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ASPEN GROUP Aspen Group USA, LLC PO Box 980022 Park City, Utah 84098

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 Seattle, WA 98104

Fire Protection Engineer

Jensen Hughes
One Research Drive, Suite 305C Westborough, MA 01581

Vertical Transportation Consulatant Lerch Bates 19515 North Creek Parkway, Suite 304 Bothell, WA 98011

<u>Structural Engineer</u> **Magnusson Klemencic Associates** 1301 5th Ave, Suite 3200 Seattle, WA 98101

<u>Lighting Designer</u> 1319 SE MLK Blvd, Suite 210 Portland, Oregon 97219

> Building Envelope Consultant RDH 2101 N 34th St Seattle, WA 98103 Accessibility Consultant
> Studio Pacifica

> Seattle, WA 98109 MEP Engineer
> WSP USA
> 1001 Fourth Ave., Suite 3100 Seattle, WA 98154

2144 Westlake Ave N, Suite F

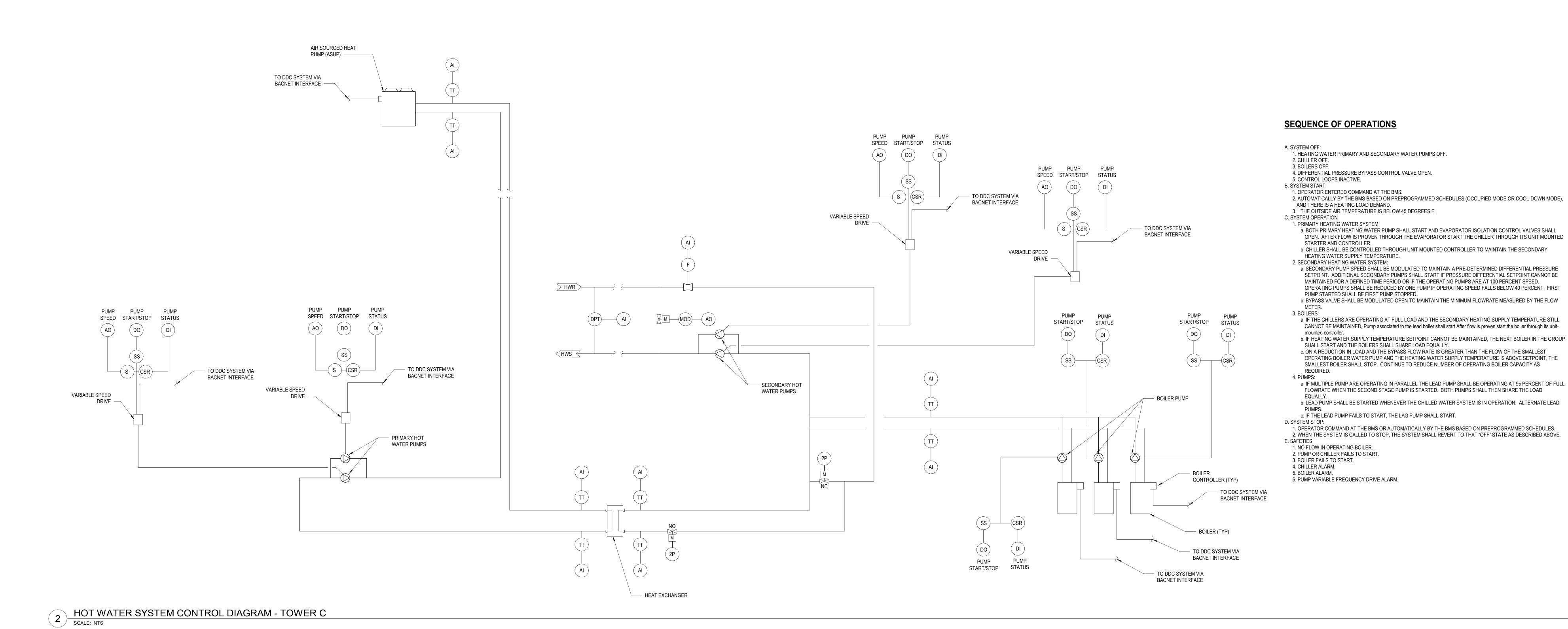
principal architect_____ project manager_____ drawn by_____

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

IFC Set 2 of 3 5/17/2024

no. date

MECHANICAL CONTROL DIAGRAM



SEQUENCE OF OPERATIONS

1. HEATING WATER PRIMARY AND SECONDARY WATER PUMPS OFF. 2. CHILLERS OFF. 3. BOILERS OFF. 4. CHILLER EVAPORATOR AUTOMATIC ISOLATION VALVES CLOSED.

5. DIFFERENTIAL PRESSURE BYPASS CONTROL VALVE OPEN. 6. CONTROL LOOPS INACTIVE. B. SYSTEM START: 1. OPERATOR ENTERED COMMAND AT THE BMS.

