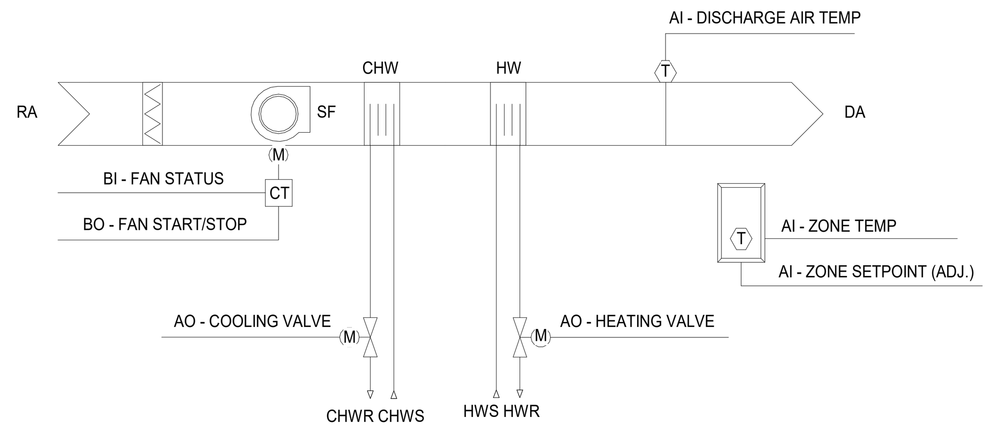


1) <u>RUN CONDITIONS - CONTINUOUS:</u>
THE UNIT SHALL RUN CONTINUOUSLY AND SHALL MAINTAIN:

A) 75°F (ADJ.) COOLING SETPOINT.
B) 70°F (ADJ.) HEATING SETPOINT.
C) ALARMS SHALL BE PROVIDED AS FOLLOWS:

I) HIGH ZONE TEMP: IF THE ZONE TEMPERATURE IS GREATER THAN THE COOLING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).
II) LOW ZONE TEMP: IF THE ZONE TEMPERATURE IS LESS THAN THE HEATING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).

2) <u>ZONE SETPOINT ADJUST:</u>
THE OCCUPANT SHALL BE ABLE TO ADJUST THE ZONE TEMPERATURE HEATING AND COOLING SETPOINTS AT THE ZONE SENSOR.

3) <u>FAN:</u>
THE FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN, UNLESS SHUTDOWN ON SAFETIES.

4) <u>COOLING COIL VALVE:</u>
THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND MODULATE THE COOLING COIL VALVE TO MAINTAIN ITS COOLING SETPOINT.

A) THE COOLING SHALL BE ENABLED WHENEVER:
I) OUTSIDE AIR TEMPERATURE IS GREATER THAN 65°F (ADJ.).
II) AND THE ZONE TEMPERATURE IS ABOVE COOLING SETPOINT.
III) AND THE FAN IS ON.

B) THE COOLING COIL VALVE SHALL OPEN WHENEVER THE FREEZESTAT (IF PRESENT) IS ON.

5) <u>HEATING COIL VALVE:</u>
THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND MODULATE THE HEATING COIL VALVE TO MAINTAIN ITS HEATING SETPOINT.

A) THE HEATING SHALL BE ENABLED WHENEVER:
I) OUTSIDE AIR TEMPERATURE IS LESS THAN 60°F (ADJ.).
II) AND THE ZONE TEMPERATURE IS BELOW HEATING SETPOINT.
III) AND THE FAN IS ON.

B) THE HEATING COIL VALVE SHALL OPEN WHENEVER THE FREEZESTAT (IF PRESENT IS ON)

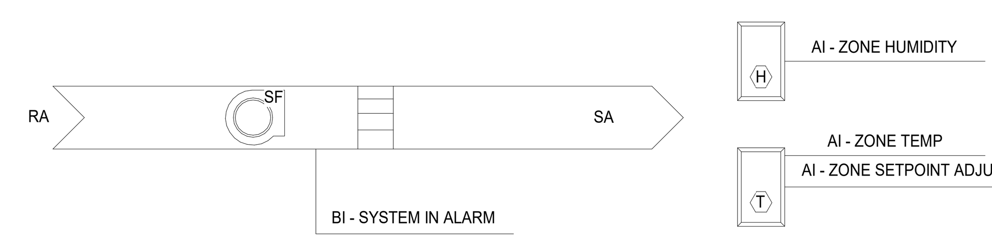
6) <u>DISCHARGE AIR TEMPERATURE:</u>
THE CONTROLLER SHALL MONITOR THE DISCHARGE AIR TEMPERATURE.

