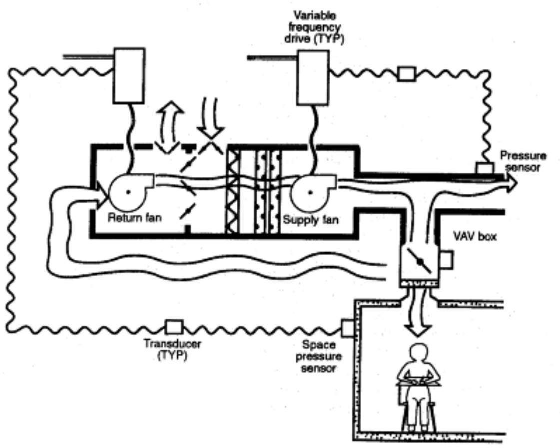
Terminals

***HVACTemplate:Zone:*IdealLoadsAirSystem** (District Cooling, District Heating)
***HVACTemplate:Zone:*BaseBoardHeat** (water, electricity)
***HVACTemplate:Zone:*FanCoil** (water)
***HVACTemplate:Zone:*PTAC** (cooling + heat water,electricity,fuel)
***HVACTemplate:Zone:*PTHP** (cooling + heat with HP)
***HVACTemplate:Zone:*WaterToAirHeatPump** (Plant:MixedWaterLoop)
***HVACTemplate:Zone:*VRF** (refrigerant)
***HVACTemplate:Zone:*Unitary** (air)
***HVACTemplate:Zone:*VAV** (air)



