

SEQUENCE OF OPERATION: TERTIARY CHILLED WATER SYSTEM

THE TERTIARY CHILLED WATER SYSTEM SHALL BE CONTROLLED BY LOCAL EMCS OPERATOR COMMAND AT THE BUILDING DDC CONTROLLER OR LOCAL DDC CONTROLLER, OR BY EMCS SOFTWARE. WHEN TERTIARY CHILLED WATER SYSTEM IS COMMANDED ON, TERTIARY CHILLED WATER PUMP CWP-01 SHALL BE ENABLED. IN AUTOMATIC MODE PUMP SHALL START AND RUN BASED ON A CALL FOR COOLING IN THE AREAS SERVED BY THE CHILLED WATER SYSTEM.

WHEN PUMP IS RUNNING, DIFFERENTIAL PRESSURE TRANSMITTER DPT-01 SHALL MODULATE PUMP SPEED TO MAINTAIN PRESSURE SETPOINT. IF PUMP CWP-01 FAILS TO RUN WHEN CALLED TO OPERATE, PUMP CWP-02 SHALL START AND RUN. PUMP OPERATION SHALL BE VERIFIED BY CURRENT SENSORS AND DIFFERENTIAL PRESSURE TRANSMITTERS.

WHEN TERTIARY CHILLED WATER PUMP IS RUNNING, TEMPERATURE CONTROL VALVE TCV-01 SHALL MODULATE TO MAINTAIN TEMPERATURE SETPOINT OF TERTIARY CHILLED WATER SUPPLY AT TEMPERATURE TRANSMITTER TS-02. TEMPERATURE SENSORS TS-01 AND TS-03 SHALL MONITOR THE TEMPERATURE DOWNSTREAM OF CONTROL VALVE TCV-01 AND OF THE TERTIARY CHILLED WATER RETURN RESPECTIVELY. FLOW METER FM-01 SHALL MEASURE THE FLOW RATE OF CHILLED WATER FROM THE CAMPUS CHILLED WATER DISTRIBUTION SYSTEM. PRESSURE SENSOR PS-01 SHALL MONITOR PRESSURE OF TERTIARY CHILLED WATER SUPPLY FROM CAMPUS SYSTEM.

IN OCCUPIED MODE, BOTH CHILLED WATER PUMPS SHALL BE DISABLED.

UPON PROOF OF RUN STATUS OF EITHER TERTIARY CHILLED WATER PUMPS, THE TEMPERATURE CONTROL VALVE TCV-01 SHALL BE MODULATED AS REQUIRED TO MAINTAIN THE BUILDING CHILLED WATER SETPOINT AT TEMPERATURE SENSOR TS-02. THE BUILDING CHILLED WATER SUPPLY TEMPERATURE SETPOINT FOR THE TERTIARY LOOP SHALL BE RESET FROM A MINIMUM OF 42F AT AN OUTSIDE AIR TEMPERATURE OF 70F AND ABOVE (ADJ.) TO A MAXIMUM OF 48F (ADJ.) AT AN OUTSIDE AIR TEMPERATURE OF 50F (ADJ.) OR BELOW.

ON LOSS OF PROOF OF RUN STATUS OF BOTH TERTIARY CHILLED WATER PUMPS CWP-01 AND CWP-02, THE TEMPERATURE CONTROL VALVE TCV-01 SHALL BE CLOSED.



