

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	1866	185	375	CHWR	10"	547	ARMSTRONG WAS-10

- NOTES:
1. PROVIDE WITH FABRICATED STEEL SHELL.
 2. PROVIDE WITH BLOW DOWN CONNECTION.
 3. PROVIDE WITH STAINLESS STEEL STRAINER.

EXPANSION TANK SCHEDULE										
DESIGNATION	LOCATION	EQUIP. SERVED	TYPE	ORIENTATION	INITIAL FILL PRESSURE (PSIG)	TANK VOLUME (GAL)	SIZE		WEIGHT (LBS)	BASIS OF DESIGN
							DI. (IN)	LENGTH (IN)		
ET-1	CHILLER PLANT	CHWS	COMPRESSION	HORIZONTAL	12	305	30	105	523	ARMSTRONG AET 30X105

- NOTES:
1. PROVIDE SADDLES WITH EXPANSION TANK.

EXHAUST FAN SCHEDULE																
DESIGNATION	TYPE	FAN				ELECTRICAL DATA					dBa	DIMENSIONS			WEIGHT (LB)	BASIS OF DESIGN
		CFM	SP (IN. W.G.)	RPM	BHP	MOTOR HP	VOLT	PH	HZ	MOTOR RPM		LENGTH (IN)	WIDTH (IN)	HEIGHT (IN)		
EF-7	AXIAL	6000	1.102	1170	1.86	2	460	3	60	1770	73	32.5	24.5	24.5	185	GREENHECK AX-54-160-0828-420

- NOTES:
1. FAN SHALL BE VFD COMPATIBLE.
 2. DIRECT DRIVE FAN.
 3. CEILING HUNG WITH SPRING ISOLATORS.
 4. HANDS-OFF-AUTO SWITCH.

UNIT HEATER SCHEDULE														
DESIGNATION	LOCATION	TYPE	KW	ELECTRICAL DATA				HORZ. AIR THROW (FT)	WIDTH (IN)	HEIGHT (IN)	DEPTH (IN)	WEIGHT (LB)	BASIS OF DESIGN	
				MOTOR HP	VOLT	PH	HZ							MOTOR RPM
UH-1	CHILLER PLANT	ELECTRIC, SUSPENDED	20	0.05	480	3	60	1550	32	21.5	28.7	6.5	85	TRANE UHEC-203DACA
UH-2	CHILLER PLANT	ELECTRIC, SUSPENDED	20	0.05	480	3	60	1550	32	21.5	28.7	6.5	85	TRANE UHEC-203DACA

- NOTES:
1. UNIT INSTALLED MOTOR STARTER.
 2. DISCONNECT FACTORY INSTALLED.
 3. WALL/CEILING MOUNTED BRACKET.
 4. WALL MOUNT THERMOSTAT KIT.

AIR TERMINAL SCHEDULE				
DESIGNATION	FACE SIZE (IN)	MIN FLOW (CFM)	MAX FLOW (CFM)	BASIS OF DESIGN
EG-1	20x8	0	380	TITUS 350-ZFL

DAMPER SCHEDULE							
DESIGNATION	DAMPER HEIGHT (IN)	DAMPER WIDTH (IN)	ASSOCIATED FAN	ELECTRICAL			BASIS OF DESIGN
				VOLT	PH	HZ	
MD-1	36	60	EF-7	120	1	60	RUSKIN-C050

- NOTES:
1. PROVIDE FACTORY INSTALLED ELECTRIC ACTUATOR.
 2. PROVIDE SWITCH PACKAGE FOR DAMPER POSITION INDICATION.

