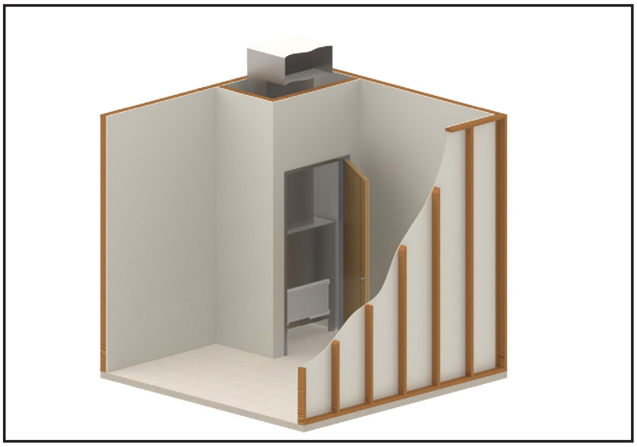
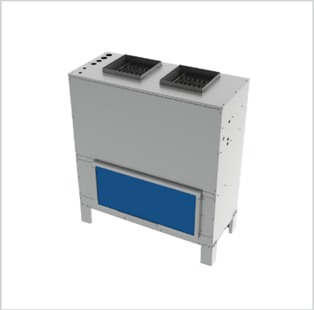


Figure 114. Typical Vertical High Output Application

HHC

HHP

HHE



VHC

Heat Transfer

ASHRAE defines heat transfer as "the flow of heat energy induced by a temperature difference."

Thermal energy can be transferred or be affected by:

- Conduction
- Convection
- Radiation
- Humidity

Thermal conduction is the mechanism of heat transfer by the transfer of kinetic energy between particles or groups of particles at the atomic level.

With solid bodies, such as with an air jet near a window, thermal conduction dominates only very close to the solid surface.

Thermal convection is the transfer by eddy mixing and diffusion in addition to conduction.

The transfer of fluid currents produced by external sources, such as by a blower, is called forced convection.

When the fluid air movement is caused by the difference in density and the action of gravity, it is called natural convection. Natural convection is very active near windows and near heat sources in the occupied spaces. The colder air falls and the warmer air rises.

Radiant heat transfer takes place through matter. It is a change in energy form, from internal energy at the source to electromagnetic energy for transmission, then back to internal energy at the receiver. Examples of radiation are sunshine through the air and window to the inside floor or ceiling light to occupants and to the floor.

All of these methods of heat transfer effect a person's comfort reaction. In addition, humidity has some effect caused by a change in evaporation rate from the body.

Heat transfer is also affected by the following factors:

- A greater temperature difference will result in a greater amount of heat transfer.
- The amount of surface area is directly proportional to the amount of heat transfer.
- The amount of time is also directly proportional to the amount of heat transfer.
- The thermal resistance of the material use affects the rate of heat transfer.

Heat loss is measured in "Btu" which is the amount of heat required to raise 1 lb. of water 1°F. Coefficients used to estimate the value of the heat loss include:

- K Factor, which is the amount of heat transferred in 1 hour through 1 sq. ft. of material, 1" thick at 1°F of temperature difference.
- C Factor, which is the amount of heat transferred in 1 hour through 1 sq. ft. of material through the specified thickness of the material used.
- R Value, is the resistance to heat transfer, measured as the reciprocal of conductance (1/K or 1/C).
- U Value, designates the overall transmission of heat in 1 hour per sq. ft. of area for the difference of 1°F across specified material.
- Conductance of individual materials is not directly applicable to the heat loss calculation. First, it must be converted to the 'R' value, which is (1/K or 1/C).

Equation 1: For a structure with multiple skin materials, the total heat transmission can be calculated as:

$$U = 1/(R1 + R2 + \ldots..Rn)$$

HYDRONIC (FAN COIL) SYSTEMS

For hydronic heating and cooling fan coil systems heat is removed from the occupied space (cooling) or added to the occupied space (heating) via a closed looop water system. Return air from the space passes across a fin tube coil. The re-conditioned air is returned to the space through the supply air outlets.

During the cooling season, heat from the return air is transferred to the water passing through the coil. The warmer water is piped to the chiller where the heat is removed and the cooler water is re-circulated. After the return air passes through the coil and the heat is removed, it is directed back to the space through the supply air outlets as directed by the room thermostat.

During the heating season, the cool return air passes through the fin tube coil. Return air is heated by the warm water being piped through the coil, and is directed back to the room through the supply air outlets as directed by the room thermostat.

Manufacturer's performance data will quantify the coil heat transfer rate (Btu/H), given the airflow rate (cfm), entering air temperature dry and wet bulb (eat), water-flow rate (gpm) and entering supply water temperature (ewt) or entering and leaving water temperature (ewt/lwt) instead of water flow rate.

Room Load Calculations

For fan coil products the typical application characteristics are similar to multi-family residential building. For these structures heating and cooling load calculations will differ from commercial applications.

Some of the unique features differentiating fan coil applications from other commercial applications include:

Heat gains are primarily imposed on the building through walls, windows, ceilings, doors and infiltration. Loads imposed by people and lighting is less significant.