2. AUTOMATICALLY BY THE BMS BASED ON PREPROGRAMMED SCHEDULES (OCCUPIED MODE OR COOL-DOWN MODE), AND THERE IS A HEATING LOAD DEMAND. 3. THE OUTSIDE AIR TEMPERATURE IS BELOW 45 DEGREES F. C. SYSTEM OPERATION a. BOTH PRIMARY HEATING WATER PUMP SHALL START AND EVAPORATOR ISOLATION CONTROL VALVES SHALL OPEN. AFTER

FLOW IS PROVEN THROUGH THE EVAPORATOR START THE CHILLER THROUGH ITS UNIT MOUNTED STARTER AND b. CHILLER SHALL BE CONTROLLED THROUGH UNIT MOUNTED CONTROLLER TO MAINTAIN THE SECONDARY HEATING WATER c. THE LEAD CHILLER IS MORE THAN 95 PERCENT LOAD AND HEATING WATER SUPPLY TEMPERATURE SETPOINT CANNOT BE

MAINTAINED, THE NEXT CHILLER IN THE GROUP SHALL START AND THE CHILLERS SHALL SHARE LOAD EQUALLY. CONTINUE TO ADD CHILLER HEATING CAPACITY AS REQUIRED TO SATISFY REQUIREMENTS ABOVE. d. ON A REDUCTION IN LOAD AND THE BYPASS FLOW RATE IS GREATER THAN THE FLOW OF THE SMALLEST OPERATING CHILLED WATER PUMP AND THE OPERATING CHILLERS ARE LOADED LESS THAN THE CAPACITY REQUIREMENTS OF ALL OPERATING CHILLERS AND THE HEATING WATER SUPPLY TEMPERATURE IS BELOW SETPOINT, THE SMALLEST CHILLER SHALL STOP. CONTINUE TO DELETE CHILLER CAPACITY AS REQUIRED. 2. SECONDARY HEATING WATER SYSTEM:

a. SECONDARY PUMP SPEED SHALL BE MODULATED TO MAINTAIN A PRE-DETERMINED DIFFERENTIAL PRESSURE SETPOINT. ADDITIONAL SECONDARY PUMPS SHALL START IF PRESSURE DIFFERENTIAL SETPOINT CANNOT BE MAINTAINED FOR A DEFINED TIME PERIOD OR IF THE OPERATING PUMPS ARE AT 100 PERCENT SPEED. OPERATING PUMPS SHALL BE REDUCED BY ONE PUMP IF OPERATING SPEED FALLS BELOW 40 PERCENT. FIRST PUMP STARTED SHALL BE FIRST PUMP STOPPED. b. BYPASS VALVE SHALL BE MODULATED OPEN TO MAINTAIN THE MINIMUM FLOWRATE MEASURED BY THE FLOW METER. 3. BOILERS: a. IF THE CHILLERS ARE OPERATING AT FULL LOAD AND THE SECONDARY HEATING SUPPLY TEMPERATURE STILL CANNOT BE

b. IF HEATING WATER SUPPLY TEMPERATURE SETPOINT CANNOT BE MAINTAINED, THE NEXT BOILER IN THE GROUP SHALL START AND THE BOILERS SHALL SHARE LOAD EQUALLY. c. ON A REDUCTION IN LOAD AND THE BYPASS FLOW RATE IS GREATER THAN THE FLOW OF THE SMALLEST OPERATING BOILER WATER PUMP AND THE HEATING WATER SUPPLY TEMPERATURE IS ABOVE SETPOINT, THE SMALLEST BOILER SHALL STOP. CONTINUE TO REDUCE NUMBER OF OPERATING BOILER CAPACITY AS REQUIRED.

MAINTAINED, Pump associated to the lead boiler shall start After flow is proven start the boiler through its unit-mounted controller.

a. IF MULTIPLE PUMP ARE OPERATING IN PARALLEL THE LEAD PUMP SHALL BE OPERATING AT 95 PERCENT OF FULL FLOWRATE WHEN THE SECOND STAGE PUMP IS STARTED. BOTH PUMPS SHALL THEN SHARE THE LOAD EQUALLY. b. LEAD PUMP SHALL BE STARTED WHENEVER THE CHILLED WATER SYSTEM IS IN OPERATION. ALTERNATE LEAD PUMPS. c. IF THE LEAD PUMP FAILS TO START, THE LAG PUMP SHALL START.

D. SYSTEM STOP: 1. OPERATOR COMMAND AT THE BMS OR AUTOMATICALLY BY THE BMS BASED ON PREPROGRAMMED SCHEDULES. 2. WHEN THE SYSTEM IS CALLED TO STOP, THE SYSTEM SHALL REVERT TO THAT "OFF" STATE AS DESCRIBED ABOVE.

E. SAFETIES: 1. NO FLOW IN OPERATING BOILER.

2. PUMP OR CHILLER FAILS TO START. 3. BOILER FAILS TO START.

4. CHILLER ALARM. 5. BOILER ALARM. 6. PUMP VARIABLE FREQUENCY DRIVE ALARM.

BACNET INTERFACE

TO DDC SYSTEM VIA TO DDC SYSTEM VIA BACNET INTERFACE -BACNET INTERFACE -(2P) PUMP PUMP SPEED START/STOP STATUS PUMP - TO DDC SYSTEM VIA BACNET INTERFACE VARIABLE SPEED DRIVE -TO DDC SYSTEM VIA BACNET INTERFACE VARIABLE SPEED PUMP PUMP PUMP SPEED START/STOP STATUS PUMP PUMP SPEED START/STOP STATUS START/STOP START/STOP STATUS STATUS DO (DO)<hws \ (SS)— (ss)— ____(S)-(CSR)-—(S)+(CSR)− TO DDC SYSTEM VIA TO DDC SYSTEM VIA BACNET INTERFACE BACNET INTERFACE SECONDARY HOT VARIABLE SPEED WATER PUMPS VARIABLE SPEED - BOILER PUMP DRIVE WATER PUMPS CONTROLLER (TYP) TO DDC SYSTEM VIA BACNET INTERFACE —(CSR) BOILER (TYP) DI TO DDC SYSTEM VIA BACNET INTERFACE PUMP PUMP START/STOP STATUS - TO DDC SYSTEM VIA

HEAT EXCHANGER

AIR SOURCED HEAT

PUMP (ASHP) -

HOT WATER SYSTEM CONTROL DIAGRAM - TOWER A&B (1) SCALE: NTS

AIR SOURCED HEAT

PUMP (ASHP) -