***HVACTemplate:Zone:*VAV:FanPowered** (air)
powered induction unit
***HVACTemplate:Zone:*VAV:HeatAndCool** (air)

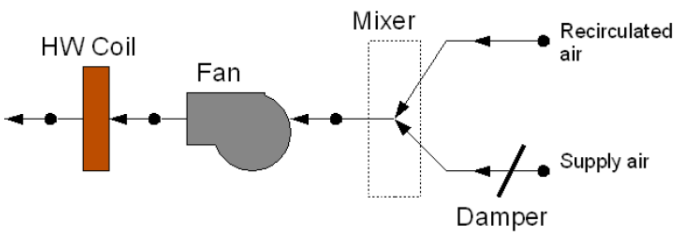
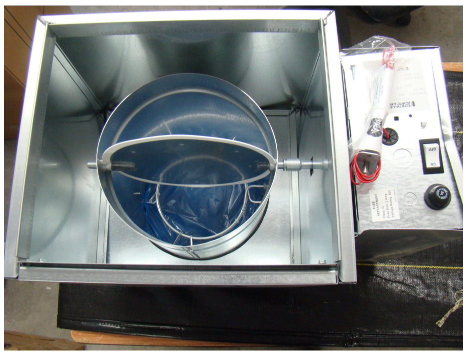
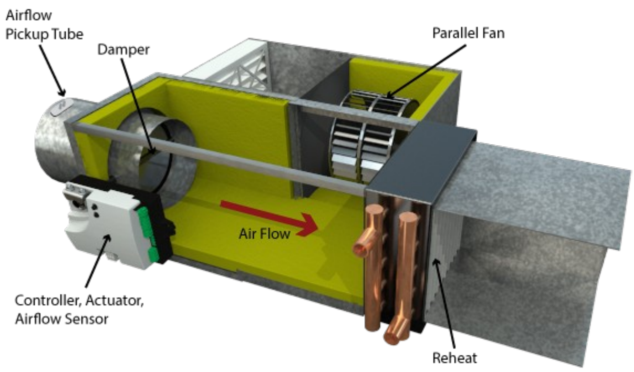
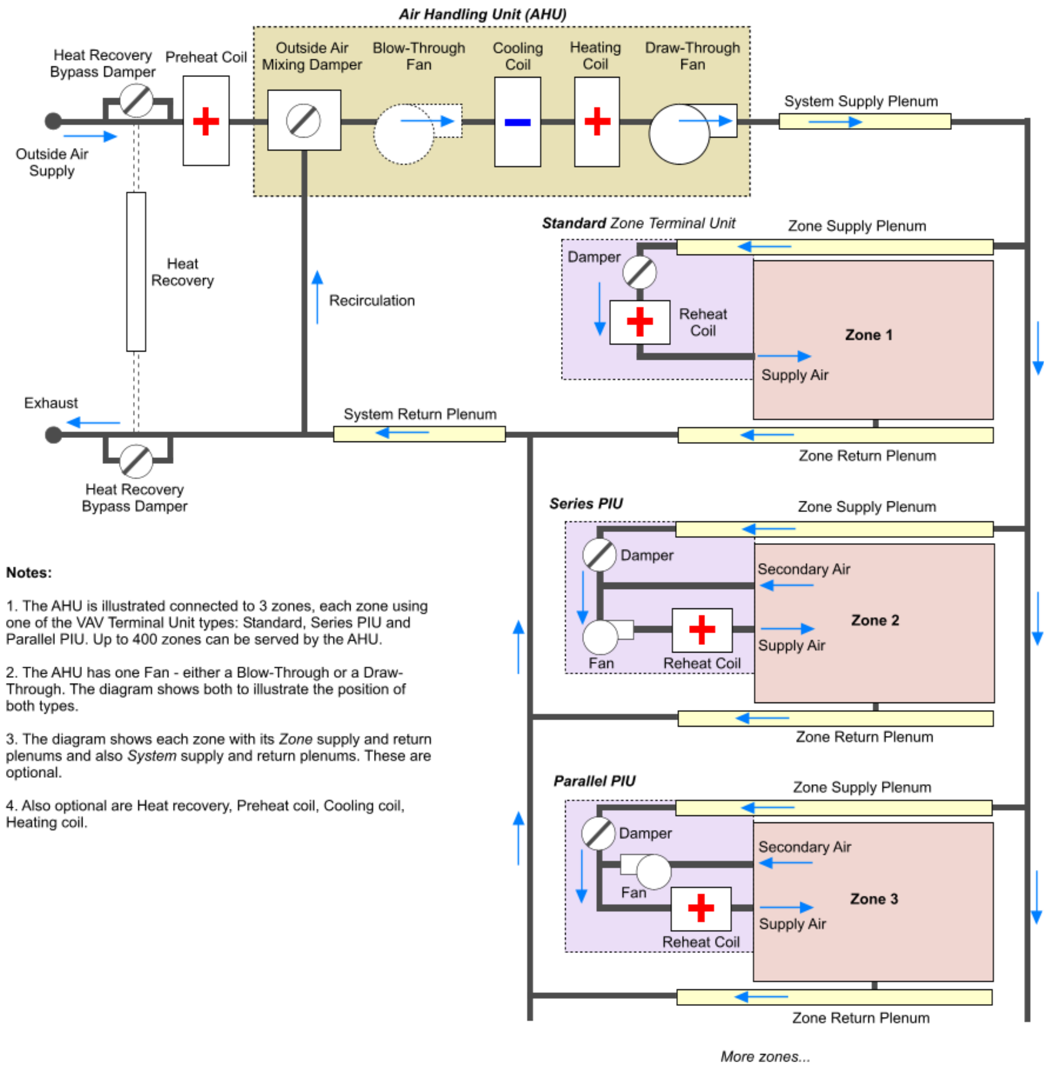


Figure 2.6: Series PIU Terminal Unit

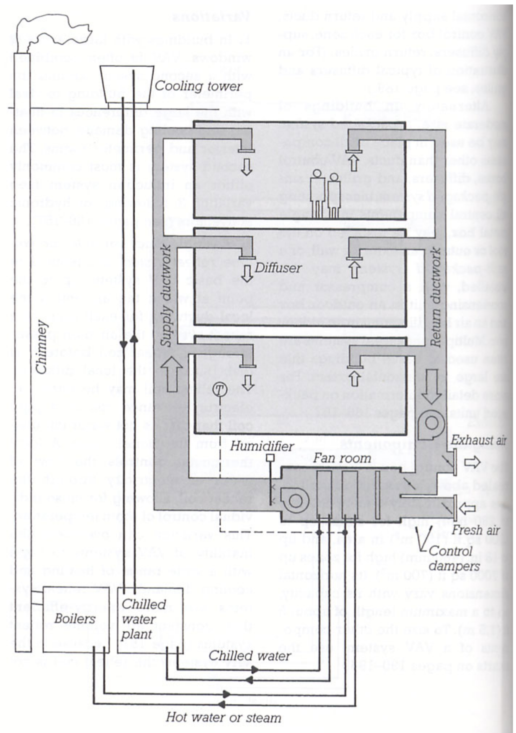




VAV Compact HVAC Airflow Schematic



*HVACTemplate:Zone:*ConstantVolume (Air)



