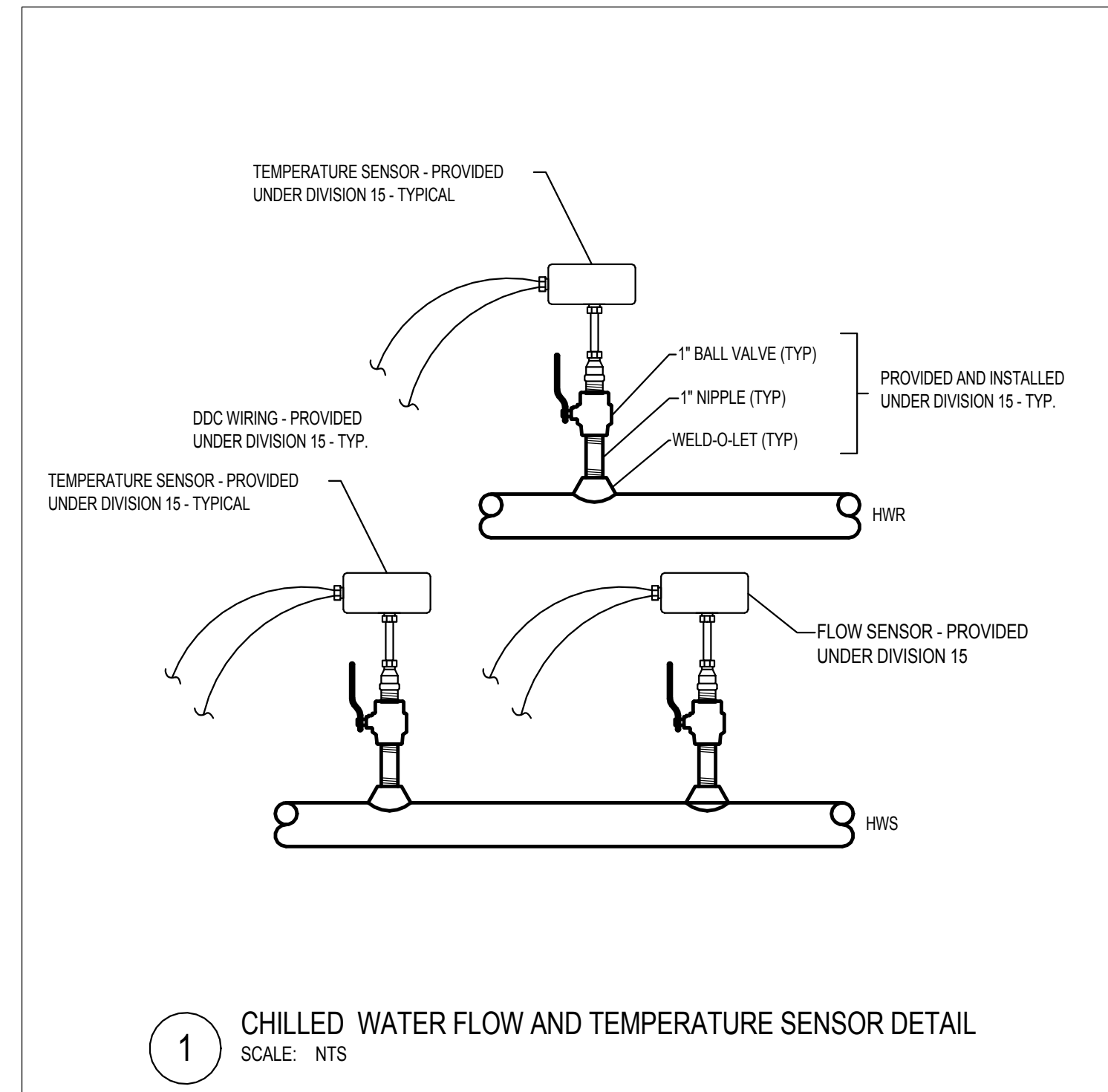
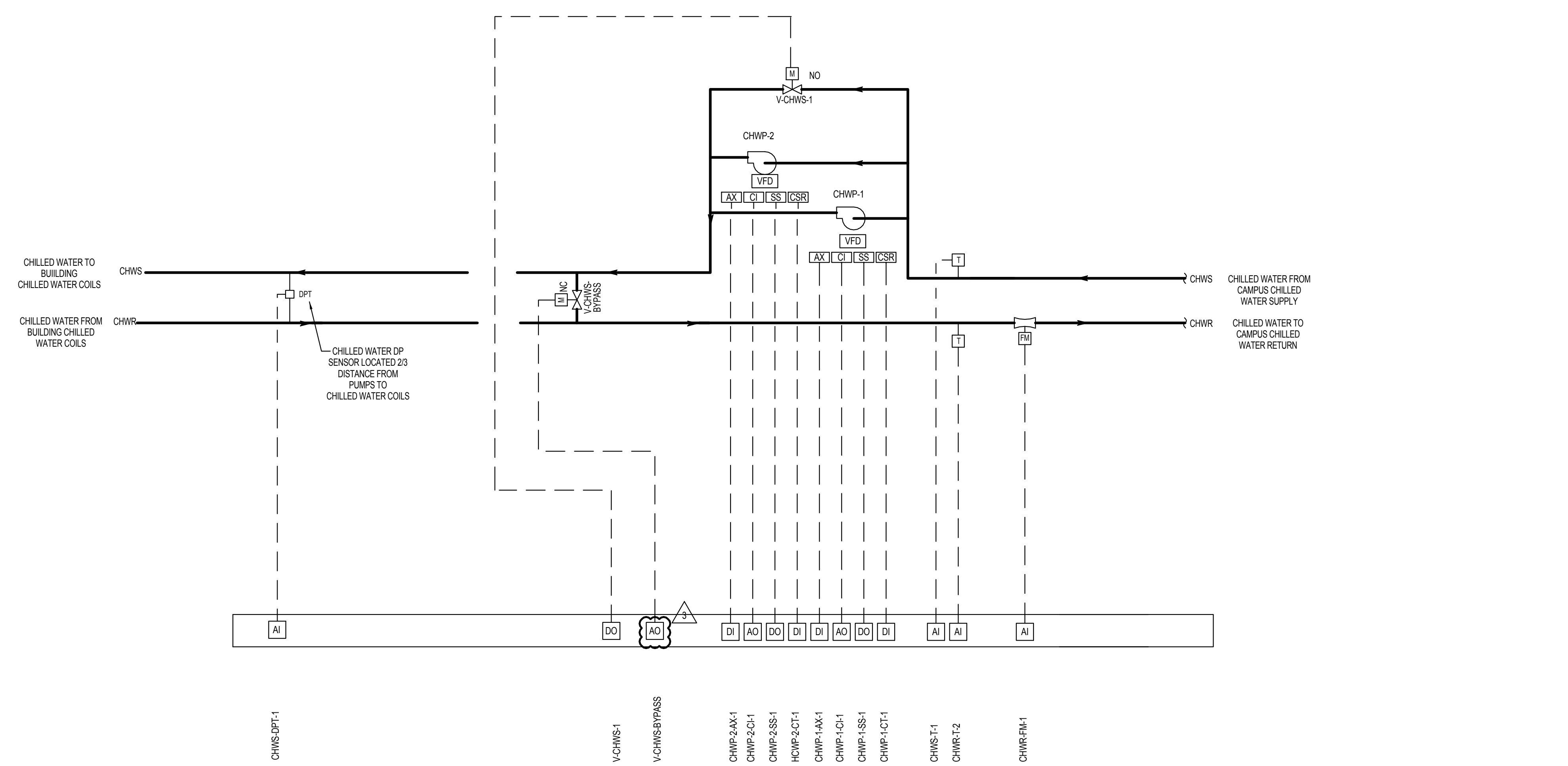