Load characteristics for fan coil zones can be more narrowly defined than zones for commercial spaces. The factors for a specific zone orientation, outdoor exposure and climate zone need to be considered. Exterior or interior shading and the time of the day affect the solar load. Another load on the space may be imposed by infiltration of outdoor air through windows and doors.

Most fan coil systems are used for relatively small capacity systems. Because loads are commonly determined by outdoor conditions, and very few days during a heating or cooling season are at design conditions, partial load conditions are prevalent. Therefore, over sizing the unit can decrease comfort in the space, especially during humid conditions.

During high humidity operations with lower dry bulb temperatures, the thermostat will direct an oversized unit to short cycle, leaving uncomfortable levels of humidity in the space. For climate zones with higher humidity levels, selecting a smaller capacity unit will allow for maximum dehumidification and comfort for the majority of the cooling season with slight discomfort on the few days when design conditions occur.

Additional information and a detailed discussion of calculating the cooling and heating loads in a space can be found in the Air Conditioning Contractors Association (ACCA) Manual N for Commercial Load Calculation, ASHRAE SDL Curriculum on Heating and Cooling Loads, or ASHRAE TC-4.0 Technical Committee for Load Calculations. The following are some equations commonly used for heating and cooling load calculations in a space.

Equation 2: Heat transfer through a window or wall:

$$Q = U * A (t_1 - t_2)$$

Where :

- Q is the Btu/H
- U is the overall coefficient Btu/HA
- A is the area in Ft^2
- t_1 and t_2 are the temperatures in °F

Equation 3: Equation for exterior surfaces – cooling:

$$Q = U * A * \Delta t$$

Where:

- Q is the heat flow in Btu/H
- U is the value for the component under consideration
- Δt is the temperature difference across the component under consideration

Equation 4: Equation for heating and non-exterior cooling:

$$Q = U * A * \Delta t$$

Where:

- Q is the heat flow in Btu/H
- U is the value for the component under consideration
- Δt is the temperature difference in degrees F between indoors and outdoors across the component under consideration, taking into account the combined effect of radiation, time lag, storage and temperature

Equation 5: Equation for sensible heating and cooling load:

$$Q = 1.08 * cfm * \Delta t$$

Where :

- Q = is the load in Btu/H
- 1.08 is a constant for density at sea level.
- cfm is the volume of conditioned air
- Δt is the temperature difference between the supply air and the room control temperature

Equation 6: Equation for latent cooling load:

$$Q = .68 * cfm * GR$$

Where:

- Q = Load in Btu/H
- .68 is the latent load constant
- GR = difference between absolute humidity between indoor humidity/area and outdoor humidity/area

Psychrometrics

One of the four major elements of thermal energy and comfort is humidity. Psychrometrics uses thermodynamics properties to analyze conditions and processes involving moist air. A detailed study of psychrometrics can be found in Chapter 1 of ASHRAE 2009 Fundamentals Handbook. This section is a summary of how knowledge of psychrometrics can be used to maximize space comfort and system performance.

Atmospheric Air (the air that you breathe), contains many gaseous components including water vapor and containments. Dry Air is atmospheric air with all moisture removed and is used only as a point of reference. Moist Air is a combination of dry air and water vapor and can be considered equal to atmospheric air for this discussion.

A psychrometric chart (**Figure 115**) is a graphical representation of the thermodynamic properties of moist air. There are several charts available to cover all common conditions. The one shown here is taken from ASHRAE 2009 Fundamentals Handbook, Chapter 1 and illustrates conditions of 32 to 100°F at sea level.

The Dry-bulb Temperature (DBT), is the temperature measured using a standard thermometer. Dry-bulb is also known as the sensible temperature.

The Wet-bulb Temperature (WBT), is the temperature measured using a 'wetted' thermometer. Wet-bulb is used to determine the moisture content of air.

The Absolute Humidity (AH), is the vapor content of air. It is described in terms of moisture per lb of dry air or grains of moisture per lb of dry air. AH is also referred to as 'moisture content' or 'humidity ratio.' There are 7000 grains in a lb. of water.

The Relative Humidity (RH), is the vapor content of air. It is described as the percentage of saturation humidity at the same temperature (%). The goal for optimum space comfort is 30-35% for heating conditions, and 45-60% for cooling conditions. Saturation humidity is the maximum vapor content (lb/lb) per lb dry air that air can hold at a fixed temperature.

The Dew Point Temperature (DPT), is the temperature at which vapor begins to fall out of air to form condensation. DPT is the temperature at which a state of saturation humidity occurs, or 100% RH. It is also known as the saturation temperature.