SINGLE DUCT, CONSTANT AIR VOLUME (CAV)

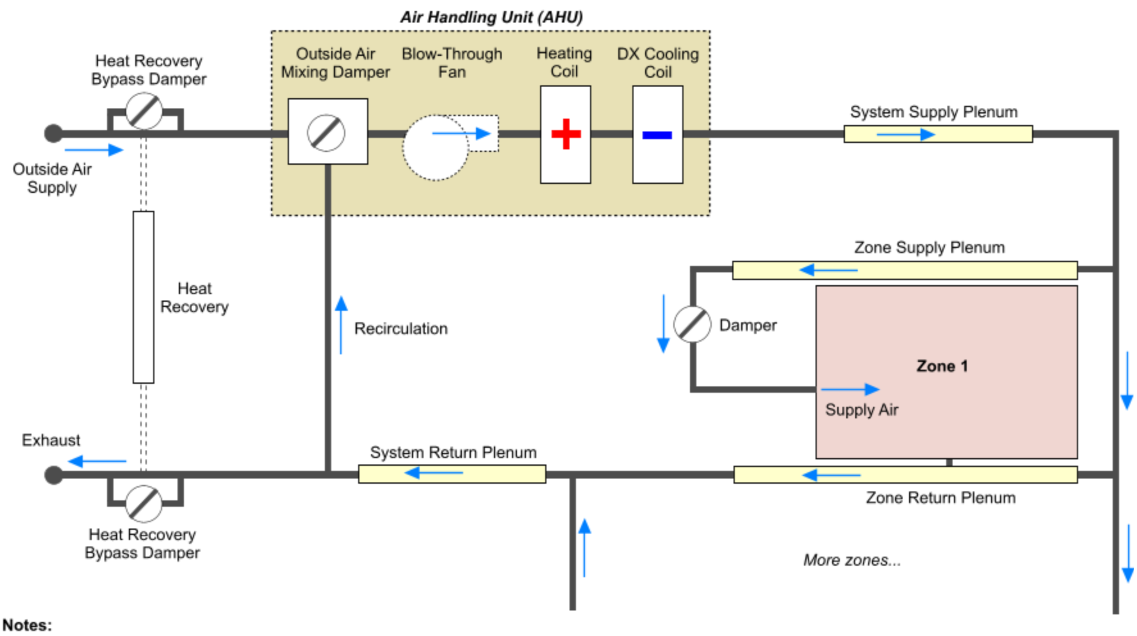
*HVACTemplate:Zone:*DualDuct (Air)

SYSTEM LEVEL

*HVACTemplate:System:*VRF (Refrigerant)

*HVACTemplate:System:*Unitary (Air) (Cooling+ heating water,electricity,gas)

Unitary Multizone Compact HVAC Airflow Schematic



Notes:

1. The AHU is illustrated connected to a single zone.Up to 400 zones can be served by the Unitary Multizone AHU.

2. The diagram shows each zone with its *Zone* supply and return plenums and also *System* supply and return plenums. These are optional.

3. Also optional are Heat recovery, Cooling coil, Heating coil.

*HVACTemplate:System:*UnitaryHeatPumpAirToAir (Air) (Cooling+ HP)

*HVACTemplate:System:*UnitarySystem (Air) (Cooling+ HP)

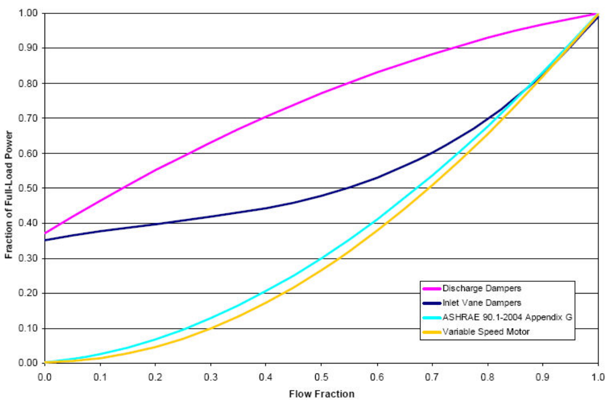
*HVACTemplate:System:*VAV (Air)

1-Inlet Vane Dampers - provides reduced power and wear on heavy duty fans. The inlet vane dampers pre-spin the air entering the fan system, reducing energy consumption by the fan motors and increasing efficiency.