VALVE SCHEDULE					
TYPE	SIZE (IN)	QUANTITY	SERVICE	MANUFACTURER	MODEL
BUTTERFLY VALVE	10	10	CHILLED WATER	NIBCO	LD-2000-5
BUTTERFLY VALVE	8	6	CONDENSER WATER	NIBCO	LD-2000-5
CHECK VALVE	10	2	CHILLED WATER	NIBCO	F-938-31
GATE VALVE	10	9	CHILLED WATER	NIBCO	F-617-0

INSTANTANEOUS WATER HEATER SCHEDULE						
DESIGNATION	INLET SIZE (IN)	TURN ON FLOW (GPM)	kW	AMPS	MAX TEMPERATURE (°F)	BASIS OF DESIGN

CONTRACT NO.
FQ17162

DESIGNED	B. YOKANATHAN	05/17
DRAWN	K. RICHARD	05/17
CHECKED	J. SILVA	05/17
APPROVED	J. SILVA	05/17

REFERENCE DRAWINGS	
NUMBER	DESCRIPTION

REVISIONS	
DATE	DESCRIPTION



WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES
OFFICE OF INFRASTRUCTURE RENEWAL PROGRAM
APPROVED: *Debra H. [Signature]*

GFP A GARRETT FIRM/PERKINS
JOINT VENTURE
SUBMITTED: *[Signature]*
PROJECT MANAGER

REPLACEMENT OF CHILLERS AND COOLING TOWERS AT THREE METRO-RAIL STATIONS
CWPC03 - FARRAGUT WEST
MECHANICAL EQUIPMENT SCHEDULES SHEET 2 OF 2
SCALE: NONE
DRAWING NO. CWPC03-M-601 M1299-030

CHILLED WATER PLANT SEQUENCE OF OPERATION:

GENERAL FOR CHILLER PLANT AT FARRAGUT WEST

THE CHILLER PLANT CONSISTS OF THREE CHILLERS WITH TWO (2) VARIABLE CAPACITY COMPRESSORS EACH, THREE COOLING TOWERS WITH VARIABLE SPEED FAN, ONE DUTY CHILLED WATER PUMP, ONE STANDBY CHILLED WATER PUMP, THREE DUTY CONDENSER WATER PUMPS, AND ONE STANDBY CONDENSER WATER PUMP.

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

THE CHILLER PLANT OPERATION IS PROGRAMMABLE.

DURING COOLING SEASON, THE CHILLERS OPERATE 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. ITS 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 55°F):

- 1) CHILLED WATER PUMP (CWP-1 OR CWP-2) AND CONDENSER WATER PUMP (CWP-1 OR CWP-2 OR CWP-3) 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.

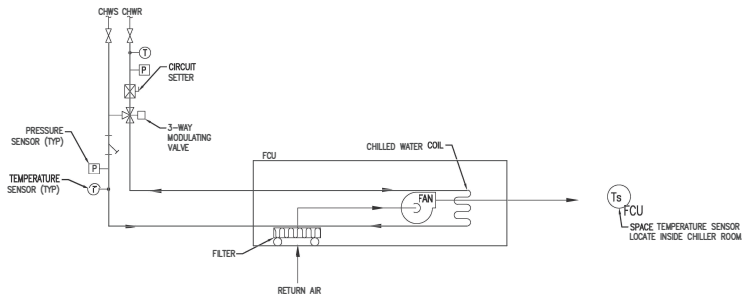
COOLING TOWER IS ENABLED WHEN CONDENSER WATER PUMP IS OPERATING. WHEN THE CONDENSER WATER SUPPLY TEMPERATURE INCREASES FROM THE SET POINT (85°F, ADJUSTABLE), THE COOLING TOWER FAN STARTS AT LOW SPEED. INCREASE AND DECREASE FAN SPEED BY VFD IN ORDER TO MAINTAIN THE CONDENSER WATER SUPPLY TEMPERATURE SET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

CHILLER CONTROL PANEL SHALL CONTROL THE OPERATION OF THE COOLING TOWER BASED ON THE SEQUENCE. THE SYSTEM SHALL HAVE THE CAPABILITY FOR ANY CHILLER (CH-1, CH-2, CH-3) TO BE OPERATED WITH ANY COOLING TOWER (CT-1, CT-2, CT-3).