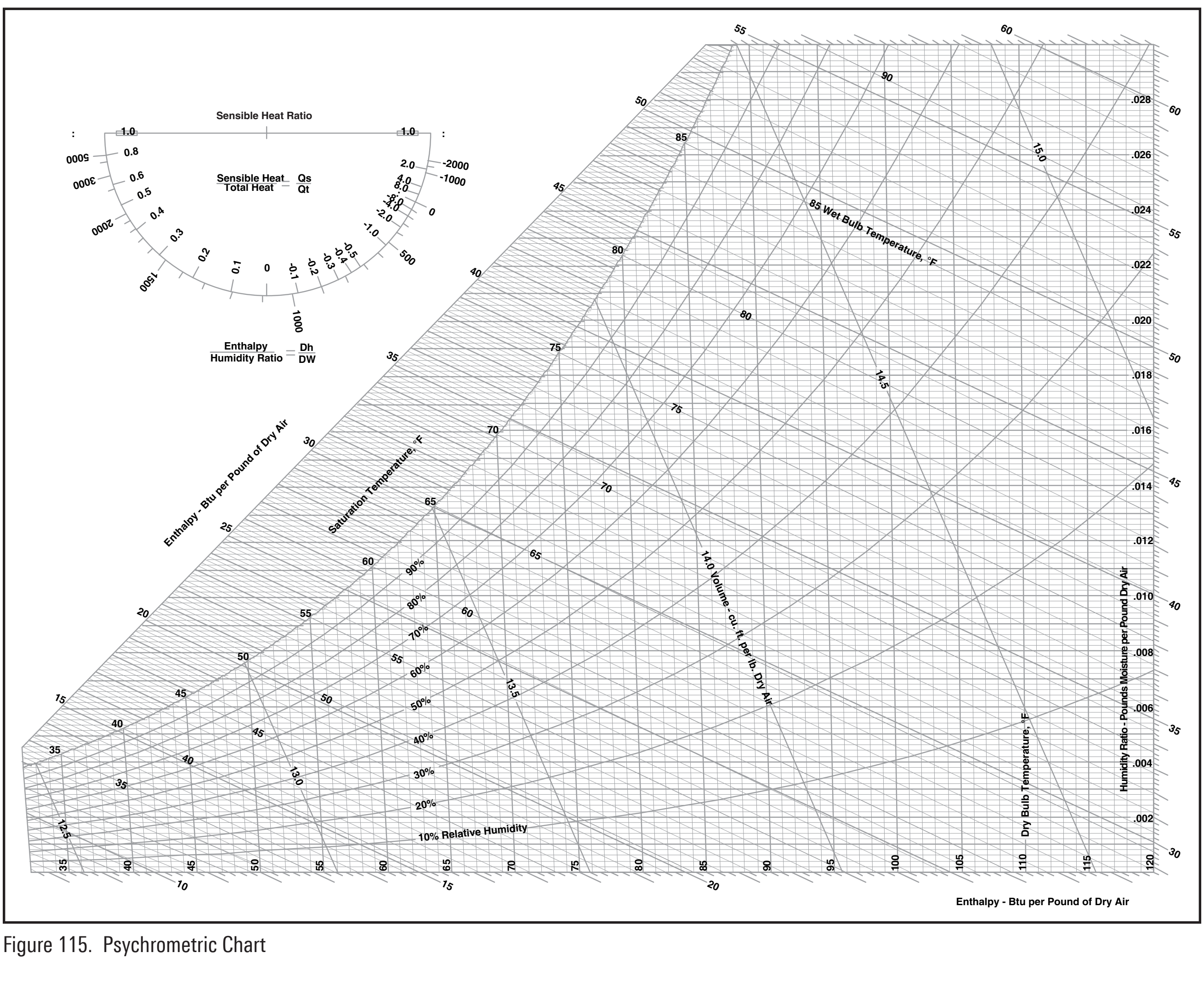


Figure 115. Psychrometric Chart

The Specific Volume (Spv), is the reciprocal of air density which is described in terms of cubic feet per lb of dry air (cu ft/lb). An increase in air temperature will result in a decrease in density and an increase in volume. A decrease in atmospheric pressure also decreased air density while increasing volume. At 5000 feet above sea level, density is decreased by 17%. Higher altitudes require larger motors and blowers to move the same effective mass, due to the increase in specific volume.

The Enthalpy (H) is the heat content of air. Enthalpy is also known as the total heat of air. Enthalpy is dependant on the wet-bulb temperature of air. It is described in terms of Btu's per lb dry air (Btu/lb).

A Status Point is a location on the psychometric chart defined by any two psychometric properties. A hydrometer or psychrometer is commonly used to define a status point.

Using a psychrometer. A sling psychrometer incorporates a standard thermometer and a wetted thermometer. The wetted thermometer should be dipped in room temperature distilled water. The psychrometer is spun (slung) until the wet-bulb temperature has stabilized.

When the wet-bulb temperature has stabilized, record both the dry-bulb and wet-bulb temperatures on your log sheet. Because of evaporation, the wet-bulb temperature will be equal to or less than the dry-bulb temperature.

At 100% RH the wet-bulb will equal the dry-bulb temperature. (Locate an umbrella before continuing the test). As the temperature difference between temperatures increases, the RH will decrease.

To locate your status-point, find the dry-bulb temperature on the bottom of the psychometric chart. Follow this line upward until it intersects with the wet-bulb temperature from the left side of the chart.

From the 'status point' you can locate:

- Absolute Humidity (AH)
- Relative Humidity (RH)
- Dew Point Temperature (DPT)
- Specific Volume (Spv)

When will condensation occur? To determine if a supply air duct or air outlet device will form condensation on the surface:

First, using the R-value of any thermal barrier, determine the minimum surface temperature.

Next, determine the DPT of the atmospheric air in contact with the surface.

