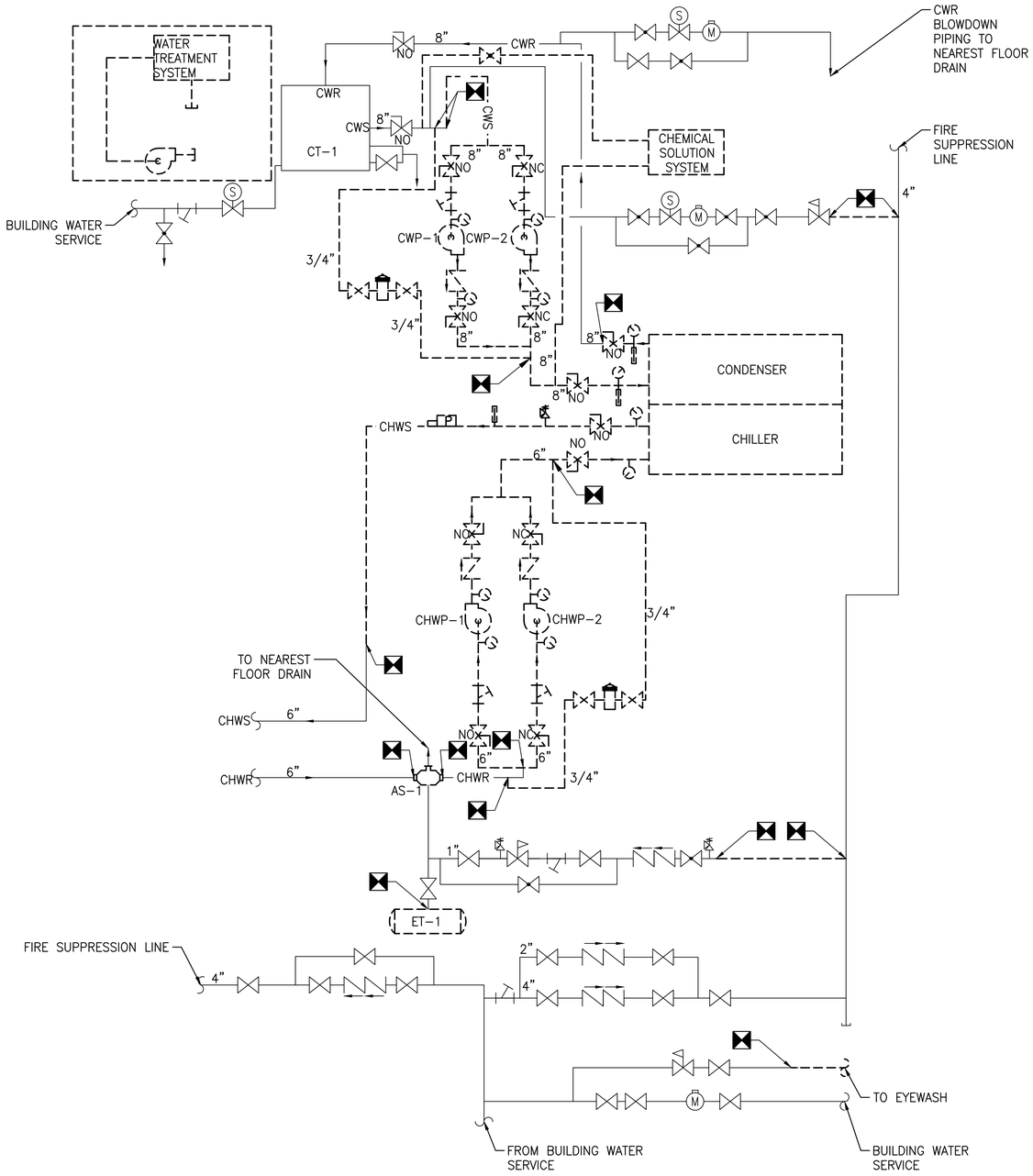

1 MECHANICAL FLOW DIAGRAM - DEMOLITION
CWPA5-M-500

SCALE: NOT TO SCALE

GFP A Gannett Fleming/Parsons JOINT VENTURE

State of Maryland 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. 041715, Expiration Date: 03/08/2020

03/29/2018

DESIGNED	C. LOOSE	07/26/17 DATE
DRAWN	C. LOOSE	07/26/17 DATE
CHECKED	R. SILVA	03/23/18 DATE

REFERENCE DRAWINGS

NUMBER	TITLE

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WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