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:

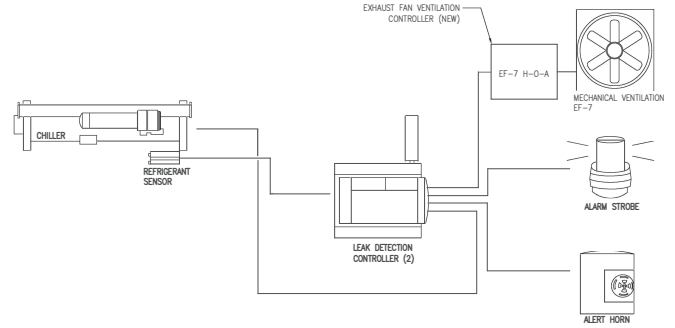
CHILLER EMERGENCY SHUTDOWN SHALL BE ENABLED THROUGH THE CHILLER MONITORING PANEL.



FAN COIL UNIT

SEQUENCE OF OPERATION:

THE FCU 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 80°F, THE FCU 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 FCU FAN SHALL TURN OFF.



MECHANICAL REFRIGERANT ALARM SYSTEM

SEQUENCE OF OPERATION:

NORMAL OPERATION:

1. PROVIDE A LOCAL HAND-OFF-AUTO SWITCH INSIDE THE CHILLER ROOM FOR FAN TEST AND INCIDENTAL FAN OPERATION. THE LOCAL FAN HAND-OFF-AUTO SWITCH SHALL INTEGRATE WITH A 1-HOUR TIMER (ADJUSTABLE).
2. IN AUTO MODE, EF-7 SHALL OPERATE FOR REFRIGERANT LEAK PURGING AS DESCRIBED IN THE SEQUENCE.
3. EF-7 SHALL BE INTERLOCKED WITH THE INTAKE AIR MOTORIZED DAMPER. AS THE FAN IS CALLED FOR OPERATION, THE DAMPER END LIMIT SWITCH SHALL BE PROVIDED OPEN BEFORE THE FAN IS ENERGIZED.
4. EF-7 SHALL OPERATE WHEN THE INSIDE SPACE TEMPERATURE OF THE ROOM REACHES 90°F.

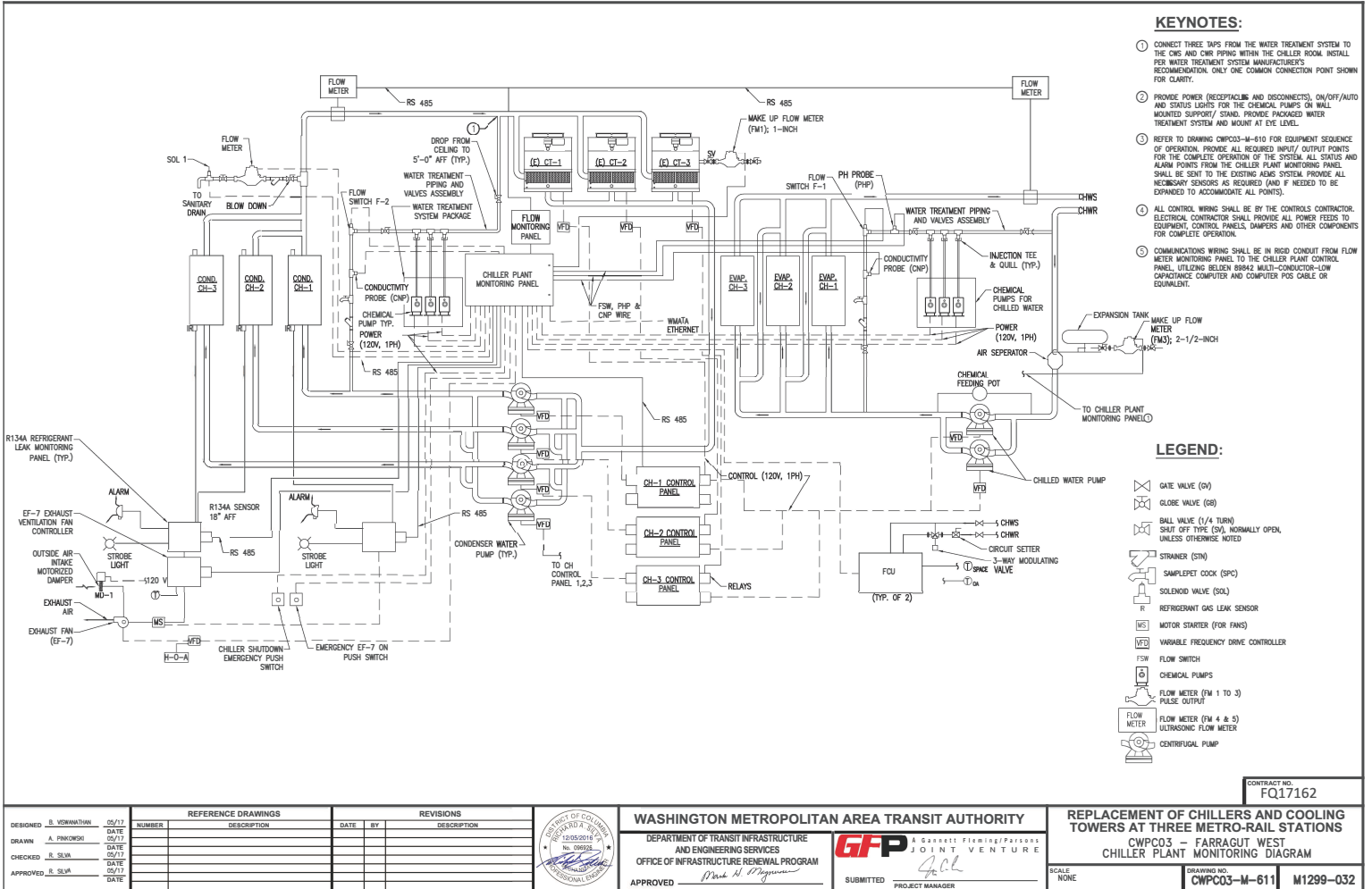
REFRIGERANT LEAK PURGING OPERATION:

1. THE REFRIGERANT SENSORS UNDER THE REFRIGERANT MONITORING PANELS MONITORS FOR R-134A LEVELS.
2. WHEN 250 PPM IS DETECTED THE FIRST ALARM LEVEL (LOW) SHALL STAGE THE MECHANICAL VENTILATION. EF-7 SHALL BE STAGED TO RUN, AND THE WARNING STROBE LIGHT (AMBER) SHALL BE ACTIVATED.
3. WHEN 500 PPM IS DETECTED, THE SECOND ALARM LEVEL (HIGH) IS REACHED, THE MECHANICAL VENTILATION EF-7 SHALL BE STAGED TO RUN (MAXIMUM EXHAUST FLOW OF 6000 CFM), AND THE WARNING STROBE LIGHT AND THE AUDIBLE HORN IS SHALL BE ACTIVATED.
4. ALARM STATUS SHALL BE CONTINUOUSLY COMMUNICATED THROUGH THE REMOTE COMMUNICATIONS SOFTWARE.

GENERAL:

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

DESIGNED B. VEMANATHAN 05/17		REFERENCE DRAWINGS		REVISIONS			WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES OFFICE OF INFRASTRUCTURE RENEWAL PROGRAM APPROVED <i>Mark H. [Signature]</i>		REPLACEMENT OF CHILLERS AND COOLING TOWERS AT THREE METRO-RAIL STATIONS CWPC03 - FARRAGUT WEST SEQUENCES OF OPERATION	CONTRACT NO. FQ17162
DRAWN A. PRKOWSKI 05/17	NUMBER	DESCRIPTION	DATE	BY	DESCRIPTION					SCALE NONE
CHECKED B. SILVA 05/17										DRAWING NO. CWPC03-M-610
APPROVED B. SILVA 05/17										M1299-031



DESIGNED	B. VEDANATHAN	DATE	05/17	REFERENCE DRAWINGS		REVISIONS	
				NUMBER	DESCRIPTION	DATE	BY
DRAWN	A. PINKOSKI	DATE	05/17				
CHECKED	J. SILVA	DATE	05/17				
APPROVED	J. SILVA	DATE	05/17				

