

## Systems Narrative

### Heating and Cooling

Heating and cooling for the building is provided by four constant volume dual deck air handling systems. For each of the four supply fans, the hot deck is heated with city-supplied steam and the cold deck is cooled with building generated chilled water. Operation of the supply fans is based on an occupied schedule of 6:30 am to 6:00 pm Tuesday through Friday and a start time of 6:00 am on Mondays during the heating season, as determined by current weather conditions. During cooling season a start time of 5:30 am Tuesday through Friday with a start time of 4:30 am on Mondays. All supply fans and associated equipment are disabled on weekends and holidays.

The chilled water system consists of one (1) 600 cooling ton Trane CVHE 3 stage centrifugal chiller, with associated chilled water pumps, condenser water pumps and one (1) two stage cooling tower. The system supplies chilled water to all fan unit cold deck coils for building cooling.

City-supplied steam is delivered to the building heating systems including the hot deck of the building air handling systems and heating water radiator systems serving perimeter spaces of the north, east, south and west sides of the building.

### Ventilation

Building ventilation is provided by four (4) supply fans, including:

- One (1) 100 hp supply fan with interlocked and sequenced return air, exhaust air, outside air dampers and two (2) control interlocked 10 hp return air fans.
- One (1) 100 hp supply fan with interlocked and sequenced return air, exhaust air, outside air dampers, and (1) control interlocked 20 hp return fan.
- One (1) 15 hp supply fan with interlocked and sequenced return air, exhaust air, and outside air dampers and no return air fan.
- One (1) 40 hp supply fan with interlocked and sequenced return air, exhaust air, outside air dampers and (1) interlocked 10 hp return air fan.

Each fan system is enabled by a signal from the BAS (based on the occupied schedule). Upon startup, the outside air and exhaust air dampers shall go to their minimum position. The mixed air temperature sensor shall modulate the economizer dampers to maintain a mixed air temperature of 60 degrees when the average zone temp is >72 degrees or maintain a mixed air temperature of 70 degrees when the average zone temp is < 70 degrees. The two return air fans shall be enabled. When the chiller plant is enabled, the unit dampers shall go to their minimum position.

### Domestic Hot Water

City-supplied steam is delivered to the building domestic hot water systems. The system consists of one (1) Synchro-flo self contained package system. The system is equipped with two 5 hp pumps with separate motors and an integral control panel. The domestic water pumping system is powered at all times. The pumps are started and stopped by the low pressure and high pressure switches built into the control panel. The controller allows for lead-lag pump operation.

### Lighting

Phillips Alto T-8 lighting is used throughout the building in common and tenant space areas. Building lighting is controlled manually and is turned off in the evening by the building janitorial staff as cleaning is completed.

### **Controls**

The building automation system (BAS) is made by Control Logic, which is a proprietary system and controls the start/stop of the air handlers, condenser, chilled water pumps and the chillers. It monitors the temperature, air-flow, pressure, and schedules on the equipment. The BAS also monitors the chiller plant and critical operating pressures, temperatures, etc. The BAS can be monitored remotely with any Internet connection.

### **Equipment Summary**

**Supply Fan 1 (SF1):** 100 hp, dual deck air handling unit serving the 6<sup>th</sup> floor through the 12<sup>th</sup> floor.

**Return Fan 1a (RF1A):** 1 of 2 10 hp return air fans serving SF1.

**Return Fan 1b (RF1B):** 2 of 2 10 hp return air fans serving SF1.

**Supply Fan 2 (SF2):** 100 hp dual deck air handling unit serving the basement through the 5<sup>th</sup> floor.

**Return Fan 2 (RF2):** 20 hp return air fan serving SF2

**Supply Fan 3 (SF3):** 40 hp dual deck air handling unit serving the basement through 2<sup>nd</sup> floor of the connecting annex building. Also serves the core of The Colorado Trust (TCT) Building basement floor through 1<sup>st</sup> floor and the perimeter of TCT 2<sup>nd</sup> floor.

**Return fan 3 (RF3):** 10 hp return air fan serving SF3.

**Supply Fan 4 (SF4):** 15 hp dual deck air handling unit serving the perimeter of TCT basement through 1<sup>st</sup> floor. *Note: no return fan is associated with SF4*

**Chilled water unit:** 600 ton Trane CVHE, 3 stage centrifugal chiller supplies chilled water to all supply fan units cold deck coils.

**Condenser pump 9 (CWP9):** 1 of 2 75 hp water circulating pumps serving the chiller unit.

**Condenser pump 10 (CWP10):** 1 of 2 75 hp water circulating pumps serving the chiller unit. *Note: CWP 9 and 10 are operated alternately, one at a time.*

**Chilled water pump7 (CHWP7):** 1 of 2 40 hp water circulating pumps serving the chiller unit.

**Chilled water pump 8 (CHWP8):** 1 of 2 40 hp water circulating pumps serving the chiller. Unit. *Note: CHWP 7 and 8 are operated alternately, one at a time.*

**Cooling tower (CT1):** 600 nominal ton 2 stage updraft tower serving the chiller unit.

**Heating zone pump north: (HWP North):** 5 hp hot water circulating pump serving radiators on the north side of the building. Also serves The Colorado Trust basement central meeting room along the east wall.

**Heating zone pump east: (HWP East):** 5 hp hot water circulating pump serving the radiators on the east side of the building.

**Heating zone pump south (HWP South):** 5 hp hot water circulating pump serving the radiators on the south side of the building.

**Heating zone pump west (HWP West):** 5 hp hot water circulating pump serving the radiators on the west side of the building.

**Control air compressor (AC1):** 5 hp dual pumps with separate motors serves control air to the tower building and The Colorado Trust building for pneumatic control.

**Garage fan north (GFN):** 1 of 2 5 ph exhaust air fans serving the lower parking area.

**Garage fan south (GFS):** 1 of 2 5 ph exhaust air fans serving the lower parking area.

**Elevator exhaust fan (EF1):** 5 hp exhaust air fan for the upper elevator mechanical room.

**General building exhaust fan (EF2):** 5 hp exhaust air fan for all electrical closets.

**Toilet exhaust fan (EF3):** 5 hp exhaust fan for all restrooms.

**Domestic water pump 1 (DWP1):** 1 of 2, 90 gpm, 10hp water pumps serving domestic water to the tower building and The Colorado Trust building.

**Domestic water pump 2 (DWP2):** 1 of 2, 90 gpm, 10 hp water pumps serving domestic water to the tower building and The Colorado Trust building.

**Condensate pump 1 (Cond1):** 2.5 hp dual pump to return steam condensate from the tower to the condensate meter.

**Condensate pump 1 (Cond2):** 2.5 hp dual pump to return steam condensate from TCT building to the condensate meter.

**Steam PRV Station:** Fisher pneumatic pressure reducing controller and valve with factory set pressure relief valve.

**Steam chemical pump:** Fractional hp chemical pump to inject steam line chemical treatment into the steam distribution piping.