DATE	ISSUED FOR	PROJECT/REVISED/ISSUE APPROVAL	DESIGN/WORK/ISSUE APPROVAL
22MAY13	BIDS		
14JUN13	ADDENDUM 3		



1 CHILLED WATER FLOW AND TEMPERATURE SENSOR DETAIL
SCALE: NTS

- KEYED NOTES**
- 1 PROVIDE CAPABILITY IN THE EMCS SOFTWARE ROUTINE FOR INPUT OF OPERATOR DEFINED LOW/HIGH LIMITS THAT CAN BE ALARMED AT OPERATORS WORK STATION.
 - 2 AT A MINIMUM EACH GRAPHIC SCREEN OR SCREENS, IF MORE THAN ONE IS NEEDED, SHALL CONTAIN ALL LISTED POINTS AND ASSOCIATED SET POINTS ON A FLOW DIAGRAM OF THE UNIT BEING REPRESENTED. THESE SET POINTS SHALL BE USER ADJUSTABLE THROUGH THE GRAPHIC SCREEN.
 - 3 A LOGICAL AND ORDERED MENU SYSTEM SHALL BE USED TO LINK ALL GRAPHIC SCREENS TOGETHER. AT A MINIMUM ALL AIR CONDITIONING UNITS AND RELATED SECONDARY EQUIPMENT SHALL BE LINKED TOGETHER AND ALL MISCELLANEOUS HVAC EQUIPMENT SHALL BE LINKED TOGETHER. FLOOR PLAN GRAPHIC SCREENS SHALL BE USED TO SHOW WHERE EQUIPMENT IS LOCATED IN THE BUILDING AND TO LINK TO THE RELATED GRAPHIC SCREENS. REFER TO DIVISION 23 FOR FURTHER REQUIREMENTS.
 - 4 X REPRESENTS THE ASSOCIATED HEAT EXCHANGER OR PUMP DESIGNATION.
- GENERAL NOTES**
1. SEE DIVISION 15 SPECIFICATIONS FOR REQUIREMENTS ASSOCIATED WITH THE EMCS.



