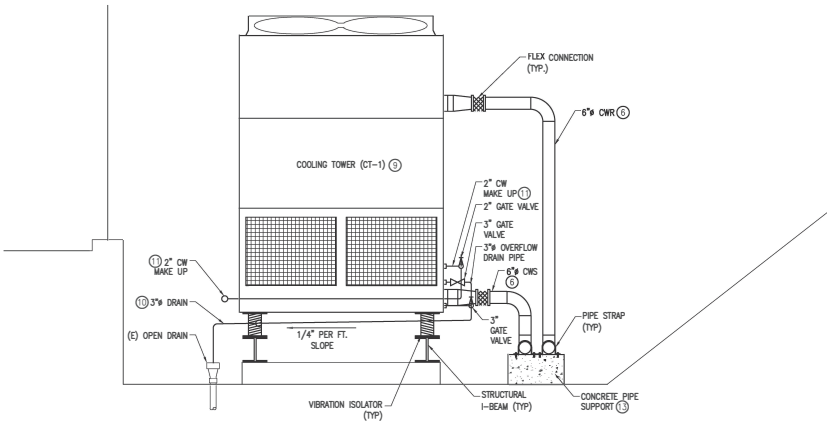
KEYNOTES:

1. SEE DWG CWPB11-M-101 FOR PLAN NOTES.



A **SECTION**
CWPB11-M-101 SCALE: 1/2"=1'-0"

Professional Certification: I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No.41715, Expiration Date: 2018-03-08

CONTRACT NO. FQ17162

DESIGNED B. VIDWANATHAN 05/17	REFERENCE DRAWINGS	REVISIONS
DRAWN A. PINKOWSKI 05/17	NUMBER / DESCRIPTION	DATE / BY / DESCRIPTION
CHECKED R. SILVA 05/17		
APPROVED B. VIDWANATHAN 05/17		

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES
OFFICE OF INFRASTRUCTURE RENEWAL PROGRAM
APPROVED

GFP A Gannett Fleming/Parsons JOINT VENTURE
SUBMITTED
PROJECT MANAGER

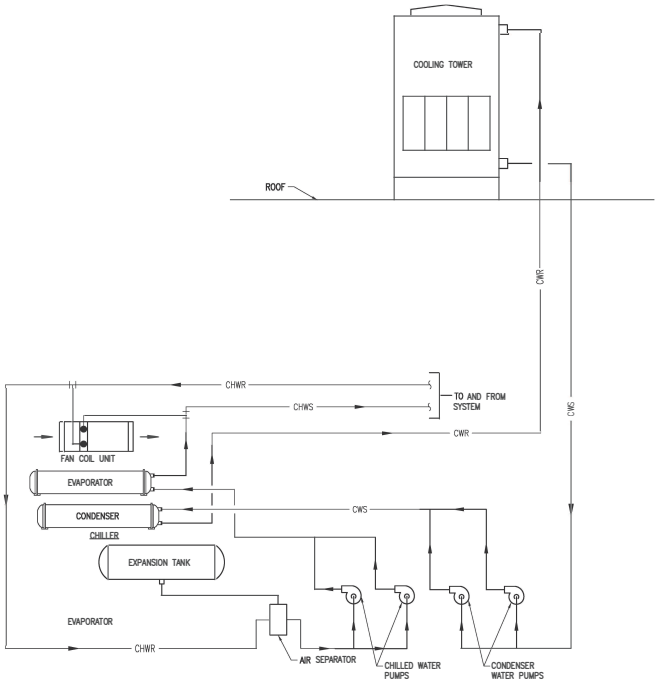
REPLACEMENT OF CHILLERS AND COOLING TOWERS AT THREE METRO-RAIL STATIONS

CWPB11 – GLENMONT
MECHANICAL SECTION

SCALE: 1/2"=1'-0" 1 6" 0 1 2
DRAWING NO. CWPB11-M-300 M1299-015

KEYNOTES:

1. THE DIAGRAM DOES NOT SHOW ALL VALVES, STRAINERS, FLOW SENSORS, GAUGES, ETC. REFER TO THE EQUIPMENT DETAILS ON DWGS M-500, M-501, & M-502.
2. CHILLER HAS 2-PASS EVAPORATOR AND 2-PASS CONDENSER.
3. THIS DIAGRAM SHOWS GENERAL ARRANGEMENT FOR CHILLER AND COOLING TOWER. REFER TO CONTRACT DOCUMENTS (DRAWINGS AND SPECIFICATIONS) FOR EXACT SCOPE OF WORK AND COOLING TOWER.
4. FOR PIPE SIZING, REFER TO DWG CWPB11-M-101.



