

### **23 21 25\_CHW DISTRICT INTERCONNECTION**

To insure operational stability, reliability, and energy efficiency of the central campus chilled water (CHW) plants and district, the following guidance is provided. The two drawings provided in Attachment A illustrate the principles of operation to be adhered to when designing a new building, or a significant building renovation, with an interconnection to the central campus CHW District.

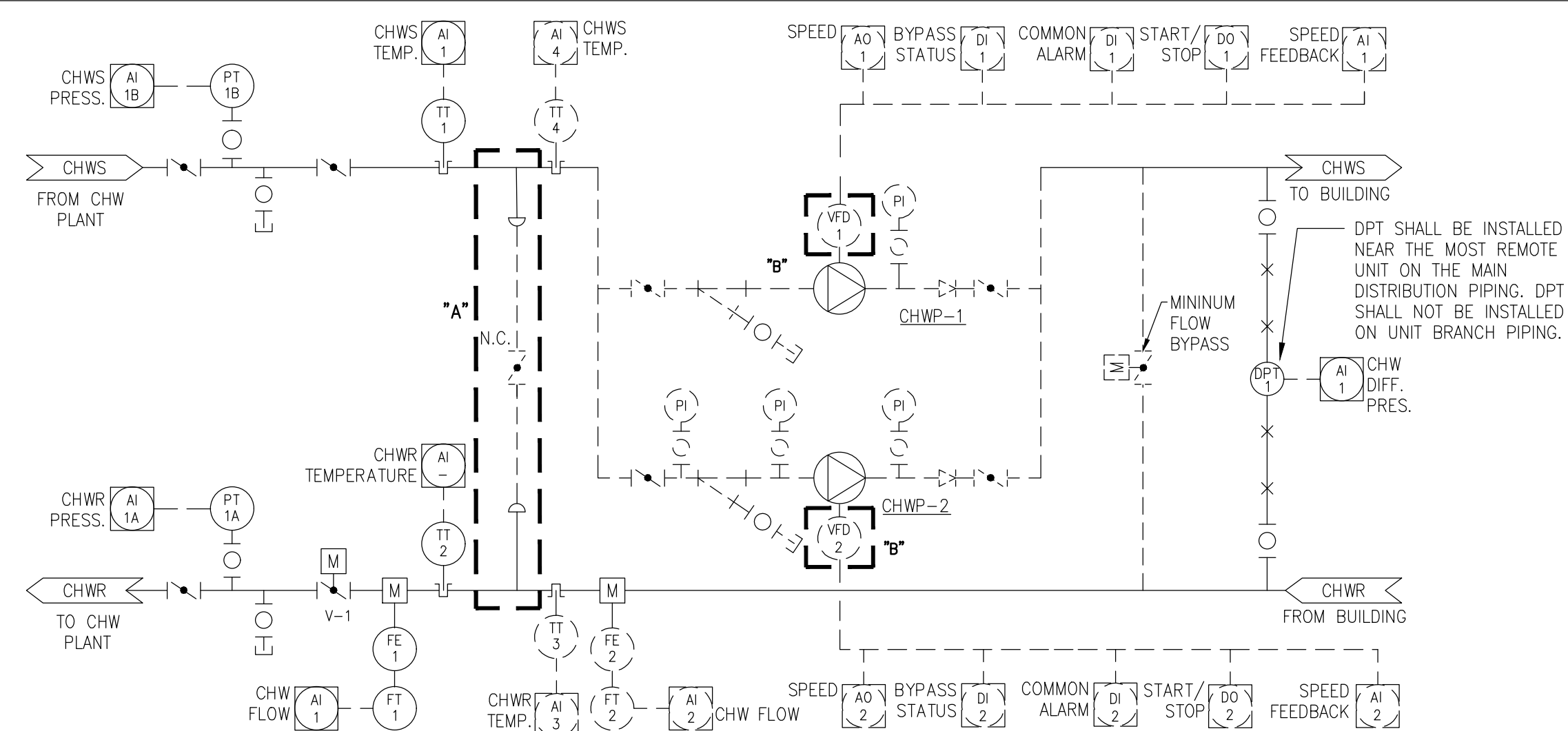
Additionally, as described in Section 23 00 00: 1) There are to be no 3-way valves or open bypasses on any CHW system equipment connected to the CWH District. 2) Process cooling water loops in buildings are to be separated from the District via an appropriately designed heat exchanger.