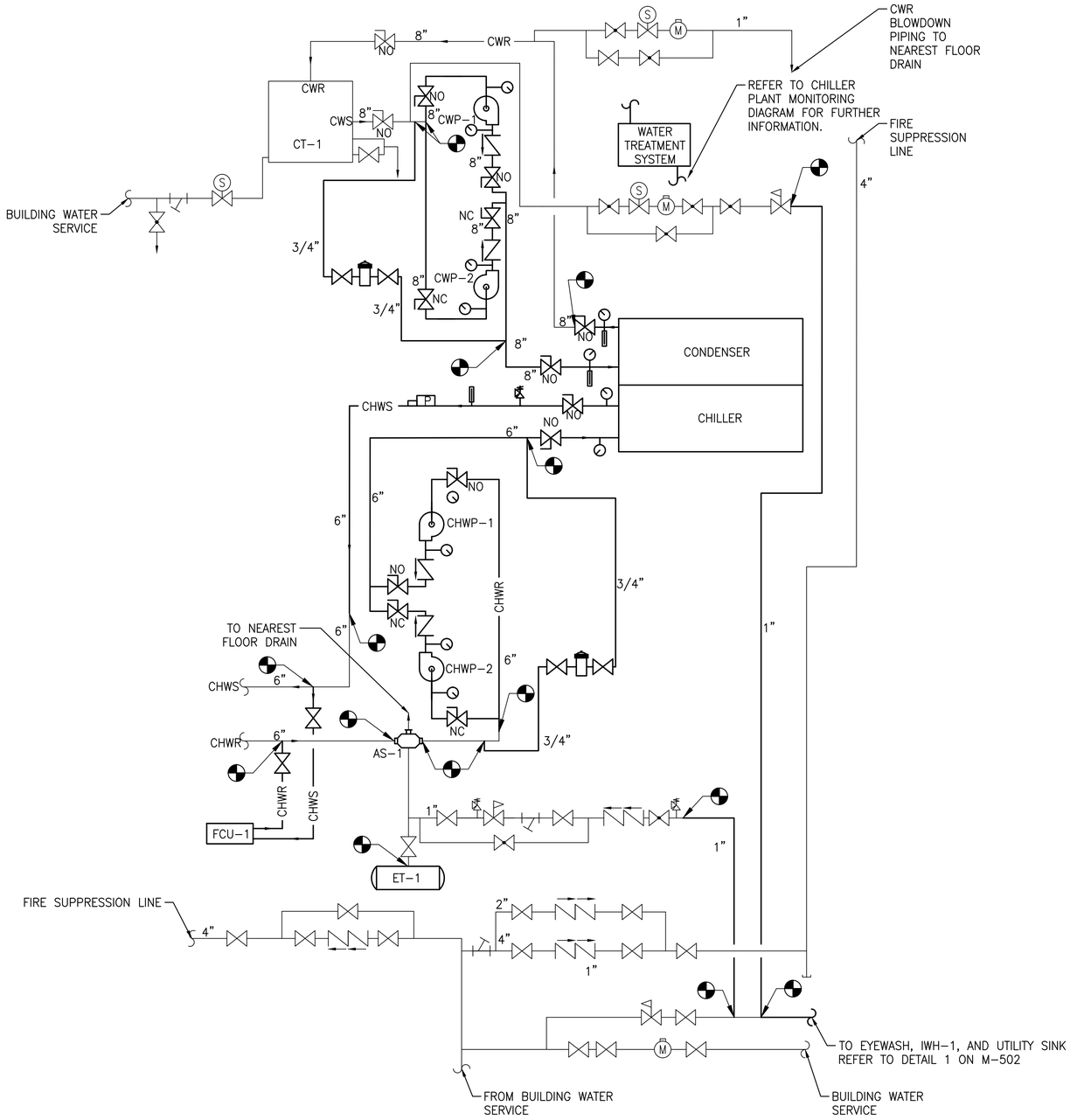
DEPARTMENT OF DESIGN AND CONSTRUCTION SERVICES
OFFICE OF INFRASTRUCTURE RENEWAL PROGRAM GROUP

APPROVED Mark H. Magnussen 03/2018 DATE
MARK MAGNUSSEN
MANAGER, ENV. PLANNING AND COMP

APPROVED 03/2018 DATE
GRAHAM SPILLER
GFP DEPUTY PROGRAM MANAGER

REPLACEMENT OF CHILLERS
AND COOLING TOWER ACCESSORIES AT EIGHT METRO-RAIL STATIONS
CWPA5 - BETHESDA (A09)
MECHANICAL FLOW DIAGRAM - DEMOLITION