MECHANICAL FLOW DIAGRAM

NOT TO SCALE

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REPLACEMENT OF CHILLERS AND COOLING TOWERS AT THREE METRO-RAIL STATIONS

CWPB11 – GLENMONT
MECHANICAL FLOW DIAGRAM

SCALE: NOT TO SCALE

DRAWING NO. CWPB11-M-500 M1299-016

CHILLER SCHEDULE

PLANT	DESIGNATION	CAPACITY (TONS)	EVAPORATOR				CONDENSER				COMPRESSOR/CHILLER ELECTRICAL								BASIS OF DESIGN
			GPM	PASSES	EWT °F	LWT °F	GPM	PASSES	EWT °F	LWT °F	VOLT	PH	HZ	RLA	LRA (EA)	QTY	MOCP	MCA	
CWPB11	CHILLER	220	406	2	55	42	660	2	85	94.5	460	3	60	194	107	2	300	218	DAIKIN/MCQUAY WMC250DC

NOTES:

1. PROVIDE WITH SPRING TYPE VIBRATION ISOLATION.
2. PROVIDE WITH CHILLED WATER FLOW INDICATOR.
3. WATER-COOLED, SEMI-HERMETIC OIL-FREE CENTRIFUGAL COMPRESSOR WATER CHILLER.
4. TWO MAGNETIC BEARING, COMPLETELY OIL-FREE CENTRIFUGAL COMPRESSORS ON EACH CHILLER.
5. INTEGRATED VARIABLE FREQUENCY DRIVE, OPERATING CONTROLS AND EQUIPMENT PROTECTION CONTROLS.
6. CHILLERS SHALL BE CHARGED WITH REFRIGERANT HFC-134A.
7. MOTORS SHALL BE LIQUID REFRIGERANT COOLED WITH INTERNAL THERMAL SENSING DEVICES IN THE STATOR WINDINGS.
8. THE CHILLER SHALL BE EQUIPPED WITH AN INTEGRATED VARIABLE FREQUENCY DRIVE (VFD) TO AUTOMATICALLY REGULATE COMPRESSOR SPEED IN RESPONSE TO COOLING LOAD AND THE COMPRESSOR PRESSURE LIFT REQUIREMENT.
9. CHILLER CONTROLS SHALL COORDINATE COMPRESSOR SPEED AND GUIDE VANE POSITION TO OPTIMIZE CHILLER EFFICIENCY.
10. CHILLER SHALL BE EQUIPPED WITH MICROTECH II CONTROLLER OR EQUIVALENT AND SHALL INCLUDE REMOTE COMMUNICATIONS CARDS WITH MODBUS RTU CAPABILITY.

COOLING TOWER SCHEDULE

DESIGNATION	SERVICE	TYPE	GPM	EWT °F	LWT °F	AMB. AIR WET BULB TEMP	FAN						OPERATING WEIGHT (LBS)	BASIS OF DESIGN
							NO.	CFM	NO. OF MOTORS	HP	V	PH	HZ	
CT-1	CONDENSER WATER	AXIAL	660	95	85	78°F	1	49,400	1	10	460	3	60	8,220	EVAPCO USS-19-311

NOTES:

1. FACTORY MOUNTED COILS, CONTROLS, MOTORS, DRIVE KITS.
2. PIPING PACKAGE WITH SINGLE 3-WAY MODULATING VALVE OPTION.
3. TOWER TO HAVE STEEL DRIVE MOTORS.
4. PROVIDE WITH GEAR DRIVE MOTORS.
5. PROVIDE A COMPLETE WORKING PLATFORM AND LADDER SYSTEM FOR SERVICE.

PUMP SCHEDULE

ITEM NO.	LOCATION	TYPE	GPM	FT HEAD	INLET (IN)	OUTLET (IN)	IMPELLER DIA (IN)	MOTOR					BASIS OF DESIGN
								RPM	HP	VOLTS	PH	HZ	
CWP-1	CONDENSER WATER	CENTRIFUGAL	660	65	5	4	10	1800	15	460	3	60	ARMSTRONG 4600 (5x4x10L)
CWP-2	CONDENSER WATER	CENTRIFUGAL	660	65	5	4	10	1800	15	460	3	60	ARMSTRONG 4600 (5x4x10L)
CHWP-1	CHILLED WATER	CENTRIFUGAL	406	116	5	4	10.75	1800	20	460	3	60	ARMSTRONG 4600 (5x4x12L)
CHWP-2	CHILLED WATER	CENTRIFUGAL	406	116	5	4	10.75	1800	20	460	3	60	ARMSTRONG 4600 (5x4x12L)