The information provided in this document is technical guidance on the principles of operation of the Central Campus CHW district for operational stability, reliability and energy efficiency. The designer of record on the specific project is responsible the development of the project specific engineering/drawings/documentation related to this guidance.

**END OF SECTION**

## **ATTACHMENT A**





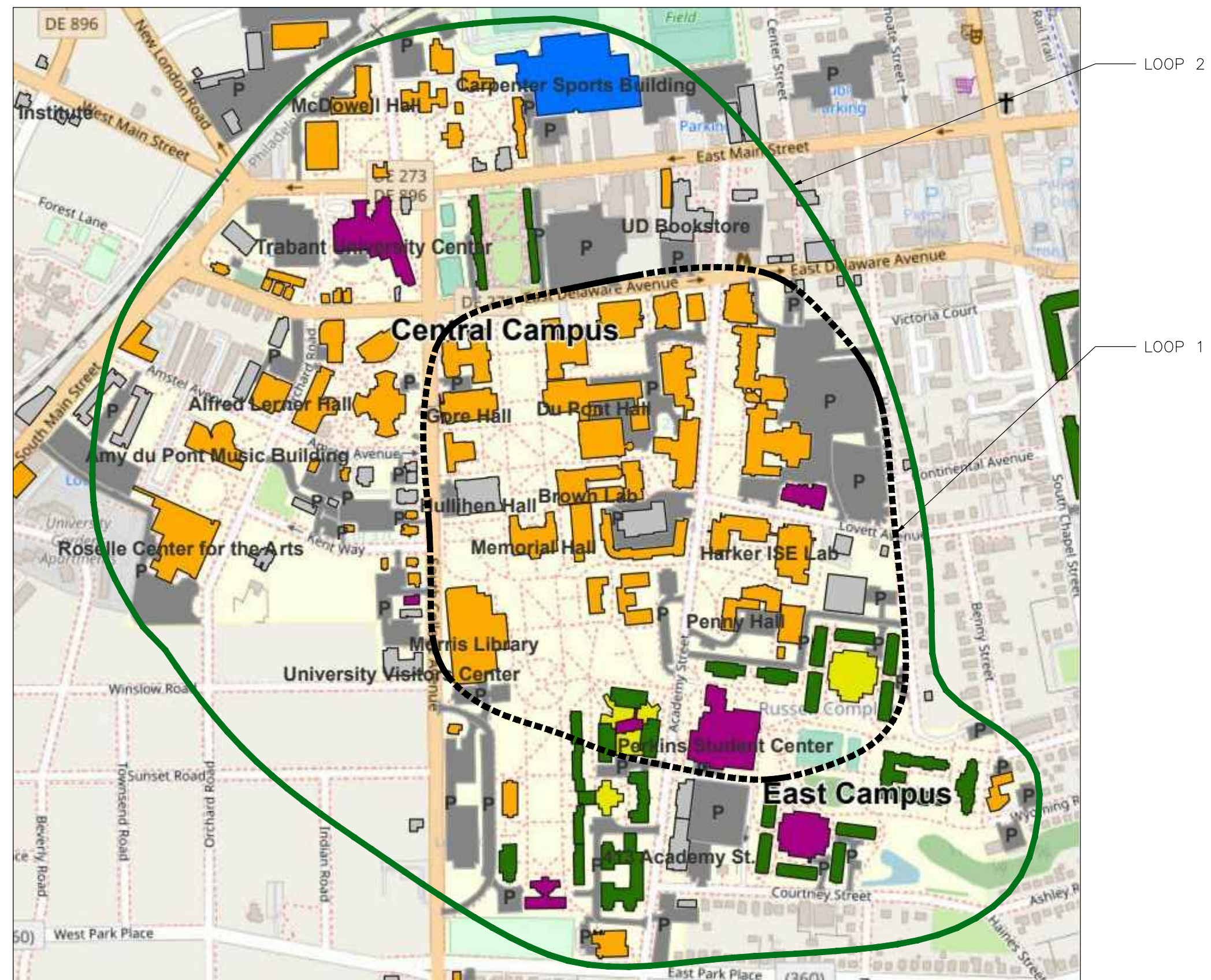
2) BUILDING PIPING WITH VFD PUMPS AND NO BYPASS – INSIDE LOOP 2

CONFIGURATIONS:

- A. THE FOLLOWING ACTIONS WILL BE TAKEN WITH THE EXISTING DECOUPLER
1. IF BUILDING CHILLED WATER SHUTDOWN IS REQUIRED FOR OTHER WORK ASSOCIATED WITH THIS SCOPE, REMOVE DECOUPLER PIPING AND CAP.
  2. IF THE DECOUPLER DOES NOT HAVE A MANUAL OR AUTOMATIC ISOLATION VALVE, REMOVE DECOUPLER PIPING AND CAP.
  3. IF THERE IS NO CHW SHUTDOWN/DRAIN-DOWN REQUIRED AND THERE IS A MANUAL OR AUTOMATIC ISOLATION VALVE IN THE DECOUPLER, CLOSE MANUAL VALVE OR REMOVE ACTUATOR OF AUTOMATIC VALVE AND CLOSE.
- B. VFDs SHALL BE INSTALLED ON CHILLED WATER PUMPS IF NOT ALREADY EXISTING.

