

## **SEQUENCE OF OPERATIONS**

A. SYSTEM OFF:

A. SYSTEM OFF:

FCU SUPPLY FAN OFF.
 MUA SUPPLY FAN OFF.
 CHILLED WATER CONTROL VALVE CLOSED.
 HEATING WATER CONTROL VALVE CLOSED.

HEATING WATER CONTROL VALVE CLOSEL
 ELECTRIC HEATING COIL DE-ENERGIZED.
 CONTROL LOOPS INACTIVE.

B. SYSTEM START:

AUTOMATICALLY BY THE BMS BASED ON PREPROGRAMMED SCHEDULE.
 OPERATOR ENTERED COMMAND AT THE BMS.

LOCAL SWITCH.
 LOCAL TEMPERATURE SENSOR.

C. SYSTEM OPERATION:

THE FCU SUPPLY FAN SHALL RUN. THE MUA SUPPLY FAN SHALL BE INTERLOCKED RUN WITH FCU SUPPLY FAN AT MINIMUM AIRFLOW.

ON A CALL FOR COOLING, THE COOLING COIL VALVE WILL BEGIN TO MODULATE OPEN. AS THE COOLING DEMAND INCREASES, THE VALVE WILL CONTINUE TO OPEN UNTIL THE DISCHARGE AIR TEMPERATURE REACHES 52°F (ADJ). ON CONTINUED CALL FOR COOLING, THE FAN WILL BEGIN TO MODULATE TOWARD THE MAXIMUM COOLING FAN AIRFLOW AS THE CHILLED WATER VALVE CONTINUES TO MODULATE OPEN MAINTAINING A 52°F (ADJ) DISCHARGE AIR TEMPERATURE. THIS PROCESS WILL CONTINUE UNTIL THE FAN REACHES THE COOLING MAXIMUM AIRFLOW AND THE CHILLED WATER VALVE REACHES MAXIMUM FLOW. UPON A DECREASE IN COOLING

DEMAND, THE SEQUENCE WILL REVERSE.

RANGE HOOD TURNED ON.

WITH NO DEMAND IN THE SPACE, THERE WILL BE NO CALL FOR COOLING OR HEATING. THE FAN WILL BE AT MINIMUM AIRFLOW. THE HEATING COIL VALVE AND COOLING COIL VALVE WILL BE OFF.

ON A CALL FOR HEATING, THE HEATING COIL VALVE WILL BEGIN TO MODULATE OPEN. AS THE HEATING DEMAND INCREASES, THE VALVE WILL CONTINUE TO MODULATE OPEN UNTIL THE DISCHARGE AIR TEMPERATURE REACHES 90°F (ADJ). ON CONTINUED CALL FOR HEATING, THE FAN BEGINS TO MODULATE FROM DEAD BAND TOWARDS THE MAXIMUM HEATING FAN AIRFLOW. THIS PROCESS WILL CONTINUE UNTIL THE FAN REACHES THE HEATING MAXIMUM AIRFLOW AND THE HOT WATER VALVE REACHES MAXIMUM FLOW. UPON A DECREASE IN

HEATING DEMAND, THE SEQUENCE WILL REVERSE.
6. THE MUA ELECTRIC COIL SHALL MODULATE TO MAINTAIN MUA DISCHARGE AIR TEMPERATURE.
7. MUA UNIT NORMALLY OPERATE AT 200 CFM. INTERLOCK WITH RANGE HOOD AND INCREASE TO 750 CFM WHEN

D. SYSTEM STOP:

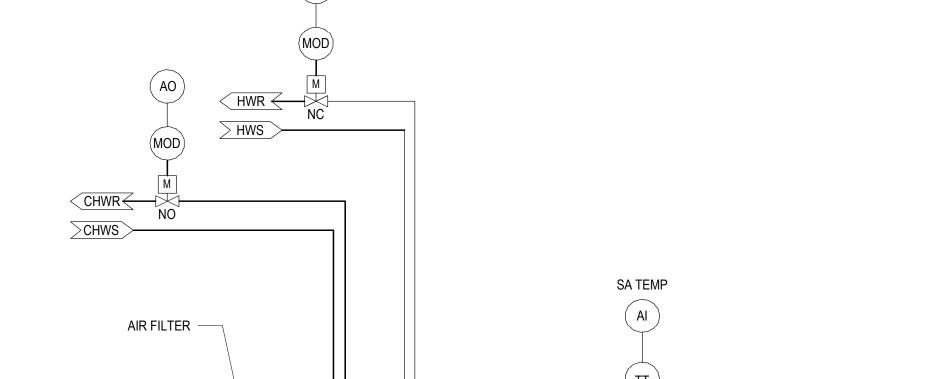
OPERATOR COMMAND AT THE BMS OR AUTOMATICALLY BY THE BMS BASED ON A PREPROGRAMMED SCHEDULE.
 MANUAL OFF AT LOCAL SWITCH.