2-Outlet Dampers - control flow by adding resistance.

3-Variable Speed Motor - the most efficient way to control flow rate.

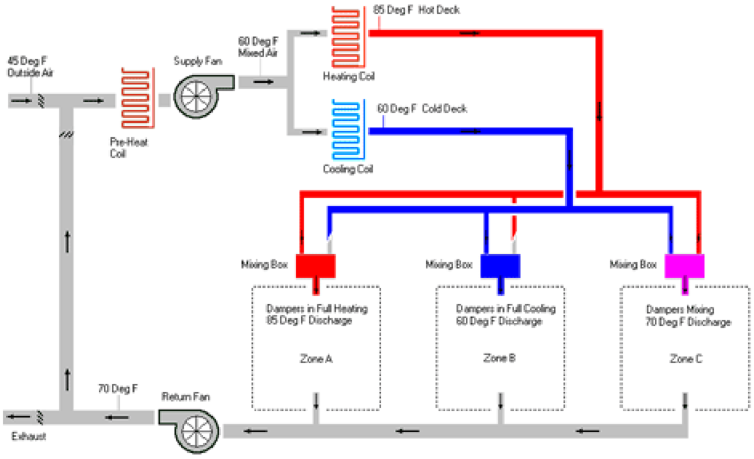
4-ASHRAE 90.1-2004 Appendix G - predefined flow characteristics from ASHRAE 90.1 Appendix G.



*HVACTemplate:System:*PackagedVAV (Air)

*HVACTemplate:System:*ConstantVolume (Air)

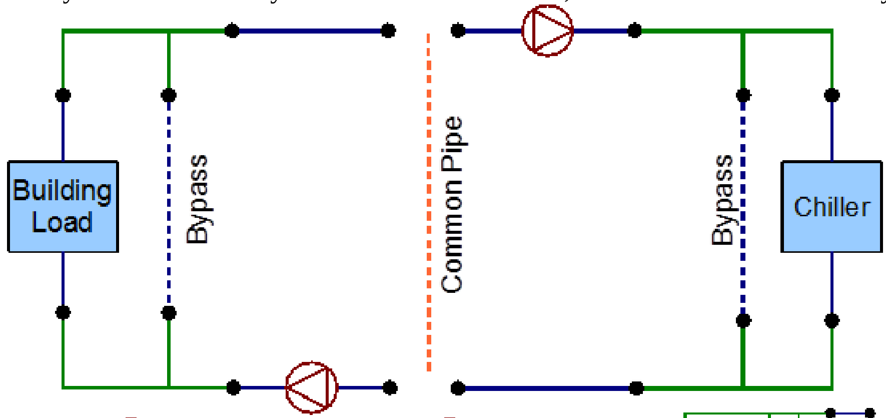
*HVACTemplate:System:*DualDuct (Air)