SEQUENCE OF OPERATIONS:

1. CHWP-1/2 SHALL RUN IN LEAD LAG ARRANGEMENT. THE PUMPS SHALL MODULATE TO MAINTAIN THE DP SET-POINT PRESSURE OF 10 PSID (ADJ) AT DP1-1. THE PUMPS SHALL AUTO-ROTATE LEAD/LAG EVERY 200 HOURS OF OPERATION. IF THE LEAD PUMP SPEED REACHES 85% THE LAG PUMP SHALL START AND RUN IN UNISON OFF THE SAME PID LOOP. WITH BOTH PUMPS RUNNING THE LAG PUMP SHALL TURN OFF IF THE SPEED DROPS TO 55%.
- 1.1. IF PUMPS ARE OFF AND DP1-1 GOES 3 PSID ABOVE THE DP SET-POINT FOR 5 MINUTES, PUMPS SHALL TURN OFF.
- 1.2. IF PUMPS ARE OFF V-1 SHALL MODULATE TO MAINTAIN DP SETPOINT.
- 1.3. IF PUMPS ARE OFF AND DP1-1 IS 1 PSID BELOW THE SETPOINT FOR 5 MINUTES, PUMP SHALL ENGAGE AT MINIMUM SPEED.
2. IF BUILDING HAS AN EXISTING MINIMUM FLOW BYPASS AND IF ANY PUMPS ARE RUNNING, MIN FLOW BYPASS SHALL MODULATE VIA DIRECT ACTING PID LOOP TO MAINTAIN A DP SET-POINT OF 15PSID ABOVE THE CONTROL SETPOINT.
3. THE CHW RETURN VALVE V-1 SHALL CLOSE IF THE OAT DROPS BELOW 35 °F (ADJ) UNLESS THE BUILDING REQUIRES YEAR-ROUND COOLING FOR PROCESS.