NOTES:

1. THE PUMPS SHALL INCLUDE VFD MOTORS.
2. CONTRACTOR TO PROVIDE ECCENTRIC REDUCER/INCREASER AT PUMP INLET/OUTLET.

FAN COIL UNIT SCHEDULE

PLANT	DESIGNATION	CAPACITY (TONS)	EVAPORATOR							ELECTRICAL				BASIS OF DESIGN
			GPM	ROWS	EWT °F	LWT °F	CFM	EAT °F	LAT °F	HP	VOLT	PH	HZ	
CWPB11	FCU-1	7-1/2	19	6	42	55	3200	80	58	1.0	460	3	60	MCQUAY MODEL HCBB30

NOTES:

1. FACTORY MOUNTED COILS, CONTROLS, MOTORS, DRIVE KITS.
2. PIPING PACKAGE WITH SINGLE 3-WAY MODULATING VALVE OPTION.

LEAK DETECTION SYSTEM

1. PROVIDE ONE (1) IR 134A REFRIGERANT GAS SENSORS FOR LEAK DETECTION (SHERLOCK 60-0054 OR EQUAL)
2. PROVIDE GAS LEAK DETECTION SYSTEM (SHERLOCK 402 NEMA 4X OR EQUAL)
   - 2.1 PROVIDE RELAY OUTPUT FOR OPERATION OF (E) EXHAUST FAN EF-6 AND EF-7
   - 2.2 PROVIDE STROBE ALARM OUTPUTS AT LEVEL 1 AND LEVEL 2
   - 2.3 AUDIBLE ALARM OUTPUT TO BE DISABLED FOR THIS APPLICATION
   - 2.4 PROVIDE COMMUNICATIONS INTERFACE FOR REMOTE MONITORING AND CONTROL GENCOM COMMUNICATIONS WITH ETHERNET CONNECTION PART 88-0541
3. REFRIGERANT GAS DETECTION INFRARED SENSOR SHALL BE MOUNTED UNDERNEATH REFRIGERANT MONITORING PANEL AND PER MANUFACTURER'S RECOMMENDATION.

FLOW MONITORING SYSTEM

1. NON-INTRUSIVE CLAMP-ON FLOW SENSORS
2. MAINTENANCE-FREE
3. ACCURACY: 1% OF VELOCITY
4. NO DEPENDENCY ON CONDUCTIVITY
5. AUTOMATICALLY ADAPT TO PIPE MATERIAL AND LIQUID PROPERTY VARIATIONS
6. BUILT-IN FLOW TOTALIZERS
7. ISOLATED RS-485 INTERFACE WITH POWER SURGE PROTECTION. SUPPORTS THE MODBUS PROTOCOL
8. ABUNDANT INPUT/OUTPUT, ISOLATED 4-20MA OUTPUT, RELAY, PULSE OUTPUT, ALARM OUTPUT
9. SELF-EXPLANATORY MENU-DRIVEN PROGRAMMING
10. PIPE SIZE RANGE, 6" ~ 8"
11. NEMA 4X (IP65) WEATHER-RESISTANT ENCLOSURE
12. ULTRASONIC FLOW METER NEMA 4X (WALL MOUNT) SIEMENS SITRANS FUS1010

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CHECKED R. SILVA 05/17
APPROVED B. VISWANATHAN 05/17

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APPROVED

GFP A Gannett Fleming/Parsons JOINT VENTURE

SUBMITTED PROJECT MANAGER

REPLACEMENT OF CHILLERS AND COOLING TOWERS AT THREE METRO-RAIL STATIONS
CWPB11 – GLENMONT
MECHANICAL EQUIPMENT SCHEDULES SHEET 1 OF 2

SCALE NONE

DRAWING NO. CWPB11-M-600 M1299-017

AIR SEPARATOR SCHEDULE

DESIGNATION	LOCATION	ORIENTATION	GPM	MAX. WORKING PRESSURE (PSIG)	MAX. WORKING TEMP. (°F)	SYSTEM SERVED	INLET & OUTLET SIZE	DRY WEIGHT (LBS)	BASIS OF DESIGN
AS–1	PUMP ROOM	VERTICAL	406	160	375	CHILLED WATER	6"	264	ARMSTRONG VAS–6

NOTES:

1. PROVIDE FABRICATED STEEL SHELL.
2. PROVIDE BLOW–DOWN CONNECTION.
3. PROVIDE WITH STAINLESS STEEL STRAINER.

EXPANSION TANK SCHEDULE

DESIGNATION	LOCATION	SYSTEM SERVED	TYPE	ORIENTATION	INITIAL FILL PRESSURE (PSIG)	TANK VOLUME (GAL)	SIZE		WEIGHT (LBS)	BASIS OF DESIGN
							DIA (IN)	LENGTH (IN)		
ET–1	PUMP ROOM	CHILLED WATER	COMPRESSION	HORIZONTAL	12	120	24	65	218	ARMSTRONG AET 24X65

NOTES:

1. PROVIDE SADDLES WITH EXPANSION TANK.

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STATE OF MARYLAND — VEERA S. VIDWANATHAN — No. 041715 — REGISTERED PROFESSIONAL ENGINEER

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES
OFFICE OF INFRASTRUCTURE RENEWAL PROGRAM

APPROVED Mark D. Magnuson

GFP A Gannett Fleming/Parsons JOINT VENTURE

SUBMITTED PROJECT MANAGER

REPLACEMENT OF CHILLERS AND COOLING TOWERS AT THREE METRO-RAIL STATIONS

CWPB11 – GLENMONT
MECHANICAL EQUIPMENT SCHEDULES SHEET 2 OF 2

SCALE NONE

DRAWING NO. CWPB11–M–601 M1299–018

CHILLED WATER PLANT SEQUENCE OF OPERATION:

GENERAL FOR CHILLER PLANT AT GLENMONT

THE CHILLER PLANT CONSISTS OF A SINGLE CHILLER WITH 2-VARIABLE CAPACITY COMPRESSORS, A COOLING TOWER WITH VARIABLE SPEED FAN, A STANDBY CHILLED WATER PUMP AND A STANDBY CONDENSER WATER PUMP.

THE CHILLER PLANT IS DESIGNED FOR CONSTANT FLOW (GPM) FOR CHILLED WATER AND CONDENSER WATER.

THE CHILLER PLANT OPERATION IS PROGRAMMABLE.

DURING COOLING SEASON; THE CHILLER OPERATES CONTINUOUSLY FOR DAY AND NIGHT TIME.

THE CHILLED WATER SUPPLY TEMPERATURE SET POINT (42°F) IS SET TO THE CHILLER PLANT DESIGN TEMPERATURE AND THE SETPOINT TEMPERATURE CAN BE MANUALLY RESET BY THE OPERATOR. IT'S ENTERING CONDENSER WATER TEMPERATURE SHALL BE 85°F.

THE CHILLED WATER SYSTEM ENABLE POINT IS CONTROLLED EITHER MANUALLY BY THE OPERATOR OR PROGRAMMABLE. IF THE CHILLED WATER SYSTEM ENABLE POINT IS ON AND THERE IS A CALL FOR COOLING (I.E. THE CHILLED WATER RETURN TEMPERATURE EXCEEDS 45°F):

1) CHILLED WATER PUMP (CHWP-1 OR CHWP-2) AND CONDENSER WATER PUMP (CWP-1 OR CWP-2) WHICH ARE MANUALLY SELECTED BY THE PLANT OPERATOR, SHALL START. PUMPS SHALL OPERATE FOR CONSTANT WATER FLOW. THE ASSOCIATED VARIABLE SPEED DRIVES SHALL BE UTILIZED TO ADJUST PUMP SPEED FOR DESIGN FLOW RATE AND SET.
2) THE CHILLER START OR STOP POINT TURNS ON.
3) AFTER CHILLED WATER AND CONDENSER FLOW ARE PROVEN BY THE FLOW SWITCHES, THE CHILLER OPERATES UNDER ITS OPERATING AND SAFETY CONTROLS. CHILLER'S INTEGRATED VARIABLE SPEED DRIVE SHALL ADJUST ITS CAPACITY IN ORDER TO MAINTAIN THE CHILLER'S CHILLED WATER SUPPLY TEMPERATURE SET POINT.

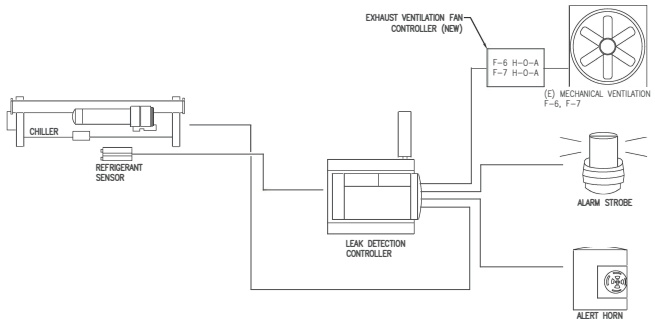
THE CHILLER STOP SEQUENCE FIRSTLY STOPS THE CHILLER. AFTER A TIME DELAY (ADJUSTABLE), THE CONDENSER WATER PUMP AND THE CHILLED WATER PUMP SHALL STOP.