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	NOT TO SCALE	CWPA5-M-500	42 of 173



1 MECHANICAL FLOW DIAGRAM - NEW WORK
CWPA5-M-501

SCALE: NOT TO SCALE

NOTE:

1. REFER TO REFERENCE DRAWING DD-ME-HVAC-007, 008, 009 FOR WATER TREATMENT CONNECTION TO SYSTEM LOOPS.

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STATE OF MARYLAND — KRISHNAN VISWANATHAN — No. 041715 — PROFESSIONAL ENGINEER

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REPLACEMENT OF CHILLERS
AND COOLING TOWER ACCESSORIES AT EIGHT METRO-RAIL STATIONS
CWPA5 - BETHESDA (A09)
MECHANICAL FLOW DIAGRAM - NEW WORK

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	NOT TO SCALE	CWPA5-M-501	43 of 173

CHILLER SCHEDULE

PLANT	DESIGNATION	CAPACITY (TONS)	EVAPORATOR					CONDENSER					COMPRESSOR/CHILLER ELECTRICAL							BASIS OF DESIGN
			GPM	PASSES	EWT (°F)	LWT (°F)	PD FT H_2O	GPM	PASSES	EWT (°F)	LWT (°F)	PD FT H_2O	VOLT	PH	HZ	RLA	LRA	MOCP	MCA	
CWPA5	CH-1	350	644	2	55.0	42.0	16.8	1050	2	85.0	94.3	17.1	460	3	60	316	174	500	356	DAINKIN WMC060DDSN26

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. CHILLERS SHALL BE CHARGED WITH REFRIGERANT R-134A.
6. MOTORS SHALL BE LIQUID REFRIGERANT COOLED WITH INTERNAL THERMAL SENSING DEVICES IN THE STATOR WINDINGS.
7. 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, OPERATING CONTROLS AND EQUIPMENT PROTECTION CONTROLS.
8. CHILLER CONTROLS SHALL COORDINATE COMPRESSOR SPEED AND GUIDE VANE POSITION TO OPTIMIZE CHILLER EFFICIENCY.
9. CHILLER SHALL BE EQUIPPED WITH MICROTECH II CONTROLLER OR EQUIVALENT AND SHALL INCLUDE REMOTE COMMUNICATIONS CARDS WITH MODBUS RTU CAPABILITY, TO CONNECT THE I/O POINTS TO CHILLER PLANT MONITORING PANEL.
10. CHILLER CAPACITY BASED ON WATER.
11. CHILLER TOTAL OPERATING WEIGHT 13079 LB
12. CHILLER DIMENSIONS 171.96 IN X 55.17 IN (FOOT PRINT)
13. PROVIDE EACH CHILLER WITH SINGLE POINT POWER CONNECTION.

VALVE SCHEDULE

TYPE	SIZE (IN)	QUANTITY	SERVICE	MANUFACTURER	MODEL
BUTTERFLY VALVE	6	6	CHILLED WATER	NIBCO	LD-2000-6
BUTTERFLY VALVE	8	6	CONDENSER WATER	NIBCO	LD-2000-8
CHECK VALVE	6	2	CHILLED WATER	NIBCO	F-918-B
CHECK VALVE	8	2	CONDENSER WATER	NIBCO	F-918-B

PUMP SCHEDULE

ITEM NO.	SERVICE	TYPE	GPM	FT HEAD	INLET (IN)	OUTLET (IN)	IMPELLER DIA (IN)	OPERATING WEIGHT (LB)	FOOTPRINT (IN)	MOTOR					BASIS OF DESIGN
										RPM	HP	VOLTS	PH	HZ	
CWP-1	CONDENSER WATER	CENTRIFUGAL	1050	125	6	6	13.19	599	32X36	1646	50	460	3	60	ARMSTRONG 4300 0613-050.0
CWP-2	CONDENSER WATER	CENTRIFUGAL	1050	125	6	6	13.19	599	32X36	1646	50	460	3	60	ARMSTRONG 4300 0613-050.0
CHWP-1	CHILLED WATER	CENTRIFUGAL	644	125	5	5	12.03	442	27X33	1662	40	460	3	60	ARMSTRONG 4300 0513H-040.0
CHWP-2	CHILLED WATER	CENTRIFUGAL	644	125	5	5	12.03	442	27X33	1662	40	460	3	60	ARMSTRONG 4300 0513H-040.0

NOTES:

1. PROVIDE WITH INVERTER DUTY, VFD COMPATIBLE MOTOR.
2. PROVIDE WITH SPRING TYPE VIBRATION ISOLATION.

LEAK DETECTION SYSTEM

1. PROVIDE (ONE) R-134A REFRIGERANT SENSOR FOR LEAK DETECTION (SHERLOCK 60-0054 OR EQUAL). UNDER-MOUNT THE REFRIGERANT MONITORING PANELS. INSTALL ALL SENSORS PER MANUFACTURER RECOMMENDATIONS.
2. PROVIDE GAS LEAK DETECTION SYSTEM (SHERLOCK 402 NEMA 4X OR EQUAL).
   - 2.1. PROVIDE COMMUNICATIONS INTERFACE FOR REMOTE MONITORING AND CONTROL GENCOM COMMUNICATIONS WITH 'CHILLER PLANT MONITORING PANEL' THROUGH RS-485 PORT/ETHERNET CONNECTION PART 88-0541.
   - 2.2. CONNECT TO PRODUCTIVITY 3000, PAC IN CHILLER PLANT MONITORING PANEL.
   - 2.3. PROVIDE RELAY OUTPUT FOR FAN EF-7, ALARM, AND STROBE OPERATION.

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 – CONNECT TO PAC 3000 IN CHILLER PLANT MONITORING PANEL
8. ABUNDANT INPUT/OUTPUT, ISOLATED 4-20MA OUTPUT, RELAY, PULSE OUTPUT, ALARM OUTPUT
9. SELF-EXPLANATORY MENU-DRIVEN PROGRAMMING
10. PIPE SIZE RANGE, 8" ~ 10"
11. NEMA 4X (IP65) WEATHER-RESISTANT ENCLOSURE
12. SIEMENS SITRANS FUS 1010 (OR APPROVED EQUAL). PROVIDE CABLES OF SUFFICIENT LENGTH TO REACH ALL TERMINATION POINTS

UNIT HEATER SCHEDULE

DESIGNATION	LOCATION	TYPE	kW	ELECTRICAL DATA					HORIZ. AIR THROW (FT)	WIDTH (IN)	HEIGHT (IN)	DEPTH (IN)	WEIGHT (LB)	BASIS OF DESIGN	NOTES
				MOTOR HP	VOLTS	PH	AMPS	RPM							
UH-7	CWPA5	ELECTRIC, SUSPENDED	7.5	1/30	480	3	9	1600	18	19.00	21.75	8.50	36.00	BERKO HUHAA748	1-4
UH-8	CWPA5	ELECTRIC, SUSPENDED	7.5	1/30	480	3	9	1600	18	19.00	21.75	8.50	36.00	BERKO HUHAA748	1-4

NOTES:

1. UNIT INSTALLED MOTOR STARTER.
2. DISCONNECT: FACTORY INSTALLED.
3. WALL/CEILING MOUNTED BRACKET.
4. WALL MOUNT THERMOSTAT KIT, SET POINT 50°F.

EXISTING 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 (EACH)	NO. OF MOTORS	HP	V	PH	HZ		
(E) CT-1	CONDENSER WATER	AXIAL	1050	95.0	85.0	78.0	3	73800	1	40	460	3	60	13970	EVAPCO LSTA 10-123

NOTES:

1. SEPARATE STARTER PANELS FURNISHED FOR FIELD MOUNTING.
2. PROVIDE DIRECT DRIVE FAN WITH INVERTER DUTY MOTORS.
3. COOLING TOWER FAN MOTORS SHALL BE RATED VFD COMPATIBLE.
4. PROVIDE WITH NEW PLASTIC FILL FOR EXISTING COOLING TOWERS.

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STATE OF MARYLAND · PROFESSIONAL ENGINEER · No. 041715

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MARK MAGNUSSEN
MANAGER, ENV. PLANNING AND COMP

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GRAHAM SPILLER
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REPLACEMENT OF CHILLERS
AND COOLING TOWER ACCESSORIES AT EIGHT METRO-RAIL STATIONS
CWPA5 - BETHESDA (A09)
MECHANICAL EQUIPMENT SCHEDULES - SHEET 1 OF 2

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	NONE	CWPA5-M-600	44 of 173

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	607	160	375	CHWR	6"	306	ARMSTRONG VAS–6

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
							DIA (IN)	LENGTH (IN)		
ET–1	CHILLER PLANT	CHWS	COMPRESSION	HORIZONTAL	12	305	30	105	523	ARMSTRONG AET 30X105