## HYDRAULIC LOOPS FOR CENTRAL CAMPUS PLANTS

## REVISIONS

CHW DISTRICT  
OPTIMIZATION  
PROGRAM

# CHW DISTRICT INTERCONNECTION STANDARD - EXISTING BUILDING

M-101





1. BUILDING SHALL BE DESIGNED TO FUNCTION WITH 30 FT OF DIFFERENTIAL PRESSURE HEAD AVAILABLE AT BUILDING WALL.



1. CHWP-1/2 SHALL RUN IN LEAD LAG ARRANGEMENT. THE PUMPS SHALL MODULATE TO MAINTAIN THE DP SET-POINT PRESSURE OF 10 PSID (ADJ) AT DP-1 - THE PUMP SHALL AUTO-ROTATE LEAD/LAG EVERY 200 HOURS OF OPERATION. IF THE LEAD PUMP SPEED REACHES 85% THE LAG PUMP SHALL START AND RUN IN UNION OFF THE SAME PID LOOP. WITH BOTH PUMPS RUNNING THE LAG PUMP SHALL TURN OFF IF THE SPEED DROPS TO 55%.
  - 1.1. IF PUMPS ARE AT MINIMUM SPEED AND DP PRESSURE AT DP-1 GOES 3 PSID ABOVE THE DP SET-POINT FOR 5 MINUTES, PUMPS SHALL TURN OFF.
  - 1.2. IF PUMPS ARE OFF AND DP PRESSURE AT DP-1 IS 1 PSID BELOW THE SETPOINT FOR 5 MINUTES, PUMP SHALL ENGAGE AT MINIMUM SPEED.
2. IF BUILDING HAS AN EXISTING MINIMUM FLOW BYPASS AND IF ANY PUMPS ARE RUNNING, MIN FLOW BYPASS SHALL MODULATE VIA DIRECT ACTING PID LOOP TO MAINTAIN A DP SET-POINT OF 15PSID ABOVE THE CONTROL SETPOINT.
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FLOW METER SCHEDULE (FURNISHED AND INSTALLED BY CONTROLS CONTRACTOR)													
TAG	TYPE	MAKE	MODEL NUMBER	TRANSDUCER LOCATION	PIPE SIZE INCHES	FLUID TEMPERATURE	PIPE MATERIAL	WETTED MATERIAL	ENCLOSURE	OUTPUT	ACCURACY	POWER	
						°F						V/PHHZ	W
FM-X	INSERTION MAGMETER	ONICON	F3500	CHW RETURN	-	42-95	STEEL	316 SS	NEMA TYPE 4X	4-20 mA	1% FLOW READING	24VDC	-

NOTES:

1. MAINTAIN MINIMUM STRAIGHT RUN PER MANUFACTURER'S RECOMMENDATION.

TEMPERATURE TRANSMITTERS SCHEDULE ( ADD ALTERNATE - FURNISHED AND INSTALLED BY CONTROLS CONTRACTOR)														
TAG	SERVICE	SENSOR TYPE	MAKE	MODEL NUMBER	OUTPUT	EXCITATION	NUMBER OF WIRES	ACCURACY	RANGE	MAX OPERATING TEMPERATURE	MAX OPERATING PRESSURE	CONNECTION TYPE(S)	CONSTRUCTION	OPTIONS
TT-X	CHWSR	IMMERSON RTD	KELE	ST-W85	4-20 mA	24 VDC	-	+/- 0.27°F	-40°F TO 221°F	80°F	150 PSIG	THERMOWELL	SS WETTED PARTS	CALIBRATION CERT
NOTES: 1. ALL THERMOWELLS TO BE FILLED WITH THERMAL CONDUCTIVE GREASE														

VALVE ACTUATOR SCHEDULE (FURNISHED AND INSTALLED BY CONTROLS CONTRACTOR)														
TAG	PROCESS DATA							ACTUATOR DATA					MAKE/MODEL	ACCESSORIES
	SERVICE	FLOW (GPM)			MAX DESIGN PRESSURE (PSIG)	MAX DESIGN TEMPERATURE (F)	CLOSE-OFF PRESSURE (PSI)	TYPE	POWER (VAC/PH/Hz)	MOUNTING	ACTION / FAIL POSITION	CONTROL SIGNAL		
MAX		MIN	AVERAGE											
-	CHW	-	-	-	150	100	100	ELECTRIC	24VAC	INTEGRAL TO VALVE	MODULATING / LAST	0-10V	NEMA 2X	BELIMO/ CCV
NOTES:														
1. FOR OUTSIDE AIR UNITS EQUIPPED WITH FREEZE STATS, VALVES SHALL BE FAIL SAFE SPRING RETURN NORMALLY CLOSED.														