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

APPROVED: *Mark H. [Signature]*

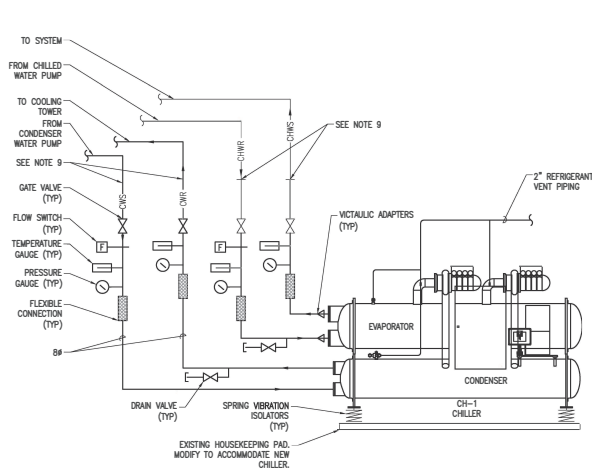
GFP A GARRETT FINANCIAL PARTNERS JOINT VENTURE
 SUBMITTED: *[Signature]*
 PROJECT MANAGER

CONTRACT NO. **FQ17162**

REPLACEMENT OF CHILLERS AND COOLING TOWERS AT THREE METRO-RAIL STATIONS
 CWPC03 - FARRAGUT WEST
 CHILLER PLANT MONITORING DIAGRAM

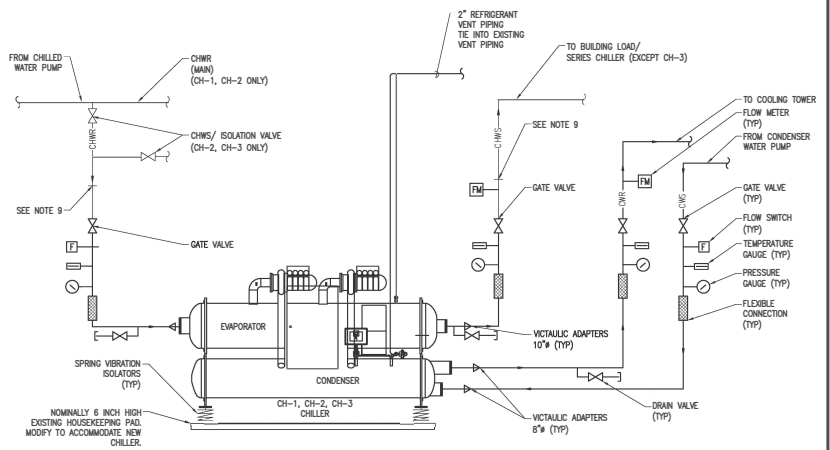
SCALE: NONE

DRAWING NO. **CWP03-M-611** | **M1299-032**



- NOTES:**
1. THIS DETAIL IS APPLICABLE TO GLENMONT (CWPE11) AND GEORGIA AVE - PETWORTH (CWPE05) CHILLER CH-1.
 2. REPLACE CHILLED WATER AND CONDENSER WATER SUPPLY AND RETURN PIPE, VALVES, & FITTINGS AS SHOWN ON THE FLOOR PLAN. GROOVED PIPE AND VICTALUC COUPLINGS SHALL BE USED.
 3. CONNECT CHILLER REFRIGERANT RELIEF VALVES TO NEW REFRIGERANT PURGE PIPE. PROVIDE A PIPING FLEXIBLE CONNECTION CLOSE TO THE CHILLER. PROVIDE A TEE IN THE DISCHARGE PIPING NEAR THE CHILLER WITH A DRAIN VALVE, NIPPLE AND CAP IN THE BOTTOM OF THE TEE.
 4. ALL PIPING SHALL BE CONFIGURED TO MINIMIZE INTERFERENCE WITH THE SERVICE AND MAINTENANCE OF THE CHILLER.
 5. PROVIDE AND INSTALL TEMPERATURE AND PRESSURE GAUGES WITH SNAGBERRS.
 6. FURNISH AND INSTALL FLOW SWITCHES AS INDICATED ON PLANS UNLESS PROVIDED ON THE CHILLER BY MANUFACTURER.
 7. FURNISH AND INSTALL SENSORS FOR ALL DATA POINTS NOT INCLUDED BY THE CHILLER MANUFACTURER.
 8. UTILIZE SUFFICIENT VICTALUC PIPE COUPLINGS TO ALLOW REMOVAL OF PIPE AND ACCESSORIES TO PERMIT EVAPORATOR AND CONDENSER TUBE REMOVAL.
 9. MAINTAIN APPROPRIATE CLEARANCES PER MANUFACTURER'S RECOMMENDATION ON PIPING TO ACCOMMODATE ALL THE VALVES, FLEX CONNECTIONS, AND PIPE FITTINGS. PERFORM ADDITIONAL PIPE CUTTING IF REQUIRED.

