What is a 2 Pipe Fan Coil System?

A 2 Pipe Fan coil system is a single closed loop supply and return water distribution system that serves each suite. The building has a central chiller and cooling tower to cool the water in the loop and a Boiler to heat the water in the loop. There is only one water loop for the building. As a result, either heating or cooling is available depending on the time of year and the date when the building decides to switch over. If the building is set to heating, the tenant is not able to receive cooling in their suite and vice versa. Suite Occupants may have to tolerate temperature swings in the fall and spring. Inside each suite is a Fan coil unit that is controlled by the suite's thermostat. Each Suites fan has three speeds, **low, medium and high**, which are calibrated to deliver different air flow quantities, in CFMs. (Cubic Feet per Minute). Each Suite is equipped with an **ECM constant air flow motor** which maintains each fan speed at a constant air flow rate. (it automatically increases fan speed if filters become dirty)

EXAMPLE:

A) The building is set for Cooling:

The resident sets their thermostat to cool. The process is:

1. The fan starts
2. The water flows through the coil
3. The air flow delivers cooling to the suite at Low, Medium or High Fan speed.
4. When the room temp is satisfied the water flow through the coil stops and the fan shuts down

Carma Records the suite operating on heating or cooling and the speed at which each fan is operating. The operating time recorded at each fan speed is used to calculate the monthly suite usage factor. (The operating time at each fan speed is multiplied by the CFM's for each fan speed

B) The building is set to heating:

The resident sets thermostat to cool

1. Nothing happens

*** Note: Some two pipe fan coil buildings may be equipped with electric heat as well. If the building is set to cooling and the tenant requests heating the thermostat may switch to the electric heat (This usage is captured in the units' electricity bill)

Sequence of Operations

When a Two Pipe Fan Coil unit operates, the following functions occur:

Starting Sequence – *When the main closed loop water circulation system is providing Heating and the room thermostat calls for Heating, the heating function is activated.*

- The thermostat opens the water flow control valve to the coil and starts the fan to establish air flow over the coil
- The Two Pipe Fan Coil System will be in heating mode of operation at any time of day until the building's central plant is switched over to cooling mode in summer.

When the main closed loop water circulation system is providing Cooling and the room thermostat calls for cooling, the cooling function is activated.

- The thermostat opens the water flow control valve to the coil and starts the fan to establish air flow over the coil

- The Two Pipe Fan Coil System will be in cooling mode of operation at any time of day until the building's central plant is switched over to heating mode in winter.

Stopping the Sequence *– The Thermostat deactivates the Heating or Cooling Function as Follows:*

- Closes the water flow to the coil
- Stops the air flow over the coil

Notes:

- CARMA Energy Monitoring records fan speed and operational time
- The fan speed, low, medium, or high, is always accurate based on the **Fan Coil Unit ECM Constant Air Flow Fan Motor**
- A Monthly Suite Usage Factor is derived as follows:
  Monthly Fan Coil Unit Operating Time (x) Fan Speed at Low, Medium or High (=) Monthly Suite Usage (in CFM)
- Each suite is allocated a percentage of total Central Plant Utilities costs based on the in-suite usage factor compared to the sum of all building suites usage factors combined, each month
- The Two Pipe water flow is thermostatically controlled and is either full water flow ("on"), or no water flow ("off")
- The ECM Constant Air Flow Fan Motor is factory calibrated to provide a specific quantity of air flow at each fan speed, low, medium and high.

How is the rate calculated?