VALVE SCHEDULE (FURNISHED AND INSTALLED BY MECHANICAL CONTRACTOR)																	
TAG	PROCESS DATA							VALVE DATA									
	SERVICE	FLOW (GPM)			MAX DESIGN PRESSURE (PSIG)	MAX DESIGN TEMPERATURE (F)	CLOSE-OFF PRESSURE (PSI)	TYPE	SIZE	BODY	ANSI PRESSURE CLASS	LEAK CLASS	MATERIAL				MAKE/MODEL
		MAX	MIN	AVERAGE									BODY	STEM/DISC	PACK/SEAT	SPRING/TRIM/BALL	
-	CHW	-	-	-	150	100	100	RESILIENT SEATED BUTTERFLY	> = 6"	150# LUGGED	150		CI	316SS	EPDM	-	ABZ/397
-	CHW	-	-	-	150	100	100	FLANGED THREE PIECE, FULL PORT BALL VALVE	2-1/2" - 4"	125#	150		BRONZE	-	TEFLON	SS	NIBCO
-	CHW	-	-	-	150	100	100	TWO PIECE, FULL PORT BALL VALVE	< 2"	125#	150		BRONZE	-	TEFLON	SS	APOLLO/70-150
-	CHW	-	-	-	150	100	100	GLOBE SILENT CHECK VALVE	-	125#	125		CS	SS	VITON	SS	TITAN/ CV51-CS
NOTES : 1. REFER TO DRAWING DRAWINGS FOR SIZE AND FLOWS																	

INSTRUMENTATION AND CONTROL SENSORS SCHEDULE (FURNISHED AND INSTALLED BY CONTROLS CONTRACTOR, TAPS AND VALVES INSTALLED BY MECHANICAL)															
TAG	SERVICE	SENSOR TYPE	MAKE	MODEL NUMBER	OUTPUT	EXCITATION	NUMBER OF WIRES	ACCURACY	OPERATING RANGE	MAX OPERATING TEMPERATURE	MAX OPERATING PRESSURE	CONNECTION TYPE(S)	CONSTRUCTION	OPTIONS	ACCESSORIES
DPT-1	CHW HEADER	DIFF PRESSURE	SCHNEIDER ELECTRIC	EPW 2104	4-20 mA	24 VDC	2	±0.1 % FS	0-100 PSID	100°F	150 PSIG	(2) 1/8" NPT (F)	SS WETTED PARTS	CALIBRATION CERTIFICATE	3-WAY COPLANAR MANIFOLD, MOUNTING BRACKET

MOTOR SCHEDULE (FURNISHED AND INSTALLED BY UD MOTOR VENDOR)																			
TAG	USE	MAKE	MODEL	MOTOR DATA															
				HP	SYNCHRONOUS SPEED	MAX SLIP	INSULATION CLASS	NEMA DESIGN	DUTY	SERVICE FACTOR ON VFD	MATERIAL			UNIT ELECTRIC DATA		EFFICIENCY			ENCLOSURE
					RPM	%					SHAFT	FRAME	BEARING	V/PH/Hz	MAX FLA AMPS	NEMA	NOM %	MIN %	
P-1	CHILLED WATER PUMP	US MOTORS	AS APPLICABLE	-	1,775	1.2	F	B	CONTINUOUS DUTY	1.15	HEAT TREATED AND STRESS RELIEVED CARBON STEEL	ROLLED STEEL	GROUNDDEED REGREASABLE STEEL BALL	460/3/60	-	PREMIUM	91.0	89.0	ODP
P-2	CHILLED WATER PUMP	US MOTORS	AS APPLICABLE	-	1,775	1.2	F	B	CONTINUOUS DUTY	1.15	HEAT TREATED AND STRESS RELIEVED CARBON STEEL	ROLLED STEEL	GROUNDDEED REGREASABLE STEEL BALL	460/3/60	-	PREMIUM	91.0	89.0	ODP
OPTIONS -																			
1. UNIT TO BE ANCHORED ON THE EXISTING FRAMES																			