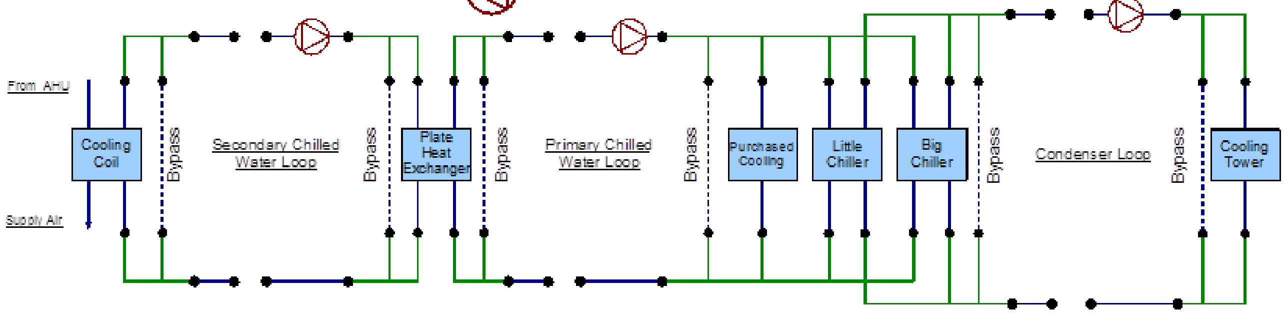


***xHVACTemplate:System:*DedicatedOutDoorAir (DOA-Air)**

*HVACTemplate:Plant:*ChilledWaterLoop

1. VariablePrimaryNoSecondary – variable flow to chillers and coils
2. ConstantPrimaryNoSecondary – constant flow to chillers and coils with bypass
3. ConstantPrimaryVariableSecondary – constant flow to chillers with bypass, variable flow to coils
4. VariablePrimaryConstantSecondary – variable flow to chillers, constant flow to coils with bypass





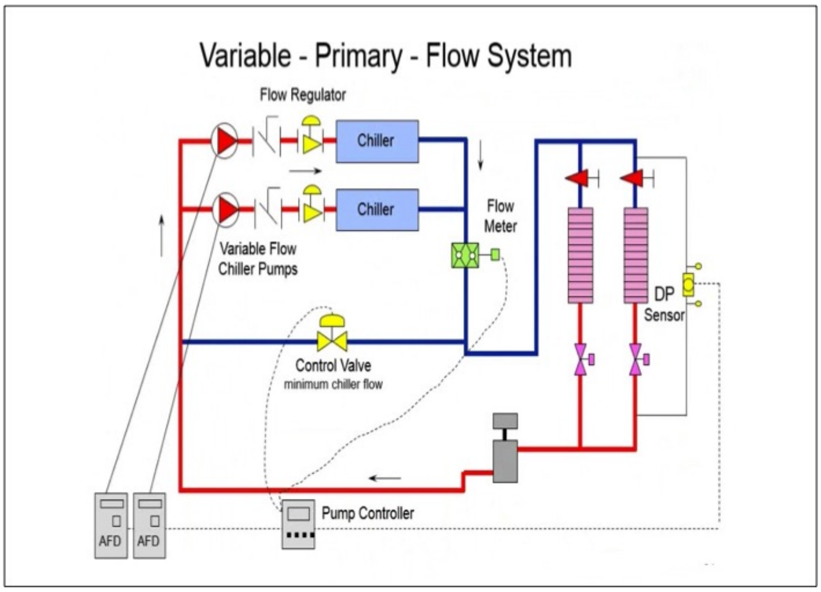
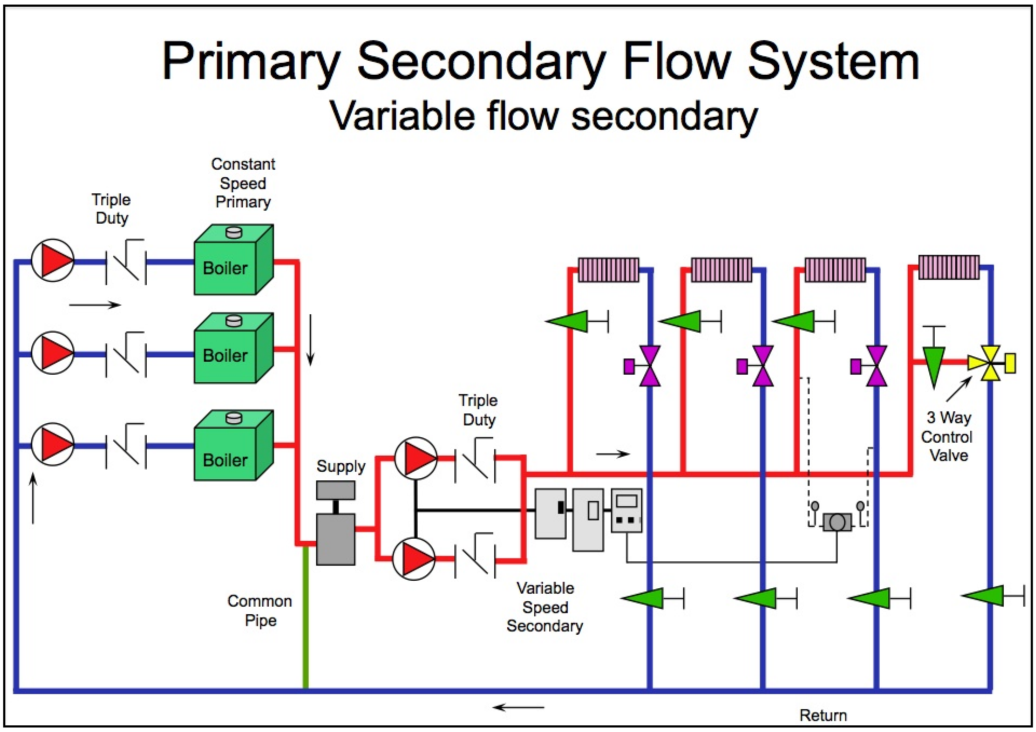