4 CHILLED WATER CONTROL SCHEMATIC
SCALE: NTS

- CHILLED WATER SYSTEM : CONTROL**
- A. GENERAL: THE GENERAL MOTORS DESIGN DOME CHILLED WATER SYSTEM IS SERVED BY CAMPUS CHILLED WATER SYSTEM. THE CHILLED WATER PUMPS ARE EACH SIZED FOR FULL BUILDING LOAD TO BOOST SYSTEM PRESSURE IF NECESSARY. CHWP-1 IS THE PRIMARY BOOSTER PUMP AND CHWP-2 IS THE STANDBY BOOSTER PUMP. THE SYSTEM IS DESIGNED TO OPERATE FIRST USING THE CHILLED WATER SUPPLY BY PASS CONTROL VALVE V-CHWS-1. IF THAT WILL NOT SATISFY THE BUILDING STATIC PRESSURE OR THE COIL CONTROL VALVES ARE FULL OPEN AND THE SUPPLY AIR TEMPERATURE IS NOT MAINTAINED, THEN ONE CHILLED WATER PUMP WILL OPERATE.
- B. CHILLED WATER BYPASS VALVE (V-CHWS-1) CONTROL. THE EMCS SHALL CONTROL THE CHILLED WATER BYPASS CONTROL VALVE THE PERCENT OPEN TO MAINTAIN DIFFERENTIAL PRESSURE AS SENSED BY THE DIFFERENTIAL PRESSURE SENSOR LOCATED 3/4 OF THE WAY DOWN THE MAJOR SUPPLY CHILLED WATER BRANCH AT THE DIFFERENTIAL PRESSURE SET POINT INITIALLY DETERMINED BY TEST AND BALANCE AND SET BY CONTROLS CONTRACTOR (FIELD ADJ.). WHEN THE DIFFERENTIAL PRESSURE IS BELOW THE SET POINT AT THE DIFFERENTIAL PRESSURE SENSOR OR THE CHILLED WATER COIL CONTROL VALVES ARE FULL OPEN AND NOT MAINTAINING THE SUPPLY AIR SET POINT, A CHILLED WATER BOOSTER PUMP SHALL START AND ITS SPEED SHALL INCREASE AND WHEN THE DIFFERENTIAL PRESSURE IS ABOVE THE SET POINT AT THE DIFFERENTIAL PRESSURE SENSOR, THE PUMP SPEED SHALL DECREASE. WHEN A PUMP IS OFF OR DESIGNATED FAILED/MAINTENANCE.
- C. CHILLED WATER PUMP CONTROL:
1. CHILLED WATER PUMP (CHWP-1 AND CHWP-2) OPERATION: HVA SETTINGS SHALL BE PROVIDED AS PART OF THE VARIABLE FREQUENCY DRIVES THROUGH THE DRIVES KEYPAD FOR THE ASSOCIATED PUMP. WHEN IN THE HAND MODE, THE ASSOCIATED PUMP SHALL BE STARTED. IN THE OFF MODE, THE ASSOCIATED PUMP SHALL BE OFF. IN THE AUTO MODE, THE PUMPS SHALL BE STARTED AND STOPPED THROUGH THE EMCS. PROVIDE AN ADJUSTABLE DELAY ON HANG RELAY WIRED BOTH IN THE HAND AND AUTO MODES. TO STAGGER THE RESTART OF EACH PIECE OF EQUIPMENT AFTER A POWER FAILURE TO PREVENT CREATING A SPIKE IN THE FACILITY ELECTRICAL DEMAND.
 2. CHILLED WATER PUMP (CHWP-1 AND CHWP-2) LOCAL REMOTE SPEED CONTROL: LOCAL REMOTE SETTINGS SHALL BE PROVIDED AS PART OF THE VARIABLE FREQUENCY DRIVE THROUGH THE DRIVES KEYPAD FOR THE CHILLED WATER SYSTEM PUMPS IN THE LOCAL MODE. THE PUMPS SPEED SHALL BE CONTROLLED THROUGH A MANUAL SPEED CONTROL LOCATED AT THE DRIVE CONTROL PANEL. IN THE REMOTE MODE, THE PUMPS SPEED SHALL BE CONTROLLED BY THE EMCS.