If the surface temperature is equal or lower than the DPT, the surface will form condensation. If yes, an additional thermal barrier may be required to solve the problem.

Sensible heating (Qsen), is the heat that raises the dry-bulb temperature of air without increasing the moisture content. Because we can easily sense this change in temperature, it is called 'sensible.' Sensible cooling is the removal of heat without removing moisture content of the air.

Latent Heat (Qlat), is the heat content of air due to the presence of water vapor. Latent heat is the heat required to evaporate this same amount of water (970 Btu/lb), also known as the latent heat of vaporization. As latent heat increases, moisture content increases.

Water can be heated to 212°F. If more heat is added, the water will vaporize but the temperature will not change.

Latent Cooling (Qlat), is the removal of latent heat from air without lowering the dry-bulb temperature. To retrieve 1 lb. of condensate, 970 Btu's would need to be removed. As latent heat decreased, moisture content decreases.

Latent Heat of Fusion is the heat required to change a liquid into a solid (144 Btu/lb. Water can be cooled to 32°F. If more heat is removed, it wall cause ice to form. To retrieve 1 lb of water from ice, 144 Btu's will need to be added.

Sensible processes can be shown as horizontal paths on a psychrometric chart. Latent processes can be shown as vertical paths on a psychrometric chart. Most processes include both, resulting in an angled or diagonal path.

Sensible heat factor is the measure of sensible heat to latent heat. Sensible heating only is 1.0. Equal proportions result in 0.5. SHF is generally higher than 0.5 because of the cooling processes that remove more sensible heat than latent heat. For residential applications the typical Sensible heat factor is 0.8.

Properties of Coils and Coil Design

Fan coil units are typically selected and sized to heat and cool a small zone with specific load requirements. Each unit defines a small zone, which typically serves a few rooms with a centrally located thermostat. Basic and vertical stack units are usually selected for single room applications.

The hot and cold water supply usually serves all or part of a single building. Water can be supplied to each unit through a two-pipe or four-pipe water supply system.

Two-pipe systems will have a lower installed cost. With a two-pipe system, both hot and cold water are supplied using the same pair of pipes. The lower cost usually translates to a lower level of occupant comfort. This limitation can cause problems when heating is desired in one unit at the same time cooling is desired in another due to solar or internal load requirements. For moderate climate regions, two-pipe systems can operate in the cooling mode with supplemental resistance heat available in zones requiring heat.

Four-pipe systems maintain higher levels of occupant comfort for all seasons. Both hot and cold water are left operational during the spring and fall seasons. This additional comfort may result in higher operational cost for utilities to operate both the chiller and the boiler during the spring and fall months.

Water side applications for fan coil designs use a chiller to lower the water temperature for heat removal and a boiler to raise the water temperature to overcome heat losses.

The water supply used is typically supplied by the local utilities. Other chemicals may need to be added to the water. Sometimes, local climate conditions require that additives such as Ethylene glycol, Propylene glycol, Methanol, Calcium chloride or Sodium chloride be added to the water supply. Care should be taken to account for changes in heat transfer caused by these additives.