FAN COIL UNIT SCHEDULE

MARK	NOMINAL CAPACITY (TONS)	EVAPORATOR							ELECTRICAL DATA				DIMENSIONS			WEIGHT (LBS)	BASIS OF DESIGN	NOTES
		GPM	ROWS	EWT (°F)	LWT (°F)	CFM	EAT (°F) (DB / WB)	LAT (°F) (DB / WB)	HP	VOLTS	PH	HZ	LENGTH (IN)	WIDTH (IN)	HEIGHT (IN)			
FCU–1	5	12.1	6	42.0	55.0	2000	80.0 / 67.0	55.9 / 54.6	1.5	460	3	60	57.2	46.0	22.4	435	DAIKIN HCBB120	1–2

NOTES:

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

FAN SCHEDULE

MARK	TYPE	FAN				ELECTRICAL DATA					dBA	DIMENSIONS		WEIGHT (LBS)	BASIS OF DESIGN	NOTES
		CFM	EXT. SP (IN. W.G.)	RPM	BHP	MOTOR HP	VOLTS	PH	HZ	MOTOR RPM		LENGTH (IN)	DIA. (IN)			
F–15	AXIAL EXHAUST	1766	1.500	3500	0.76	1	460	3	60	3500	80	17.0	17.0	83	GREENHECK AX–36–160–0413–M10	1–3
F–16	AXIAL EXHAUST	1766	1.500	3500	0.76	1	460	3	60	3500	80	17.0	17.0	83	GREENHECK AX–36–160–0413–M10	1–3

NOTES:

1. PROVIDE TWO SPEED FAN.
2. CEILING HUNG WITH VIBRATION ISOLATION.
3. PROVIDE WITH HAND/OFF/AUTOMATIC SWITCH.

INSTANTANEOUS WATER HEATER SCHEDULE

MARK	INLET SIZE (IN.)	TURN ON FLOW (GPM)	kW	VOLTS	AMPS	MAX. TEMPERATURE (°F)	BASIS OF DESIGN	NOTES
IWH–1	1/2	0.3	2.4	120	20	90	EEMAX EX2412T	1

NOTES:

1. PROVIDE WITH THERMOSTATIC MIXING VALVE: BRADLEY MODEL S19–2000.

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GRAHAM SPILLER
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REPLACEMENT OF CHILLERS AND COOLING TOWER ACCESSORIES AT EIGHT METRO-RAIL STATIONS
CWPA5 - BETHESDA (A09)
MECHANICAL EQUIPMENT SCHEDULES - SHEET 2 OF 2

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	NONE	CWPA5-M-601	45 of 173

CHILLED WATER PLANT SEQUENCE OF OPERATION:

GENERAL FOR CHILLER PLANT AT BETHESDA STATION

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

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 55°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.