 3. CHILLED WATER PUMP (CHWP-1 AND CHWP-2) AUTOMATIC START/STOP CONTROL: WHEN THE LEAD OR STANDBY PUMP IS STARTED, A COMMAND SHALL BE SENT TO THE PUMPS VARIABLE FREQUENCY DRIVE, STARTING THE ASSOCIATED PUMP. WHEN THE EMCS SENDS A STOP COMMAND TO THE VARIABLE FREQUENCY DRIVE, THE ASSOCIATED PUMP SHALL STOP.
 4. CHILLED WATER SYSTEM PUMP (CHWP-1 AND CHWP-2) FAILURE: THE LEAD PUMP SHALL BE COMMANDED BY THE EMCS TO OPERATE WHEN THERE IS A DEMAND FOR CHILLED WATER. IN THE EVENT THAT A PUMP SHOULD FAIL, THE EMCS SHALL SEND A STOP SIGNAL TO THE FAILED PUMPS VARIABLE FREQUENCY DRIVE, GENERATE AN ALARM AT THE EMCS, AND START THE STANDBY PUMP. UPON PROOF BY THE ASSOCIATED CURRENT SENSING RELAY THAT THE STANDBY PUMP IS RUNNING, THE EMCS SHALL SWITCH THE STANDBY PUMP DESIGNATION FROM STANDBY TO PRIMARY AND THE FAILED PUMP SHALL BE DESIGNATED 'FAILED/MAINTENANCE' BY THE EMCS. EVERY MONTH THE EMCS SHALL ALTERNATE THE LEAD/STANDBY DESIGNATIONS FOR THE PUMPS.
 5. CHILLED WATER SYSTEM PUMP (CHWP-1 AND CHWP-2) SPEED CONTROL: WHEN THE LEAD PUMP IS ON, THE EMCS SHALL CONTROL THE SPEED OF THE PUMP TO MAINTAIN DIFFERENTIAL PRESSURE AS SENSED BY THE DIFFERENTIAL PRESSURE SENSOR LOCATED 3/4 OF THE WAY DOWN THE MAJOR SUPPLY CHILLED WATER BRANCH AT THE DIFFERENTIAL PRESSURE SET POINT INITIALLY DETERMINED BY TEST AND BALANCE AND SET BY CONTROLS CONTRACTOR (FIELD ADJ.). WHEN THE DIFFERENTIAL PRESSURE IS BELOW THE SET POINT AT THE DIFFERENTIAL PRESSURE SENSOR, THE PUMP SPEED SHALL INCREASE AND WHEN THE DIFFERENTIAL PRESSURE IS ABOVE THE SET POINT AT THE DIFFERENTIAL PRESSURE SENSOR, THE PUMP SPEED SHALL DECREASE. WHEN A PUMP IS OFF OR DESIGNATED FAILED/MAINTENANCE, THE VFD SHALL BE COMMANDED BY THE EMCS TO THE UNLOADED POSITION (0%).
- D. MONITORING:
1. EQUIPMENT STATUS: CURRENT RELAYS SHALL BE USED TO MONITOR THE STATUS OF WATER PUMPS AND THE CHILLED WATER CONTROL VALVE. IF THE STATUS INDICATED DOES NOT MATCH THE COMMANDED OUTPUT, AN ALARM SHALL BE GENERATED.
 2. ADDITIONAL MONITORING: IN ADDITION TO THE POINTS MENTIONED IN THESE SEQUENCES PROVIDE THE ADDITIONAL MONITORING POINTS LISTED IN THE 'EMCS POINT FUNCTION SCHEDULE'.
- E. FAILURE MODE: UPON LOSS OF CONTROL SIGNAL OR ELECTRICAL POWER THE CONTROL DEVICES SHALL FAIL IN THE MANNER INDICATED IN THE 'EMCS POINT FUNCTION SCHEDULE' ON THE DRAWINGS.
- H. CHILLED WATER PUMP BYPASS VALVE SHALL OPEN TO MAINTAIN MINIMUM FLOW THROUGH THE PUMPS.