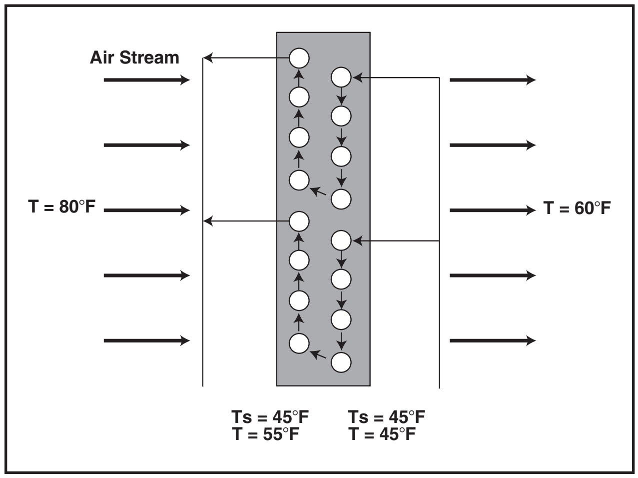


Figure 116. Coil Design

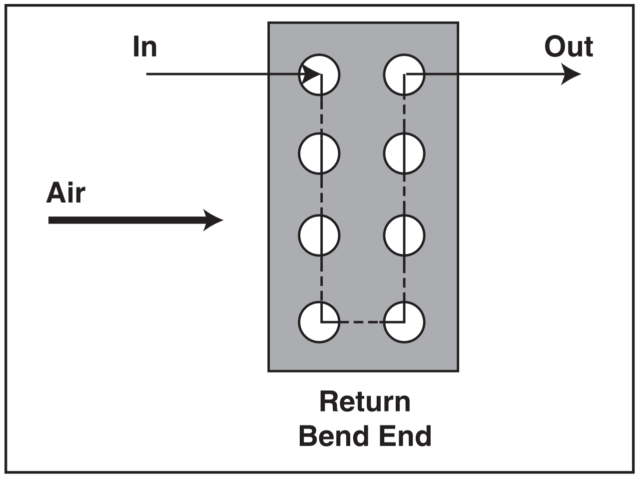


Figure 117. Parallel Flow

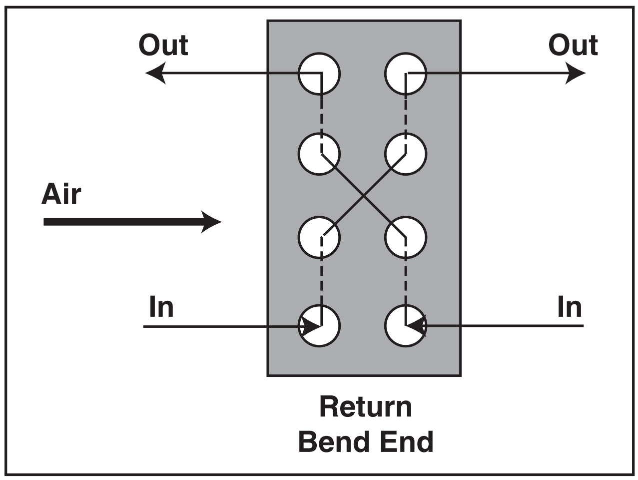


Figure 118. Cross Flow

Vertical Stack Risers

For high-rise buildings where a common floor to floor footprint is present, it may be economical to design the system using vertical stack fan coil units.

Vertical stack models can minimize installation cost because the units are orientated one on top of the other and use common supply and return water pipes.

For tall structures with more than three floors, it is recommended to adjust the pipe size for optimum performance.

The term "riser" describes the pipe used to transport supply or return water (chilled or hot) to or from the vertical stack unit water coil as well as condensate water from the drain pan.

Risers are typically insulated with elastomeric, closed cell, thermal insulation to minimize heat loss or gain from the water to the ambient space.

If the unit is not equipped with a riser pipe of adequate length to reach from floor to floor, a riser extension can be installed to connect the vertical stack unit to a unit located on an adjacent floor. The riser extension can also act as the transition where the pipe size changes from one floor to the next. The diameter of the pipe will increase or decrease as piping extends throughout the building in order to equalize pressure and velocity of the water flow.

RISER SIZING

A detailed discussion on water pipe sizing can be found in the ASHRAE 2009 Fundamentals Handbook, Chapter 22. In general, operating pressure between the supply and return riser is in the range of 10 to 15 psi. Design velocities are typically between 1 and 4 fps. Typical riser pressure loss is designed for about 3 feet of head pressure loss per 100 feet of piping. As a rule of thumb, 10 feet of head pressure equates to about 5 psi.

Water delivery can be made through a two-pipe system using three risers (one each supply, return and condensate) or a four-pipe system using five pipes (chilled water supply, chilled water return, hot water supply, hot water return and condensate pipe) as specified.

Reminder: Two-pipe systems may require supplemental electric heat for moderate times when some zones require cooling while other zones require heat.

Two different configurations are available for return piping, standard return and reverse return. In the standard configuration, (**Figures 119 and 120**), water flows from the first fan coil in the loop through the last, and returns from the last unit back through the first. In a reverse return system, (**Figures 121 and 122**), both the supply and return flow run from the first unit in the system through the last and returns to the chiller through a separate riser.

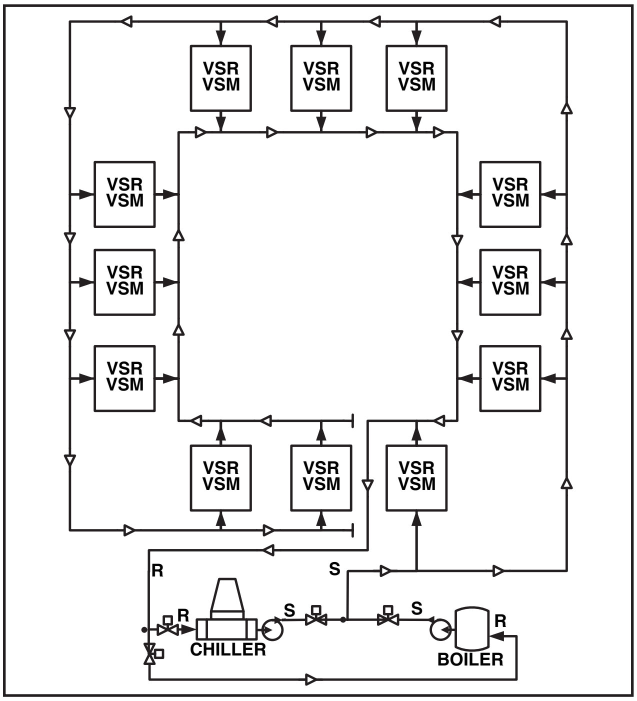


Figure 119. Piping Layout for a Horizontal 2-Pipe System with Standard Return Piping