CHILLER PIPING DETAIL (CWPE05 & CWPB11)
NOT TO SCALE



- NOTES:**
1. THIS DETAIL IS APPLICABLE TO FARRAGUT WEST (CWPC03) CHILLERS CH-1, CH-2, CH-3.
 2. REPLACE CHILLED WATER AND CONDENSER WATER SUPPLY AND RETURN PIPE, VALVES, & FITTINGS FROM CHILLER TO AND INCLUDING NEAREST ISOLATION VALVE. GROOVED PIPE AND VICTALUC COUPLINGS SHALL BE USED.
 3. CONNECT CHILLER REFRIGERANT RELIEF VALVES TO NEW REFRIGERANT PURGE PIPE. PROVIDE A PIPING FLEXIBLE CONNECTION CLOSE TO THE CHILLER. PROVIDE A TEE IN THE DISCHARGE PIPING NEAR THE CHILLER WITH A DRAIN VALVE, NIPPLE AND CAP IN THE BOTTOM OF THE TEE.
 4. ALL PIPING SHALL BE CONFIGURED TO MINIMIZE INTERFERENCE WITH THE SERVICE AND MAINTENANCE OF THE CHILLER.
 5. PROVIDE AND INSTALL TEMPERATURE AND PRESSURE GAUGES WITH SNAGBERRS.
 6. FURNISH AND INSTALL FLOW SWITCHES AS INDICATED ON PLANS UNLESS PROVIDED ON THE CHILLER BY MANUFACTURER.
 7. FURNISH AND INSTALL SENSORS FOR ALL DATA POINTS NOT INCLUDED BY THE CHILLER MANUFACTURER.
 8. UTILIZE SUFFICIENT VICTALUC PIPE COUPLINGS TO ALLOW REMOVAL OF PIPE AND ACCESSORIES TO PERMIT EVAPORATOR AND CONDENSER TUBE REMOVAL.
 9. MAINTAIN APPROPRIATE CLEARANCES PER MANUFACTURER'S RECOMMENDATION ON PIPING TO ACCOMMODATE ALL THE VALVES, FLEX CONNECTIONS AND PIPE FITTINGS. PERFORM ADDITIONAL PIPE CUTTING IF REQUIRED.
 10. PROVIDE SPARE GATE VALVES IN CONDENSER WATER RETURN & SUPPLY PIPES FOR FUTURE SIDE-STREAM CLEANER SYSTEM.

CHILLER PIPING DETAIL (CWPC03)
NOT TO SCALE



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: 2019-03-08

CONTRACT NO.
FQ17162

DESIGNED	REFERENCE DRAWINGS		REVISIONS	
	NUMBER	DESCRIPTION	DATE	BY
B. VIGNATHAN	05/17			
M. OLATA	05/17			
J. SILVA	05/17			