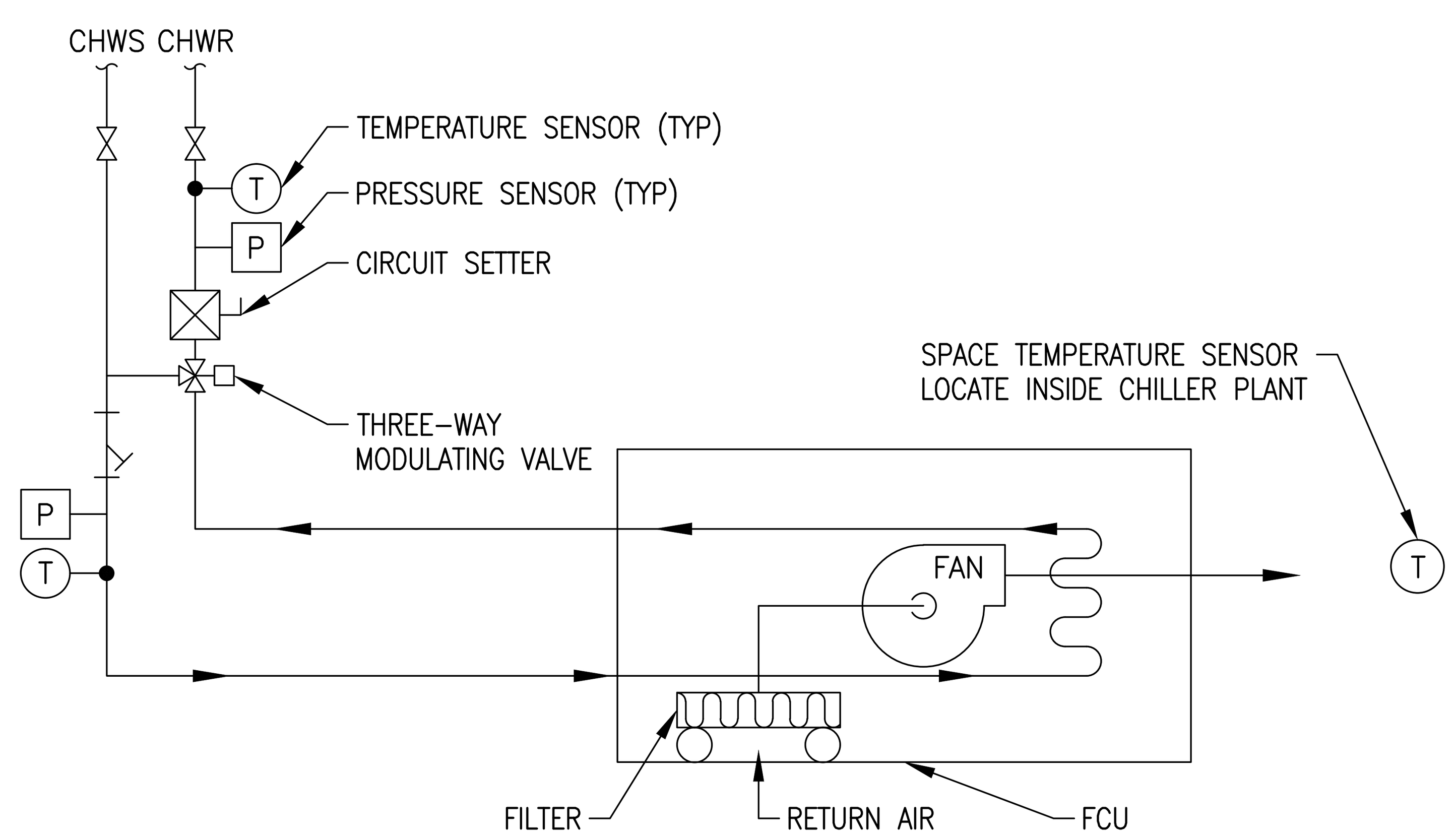
COOLING TOWER IS ENABLED WHEN CONDENSER WATER PUMP IS OPERATING. WHEN THE CONDENSER WATER SUPPLY TEMPERATURE INCREASES FROM THE SET POINT (85°F, ADJUSTABLE), THE COOLING TOWER FAN STARTS AT LOW SPEED. INCREASE AND DECREASE FAN SPEED BY VFD IN ORDER TO MAINTAIN THE CONDENSER WATER SUPPLY TEMPERATURE SET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

CHILLER CONTROL PANEL SHALL CONTROL THE OPERATION OF THE CHILLER AND PUMPS. THE LOCAL COOLING TOWER CONTROL PANEL SHALL CONTROL THE FAN OPERATION PER THE SEQUENCE.

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.