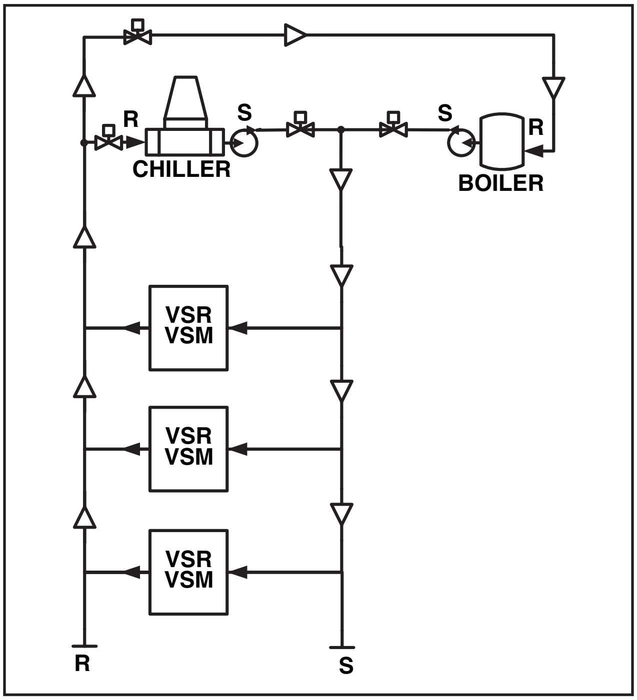


Figure 120. Piping Layout for a Vertical Stack 2-Pipe System with Standard Return Piping

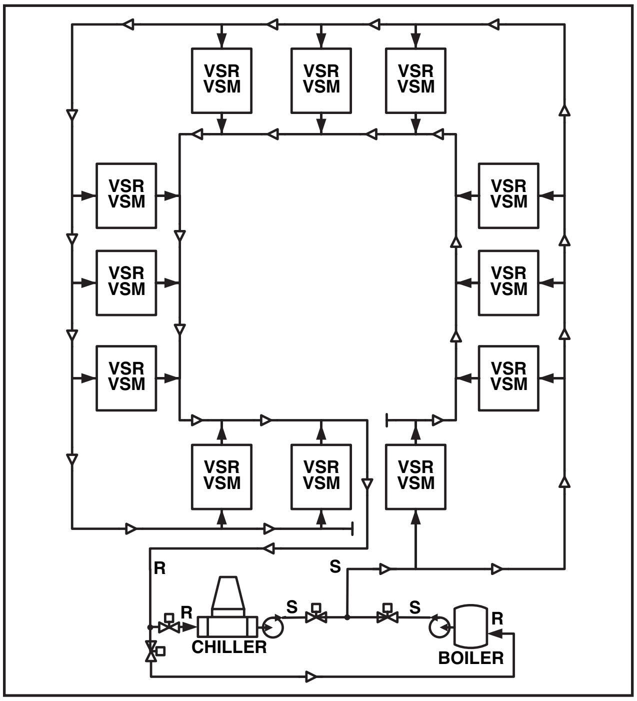


Figure 121. Piping Layout for a Horizontal 2-Pipe System with Reverse Return Piping

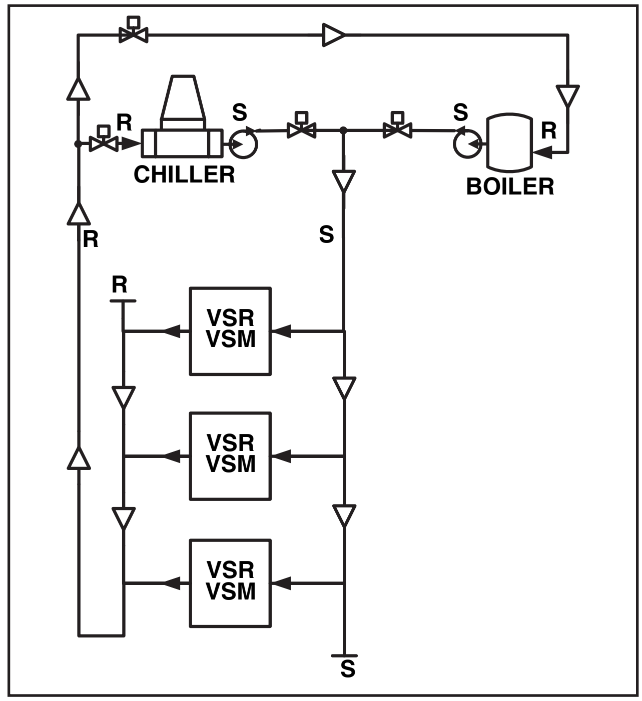


Figure 122. Piping Layout for a Vertical 2-Pipe System with Reverse Return Piping