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

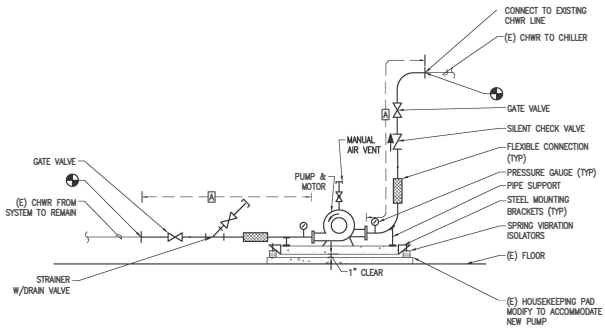
APPROVED: *Mark H. Kappeman*

GFP JOINT VENTURE
A GARRETT FIRM/PRISON
SUBMITTED: *GFP*
PROJECT MANAGER

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

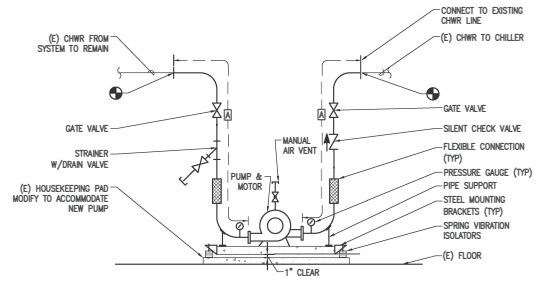
MECHANICAL DETAILS SHEET 1 OF 5

SCALE: NOT TO SCALE
DRAWING NO.: M-500
M1299-033



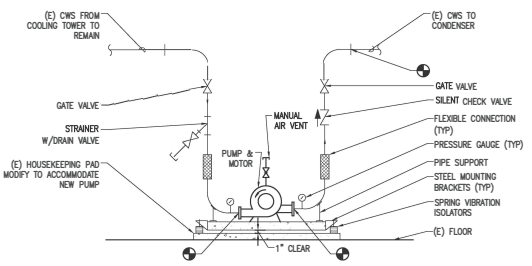
NOTE:
1. "A" DIMENSION FROM PUMP INLET/OUTLET SHALL BE FIELD COORDINATED FOR PROPER INSTALLATION TO THE POINT OF CONNECTION TO EXISTING.

TYPICAL CHILLED WATER PUMP DETAIL (CWPC03)
NOT TO SCALE



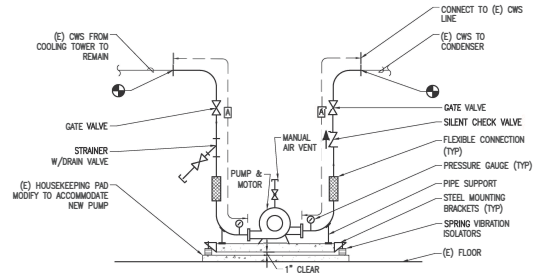
NOTE:
1. "A" DIMENSION FROM PUMP INLET/OUTLET SHALL BE FIELD COORDINATED FOR PROPER INSTALLATION TO THE POINT OF CONNECTION TO EXISTING.

TYPICAL CHILLED WATER PUMP DETAIL (CWPB11 & CWPE05)
NOT TO SCALE



NOTE:
1. "A" DIMENSION FROM PUMP INLET/OUTLET SHALL BE FIELD COORDINATED FOR PROPER INSTALLATION TO THE POINT OF CONNECTION TO EXISTING.

TYPICAL CONDENSER WATER PUMP DETAIL (CWPC03)
NOT TO SCALE



NOTE:
1. "A" DIMENSION FROM PUMP INLET/OUTLET SHALL BE FIELD COORDINATED FOR PROPER INSTALLATION TO THE POINT OF CONNECTION TO EXISTING.

TYPICAL CONDENSER WATER PUMP DETAIL (CWPB11 & CWPE05)
NOT TO SCALE



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: 2019-03-08

CONTRACT NO.
FQ17162

DESIGNED	B. VEDANATHAN	05/17
DRAWN	M. OLATA	05/17
CHECKED	J. SILVA	05/17
APPROVED	J. SILVA	05/17

REFERENCE DRAWINGS	
NUMBER	DESCRIPTION

REVISIONS		
DATE	BY	DESCRIPTION



WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES
OFFICE OF INFRASTRUCTURE RENEWAL PROGRAM
APPROVED: *Mark H. Kapperman*

GFP A GARRETT FIRMING/PALSONS JOINT VENTURE
SUBMITTED: *Jack*
PROJECT MANAGER

REPLACEMENT OF CHILLERS AND COOLING TOWERS AT THREE METRO-RAIL STATIONS
MECHANICAL DETAILS SHEET 2 OF 5
SCALE: NOT TO SCALE
DRAWING NO. M-501
M1299-034