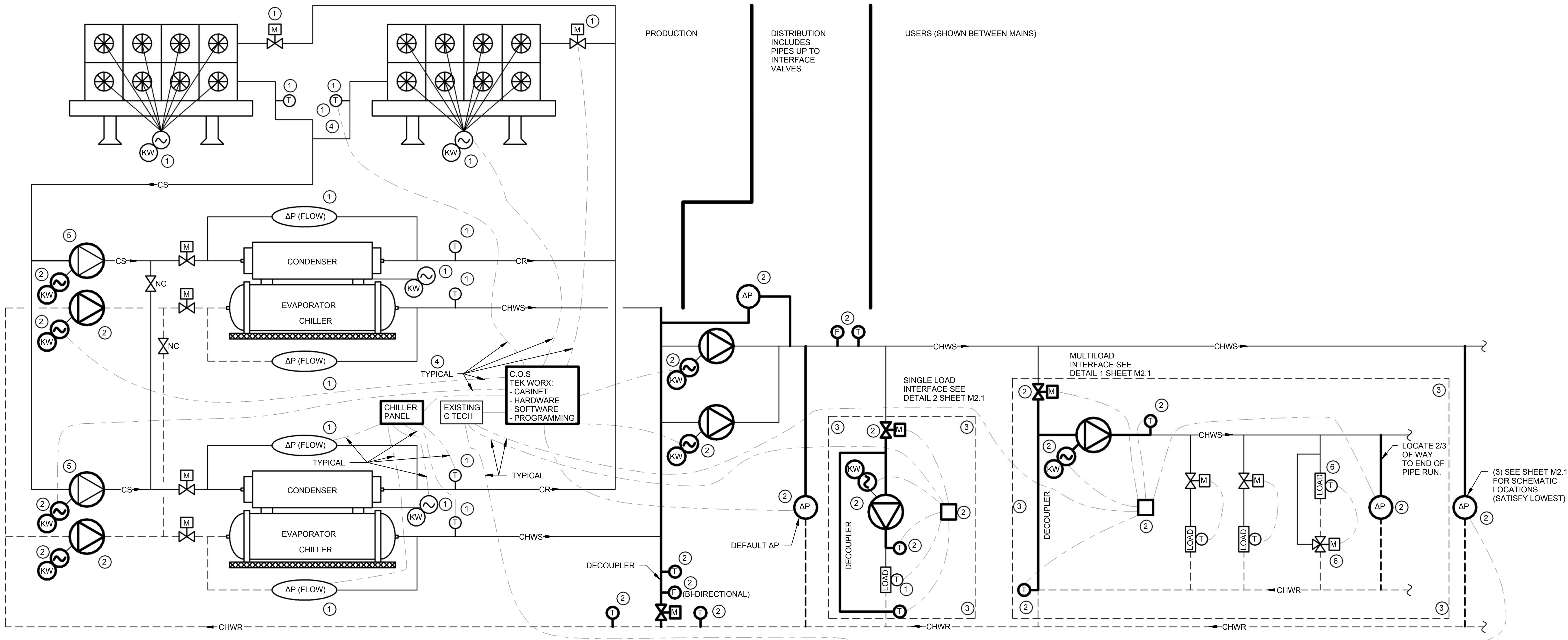
INTERFACE SCHEDULE						
Mark	Interface Type	Control Valve E/N	Max GPM	Cv	Pump E/N	Location
MCV-AHU1	SINGLE	NEW	78 GPM	25.8	NEW	10TH FLR (PENTHOUSE)
MCV-AHU2A	MULTIPLE/SPECIAL	NEW	117 GPM	51.7	N/A	BASEMENT (MECH ROOM)
MCV-AHU3	SINGLE	EXISTING	33 GPM	13.3	NEW	9TH FLR (MECH ROOM)
MCV-AHU4	SINGLE	EXISTING	169 GPM	73.1	NEW	9TH FLR (MECH ROOM)
MCV-AHU4A	MULTIPLE/SPECIAL	NEW	73 GPM	44.2	N/A	3RD FLR (PENTHOUSE)
MCV-AHU5A	MULTIPLE/SPECIAL	NEW	78 GPM	40.1	N/A	3RD FLR (PENTHOUSE)
MCV-AHU6	SINGLE	EXISTING	48 GPM	22.7	NEW	8TH FLR (MECH ROOM)
MCV-AHU7	SINGLE	EXISTING	40 GPM	18.7	NEW	7TH FLR (MECH ROOM)
MCV-AHU7A	MULTIPLE/SPECIAL	NEW	159 GPM	39.9	NEW	2ND FLR (C&E MECH ROOM)
MCV-AHU8	SINGLE	EXISTING	54 GPM	24.5	NEW	6TH FLR (MECH ROOM)
MCV-AHU9	SINGLE	EXISTING	74 GPM	33.3	NEW	5TH FLR (MECH ROOM)
MCV-AHU10	SINGLE	NEW	200 GPM	67.8	EXISTING	5TH FLR (PENTHOUSE)
MCV-AHU10(a)	SINGLE / SPECIAL	NEW	200 GPM	67.8	N/A	5TH FLR (PENTHOUSE)
MCV-AHU11	SINGLE	NEW	80 GPM	25.1	EXISTING	5TH FLR (PENTHOUSE)
MCV-AHU12	SINGLE	EXISTING	72 GPM	31.6	NEW	4TH FLR (MECH ROOM)
MCV-AHU13	SINGLE	EXISTING	44 GPM	19.8	NEW	3RD FLR (MECH ROOM)
MCV-AHU16	SINGLE	EXISTING	240 GPM	58.3	NEW	2ND FLR (KITCHEN)
MCV-AHU17	MULTIPLE	NEW	33 GPM	7.2	NEW	SUB-BASEMENT (ELEVATOR BANK)
MCV-AHU22	SINGLE	EXISTING	31 GPM	7.1	NEW	BASEMENT (ELEVATOR LOBBY)
MCV-AHU23	SINGLE	NEW	120 GPM	26.9	NEW	SUB-BASEMENT (NEAR AHU)
MCV-AHU24	SINGLE	EXISTING	69 GPM	16.6	NEW	SUB-BASEMENT (NEAR AHU)