A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) HIGH DISCHARGE AIR TEMP: IF THE DISCHARGE AIR TEMPERATURE IS GREATER THAN 120°F (ADJ.).
II) LOW DISCHARGE AIR TEMP: IF THE DISCHARGE AIR TEMPERATURE IS LESS THAN 40°F (ADJ.).

7) <u>FAN STATUS:</u>
THE CONTROLLER SHALL MONITOR THE FAN STATUS.

A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
II) FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
III) FAN RUNTIME EXCEEDED: FAN STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

2 FAN COIL UNIT CONTROL SCHEMATIC
SCALE: N.T.S.



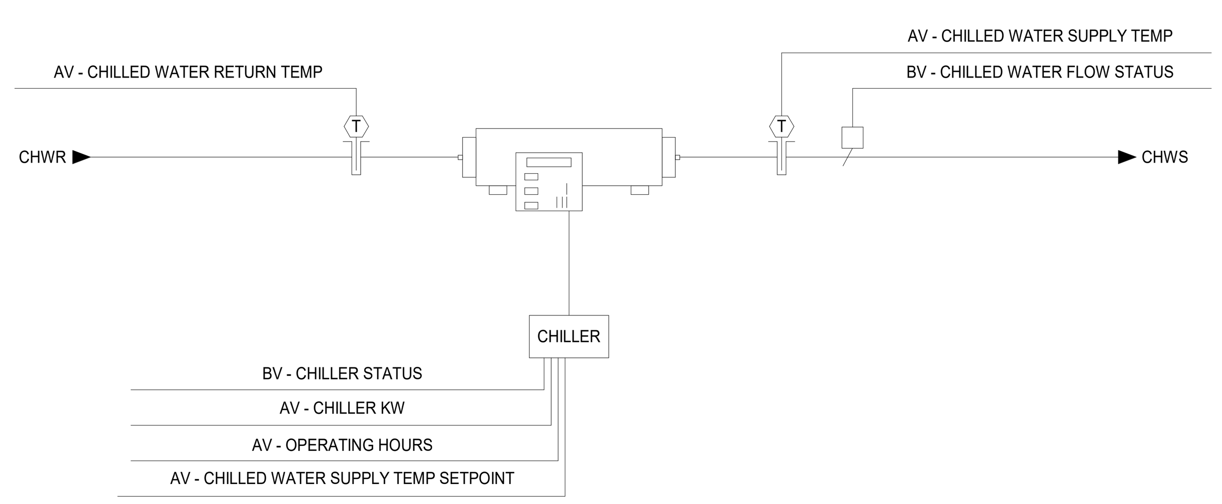
1) <u>COMPUTER ROOM UNIT:</u>

CONTROL SEQUENCE PER MANUFACTURER'S STANDARD CONTROL.
REFER TO SPECIFICATIONS FOR DETAILS.

ALARMS SHALL BE PROVIDED IF SPACE TEMPERATURE EXCEEDS 85 F (ADJ.)

CONTRACTOR TO MOUNT ZONE SENSORS AND PROVIDE CONTROL WIRING TO SPACE SENSORS AND TO ASSOCIATED AIR COOLED CONDENSING UNIT.