WHEN THE SYSTEM IS CALLED TO STOP, THE SYSTEM SHALL REVERT TO THAT "OFF" STATE AS DESCRIBED ABOVE.

E. SETPOINTS:

1. SPACE TEMPERATURE 70°F HEATING AND 75°F COOLING. ALARM AT BMS AT +/- 2°F FROM SETPOINT.

FAN COIL UNIT DIAGRAM - COOLING AND HEATING WITH MUA



FCU FCU

SPEED START/STOP STATUS

FCU

## SEQUENCE OF OPERATIONS

A. SYSTEM OFF:

SUPPLY FAN OFF.
 CHILLED WATER CONTROL VALVE CLOSED.
 HEATING WATER CONTROL VALVE CLOSED.

B. SYSTEM START:

1. AUTOMATICALLY BY THE BMS BASED ON PREPROGRAMMED SCHEDULE.

OPERATOR ENTERED COMMAND AT THE BMS.
 LOCAL SWITCH.
 LOCAL TEMPERATURE SENSOR.

CONTROL LOOPS INACTIVE.

C. SYSTEM OPERATION:

1. THE SUPPLY FAN SHALL RUN.

2. COOLING:
ON A CALL FOR COOLING, THE COOLING COIL VALVE WILL BEGIN TO MODULATE OPEN. AS THE COOLING DEMAND INCREASES, THE VALVE WILL CONTINUE TO OPEN UNTIL THE DISCHARGE AIR TEMPERATURE REACHES 52°F (ADJ). ON CONTINUED CALL FOR COOLING, THE FAN WILL BEGIN TO MODULATE TOWARD THE MAXIMUM COOLING FAN AIRFLOW AS THE CHILLED WATER VALVE CONTINUES TO MODULATE OPEN MAINTAINING A 52°F (ADJ) DISCHARGE AIR TEMPERATURE. THIS PROCESS WILL CONTINUE UNTIL THE FAN REACHES THE COOLING MAXIMUM AIRFLOW AND THE

PROCESS WILL CONTINUE UNTIL THE FAN REACHES THE HEATING MAXIMUM AIRFLOW AND THE HOT WATER VALVE REACHES MAXIMUM FLOW. UPON A DECREASE IN HEATING DEMAND, THE

CHILLED WATER VALVE REACHES MAXIMUM FLOW. UPON A DECREASE IN COOLING DEMAND, THE SEQUENCE WILL REVERSE.

3. DEAD BAND:
WITH NO DEMAND IN THE SPACE, THERE WILL BE NO CALL FOR COOLING OR HEATING. THE FAN WILL BE AT MINIMUM AIRFLOW. The heating coil valve and cooling coil valve WILL BE OFF.

4. HEATING:
ON A CALL FOR HEATING, THE HEATING COIL VALVE WILL BEGIN TO MODULATE OPEN. AS THE HEATING DEMAND INCREASES, THE VALVE WILL CONTINUE TO MODULATE OPEN UNTIL THE DISCHARGE AIR TEMPERATURE REACHES 90°F (ADJ). ON CONTINUED CALL FOR HEATING, THE FAN BEGINS TO MODULATE FROM DEAD BAND TOWARDS THE MAXIMUM HEATING FAN AIRFLOW. THIS

SEQUENCE WILL REVERSE.

D. SYSTEM STOP:

OPERATOR COMMAND AT THE BMS OR AUTOMATICALLY BY THE BMS BASED ON A PREPROGRAMMED SCHEDULE MANUAL OFF AT LOCAL SWITCH.