MCV-AHU25	SINGLE	EXISTING	80 GPM	19.6	NEW	SUB-BASEMENT (NEAR AHU)
MCV-AHU31	SINGLE	NEW	132 GPM	34.7	NEW	8TH FLR (ELEVATOR LOBBY)
MCV-AHU33	SINGLE	EXISTING	165 GPM	79.6	EXISTING	4TH FLR (MECH ROOM SOUTH)
MCV-AHU39	SINGLE / SPECIAL	NEW	54 GPM	14	NEW	5TH FLR (BREAK ROOM)
MCV-AHU41	MULTIPLE/SPECIAL	NEW	12 GPM	3.7	N/A	BASEMENT (MECH ROOM)
MCV-AHU43	SINGLE	NEW	43 GPM	30.2	NEW	SUB-BASEMENT (ROOM FROM LOADING DOCK)
MCV-BLDG19	SINGLE	NEW	120 GPM	19.2	EXISTING	BASEMENT BLDG 19
MCV-BLDG 7	MULTIPLE	NEW	191 GPM	26.5	EXISTING	LAUNDRY FLOOR BLDG 7
MCV-C&E 1&2	MULTIPLE	NEW	431 GPM	81	EXISTING	BASEMENT (MECH ROOM)
MCV-C&E 3&4	MULTIPLE	NEW	913 GPM	173	NEW	BASEMENT (MECH ROOM)
MCV-CP	SPECIAL	NEW			NEW	CENTRAL PLANT
MCV-FL1	MULTIPLE	NEW	436 GPM	101.7	NEW	1ST FLR (ELEVATOR LOBBY)
MCV-FL3	MULTIPLE	NEW	180 GPM	42.2	NEW	3RD FLR (ELEVATOR LOBBY)
MCV-FL4	MULTIPLE	NEW	117 GPM	27.7	NEW	4TH FLR (ELEVATOR LOBBY)
MCV-FL6	MULTIPLE	NEW	133 GPM	32.9	NEW	6TH FLR (ELEVATOR LOBBY)
MCV-FL7	MULTIPLE	NEW	107 GPM	26.7	NEW	7TH FLR (ELEVATOR LOBBY)
MCV-FL8	MULTIPLE	NEW	110 GPM	28.6	NEW	8TH FLR (ELEVATOR LOBBY)
MCV-FL9	MULTIPLE	NEW	105 GPM	26.4	NEW	9TH FLR (ELEVATOR LOBBY)
MCV-FL10	MULTIPLE	NEW	116 GPM	32.8	NEW	10TH FLR (PENTHOUSE)
MCV-N2	MULTIPLE	NEW	94 GPM	23	NEW	2ND FLR (ELEVATOR LOBBY)
MCV-N5	MULTIPLE	NEW	29 GPM	7.3	NEW	5TH FLR (ELEVATOR LOBBY)
MCV-SW2	MULTIPLE	NEW	171 GPM	41	NEW	2ND FLR (ELEVATOR LOBBY)
MCV-SW5	MULTIPLE	NEW	148 GPM	36.9	NEW	5TH FLR (ELEVATOR LOBBY)