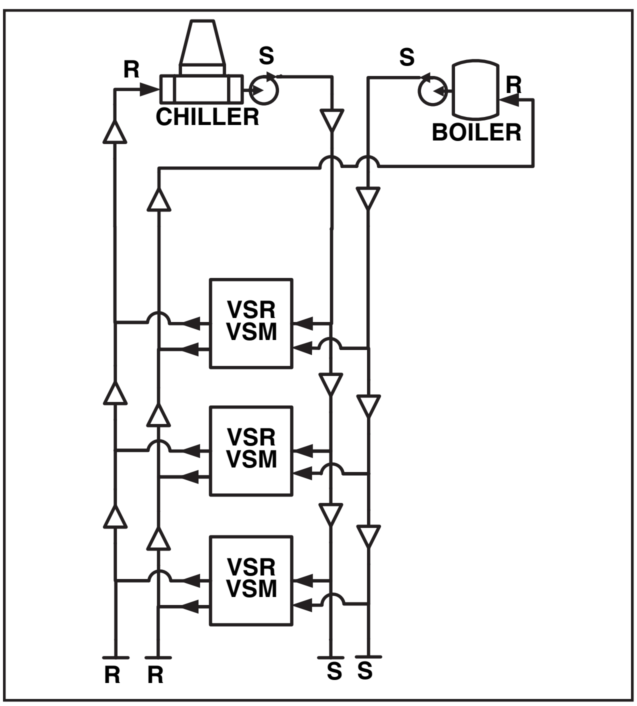


Figure 123. Vertical Stack 4-Pipe System with Standard Return Piping

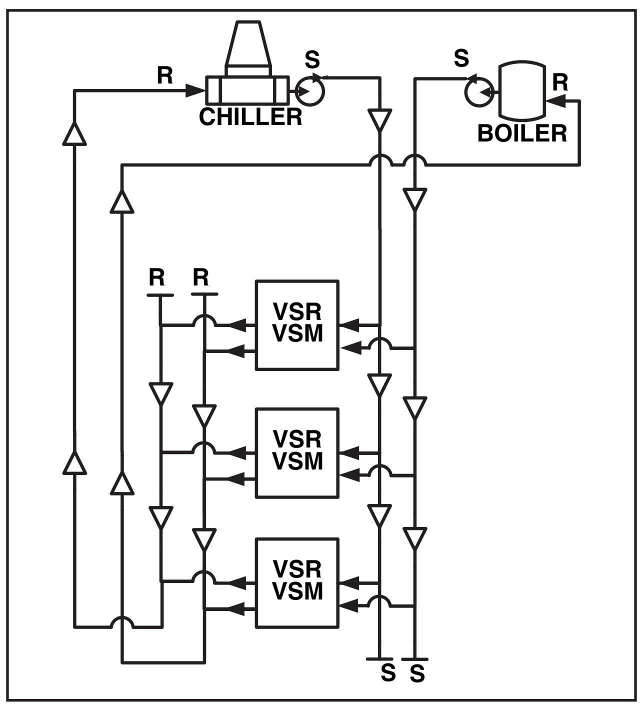


Figure 124. Vertical Stack 4-Pipe System with Reverse Return Piping

EXPANSION LOOPS

Copper pipe will expand and contract with changes in pipe temperature created by changes of water temperature. Each Titus vertical stack unit is equipped with an internal expansion loop.

For two-pipe systems where the same pipe carries both chilled and hot water and high rise buildings with more than five floors, additional expansion loops may be required.

Controls and Valve Packages

Comfort control for occupants in the space is regulated by a room thermostat and control valve package mounted on the unit water coil.

The room thermostat performs the function monitoring the room temperature conditions and signaling the unit fan and valve controls to operate within in preset limits to maintain occupant comfort.

Figure 125 shows a basic two-pipe system package. Supply water is piped to the bottom of the coil to ensure that any air bubbles forming in the supply water will be transmitted to the upper level where they can be discharged from the system through the optional air vent on the return pipe immediately outside the coil.

Shut off valves are located on both supply and return waterlines to enable the coil to be isolated during installation and maintenance.

Drain valves allow the coil to be drained during maintenance or removal.

A two-way water valve is used to adjust and balance the water flow into the coil to provide the specified amount of heat to the zone.

A valve motor operates on a signal from the room thermostat to adjust the water flow in response to space heating conditions.

The air vent allows air bubbles to escape the system for maximum heat transfer system performance.

Optional control components, (**Figure 126**), are available to enhance the operations of the system or improve the process of installation and maintenance.

Automatic air vent ports keep the water supply system free of air build up on a continuous basis.

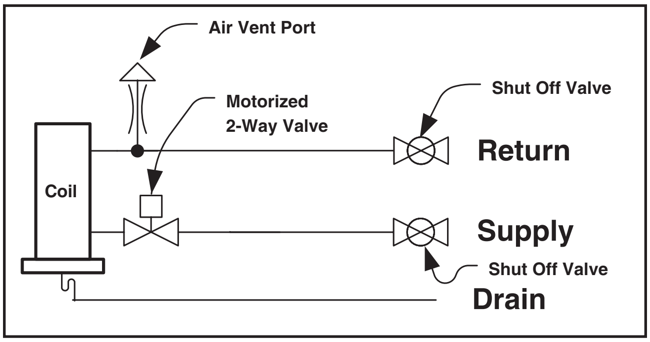


Figure 125. 2-Pipe with 2-Way Valve and 2 Shut off Valves

Unions can be provided for the connection of the water coil to the supply and return water lines. Unions allow the water coil to be removed from the unit without cutting into the water lines and soldering them together during installation and maintenance.

Pete's Plugs provide the installer or maintenance technician a tool for connecting a pressure gage for reading the water pressure at the coil.

Flow Control Valves are available as fixed or adjustable options. A fixed valve will be sized in accordance to the CV specified by the design engineer to provide the water flow required to meet the maximum load conditions required in the zone. This feature may save time during the initial start up. An adjustable valve must be commissioned at the jobsite during start up to limit the specified water flow to the coil. The adjustable feature does provide for future changes to match changes in load requirements.

