

SEQUENCE OF OPERATIONS – CHWS

CHILLED WATER SYSTEM

CHILLER CONTROL:

THE CHILLED WATER SYSTEM IS COMPRISED OF 3 CHILLERS. CHILLER 1&3 SHALL BE THE PRIMARY CHILLERS AND SHALL OPERATE IN A LEAD/LAG MANNER AS REQUIRED MAINTAINING CHILLED WATER SUPPLY SETPOINT. CHILLER 2 SHALL OPERATE AS A STANDBY CHILLER AND SHALL BE ENABLED IF CHILLERS 1&3 CANNOT MAINTAIN CHILLED WATER SETPOINT. DURING TIMES OF LOW DEMAND CHILLER 2 SHALL BE EXERCISED MONTHLY TO ENSURE PROPER OPERATION.

THE CHILLED WATER SYSTEM SHALL BE ENABLED BASED ON OUTDOOR AIR TEMPERATURE AND AIR HANDLER COOLING DEMAND. AIR HANDLER COOLING DEMAND IS BASED OFF CHILLED WATER VALVE POSITION TO MAINTAIN DESIRED SETPOINT. THE CHILLED WATER SYSTEM SHALL BE ENABLED WHEN THE OUTDOOR AIR TEMPERATURE IS ABOVE THE LOCKOUT SETPOINT. THE GREATEST ZONE DEMAND EXCEEDS THE SET DEVIATION, AND THE CHWV POSITION HAS REACHED 100% OPEN FOR THE SPECIFIED TIME PERIOD. THE OUTDOOR AIR SETPOINT, ZONE DEVIATION, CHWV POSITION AND TIME PERIOD SHALL BE SEPARATELY ADJUSTABLE.

OPTIMUM START:

AN OPTIMUM START STRATEGY SHALL BE INCORPORATED REFERENCEING OUTDOOR AIR AND ZONE TEMPERATURES. THE CHILLERS SHALL BE ENABLED PRIOR TO BUILDING OCCUPANCY AS REQUIRED TO MEET ZONE SETPOINTS AT THE START OF THE OCCUPIED MODE VIA THE AIR HANDLER CALL FOR COOLING. THE CHILLERS SHALL BE DISABLED PRIOR TO THE START OF THE UNOCCUPIED MODE ALLOWING THE EXISTING CHILLED WATER TO MAINTAIN OCCUPIED SPACE TEMPERATURES UNTIL THE UNOCCUPIED MODE BEGINS.

CHILLED WATER SUPPLY SETPOINT:

CHILLED WATER SUPPLY SETPOINT SHALL BE RESET BASED ON OUTDOOR AIR TEMPERATURE. AS OUTDOOR AIR TEMPERATURE INCREASES FROM 55°F (ADJ.) TO 95°F THE CHILLED WATER SUPPLY SETPOINT SHALL DECREASE FROM 55°F (ADJ.) TO 45°F (ADJ.).

A CHILLED WATER DELTA T STRATEGY SHALL BE INCORPORATED AS PART OF THE TEMPERATURE RESET AS FOLLOWS:

IF THE DELTA T IS LESS THAN 4°F THE CHW SETPOINT SHALL BE 55°F (ADJ.).

IF THE DELTA T IS 4°F TO 10°F THE CHW SETPOINT SHALL BE 50°F (ADJ.)

IF THE DELTA T IS GREATER THAN 10°F THE CHW SETPOINT SHALL BE 45°F

ENABLING THE CHILLER RESULTS IN A CALL FOR THE ASSOCIATED CHILLED AND CONDENSING WATER PUMP OPERATION FROM THE CHILLER ITSELF. THIS ENSURES CHILLERS AND RELATED PUMPS SHALL BE PUT INTO SERVICE REGARDLESS IF THE CHILLERS ARE STARTED BY THE BAS, MANUAL OVERRIDE OR STARTED AT THE CHILLER CONTROL PANEL ITSELF. NOTE WHEN STARTED BY ANOTHER SOURCE OTHER THAN THE BAS, THE CHILLED AND CONDENSING WATER PUMPS SHALL OPERATE AT A PRE-DESIGNATED SPEED ENSURING MINIMUM WATER FLOWS ARE MET.

WHEN THE SYSTEM IS ENABLED, THE LEAD CHILLER SHALL BE SENT A START COMMAND. WHEN THE LEAD CHILLER REQUESTS CHILLED WATER PUMP OPERATION, THE LEAD CHILLED WATER PUMP SYSTEM SHALL BE ENABLED. WHEN THE LAG CHILLER REQUESTS CONDENSER WATER PUMP OPERATION, THE LAG COOLING TOWER SHALL BE ENABLED. THE ASSOCIATED TOWER FAN AND THE ASSOCIATED CONDENSER WATER PUMP SHALL BE ENABLED. LAG CHILLER OPERATION SHALL FOLLOW IN SEQUENCE BASED ON DEMAND FOR ADDITIONAL COOLING CAPACITY OR ACTION TAKEN IN THE EVENT OF A LEAD CHILLER FAILURE. LAG CHILLER SHALL BE COMMANDED (SIMILAR TO ABOVE) ON BY DEMAND WHEN THE LEAD CHILLER CURRENT DRAW IS GREATER THAN 98% OF FULL LOAD RATING AND THE CHILLED WATER SUPPLY TEMPERATURE IS 2 DEGREES ABOVE SETPOINT FOR 10 MINUTES BEFORE THE LAG CHILLER IS ENABLED. THE LEAD CHILLER SHALL UNLOAD TO CURRENT DRAW OF 50%. THE LEAD AND LAG CHILLERS SHALL THEN RAMP UP TO MEET THE BUILDING DEMAND. TO PREVENT HIGH TEMPERATURE CONDITIONS THE LAG CHILLER SHALL ALSO BE STARTED IF THE CHILLED WATER SUPPLY TEMPERATURE IS 4 DEGREES ABOVE SETPOINT FOR 15 MINUTES REGARDLESS OF LEAD CHILLER CURRENT DRAW. LAG CHILLER OPERATION SHALL BE TERMINATED WHEN THE LEAD CHILLER CURRENT DRAW IS 45% OF FULL LOAD AND THE CHILLED WATER TEMPERATURE IS AT OR BELOW THE CHILLED WATER SETPOINT FOR 10 MINUTES.