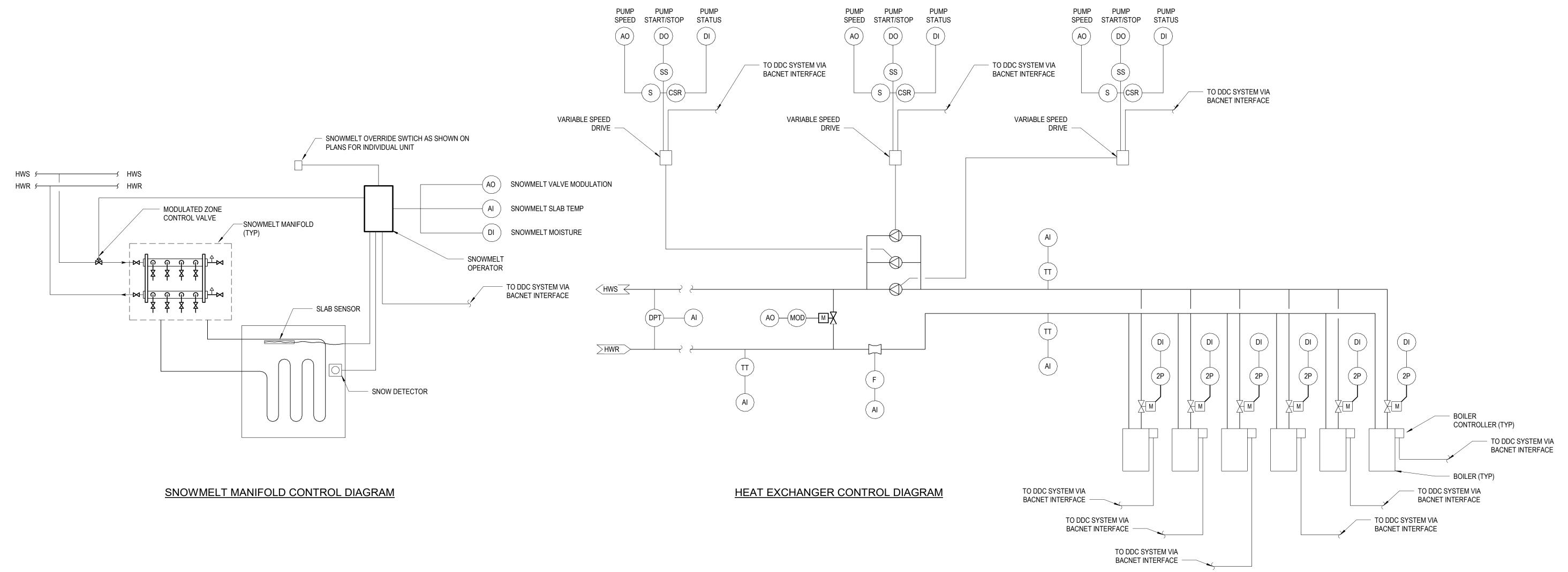
WHEN THE SYSTEM IS CALLED TO STOP, THE SYSTEM SHALL REVERT TO THAT "OFF" STATE AS DESCRIBED ABOVE

E. SETPOINTS:

1. SPACE TEMPERATURE 70°F HEATING AND 75°F COOLING. ALARM AT BMS AT +/- 2°F FROM SETPOINT.

PAN COIL UNIT DIAGRAM - COOLING AND HEATING

SCALE: NTS



ZONE LOCAL ZONE SETPT OVERRIDE TEMP

## **SEQUENCE OF OPERATIONS**

A. GENERAL:

1. THE VARIABLE VOLUME SYSTEM IS DESIGNED TO PROVIDE GLYCOL HOT WATER TO SNOWMELT MANIFOLDS.
2. SOURCE WATER TEMPERATURES SHALL BE MAINTAINED BY THE HEATING WATER SYSTEM CONTROLS.

B. SYSTEM OPERATION:

1. SYSTEM SHALL BE ENABLED:
a. WHEN THE OUTSIDE AIR TEMPERATURE IS BELOW 35°F (ADJ.), AND THE HUMIDITY SENSOR IS ABOVE 80% RH, OR
b. BY THE OPERATOR ENTERED COMMAND AT THE BMS, OR
c. VIA MOISTURE AND TEMPERATURE SENSORS LOCATED FOR LOCAL SNOWMELT ZONE CONTROL.
2. ONCE ENABLED, SYSTEM SHALL REMAIN ENABLED FOR AT LEAST ONE HOUR (ADJ.).

3. SYSTEM SHALL BE DISABLED:

a. WHEN THE PAVEMENT TEMPERATURE IS ABOVE 50°F AND AND HUMIDTY DROPS BELOW 50%, OR

b. THE OUTSIDE AIR TEMPERATURE RISES ABOVE 40°F (ADJ.), OR c. BY THE OPERATOR ENTERED COMMAND AT THE BMS.