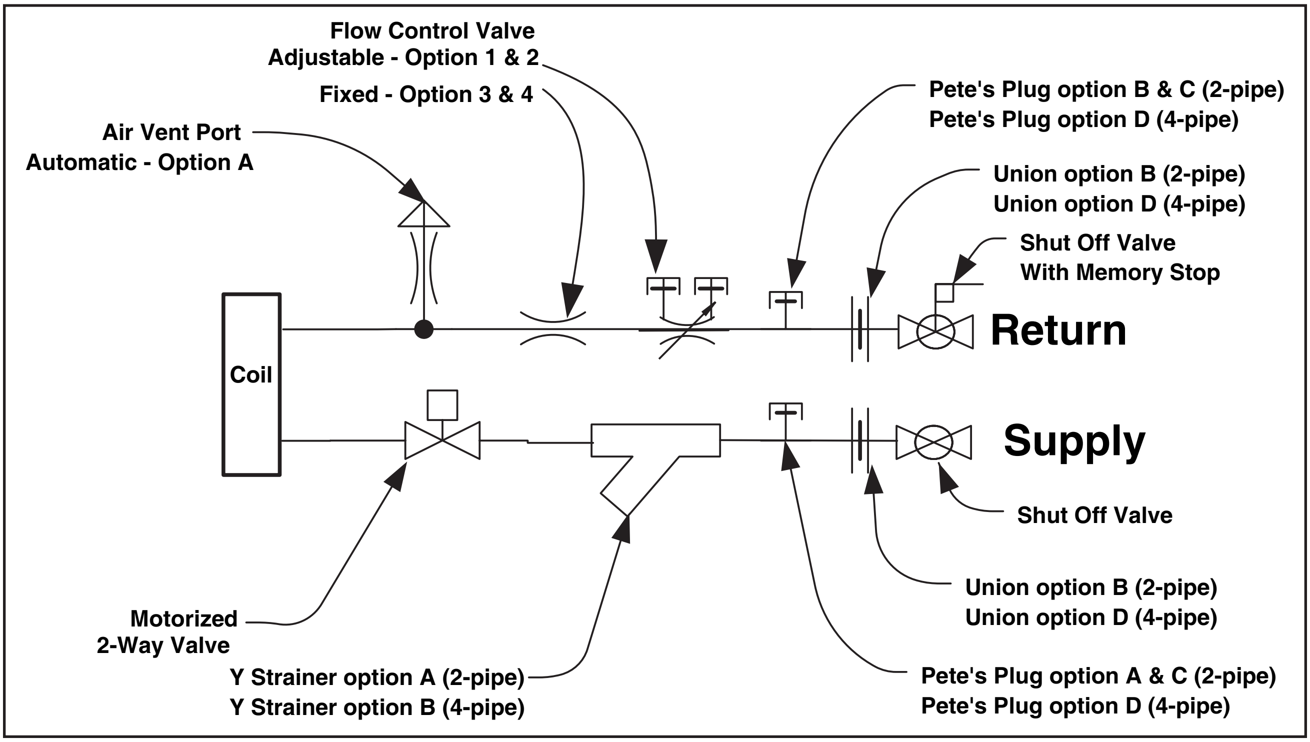


Figure 126. 2-Way Valve Component Options

A Motorized Water Valve can be provided. The motor will be operated in response to a signal from the zone thermostat to automatically reset the water flow to meet changing zone load requirements. A two-way valve controls water flow by opening or closing the flow control valve to the coil with a spring return. A three-way valve controls flow to the coil by bypassing excess water directly to the return pipe.

The Y-Strainer option is installed in the supply water line ahead of the coil. It will remove sediment from the water supply before it can enter the coil and restrict water flow and reduce system performance.

Manual Shut Off Valves are available with or without memory stops. The basic valve allows maintenance personal to shut off the flow of water to the coil at the unit. The optional memory stop lets the operator re-open the valve to it previous position without re-balancing.

An Aquastat Switch can be installed in the water supply line and connected to the thermostat. Aquastats are most commonly used where there is a two-pipe system or supplemental electric heat.

The Aquastat senses when the supply water is for heating or cooling. For a two-pipe system, if a zone thermostat is calling for heat and the supply water is cold, the thermostat will be locked out. For supplemental heat, the heat will be locked out when warm water is available in the supply lines.

THERMOSTAT

The zone thermostat may be mounted on the fan coil unit, on the wall near the unit, or mounted on the wall or in the return duct away from the unit.

Thermostats may be powered by a 24-volt power supply (with transformer) or by the same line voltage as the unit. Economically, if the thermostat is physically located more than 8 feet from the unit, line voltage is preferred.

Each fan coil controls the room space temperature in response to a signal from the thermostat. The thermostat is programmed with cooling and heating set-point values as directed by the occupant or building manager.

Typically, the zone thermostat provides a read out to tell the occupant what the set-point temperature is for the unit and what the temperature is the temperature in the space at present. Space temperature control is + or -1°F from the set point temperature. (Thermostats with an auto-changeover feature have a 4°F dead-band for switching.)

Other thermostat features include a three-speed switch for the occupant to adjust the fan output volume, a manual changeover switch to change operation from cooling to heating conditions and an on/off switch to override the thermostat and shut the unit off as desired by the occupant.