Figure 5

1. VariablePrimaryNoSecondary



3.ConstantPrimaryVariableSecondary

***HVACTemplate:Plant:*Chiller**

(Chiller type: Centrifugal,reciprocating,screw)

(Condenser: Water cooled, Air Cooled, Evaporatively Cooled)

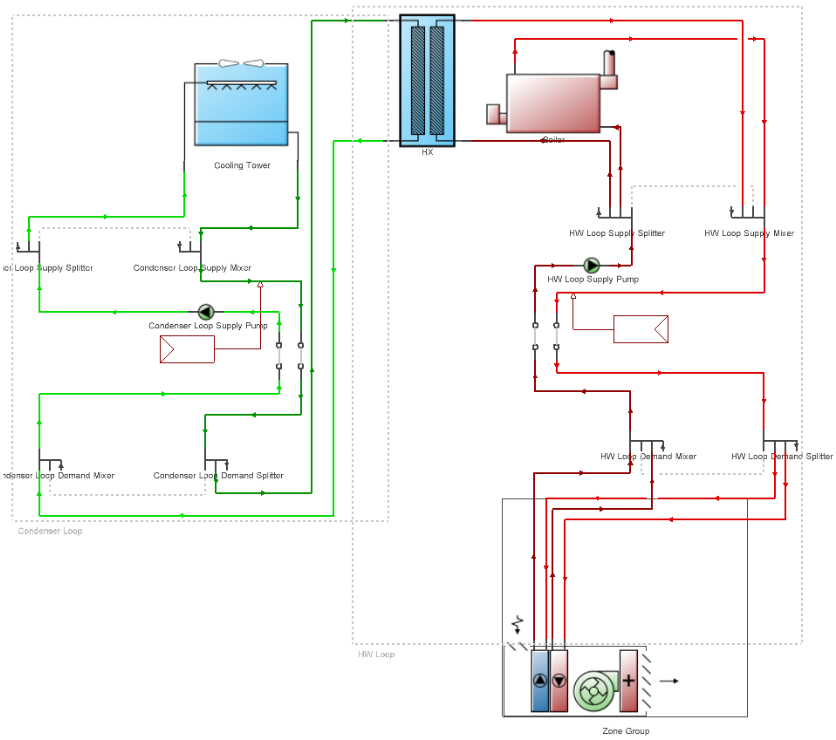
***HVACTemplate:Plant:*Tower**

***HVACTemplate:Plant:*HotWaterLoop**

(constant flow, variable flow)

***HVACTemplate:Plant:*Boiler**

***HVACTemplate:Plant:*MixedWaterLoop**



HVACTemplate:Zone:IdealLoadsAirSystem

ZoneHVAC:IdealLoadsAirSystem (DistrictHeating and DistrictCooling energy)