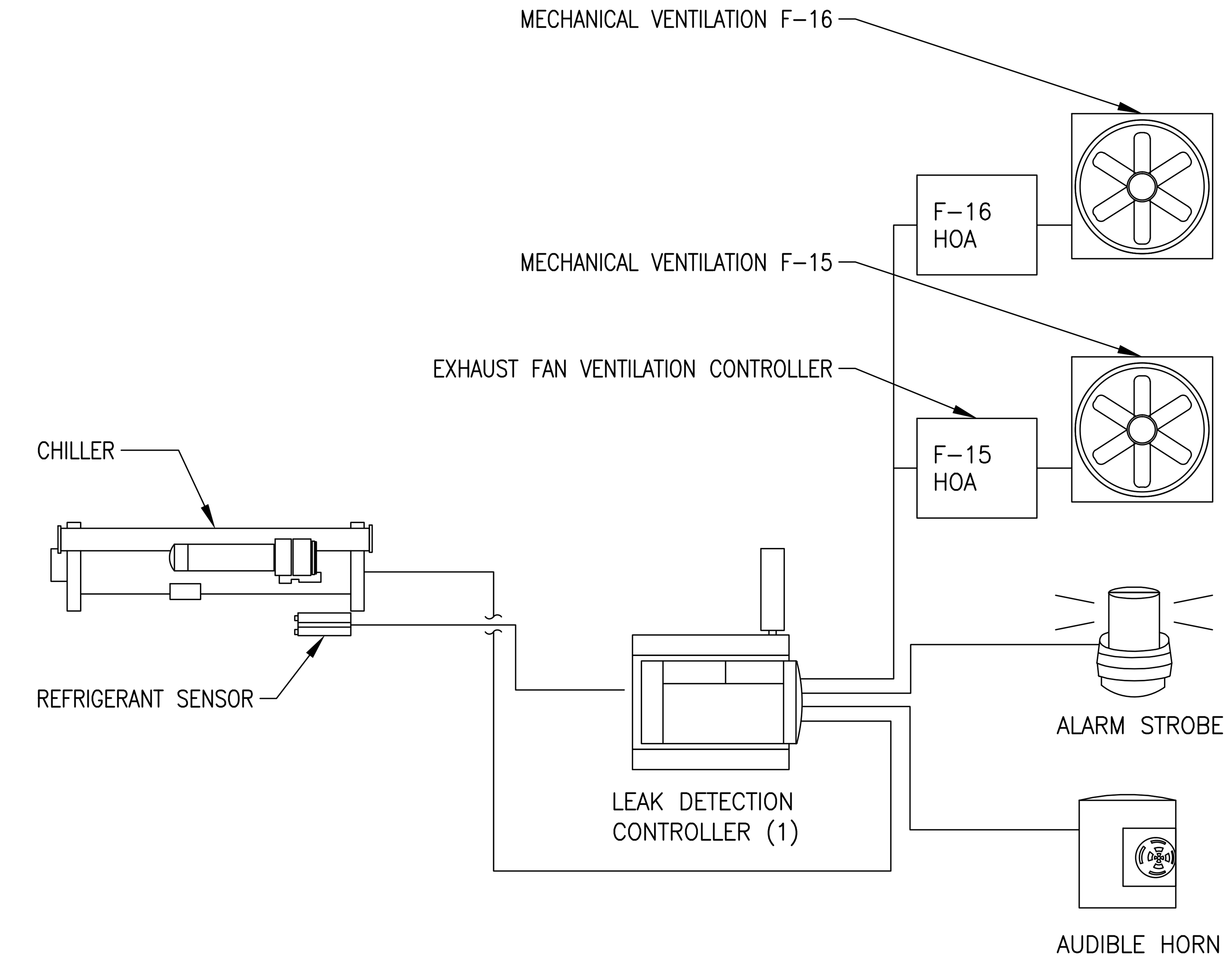
CHILLER EMERGENCY SHUTDOWN:

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



FAN COIL UNIT (FCU-1) 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 82°F, THE FCU FAN SHALL BE STARTED. THE THREE WAY VALVE SHALL CONTROL THE CHILLED WATER FLOW TO MAINTAIN THE SPACE SETPOINT TEMPERATURE OF 80°F. WHEN THE SPACE TEMPERATURE FALLS BELOW 78°F, THE FCU FAN SHALL TURN OFF. UPON ACTIVATION OF THE EXHAUST FANS (F-15, F-16), THE FCU SHALL SHUT DOWN.



MECHANICAL REFRIGERANT ALARM SYSTEM SEQUENCE OF OPERATION:

NORMAL OPERATION:

1. PROVIDE A LOCAL HAND-OFF-AUTOMATIC (HOA) SWITCH INSIDE THE CHILLER PLANT FOR FAN TEST AND INCIDENTAL FAN OPERATION. THE LOCAL FAN HOA SWITCH SHALL INTEGRATE WITH A 1-HOUR TIMER (ADJUSTABLE).
2. IN AUTOMATIC MODE, F-15, F-16 SHALL OPERATE FOR REFRIGERANT LEAK PURGING AS DESCRIBED IN THE SEQUENCE.
3. F-15, F-16 SHALL BE INTERLOCKED WITH THE INTAKE AIR MOTORIZED DAMPER, AND, IF FOUND, THE EXHAUST AIR AUTOMATIC DAMPER. AS THE FANS ARE CALLED FOR OPERATION, THE DAMPER END LIMIT SWITCHES SHALL BE PROVED OPEN BEFORE THE FANS ARE ENERGIZED.
4. F-15, F-16 SHALL OPERATE WHEN THE INSIDE SPACE TEMPERATURE OF THE SPACE REACHES 90°F.
5. DURING NORMAL OPERATION, TWO-SPEED FANS SHALL OPERATE AT LOW-SPEED MINIMUM FLOW OF 1,000 CFM (NOMINAL).