KEYNOTES

1. EXISTING DEVICE - NEW SIGNAL TO TECS
2. NEW DEVICE
3. ALL WORK BY TAC AND MOST REPORT / CONTROLLED BY EXISTING BAS.
4. BY TAC
5. NEW MOTOR ONLY.
6. IF LOAD REPRESENTS AHU THEN REPLACE 3-WAY VALVE WITH 2-WAY VALVE. SEE SHEET M2.1. IF LOAD REPRESENTS FCU THEN LEAVE 3-WAY IN PLACE.

CONTROL SCHEMATIC

SCALE: NONE

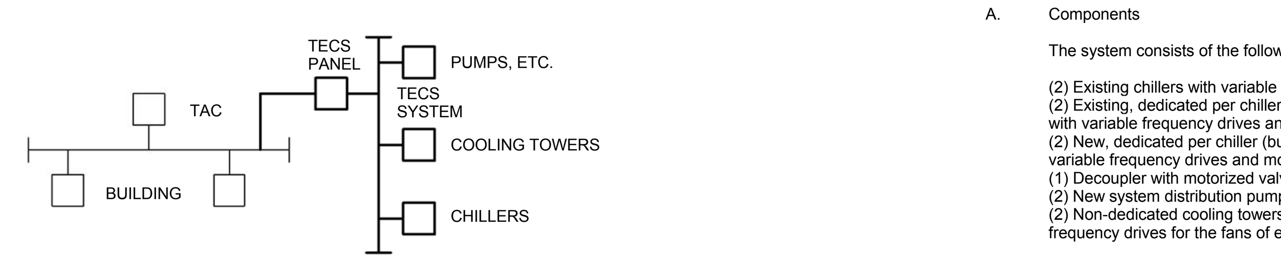
I/O Type							
	AI	4-20mA Input	HARDWARE	HARDWARE	HARDWARE	HARDWARE	
	AO	4-20mA Output					
	DI	24VDC Input					
	DO	Dry Contact					
Point Name	**Point Type**	**Origin**	**AI**	**AO**	**DI**	**DO**	**Network**
CH-1 kW	AI	tecs	✓				
CH-1 Evap DP	AI	tecs	✓				
CH-1 Cond DP	AI	tecs	✓				
CH-1 Evap LWT	AI	tecs	✓				
CH-1 Cond LWT	AI	tecs	✓				
CH-1 Demand Limit	AO	tecs		✓			
CH-1 Running	DI	tecs			✓		
CH-1 Fail	DI	tecs			✓		
CH-1 S/S (Enable)	DO	tecs				✓	
CH-2 kW	AI	tecs	✓				
CH-2 Evap DP	AI	tecs	✓				
CH-2 Cond DP	AI	tecs	✓				
CH-2 Evap LWT	AI	tecs	✓				
CH-2 Cond LWT	AI	tecs	✓				
CH-2 Demand Limit	AO	tecs		✓			
CH-2 Running	DI	tecs			✓		
CH-2 Fail	DI	tecs			✓		
CH-2 S/S (Enable)	DO	tecs				✓	
PCP-1 VFD kW	AI	tecs	✓				
PCP-1 VFD Speed Reference	AO	tecs		✓			
PCP-1 VFD Running	DI	tecs			✓		
PCP-1 VFD Fail	DI	tecs			✓		
PCP-1 Pump DPS	DI	tecs			✓		
PCP-1 S/S (Enable)	DO	tecs				✓	
PCP-2 VFD kW	AI	tecs	✓				
PCP-2 VFD Speed Reference	AO	tecs		✓			
PCP-2 VFD Running	DI	tecs			✓		
PCP-2 VFD Fail	DI	tecs			✓		