COOLING TOWER IS ENABLED WHEN CONDENSER WATER PUMP IS OPERATING. WHEN THE CONDENSER WATER SUPPLY TEMPERATURE INCREASES FROM THE SET POINT (85°F, ADJUSTABLE), THE COOLING TOWER FAN STARTS AT LOW SPEED. INCREASE AND DECREASE FAN SPEED IN ORDER TO MAINTAIN THE CONDENSER WATER SUPPLY TEMPERATURE SET POINT.

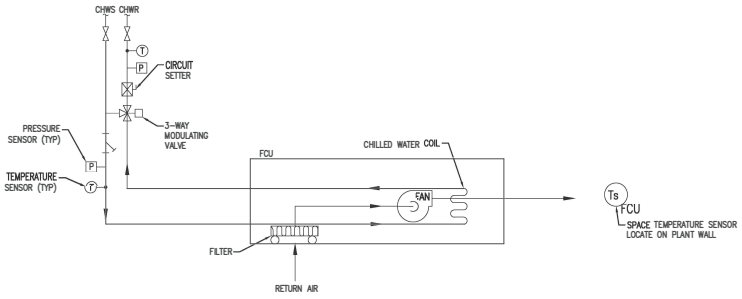
CONFIRM THE PUMPS DESIRED STATE (I.E. ON OR OFF) FROM THEIR VARIABLE SPEED DRIVES. GENERATE AN ALARM IF STATUS DEVIATES FROM START OR STOP CONTROL.

CHILLER EMERGENCY SHUTDOWN:

CHILLER EMERGENCY SHUTDOWN SHALL BE ENABLED THROUGH THE CHILLER MONITORING PANEL.



MECHANICAL REFRIGERANT ALARM SYSTEM



FAN COIL UNIT

SEQUENCE OF OPERATION:

THE FAN COIL UNIT FAN AND THE CHILLED WATER FLOW CONTROL VALVE SHALL BE CONTROLLED BY THE SPACE TEMPERATURE SENSOR VIA THE PRODUCTIVITY 3000, PAC AT THE CHILLER PLANT MONITORING PANEL. WHEN THE SPACE TEMPERATURE RISES ABOVE 82°F, THE FAN COIL UNIT FAN SHALL BE STARTED. THE THREE WAY VALVE SHALL CONTROL THE CHILLED WATER FLOW TO MAINTAIN THE SPACE SET POINT TEMPERATURE OF 80°F. WHEN THE SPACE TEMPERATURE FALLS BELOW 78°F, THE FAN COIL UNIT FAN SHALL TURN OFF.

SEQUENCE OF OPERATION:

REFRIGERANT LEAK PURGING OPERATION:

THE REFRIGERANT SENSOR UNDER THE CHILLER MONITORS FOR R-134A LEVELS. WHEN 250 PPM IS DETECTED THE FIRST ALARM LEVEL (LOW) WILL STAGE THE (E) MECHANICAL VENTILATION. F-6 AND F-7 SHALL BE STAGED TO RUN, AND THE WARNING STROBE LIGHT (AMBER) SHALL BE ACTIVATED. WHEN 500 PPM IS DETECTED, THE SECOND ALARM LEVEL (HIGH) IS REACHED, THE MECHANICAL VENTILATION F-6 AND F-7 SHALL BE STAGED TO RUN (MAXIMUM 2000 CFM EACH), AND THE WARNING STROBE LIGHT IS ACTIVATED. THE AUDIBLE HORN IS ALSO ACTIVATED. – ALARM STATUS IS CONTINUOUSLY COMMUNICATED THROUGH THE REMOTE COMMUNICATIONS SOFTWARE.

NORMAL OPERATION:

EXHAUST FANS F-6, F-7 SHALL OPERATE WHEN THE INSIDE SPACE TEMPERATURE OF THE ROOM REACHES 90° F. THE CORRESPONDING INTAKE/EXHAUST MOTORIZED DAMPERS SHALL BE INTERLOCKED TO OPEN.

PROVIDE NEW EXHAUST FAN VENTILATION CONTROLLER FOR F-6, F-7. NEW VENTILATION CONTROLLER SHALL BE PROVIDED WITH INPUT AND OUTPUT FOR OPERATION WITH THE REFRIGERANT MONITORING PANEL, PER SEQUENCE OF OPERATION.

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SEQUENCES OF OPERATION

SCALE: NOT TO SCALE

DRAWING NO. CWPB11-M-610 M1299-019