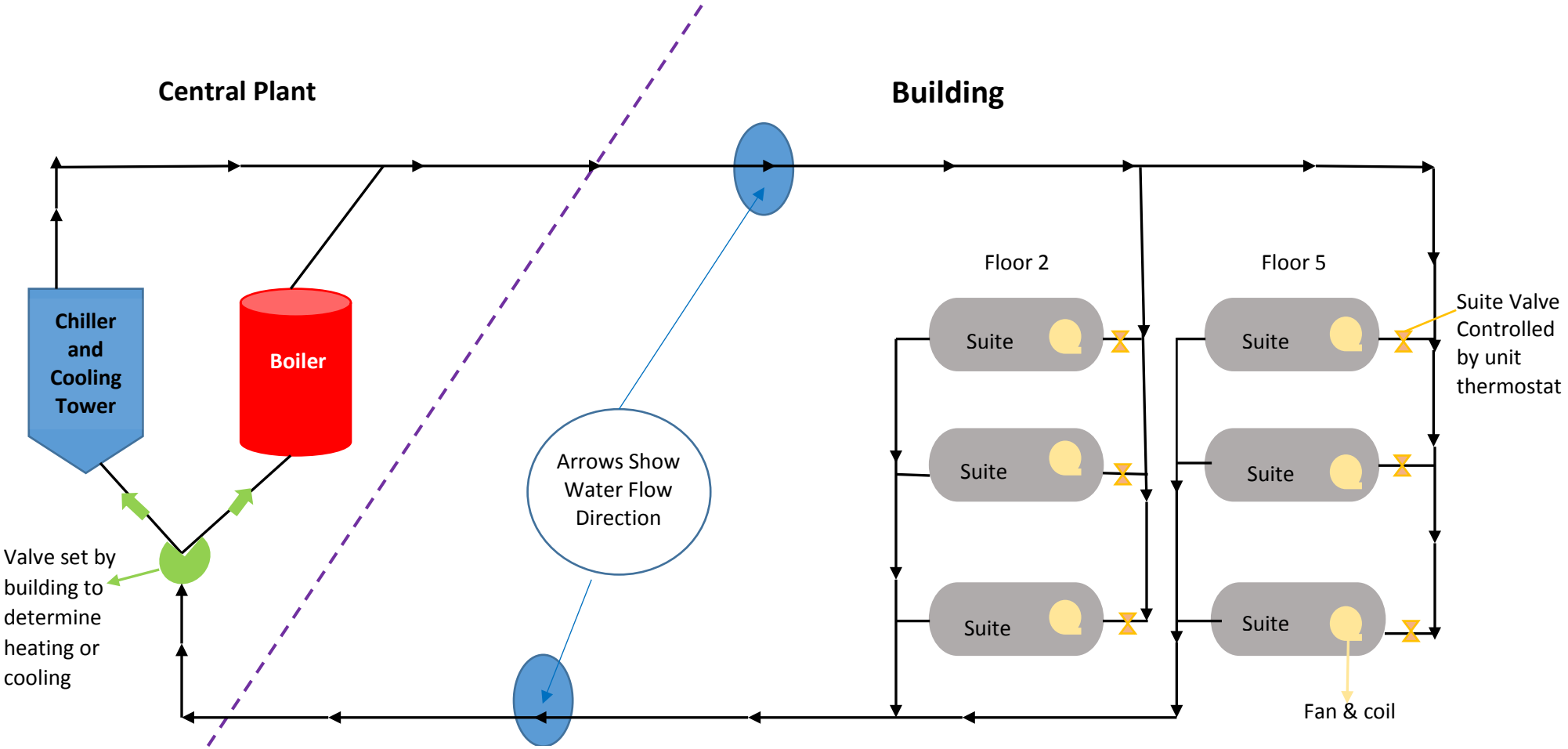
The monthly rate is calculated based on the total cost of the utilities to operate the Central Plant (for example the natural gas usage and electricity required to operate the central plant) with the common area and retail costs removed. The remainder is the total monthly cost to operate the central plant for the suites. Carma records the speed the fan is operating and how long it operates at each speed. Each fan speed has a specific CFM (cubic feet per minute value). Carma divides the central plant operating cost for the suites by the total CFMs for all suites to derive a rate per usage that each suite is charged each month. (Cost per CFM)