Point Name	**Point Type**	**Origin**	**AI**	**AO**	**DI**	**DO**	**Network**
PCP-2 Pump DPS	DI	tecs			✓		
PCP-2 S/S (Enable)	DO	tecs				✓	
SCHWP-1 VFD kW	AI	tecs	✓				
SCHWP-1 VFD Speed Reference	AO	tecs		✓			
SCHWP-1 VFD Running	DI	tecs			✓		
SCHWP-1 VFD Fail	DI	tecs			✓		
SCHWP-1 Pump DPS	DI	tecs			✓		
SCHWP-1 S/S (Enable)	DO	tecs				✓	
SCHWP-2 VFD kW	AI	tecs	✓				
SCHWP-2 VFD Speed Reference	AO	tecs		✓			
SCHWP-2 VFD Running	DI	tecs			✓		
SCHWP-2 VFD Fail	DI	tecs			✓		
SCHWP-2 Pump DPS	DI	tecs			✓		
SCHWP-2 S/S (Enable)	DO	tecs				✓	
CWP-1 VFD kW	AI	tecs	✓				
CWP-1 VFD Speed Reference	AO	tecs		✓			
CWP-1 VFD Running	DI	tecs			✓		
CWP-1 VFD Fail	DI	tecs			✓		
CWP-1 Pump DPS	DI	tecs			✓		
CWP-1 S/S (Enable)	DO	tecs				✓	
CWP-2 VFD kW	AI	tecs	✓				
CWP-2 VFD Speed Reference	AO	tecs		✓			
CWP-2 VFD Running	DI	tecs			✓		
CWP-2 VFD Fail	DI	tecs			✓		
CWP-2 Pump DPS	DI	tecs			✓		
CWP-2 S/S (Enable)	DO	tecs				✓	
CTF-1 VFD kW	AI	tecs	✓				
CTF-1 VFD Speed Reference	AO	tecs		✓			
CTF-1 VFD Running	DI	tecs			✓		
CTF-1 Fail	DI	tecs			✓		

Point Name	**Point Type**	**Origin**	**AI**	**AO**	**DI**	**DO**	**Network**
CTF-1 S/S (Enable)	DO	tecs				✓	
CTF-2 VFD kW	AI	tecs	✓				
CTF-2 VFD Speed Reference	AO	tecs		✓			
CTF-2 VFD Running	DI	tecs			✓		
CTF-2 Fail	DI	tecs			✓		
CTF-2 S/S (Enable)	DO	tecs				✓	
CH-1 Evap Iso Iso Valve Open LS	DI	tecs			✓		
CH-1 Evap Iso Iso Valve Closed LS	DI	tecs			✓		
CH-1 Evap Iso Iso Valve Pilot (Enable)	DO	tecs				✓	
CH-2 Evap Iso Valve Open LS	DI	tecs			✓		
CH-2 Evap Iso Valve Closed LS	DI	tecs			✓		
CH-2 Evap Iso Valve Pilot (Enable)	DO	tecs				✓	
CH-1 Cond Iso Valve Open LS	DI	tecs			✓		
CH-1 Cond Iso Valve Closed LS	DI	tecs			✓		
CH-1 Cond Iso Valve Pilot (Enable)	DO	tecs				✓	
CH-2 Cond Iso Valve Open LS	DI	tecs			✓		
CH-2 Cond Iso Valve Closed LS	DI	tecs			✓		
CH-2 Cond Iso Valve Pilot (Enable)	DO	tecs				✓	
CHW Bypass Valve Position Feedback	AI	tecs	✓				
CHW Bypass Valve Position Reference	AO	tecs		✓			
CT-1 Inlet Iso Valve Open LS	DI	tecs			✓		
CT-1 Inlet Iso Valve Closed LS	DI	tecs			✓		
CT-1 Inlet Iso Valve Pilot (Enable)	DO	tecs				✓	
CT-2 Inlet Iso Valve Open LS	DI	tecs			✓		
CT-2 Inlet Iso Valve Closed LS	DI	tecs			✓		
CT-2 Inlet Iso Valve Pilot (Enable)	DO	tecs				✓	