3 COMPUTER ROOM CONTROL SCHEMATIC
SCALE: N.T.S.

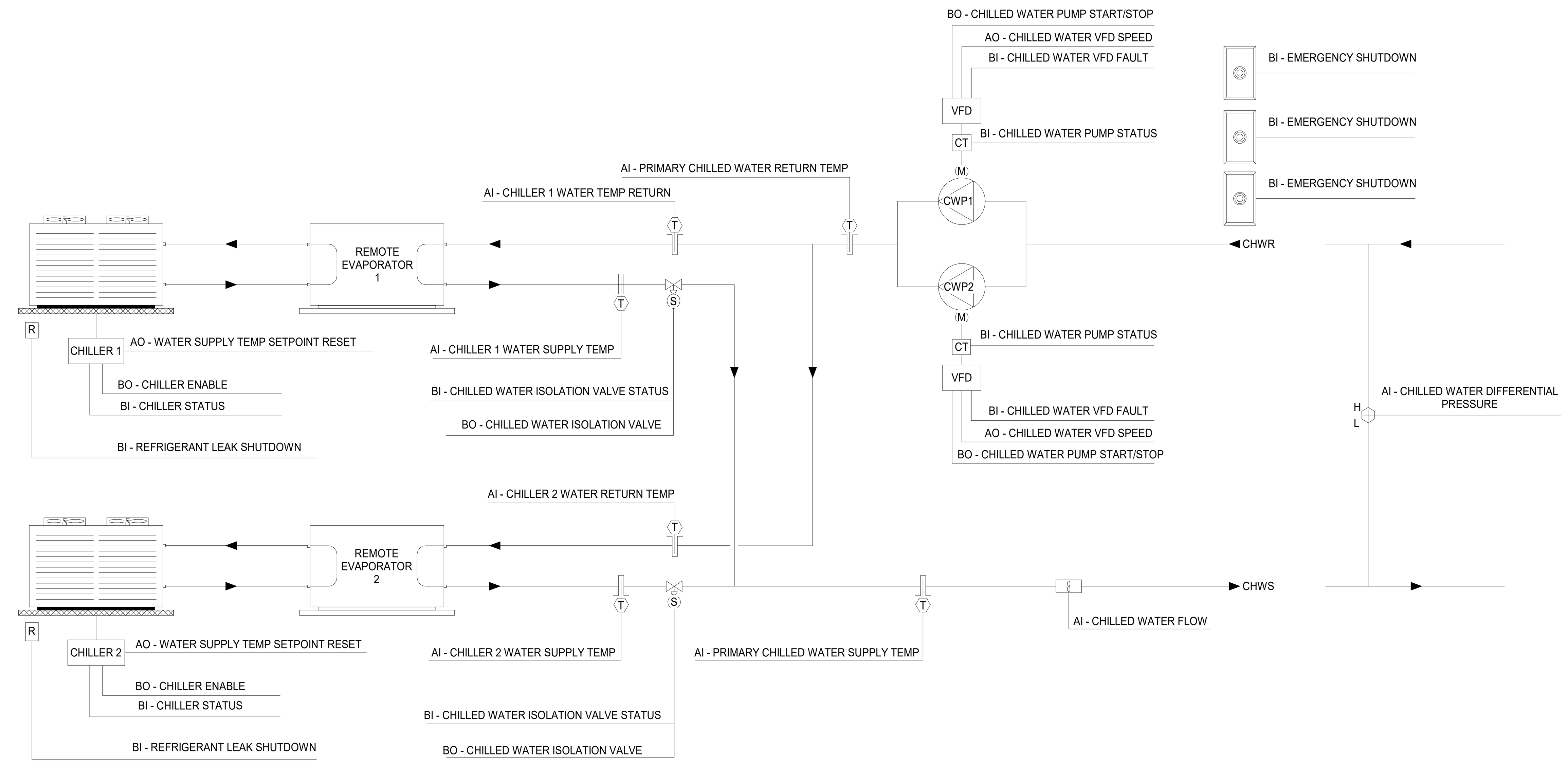


1) <u>CHILLER INTERFACE MONITORING:</u>

CURRENT CHILLER STATUS AND OPERATING CONDITIONS SHALL BE MONITORED THROUGH ITS COMMUNICATION INTERFACE PORT. THE INTERFACE SHALL MONITOR AND TREND THE POINTS SHOWN.

<u>NOTE:</u>
THIS CHILLER INTERFACE SCHEMATIC MAY NOT REFLECT THE ACTUAL SENSORS AND POINTS AS SUPPLIED BY THE CHILLER MANUFACTURER. ALL INTERFACE POINTS SHALL BE COORDINATED WITH THE CHILLER SUPPLIER.

4 CHILLER MONITORING CONTROL SEQUENCE
SCALE: N.T.S.



1) <u>CHILLER - RUN CONDITIONS:</u>
- THE CHILLER SHALL BE ENABLED TO RUN WHENEVER THE OUTSIDE AIR TEMPERATURE IS GREATER THAN 60°F (ADJ.).
- A USER DEFINABLE NUMBER OF CHILLED WATER COILS NEED COOLING.

TO PREVENT SHORT CYCLING, THE CHILLER SHALL RUN FOR AND BE OFF FOR MINIMUM ADJUSTABLE TIMES (BOTH USER DEFINABLE), UNLESS SHUTDOWN ON SAFETIES OR OUTSIDE AIR CONDITIONS.

THE CHILLER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.

2) <u>EMERGENCY SHUTDOWN:</u>

THE CHILLER SHALL SHUT DOWN AND AN ALARM SHALL BE GENERATED UPON RECEIVING AN EMERGENCY SHUTDOWN SIGNAL STATUS.

3) <u>REFRIGERANT DETECTION:</u>
THE CHILLER SHALL SHUT DOWN AND AN ALARM SHALL BE GENERATED UPON RECEIVING A REFRIGERANT LEAK DETECTION STATUS.