POINT NAME	HARDWARE	SOFTWARE											GRAPHICS	ALARM LIMITS	NOTES		
		FAIL MODE	DIRECT DIGITAL CONTROL	SET POINT ADJUSTMENT	TOTALIZER	RUN TIME	ALARMS/LIMITS	SOFTWARE INTERLOCKS	TRENDS	2-D GRAPHICS	FLOOR PLAN	POINT LIST					
CHWS WATER SYSTEM (CHWP-1, CHWP-2 & V-CHWS-1)																	
CAMPUS CHWS SUPPLY CALCULATED BTU	CAMPUS BTU-2																CALCULATED FROM CAMPUS FLOW & TEMPERATURES
CAMPUS CHILLED WATER BYPASS MODULATING VALVE	CAMPUS BYPASS-C-CHWS-1																
CHWS WATER PUMP FAULT ALARM	CHWP-X-AX-1																TYPICAL FOR 2
CHWS WATER PUMP SPEED CONTROL	CHWP-X-CI-1																TYPICAL FOR 2
CHWS HOT WATER PUMP STATUS	CHWP-X-CT-1																TYPICAL FOR 2
CHWS HOT WATER PUMP START/STOP	CHWP-X-SS-1																TYPICAL FOR 2
CHWS WATER SYSTEM RETURN TEMPERATURE	CHWS-T-1																
CHWS WATER SYSTEM SUPPLY TEMPERATURE	CHWS-T-2																CHWS WATER TEMPERATURE
CHWS WATER SYSTEM FLOW	CHWR-FM-1																CHWS WATER FLOW
CHWS WATER SYSTEM DIFFERENTIAL PRESSURE TRANSMITTER	CHWS-DPT-1																
BUILDING CHILLED WATER PUMP BYPASS VALVE	PUMP BYPASS-CHWS																

SITE/BUILDING PLAN & NORTH ARROW

DISCLAIMER & TYPICAL NOTES

REVISIONS

NO.	DATE	DESCRIPTION	BY	CHECKED
1				

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Worldwide Facilities Group

General Motors Corporation

Warren Technical Center Campus
Site ID: 1563

Structure ID: 4235
Level:

MECHANICAL HVAC CONTROLS

DATE: 22MAY13

SCALE: 12" = 1'-0"

PROJECT NUMBER: MH8-104