VARIABLE FREQUENCY DRIVE SCHEDULE (FURNISHED AND INSTALLED BY VFD VENDOR)																															
TAG	LOCATION	SERVICE	TYPE	MAKE	MODEL NUMBER	MOTOR SIZE	EFF.	V/PH/Hz	MAX CURRENT	OUTPUT CURRENT	DISTANCE FROM MOTOR	FREQUENCY CONTROL					VOLTAGE RANGE	SHORT CIRCUIT CURRENT RATING	DRIVE FUSES	HEAT DISSIPATION	AIRFLOW REQUIREMENT	COMMUNICATION	BYPASS	ENCLOSURE	HARMONIC PERFORMANCE	REACTOR IMPEDANCE	EM/IRMI FILTERS	PROTECTION	DISCONNECT	WEIGHT	
						HP			AMPS	AMPS	FT	RANGE	ACCURACY	SETTING RESOLUTION	OUTPUT RESOLUTION	MIN										LBS					
						Hz			DIGITAL	ANALOG	DIGITAL	ANALOG	Hz	DIGITAL	ANALOG	DIGITAL										ANALOG				Hz	
VFD-1	-	P-1		ABB	ACH550	-	98%	480/3/60	-	-	-	10 - 500	0.10%	1.00%	0.1 HZ	1% OF MAX FREQ	0.01	+30% TO -35%	100,000 SCCR	-			BACNET - VFD, BYPASS, & AUX I/O	2 CONTACTOR W/ NEC RATED SERVICE SWITCH	NEMA 1	6 PULSE WITH DUAL DC CHOKES	5%		INTEGRAL CIRCUIT BREAKER	YES	
VFD-2	-	P-2		ABB	ACH550	-	98%	480/3/60	-	-	-	10 - 500	0.10%	1.00%	0.1 HZ	1% OF MAX FREQ	0.01	+30% TO -35%	100,000 SCCR	-			BACNET - VFD, BYPASS, & AUX I/O	2 CONTACTOR W/ NEC RATED SERVICE SWITCH	NEMA 1	6 PULSE WITH DUAL DC CHOKES	5%		INTEGRAL CIRCUIT BREAKER	YES	
NOTES :																															
1. ALL DRIVE COMPONENTS TO BE INSTALLED IN ONE COMPLETE UL508 ENCLOSURE																															