EQUIPMENT INPUT/OUTPUT SUMMARY

POINT NAME	BO		BI			AI			AO		PROGRAMS				GRAGHIC							
	ENABLE / DISABLE	OPEN / CLOSE	STATUS	POSITION	PULSE - TOTALIZING	FLOW STATUS	KW / KWH	FREQUENCY	VOLTS / AMPS	PRESSURE	TEMPERATURE	FLOW	LEVEL	TIME		ELECTRIC	RESET	HI LIMIT ALARM	LOW LIMIT ALARM	ABNORMAL OFF	RUN TIME TOTAL	
TERTIARY CHILLED WATER PUMP CWP-01	●		●												●						●	
CWP-01 VFC STATUS			●																			●
CWP-01 VFC FAULT			●																			●
CWP-01 VFC HAND-OFF-AUTO			●																			●
CWP-01 VFC SPEED							●	●														●
CWP-01 VFC FREQUENCY							●															●
CWP-01 VFC ALARM																						●
CWP-01 VOLTAGE EACH PHASE								●	●													●
CWP-01 CURRENT EACH PHASE								●														●
CWP-01 POWER								●														●
CWP-01 POWER FACTOR																						●
CWP-01 VFC ACCELERATION TIME									●	●												●
CWP-01 VFC DECELERATION TIME										●	●											●
CWP-01 STATUS. DPT-01										●												●
TERTIARY CHILLED WATER PUMP CWP-02			●																			●
CWP-02 VFC STATUS																						●
CWP-02 VFC FAULT																						●
CWP-02 VFC HAND-OFF-AUTO																						●
CWP-02 VFC SPEED								●	●													●
CWP-02 VFC FREQUENCY								●														●
CWP-02 VFC ALARM																						●
CWP-02 VOLTAGE EACH PHASE									●	●												●
CWP-02 CURRENT EACH PHASE									●													●
CWP-02 POWER									●													●
CWP-02 POWER FACTOR																						●
CWP-02 VFC ACCELERATION TIME									●	●												●
CWP-02 VFC DECELERATION TIME										●	●											●
CWP-02 STATUS. DPT-01										●												●
TERTIARY CHS WATER TEMP FROM CAMPUS, TS-01											●											●
TERTIARY CHSMIXED WATER TEMP, TS-02											●											●
TERTIARY CHR WATER TEMP, TS-03											●											●
TERTIARY CHILLED WATER SUPPLY FLOW, FM-01												●										●
TERTIARY CHILLED WATER SUPPLY PRESSURE, PS-01													●									●
TERTIARY CHILLED WATER SUPPLY PRESSURE, PS-02														●								●

Facilities
Management
Energy Services
P. (405) 744-7131
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OKLAHOMA STATE UNIVERSITY
ENGINEERING STANDARDS
MECHANICAL CONTROL STANDARD