Point Name	**Point Type**	**Origin**	**AI**	**AO**	**DI**	**DO**	**Network**
Plant DP	AI	tecs	✓				
Building No. 1 DP	AI	tecs					✓
Building No. 2 DP	AI	tecs					✓
Building No. 3 DP	AI	tecs					✓
PCW Return Temp	AI	tecs	✓				
SCW Supply Temp	AI	tecs	✓				
SCW Return Temp	AI	tecs	✓				
SCW Flow	AI	tecs	✓				
CHW Bypass Temp	AI	tecs	✓				
CHW Bypass Flow	AI	tecs	✓				
CT-1 LWT	AI	tecs	✓				
CT-2 LWT	AI	tecs	✓				

	AI	AO	DI	DO	NETWORK
Total:	**28**	**11**	**38**	**16**	**3**



SYSTEM ARCHITECTURE

SCALE: NONE

SYSTEM POINTS LIST

ROBLEY REX VA MEDICAL CNETER

	HARDWARE																			
			ANALOG											BINARY						
			INPUT					OUTPUT				INPUT			OUTPUT					
	NUMBER		TEMPERATURE	PRESSURE DIFFERENTIAL	KW	GPM	PRESSURE	SPEED	MODULATE						ON / OFF	OPEN / CLOSE	ENABLE / DISABLE	MONITOR	DRIVE SYSTEM FAULT	DRIVE RESET
SINGLE LOAD INTERFACE	21																			
CONTROL VALVE (INCLUDING STATUS)									●									●		
CHILLED WATER RETURN TEMPERATURE			●																	
PUMP SPEED								●												
DISCHARGE (SPACE) TEMPERATURE			●																	
DRIVE FAULT STATUS																			●	
DRIVE RESET																				●
MULTIPLE LOAD INTERFACE	16																			
CONTROL VALVE (INCLUDING STATUS)									●									●		
CHILLED WATER RETURN TEMPERATURE			●																	
PUMP SPEED								●												
SYSTEM ΔP				●																

PPSEQUENCE OF OPERATION

I. CENTRAL SYSTEM (TECS)

A. Components

The system consists of the following:

(2) Existing chillers with variable frequency drives.
(2) Existing, dedicated per chiller (but cross connected), condenser water pumps with variable frequency drives and valves at each chiller.
(2) New, dedicated per chiller (but cross connected) chilled water pumps with variable frequency drives and motorized valves at each chiller.
(1) Decoupler with motorized valve.
(2) New system distribution pumps with variable frequency drives.
(2) Non-dedicated cooling towers with motorized isolation valves and variable frequency drives for the fans of each tower.

B. Notes

1. If all chilled water loads are connected to the Central System, there is not enough chiller capacity to meet the load on a design day.
2. Changeover to/from satellite chillers is accomplished manually.
3. Whenever cross connections are in use, all affected components shall be operated manually.