- Set the unit on/off flag *UnitOn*. The unit is off (*UnitOn* = *False*) if the unit availability schedule value is < = 0; otherwise the unit is on (*UnitOn* = *True*). If the unit is on, the calculation proceeds through the remaining steps. If the unit is off, the zone inlet node conditions are set to the zone node condition, the inlet node mass flow rate is set to zero, and the unit outputs are set to zero.
- Calculate the minimum outdoor air mass flow rate based on the specifications in the DesignSpecification:OutdoorAir object, if specified.
- Calculate the sensible and latent impact of the outdoor air flow relative to the zone conditions. *(compensate zone loads).*
- Determine if the unit needs to heat or cool:
  - **If** *outdoor air sensible impact* is > = load to zone cooling setpoint and the current thermostat type is not SingleHeatingSetPoint, **then** unit is in **cooling mode** (i.e. la ventilación no compensa las cargas de refirgeración de la zona)
  - **If** *outdoor air sensible impact* is < load to zone heating setpoint **then** unit is in **heating mode**
  - **Else** if neither condition is true, then unit is in **deadband mode** (provides outdoor air but shuts off economizer and heat recovery and all humidity control options except *Humidistat* option)
- **If** in **cooling mode**, simulate outdoor air economizer and adjust outdoor air mass flow rate.
- <u>Calculate supply air mass flow rate</u>:
  - **If** outdoor air flow rate exceeds applicable maximum flow rate (heating or cooling) **then** reduce outdoor air mass flow rate, issue warning, and set supply air mass flow rate equal to outdoor air mass flow rate.**(0)**
  - **Else**
    - **(1)** Calculate supply air mass flow rate required to **meet zone sensible load at the applicable** (heating or cooling) **supply temperature limit** (*Tmax;heating* or *Tmin;cooling*)
      - *ms* = *Qz*/(*cp;air* (*Ts* -*Tz*))
    - **If** *DehumidCtrlType* = Humidistat (and other conditions are met, see below), **then** calculate the **(2)** supply air mass flow rate required to meet the humidistat dehumidification setpoint at *Wmin;dehum*
    - **If** *HumidCtrlType* = Humidistat (and other conditions are met, see below), **then** calculate the supply air mass flow rate **(3)** required to meet the humidistat humidification setpoint at *Wmax;humid*
    - ***Set the supply air mass flow rate*** *to the greatest of these (1,2,3), but limit to the applicable* (heating or cooling) maximum flow rate
- <u>Calculate the mixed air conditions,</u> modeling heat recovery, if applicable:
  - The recirculation air conditions are set equal to the zone return air node conditions; **if** there is no return air node the recirculation air conditions are set equal to the conditions at the zone node.
  - The unit entering conditions are then:
    - **If** *ms* > *moa* **then** (impulsión > aire exterior) (note: ms= mass supply, moa= mass aoutside air):
      - *hma* = (*moa hoa* + (*ms* -*moa*) *hrecirc*)/*ms (entalpia antes del equipo)*
      - *Wma* = (*moa Woa* + (*ms*-*moa*) *Wrecirc*)/*ms (humedad especifica antes del equipo)*
      - *Tma* = PsyHFnTdbW(*hma;Wma) (temperatura seca antes del equipo)*
    - **Otherwise** *the entering air conditions are set equal to the outside air conditions.*
- <u>*Calculate the supply air temperature required to meet the zone sensible load at the* supply air mass flow rate,</u> but limit to the applicable (heating or cooling) supply temperature limit (*Tmax;heating* or *Tmin;cooling*)
  - $T_s = T_z + Q_z/(c_{p;air}\, m_s)$ (temperatura de impulsión)
- <u>*Calculate the supply humidity ratio based on the specified humidity control types,*</u> but limit to the applicable (heating or cooling) supply humidity ratio limit.
  - ***DehumidCtrlType:***
    - *DehumidCtrlType* = ***None*** sets the supply air humidity ratio equal to the mixed air humidity ratio.
    - *DehumidCtrlType* = ***Humidistat***, this will actively dehumidify to the humidistat dehumidification setpoint during cooling and <u>deadband operation</u>, and during heating operation **if** *HumidCtrlType* = *Humidistat.*
    - *DehumidCtrlType* = ***ConstantSensibleHeatRatio*** sets the supply air humidity ratio using the cooling sensible heat ratio. (RatioSen=Qs/Qt, luego Qt=Qs/RatioSen => Qlatent=Qt-Qs)
    - *DehumidCtrlType* = ***ConstantSupplyHumidityRatio*** sets the supply air humidity ratio = *Wmin;dehum*
  - ***HumidCtrlType:***
    - *HumidCtrlType* = ***None*** sets the supply air humidity ratio equal to the mixed air humidity ratio.
    - *HumidCtrlType* = ***Humidistat***, this will actively humidify to the humidistat humidifying setpoint during heating and <u>deadband operatio</u>n, and during cooling operation **if** *DehumidCtrlType* = *Humidistat*
    - *HumidCtrlType* = ***ConstantSupplyHumidityRatio*** sets the supply air humidity ratio = *Wmax;humid*

- *Limit supply humidity ratio to saturation at the supply temperature*
- *Check the applicable capacity limits (sensible heating and total cooling) and adjust* supply air temperature and humidity if needed.
- Set the zone inlet node conditions to the supply air mass flow rate, temperature, and humidity ratio.
- Calculate the unit output and load components.