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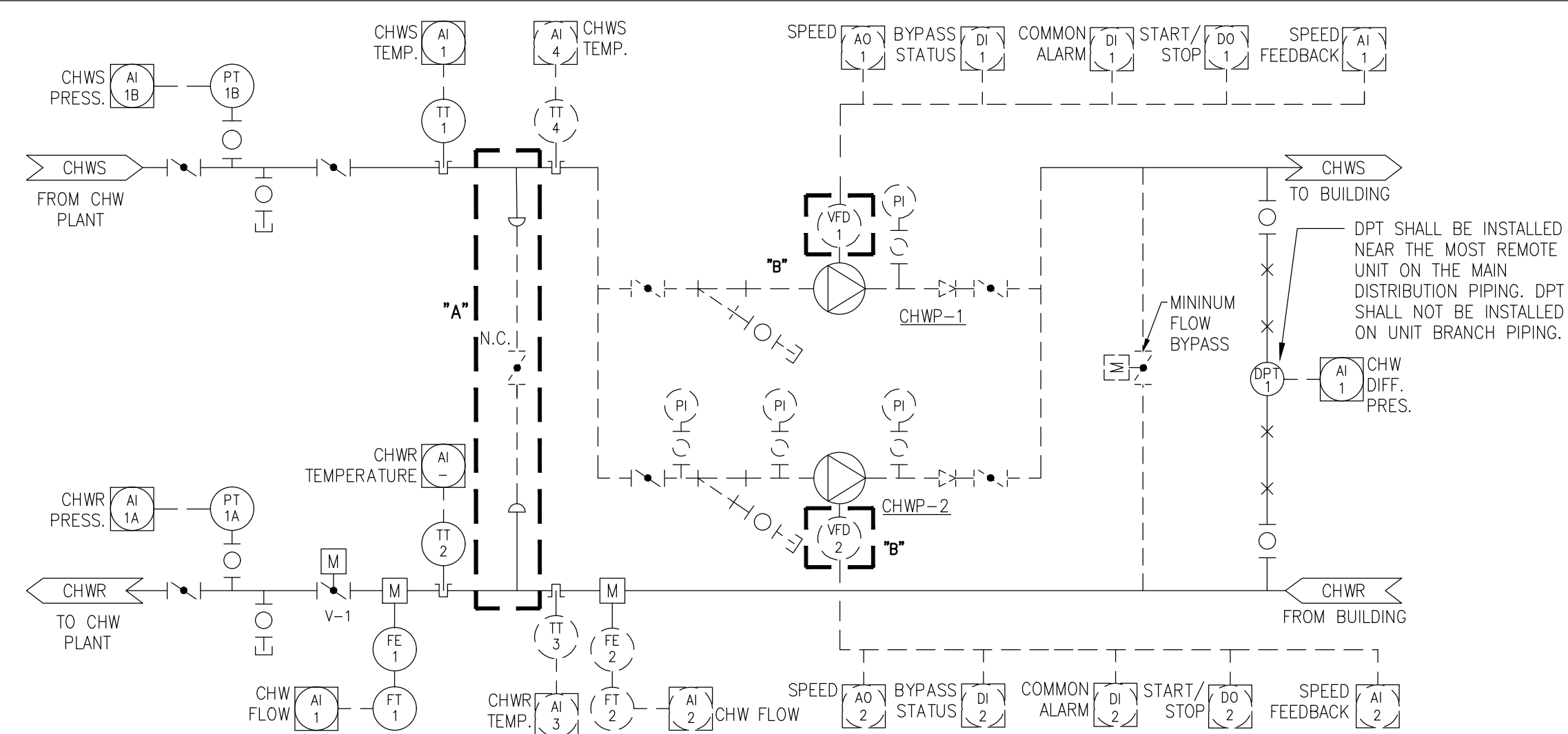
# CHW DISTRICT OPTIMIZATION PROGRAM