C. GHW DISTRIBUTION PUMP :

1. GLYCOL HEATING WATER DISTRIBUTION PUMP SHALL BE STARTED TO SUPPLY HEATING HOT WATER THROUGH THE SYSTEM UPON ACTIVATION BY THE SNOWMELT CONTROL SYSTEM. BMS SHALL PROVE OPERATION OF THE PUMP. UPON PUMP FAILURE, THE BMS SHALL ALARM. THE VARIABLE FREQUENCY DRIVE MODULATES PUMP SPEED TO MAINTAIN SYSTEM DIFFERENTIAL PRESSURE SETPOINT AS SENSED NEAR THE END OF THE MAIN PIPING RUN.

D. GHW TEMPERATURE CONTROL :
1. THE HEATING HOT WATER SYSTEM VALVE SHALL MODULATE TO MAINTAIN THE GHW SUPPLY TEMPERATURE OF 110°F (ADJ.)

SETPOINT.

E. SNOWMELT ZONE CONTROL:

1. ONCE THE SNOWMELT SYSTEM IS ENABLED, HEAT IS APPLIED TO THE SNOWMELT SYSTEM THROUGH OPENING THE ZONE VALVE.

THE CONTROL SHALL MAINTAIN THE SLAB TEMPERATUER ABOVE FREEZING. IF MOISTURE IS DETECTED, THE CONTROL SHALL

START THE "MELTING MODE". IN THIS MODE THE CONTROL SHALL REGULATE THE HEAT SOURCE AND MODULATE THE ZONE VALVE

TO MAINTAIN THE SLAB TEMPERATURE AT THE WARM-WEATHER CUTOFF SET POINT. IT SHALL REMAIN IN THIS MODE UNTIL NO MOISTURE IS PRESENT OR THE MINIMUM RUNTIME HAS ELAPSED, WHICHEVER IS LONGER.

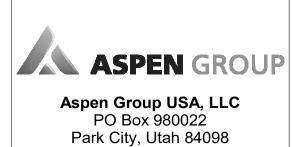
2. MANUAL OVERRIDE SWITCH ON RESIDENTIAL UNIT: OVERRIDE SWITCH INSTALLED INSIDE THE UNIT WILL ACTIVATE THE DECK SNOWMELT ZONE IN THEIR RESPECTIVE UNIT AND OPEN THE ZONE CONTROL VALVE FOR A MINIMUM OF ONE (1) HOUR. THE ZONE CONTROL VALVE SHALL BE CLOSED WHEN THE SLAB TEMPERATURE IS MAINTAINED AND NO MOISTURE IS PRESENT.

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159 South Jackson St, Suite 600 Seattle, Washington 98104 USA +1 206 624 5670 olsonkundig.com

Project:
SOMMET BL
9300 Marsac Ave (E



Pool Consultant
Cloward H20
2696 N University Ave, Suite 290
Provo, UT 84604

<u>Landscape Architect</u> **EPG Design**6949 South High Tech Drive, Suite 100
Midvale, Utah 84047

Specifications Writer Friday Group 88 Mainelli Road Middlebury, VT

Code Consultant
Holmes
600 1st Avenue, Suite 200A

Fire Protection Engineer

Jensen Hughes

One Research Drive, Suite 305C

Seattle, WA 98104

Vertical Transportation Consulatant
Lerch Bates

Westborough, MA 01581

19515 North Creek Parkway, Suite 304
Bothell, WA 98011

Structural Engineer
Magnusson Klemencic Associates

1319 SE MLK Blvd, Suite 210 Portland, Oregon 97219

1301 5th Ave, Suite 3200
Seattle, WA 98101

Lighting Designer

Building Envelope Consultant RDH 2101 N 34th St Seattle, WA 98103

Accessibility Consultant
Studio Pacifica
2144 Westlake Ave N, Suite F
Seattle, WA 98109

MEP Engineer
WSP USA
1001 Fourth Ave., Suite 3100
Seattle, WA 98154

principal architect\_\_\_\_\_ project manager\_\_\_\_ drawn by\_\_\_\_\_

checked by <u>Checker</u>
job no.
date 5/17/2024

evisions:

no. date

1 5/17/2024 IFC 2

IFC Set 2 of 3 5/17/2024

MECHANICAL CONTROL DIAGRAM