C. Distribution Pumps

1. Pumps shall operate in a lead/lag scenario, with change of lead pump once/week.
2. Pumps shall modulate to maintain the minimum CWS/CWR ΔP at three locations. If any ΔP signal is lost, the system operates on the default ΔP and maintains the last variable reading. This action also initiates an alarm.
3. Operation in one pump versus two pump mode shall be optimized for least KW/Ton. Provide dead band.

D. Condenser Water Pumps

When any chiller is enabled, its respective condenser water pump shall be enabled. Pump speed shall modulate to minimize Plant KW/TON, but shall not go below the manufacturer's minimum flow. Flow shall be derived from chiller ΔP.

E. Chiller CW Pumps

When any chiller is enabled, its respective chilled water pump shall be enabled. Pump speed shall modulate to minimize plant KW/TON, but shall not go below the manufacturer's minimum flow. Flow shall be derived from chiller ΔP.

F. Optimization

The following central plant equipment shall be optimized on a real time basis, to minimize plant KW/TON while still meeting the load.

Chiller
- Enable/disable
- Lvg CW temp

Towers
- Enable/disable (include isolation valve)
- Fan speed of enabled tower(s)
- Tower leaving water temperature

Chiller CW Pumps
- Pump speed of enabled pump(s)

Condenser Pumps
- Pump speed of enabled pump(s)

Optimization factors shall include pump curves, tower performance, and chiller performance as well as OA temperature, time of day, and variable primary flow operation.

II. DISTRIBUTION/USER INTERFACES (TAC)

Single Load Interface see detail (2/M2.1)

1. The two-way control valve in the CWS shall modulate to maintain the CWR temperature. Alarm if CWR is too low
2. Pump speed shall modulate to maintain either AHU discharge temperatures or space temperature (keep same as existing). Pumps shall have a minimum GPM to prohibit laminar flow in the AHU coil. (Initial set point 30% speed.) Then close CWS valve.

Multiple Load Interface see detail (1/M2.1)

1. The two-way control valve in the CWS shall modulate to maintain the CWR temp. Alarm if CWR is too low
2. Pump speed shall modulate to maintain a supply to return pressure differential.

III. MISCELLANIOUS (TAC)

1. Each of the 5 satallite chiller systems with a make up water connection shall have a motorized valve (NO) installed in the make up water line. The valve shall activate whenever the satallite chiller is disabled.
2. The two satallite chiller systems (5th floor penthouse and 2nd floor) serving AHUs that are to have 3 way valves replaced with 2 way valves shall have a (NC) pressure activated by-pass valve. The valve is to be enabled only when the satallite chillers are enabled. The valve shall modulate to maintain system ΔP when AHUs are at low flow.
3. Special application AHU 39 (fifth floor) when AHU receives chilled water from central plant, 3-way valve at unit to be driven full open. Also, manual by-pass (not part of 3 way valve) is to be closed.
4. Special application AHU 10 (fifth floor) when AHU receives chilled water from central plant by-pass motorized valve is to open. Otherwise valve is closed.
5. Special application AHU 10 (fifth floor) when AHU receives chilled water from central plant, 3-way valve at unit to be driven full open.

FINAL SET

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Luckett & Farley
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737 South Third Street, Louisville, Kentucky 40202-2100
502-585-4181 502-587-0488 Fax www.luckett-farley.com
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amec
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3800 Ezell Road, Suite 100 Nashville, Tennessee 37211 Phone: 615-333-0630 Fax: 615-781-0655

PARADIGM
ENGINEERS AND CONSTRUCTORS
PO BOX 436223
Louisville, Kentucky 40253
502-339-8511 www.paradigmusa.com

VAMC - RE-DESIGN
CHILLED WATER DISTRUBUTION
ROBLEY REX VA MEDICAL CENTER
800 Zorn Ave.
Louisville, Kentucky 40206
PROJECT: 603-10-505

Department of Veterans Affairs

REVISIONS		
#	Description	Date

COMM. NO. 2010.123.00	
MADE BY SRH	CHECKED MM/JR
DATE 12-22-2010	
CONTROLS	
DRAWING NO. M2.2	BID PKG.

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