Diagram 1: High Overview of the system

Diagram 2: Tenant Suite

Diagram 1

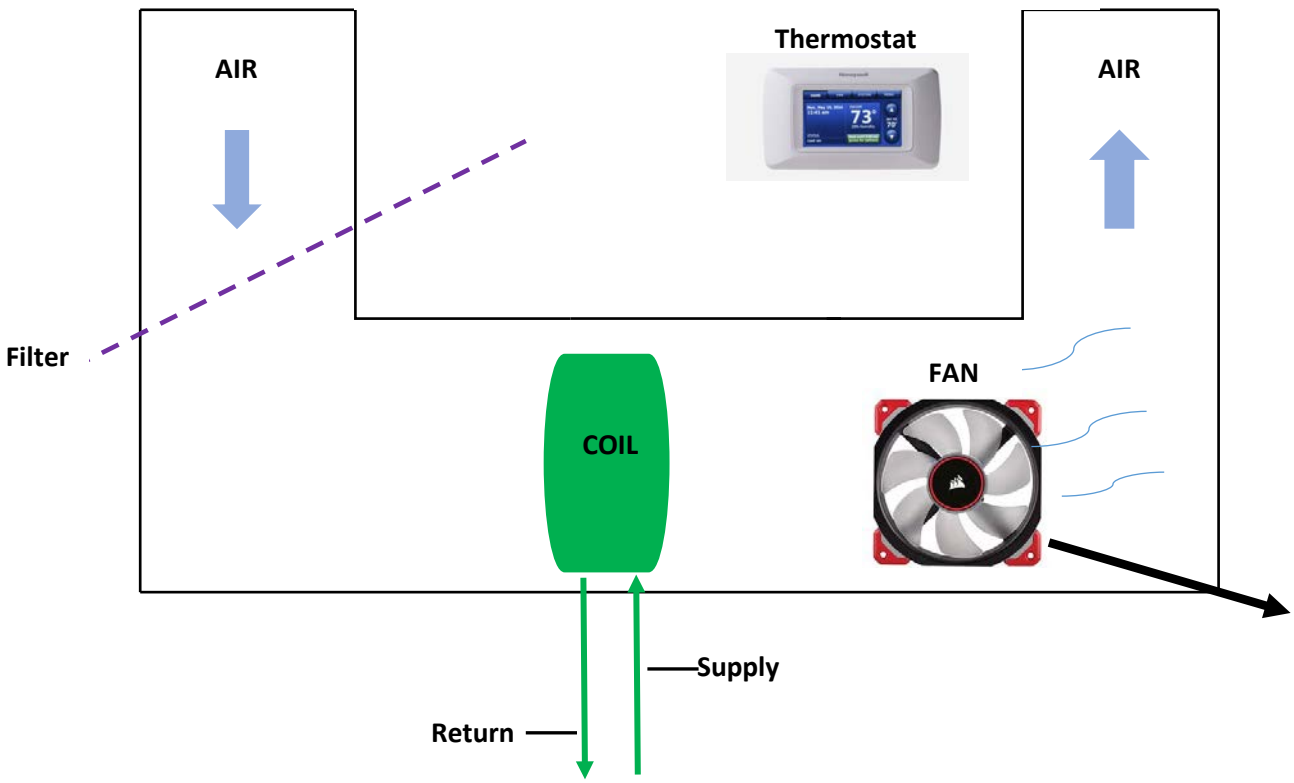
2 PIPE FAN COIL SYSTEM



- There is one central water loop that provides heating or cooling to the fan coils units in each suite
- The building determines whether the suites can have heating or cooling depending on the time of year. The building is either entirely on heating or entirely on Cooling.
- Each tenant will set the thermostat which will start the fan and water flow through the coil to meet the temperature required. When the temperature is satisfied the water flowing through the coil stops and the fan shuts off
- Temporary in-suite discomfort may occur if the tenant tries to use cooling but the building is still set for heating and vice versa

DIAGRAM 2

TENANT SUITE



******Note******

The Suite cannot control whether they have heating or cooling.

The property management will set the building to heating or cooling depending on the time of year.

**** CARMA records the speed (Low, Medium or High) the fan is operating and total operating time at each speed each month**

- **Steps:**
  1. The tenant sets the thermostat
  2. The fan turns on
  3. The Control Valve opens and allows water flow through the coil
  4. The fan circulates heating or cooling depending on the thermostat set point
  5. When temperature set point is achieved water flow through the coil stops
  6. The fan shuts down

- Temporary in-suite Discomfort may occur if the unit tries to use heating when the building is set to cooling and vice versa.