4) <u>CHILLED WATER ISOLATION VALVE:</u>
THE VALVE SHALL OPEN ANYTIME THE CHILLER IS CALLED TO RUN. THE VALVE SHALL ALSO OPEN WHENEVER THE CHILLED WATER PUMP RUNS FOR FREEZE PROTECTION.

A) THE VALVE SHALL OPEN PRIOR TO THE CHILLER BEING ENABLED AND SHALL CLOSE ONLY AFTER THE CHILLER IS DISABLED. THE VALVE SHALL THEREFORE HAVE:

I) A USER ADJUSTABLE DELAY ON START.
II) AND A USER ADJUSTABLE DELAY ON STOP.

B) THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.

C) ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) FAILURE: VALVE COMMANDED OPEN BUT THE STATUS INDICATES CLOSED.
II) OPEN IN HAND: VALVE COMMANDED CLOSED BUT THE STATUS INDICATES OPEN.

5) <u>CHILLED WATER PUMP LEAD/STANDBY OPERATION:</u>
THE TWO CHILLED WATER PUMPS SHALL RUN ANYTIME THE CHILLER IS CALLED TO RUN.

A) THE LEAD PUMP SHALL START PRIOR TO THE CHILLER BEING ENABLED AND SHALL STOP ONLY AFTER THE CHILLER IS DISABLED. THE PUMP(S) SHALL THEREFORE HAVE:
I) A USER ADJUSTABLE DELAY ON START.
II) AND A USER ADJUSTABLE DELAY ON STOP.

B) THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.

C) THE TWO PUMPS SHALL OPERATE IN A LEAD/STANDBY FASHION.
I) THE LEAD PUMP SHALL RUN FIRST.
II) ON FAILURE OF THE LEAD PUMP, THE STANDBY PUMP SHALL RUN AND THE LEAD PUMP SHALL TURN OFF.

D) THE DESIGNATED LEAD PUMP SHALL ROTATE UPON ONE OF THE FOLLOWING CONDITIONS (USER SELECTABLE):
I) MANUALLY THROUGH A SOFTWARE SWITCH
II) DAILY
III) WEEKLY
IV) MONTHLY

E) CHILLED WATER PUMP ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
II) RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.

6) <u>CHILLED WATER DIFFERENTIAL PRESSURE CONTROL:</u>
THE CONTROLLER SHALL MEASURE CHILLED WATER DIFFERENTIAL PRESSURE AND MODULATE THE LEAD CHILLED WATER PUMP VFD TO MAINTAIN ITS CHILLED WATER DIFFERENTIAL PRESSURE SETPOINT. THE FOLLOWING SETPOINTS ARE RECOMMENDED VALUES. ALL SETPOINTS SHALL BE FIELD ADJUSTED TO MEET THE REQUIREMENTS OF ACTUAL FIELD CONDITIONS.

THE CONTROLLER SHALL MODULATE CHILLED WATER PUMP SPEED TO MAINTAIN A CHILLED WATER DIFFERENTIAL PRESSURE OF 12LBF/IN2 (ADJ.). THE VFD MINIMUM SPEED SHALL NOT DROP BELOW 54% (ADJ.).

A) ON DROPPING CHILLED WATER DIFFERENTIAL PRESSURE, THE VFDS SHALL STAGE ON AND RUN TO MAINTAIN SETPOINT AS FOLLOWS:
I) THE CONTROLLER SHALL MODULATE THE LEAD VFD TO MAINTAIN SETPOINT.
II) IF THE LEAD VFD SPEED IS GREATER THAN A SETPOINT OF 90% (ADJ.), THE LAG VFD SHALL STAGE ON.
III) THE LAG VFD SHALL RAMP UP TO MATCH THE LEAD VFD SPEED AND THEN RUN IN UNISON WITH THE LEAD VFD TO MAINTAIN SETPOINT.

B) ON RISING CHILLED WATER DIFFERENTIAL PRESSURE, THE VFDS SHALL STAGE OFF AS FOLLOWS:
I) IF THE VFD SPEEDS DROPS BACK TO 60% (ADJ.) BELOW SETPOINT, THE LAG VFD SHALL STAGE OFF.
II) THE LEAD VFD SHALL CONTINUE TO RUN TO MAINTAIN SETPOINT.

C) ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) HIGH CHILLED WATER DIFFERENTIAL PRESSURE: IF 25% (ADJ.) GREATER THAN SETPOINT.
II) LOW CHILLED WATER DIFFERENTIAL PRESSURE: IF 25% (ADJ.) LESS THAN SETPOINT.