## CHW DISTRICT INTERCONNECTION STANDARD - SCHEDULES

PROJECT: CHW DISTRICT OPTIMIZATION
DATE: 06.27.2019
DRAWN: RN
CHECKED: TS
UD WORK ORDER #: 572963

# M-103





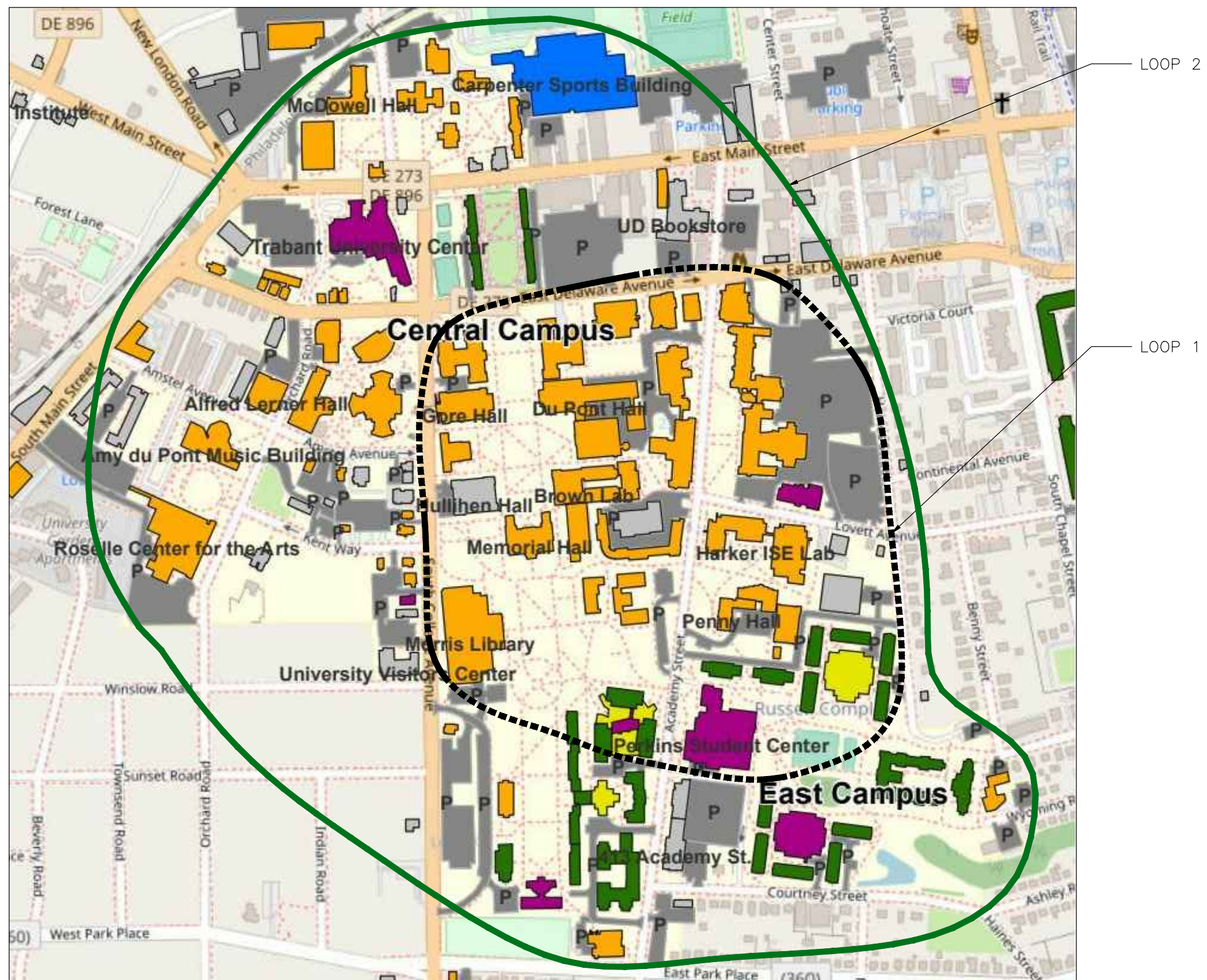
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## HYDRAULIC LOOPS FOR CENTRAL CAMPUS PLANTS

## REVISIONS

[illegible]

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# M-101





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1. CHWP-1/2 SHALL RUN IN LEAD LAG ARRANGEMENT, THE PUMPS SHALL MODULATE TO MAINTAIN THE DP SET-POINT PRESSURE OF 10 PSID (ADJ) AT DDT-1. THE PUMPS SHALL AUTO-ROTATE LEAD/LAG EVERY 200 HOURS OF OPERATION, IF THE LEAD PUMP SPEED REACHES 85% THE LAG PUMP SHALL START AND RUN IN UNION OFF THE SAME PID LOOP. WITH BOTH PUMPS RUNNING THE LAG PUMP SHALL TURN OFF IF THE SPEED DROPS TO 55%.
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