WHEN THE CHILLER IS DISABLED, ITS ASSOCIATED CONDENSER WATER PUMP SHALL BE COMMANDED OFF AND COOLING TOWER ISOLATION VALVE SHALL CLOSE.

CHILLER ALARMS, FAILURES AND ACTIONS DEFINED (ALARM ANNUNCIATION AND/OR ACTION TAKEN): ANY CHILLER THAT HAS FAILED AS DEFINED BELOW, UNLESS BY POWER LOSS, SHALL BE LOCKED OUT UNTIL A RESET IS EXECUTED THROUGH THE GRAPHIC INTERFACE. IN HANDLING THE FAILURE OF A CHILLER BY POWER LOSS AS OPPOSED TO AN INTERNAL OR EXTERNAL FAILURE THE BAS SHALL NOT LOCK OUT THE CHILLER MAKING IT ELIGIBLE FOR OPERATION WITHOUT A MANUAL RESET UPON THE RESTORATION OF POWER.

1. ALL CHILLER ALARMS GENERATED FROM THE CHILLER THROUGH BACNET COMMUNICATION (ALARM ANNUNCIATION)

2. FAILURE OF A CHILLER TO PROOF OPERATION (RUN CONTACTS) WITHIN 5 MINUTES OF BEING COMMANDED ON (ALARM ANNUNCIATION, MANUAL RESET REQUIRED)

3. HIGH CHILLER EVAPORATOR LEAVING WATER TEMPERATURE CONDITION, 3°F ABOVE SETPOINT AND A DIFFERENTIAL TEMPERATURE LESS THAN 8°F FOR 5 MINUTES AFTER AN INITIAL DELAY OF 15 MINUTES FROM START-UP (ALARM ANNUNCIATION, MANUAL RESET REQUIRED)


4. ASSOCIATED CONDENSING WATER PUMP FAILURE, NO PROOF OF OPERATION 10 SECONDS AFTER BEING COMMANDED TO START UNLESS THERE HAS BEEN A POWER LOSS DETECTED AT THE ASSOCIATED CHILLER (ALARM ANNUNCIATION, MANUAL RESET REQUIRED)

5. POWER LOSS TO CHILLERS OR CHILLERS (ALARM ANNUNCIATION, AUTOMATIC RESET)

THE REMAINING PARTS OF THE SYSTEM, CHILLED WATER PUMPS, CONDENSER WATER PUMPS, COOLING TOWERS, CHEMICAL TREATMENT, ETC. SHALL HAVE CONTROL SEQUENCE SIMILAR TO THE EXISTING.

GENERAL SERVICES ADMINISTRATION

GSA



Control Technologies  
DEFINING BUILDING PERFORMANCE

4185E LA PALMA AVENUE  
SUITE 200  
DOWNEY, CA 90240  
PHONE (714) 864-7160  
FAX: (714) 864-7161

KEY PLAN

MARK	DATE	DESCRIPTION
50%	12/29/15	50% SUBMISSION
100%	4/14/16	100% SUBMISSION
REV1	6/28/16	FIELD REVISIONS (FIRST FLOOR FCU)

REVISION NOTES

GRAPHIC SCALE

LATE CON. NO.	
A/E TASK NO.	
CONS. CONTR.	J&M BUILDING SOLUTIONS
CONS. WORK	J&M BUILDING SOLUTIONS
FRAME A/E	
SUB A/E	CONTROL TECHNOLOGIES, INC.
CONSTR. CON.	J&M BUILDING SOLUTIONS
NAME	Glen Anderson Federal Building
STREET	501 W Ocean Blvd
CITY/ST/ZIP	Long Beach CA 90802
BUILDING NO.	04021327
OTHER	
BUILDING NO.	
FACILITY CODE	
PROJECT	Glen Anderson Federal Building
TITLE	Long Beach— DDC Upgrade Project
DESCRIPTION	GS-09P-14-KS-C-0003
PROJECT NO.	C15139
SUBMISSION	
GSA PM	O&M
SUB. DATE	07/18/2017
DRAWING TITLE	Glen Anderson Federal Building
FILE NAME	C15139 Glen Anderson Control Drawings.dwg
FLOOR NO.	
DRAWN BY	DAM
CHECKED BY	
DATE DRAFTED	01/18/2017
SHEET SIZE	11 X 17
DRAWING NO.	ZM 6 22
DISCIPLINE	
SHEET TYPE	
SHEET	022
OF	066