DRAWN BY: C.SPENCER
CHECKED BY:
APPROVED BY:
DATE: 03-15-2018
PROJECT #:
SCALE: NTS

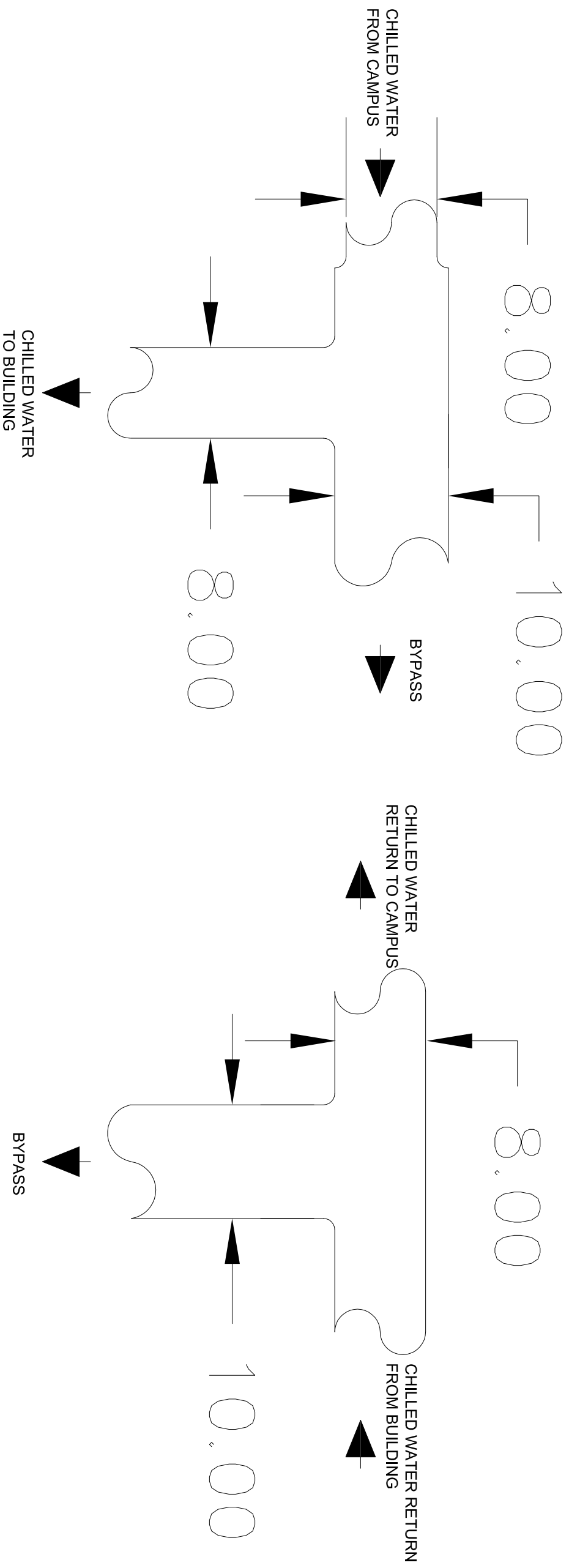
CONTROLS TABLE
OSU E.S. STANDARDS

SHEET NUMBER

2

DESIGN GUIDELINES FOR TERTIARY PUMP SETUP

- 1 - THE DIFFERENTIAL PRESSURE SENSOR MUST BE INSTALLED AS NEAR AS POSSIBLE TO THE FURTHEST LOAD IN THE BUILDING . .
- 2 - THE DIFFERENTIAL PRESSURE SETPOINT MUST BE CONFIRMED BY PRESSURE READINGS AT THE PROPOSED INSTALLATION LOCATION OF THE DIFFERENTIAL PRESSURE SENSOR. ALL VALVES DOWNSTREAM SHALL BE OPEN AT 100% BEFORE PRESSURE READINGS ARE TAKEN.
- 3 - A SECOND DIFFERENTIAL PRESSURE SENSOR SHALL BE INSTALLED ACROSS A LARGE LOAD FOR WHICH PROPER FLOW MUST BE MAINTAINED.
- 4 - HYDRAULIC BRIDGE PIPING SHALL BE OVERSIZED BY ONE STANDARD PIPE DIAMETER OVER SUPPLY AND RETURN PIPING SIZE, IN ORDER TO LIMIT PRESSURE DROP ACROSS BRIDGE.
- 5 - HYDRAULIC BRIDGE LENGTH SHOULD BE MAXIMIZED. IT SHALL BE NO LESS THAN TWO (2) PIPE DIAMETERS AND NO MORE THAN TEN (10) PIPE DIAMETERS IN LENGTH (REF. SUPPLY AND RETURN PIPING).
- 6 - CHECK VALVE IN BRIDGE MUST OF THE NON-SLAM TYPE, AND BE ORIENTED TO PERMIT FLOW FROM RETURN TO SUPPLY.
- 7 - HYDRAULIC BRIDGE MUST BE DESIGNED TO AVOID A BULL HEAD CONFIGURATION (SEE BELOW FOR EXAMPLES). DESIGN MUST BE REVIEWED BY OSU ENERGY SERVICES.
- 8 - FOLLOW MANUFACTURER'S RECOMMENDATIONS FOR REQUIRED STRAIGHT PIPE LENGTHS UPSTREAM AND DOWNSTREAM OF THE FLOW METER.
- 9 - ALL THREADELETS TO BE $\frac{3}{4}$ " FNPT



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