7) <u>CHILLER:</u>
THE CHILLER SHALL BE ENABLED A USER ADJUSTABLE TIME AFTER PUMP STATUSES ARE PROVEN ON. THE CHILLER SHALL THEREFORE HAVE A USER ADJUSTABLE DELAY ON START.

A) THE DELAY TIME SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.

B) THE CHILLER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.

C) ALARMS SHALL BE PROVIDED AS FOLLOWS:

I) CHILLER FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
II) CHILLER RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.

8) <u>CHILLED WATER SUPPLY TEMPERATURE SETPOINT:</u>
THE CHILLED WATER SUPPLY TEMPERATURE SETPOINT SHALL RESET USING A TRIM AND RESPOND ALGORITHM BASED ON COOLING REQUIREMENTS.

THE CHILLED WATER SUPPLY TEMPERATURE SETPOINT SHALL RESET TO A LOWER VALUE AS THE FACILITY'S CHILLED WATER VALVES OPEN BEYOND A USER DEFINABLE THRESHOLD (90% OPEN, TYP.). ONCE THE CHILLED WATER COILS ARE SATISFIED (VALVES CLOSING) THEN THE CHILLED WATER SUPPLY TEMPERATURE SETPOINT SHALL GRADUALLY RISE OVER TIME TO REDUCE COOLING ENERGY USE.

9) <u>PRIMARY WATER TEMPERATURE MONITORING:</u>

A) THE FOLLOWING TEMPERATURES SHALL BE MONITORED:
I) CHILLED WATER SUPPLY.
II) CHILLED WATER RETURN.

B) ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) HIGH CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS GREATER THAN 55°F (ADJ.).
II) LOW CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS LESS THAN 38°F (ADJ.).

10) <u>CHILLER LEAD/LAG OPERATION:</u>
THE TWO CHILLERS SHALL OPERATE IN A LEAD/LAG FASHION.

I) THE LEAD CHILLER SHALL RUN FIRST.
II) ON FAILURE OF THE LEAD CHILLER, THE LAG CHILLER SHALL RUN AND THE LEAD CHILLER SHALL TURN OFF.
III) AS CHILLED WATER TEMPERATURE INCREASES ABOVE A SETPOINT OF 55°F (ADJ.), THE LAG CHILLER SHALL STAGE ON AND RUN IN UNISON WITH THE LEAD CHILLER TO MAINTAIN CHIILED WATER TEMPERATURE SETPOINT.
IV) AS CHILLED WATER TEMPERATURE GOES BACK TO 5°F BELOW SETPOINT (ADJ.), THE LAG CHILLER SHALL STAGE OFF.

A) THE DESIGNATED LEAD CHILLER SHALL ROTATE UPON ONE OF THE FOLLOWING CONDITIONS: (USER SELECTABLE):
I) MANUALLY THROUGH A SOFTWARE SWITCH
II) IF CHILLER RUNTIME (ADJ.) IS EXCEEDED
III) DAILY
IV) WEEKLY
V) MONTHLY

B) CHILLER ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
II) RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
III) RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.
IV) LEAD CHILLER FAILURE: THE LEAD CHILLER IS IN FAILURE AND THE STANDBY CHILLER IS ON.

11) <u>CHILLER 1 CHILLED WATER TEMPERATURE MONITORING:</u>
THE FOLLOWING TEMPERATURES SHALL BE MONITORED:

I) CHILLER 1 WATER SUPPLY.
II) CHILLER 1 WATER RETURN.

A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) HIGH CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS GREATER THAN 55°F (ADJ.).
II) LOW CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS LESS THAN 38°F (ADJ.).

12) <u>CHILLER 2 CHILLED WATER TEMPERATURE MONITORING:</u>
THE FOLLOWING TEMPERATURES SHALL BE MONITORED:
I) CHILLER 2 WATER SUPPLY.
II) CHILLER 2 WATER RETURN.

A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) HIGH CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS GREATER THAN 55°F (ADJ.).
II) LOW CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS LESS THAN 38°F (ADJ.).

1 CHILLED WATER SYSTEM CONTROLS SCHEMATIC
SCALE: N.T.S.

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SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

12/06/21
JOSHUA R. APLING
REGISTERED
PE 10910274
STATE OF INDIANA
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

DRAWN: SSB CHK'D: ESA
DESIGNED: SSB
APPRV'D: JRA
DATE: DECEMBER 20, 2021
PROJECT NUMBER
2063-1048-90

SULLIVAN COUNTY SHERIFF'S OFFICE AND CORRECTIONAL FACILITY
2357 NORTH SECTION STREET SULLIVAN, INDIANA 47882

CONTROL SCHEMATICS - III

DRAWING NUMBER
M7.3
MECHANICAL

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