HVACTemplate:Zone:PTAC

HVACTemplate:System:UnitarySystem

Cooling Coil Type

• SingleSpeedDX (the default)
Coil:Cooling:DX:SingleSpeed
• TwoSpeedDX
Coil:Cooling:DX:TwoSpeed
• MultiSpeedDX
Coil:Cooling:DX:MultiSpeed
• TwoStageDX & TwoStageHumidityControlDX
Coil:Cooling:DX:TwoStageWithHumidityControlMode
• HeatExchangerAssistedDX
CoilSystem:Cooling:DX:HeatExchangerAssisted
HeatExchanger:AirToAir:SensibleAndLatent
Coil:Cooling:DX:SingleSpeed

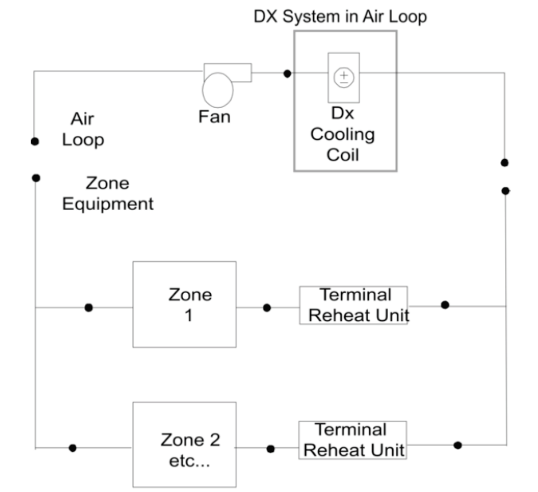


Figure 1.150: Schematic of CoilSystem:Cooling:DX Object in an Air Loop for a Blow Through Application

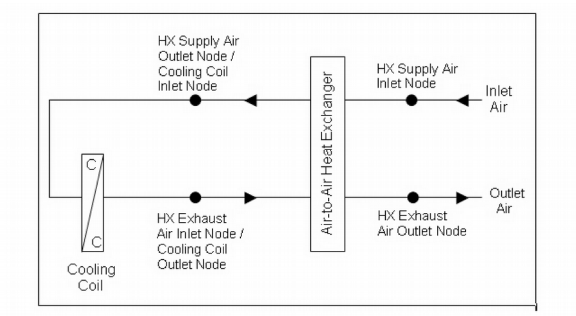
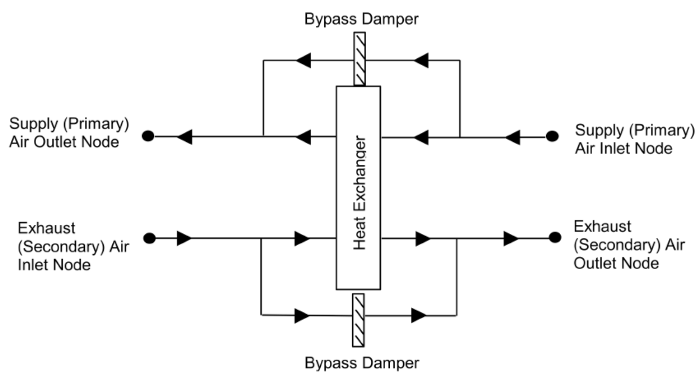


Figure 1.151: Schematic of the CoilSystem:Cooling:DX:HeatExchangerAssisted compound object



- SingleSpeedDXWaterCooled

Coil:Cooling:WaterToAirHeatPump:EquationFit

- ChilledWater

Coil:Cooling:Water

- ChilledWaterDetailedFlatModel

Coil:Cooling:Water:DetailedGeometry

- HeatExchangerAssistedChilledWater

CoilSystem:Cooling:DX:HeatExchangerAssisted
HeatExchanger:AirToAir:SensibleAndLatent
Coil:Cooling:Water