REFRIGERANT LEAK PURGING OPERATION:

1. REFRIGERANT INFRARED GAS SENSOR SHALL MONITOR FOR R-134A LEVELS.
2. WHEN 250 PPM IS DETECTED, THE FIRST ALARM LEVEL (LOW) SHALL STAGE THE MECHANICAL VENTILATION. F-15, F-16 SHALL BE SET TO RUN AT LOW-SPEED MINIMUM FLOW OF 1,000 CFM (NOMINAL), AND THE WARNING STROBE LIGHT (AMBER) SHALL BE ACTIVATED.
3. WHEN 500 PPM IS DETECTED, THE SECOND ALARM LEVEL (HIGH) SHALL STAGE THE MECHANICAL VENTILATION. F-15, F-16 SHALL BE SET TO RUN AT MAXIMUM EXHAUST FLOW OF 3,500 CFM (NOMINAL), AND THE WARNING STROBE LIGHT (AMBER) AND AUDIBLE ALARM HORN SHALL BE ACTIVATED.
4. ALARM STATUS SHALL BE CONTINUOUSLY COMMUNICATED VIA THE REMOTE COMMUNICATIONS SOFTWARE.

GENERAL:

1. PROVIDE NEW EXHAUST FAN VENTILATION CONTROLLER FOR F-15, F-16. VENTILATION CONTROLLER SHALL BE PROVIDED WITH INPUT AND OUTPUT FOR OPERATION WITH THE REFRIGERANT MONITORING PANEL AND THERMOSTAT, PER THE SEQUENCE OF OPERATION.
2. CONTRACTOR SHALL VERIFY IN FIELD ANY EXISTING AUTOMATIC DAMPER(S) IN THE EXISTING TO REMAIN DUCTWORK. IF AUTOMATIC DAMPER(S) ARE FOUND, ARE OPERATIONAL, AND ARE IN GOOD CONDITION, CONTRACTOR SHALL INTEGRATE AUTOMATIC DAMPER(S) WITH F-15, F-16 FOR ACTUATION WHEN FANS ARE ON. IF AUTOMATIC DAMPER(S) ARE FOUND, BUT ARE NON-OPERATIONAL AND/OR IN POOR CONDITION, AUTOMATIC DAMPER(S) SHALL BE REPLACED IN-KIND AND THE REPLACEMENT AUTOMATIC DAMPER(S) SHALL BE INTEGRATED WITH F-15, F-16 FOR ACTUATION WHEN FANS ARE ON.

ALARM CONDITIONS:

GENERAL:

SEND ALL EQUIPMENT STATUS AND ALARM CONDITIONS TO CHILLER PLANT CONTROL PANEL WITHIN THE CHILLER PLANT. REFER TO CHILLER SPECIFICATION 15625 FOR ALL THE CHILLER, PUMP RELATED ANALOG POINT, STATUS POINTS, CONTROL POINTS, AND ALARM POINTS REQUIREMENTS. PROVIDE CAPABILITY FOR THE CONTROL POINTS TO BE CONNECTED TO THE AEMS SYSTEM. IN ADDITION TO THE ABOVE, ALSO PROVIDE THE FOLLOWING:

HAND/OFF/AUTO:

CHILLER PLANT FAN COIL UNIT/AHU
CHILLER PLANT EXHAUST/SUPPLY FANS
CHILLER PLANT UNIT HEATERS

EQUIPMENT STATUS WITH VISUAL INDICATING LAMPS (ON/OFF/FAULT):

CHILLER PLANT FAN COIL UNIT/AHU
CHILLER PLANT EXHAUST/SUPPLY FANS
CHILLER PLANT UNIT HEATERS

ALARMS:

FAN FAILURE ALARM (FCU, EXHAUST/SUPPLY FANS): INITIATE AN ALARM UPON SENSING A LOSS OF POWER FROM THE CURRENT SENSOR WHEN THE UNITS ARE COMMANDED TO RUN.

HIGH TEMPERATURE ALARM: INITIATE AN ALARM WHEN THE SPACE TEMPERATURE RISES ABOVE SETPOINT. INITIAL SET POINT SHALL BE 90 DEG F (ADJUSTABLE).

LOW TEMPERATURE ALARM: INITIATE AN ALARM WHEN THE SPACE TEMPERATURE FALLS BELOW SETPOINT. INITIAL SETPOINT SHALL BE 45 DEG F (ADJUSTABLE).

UNIT COMMON ALARM: INITIATE AN ALARM UPON RECEIVING A COMMON ALARM FROM THE UNIT FACTORY CONTROLS OF FCU/AHU. THIS INCLUDES THE FILTER CHANGE ALARM AS WELL.

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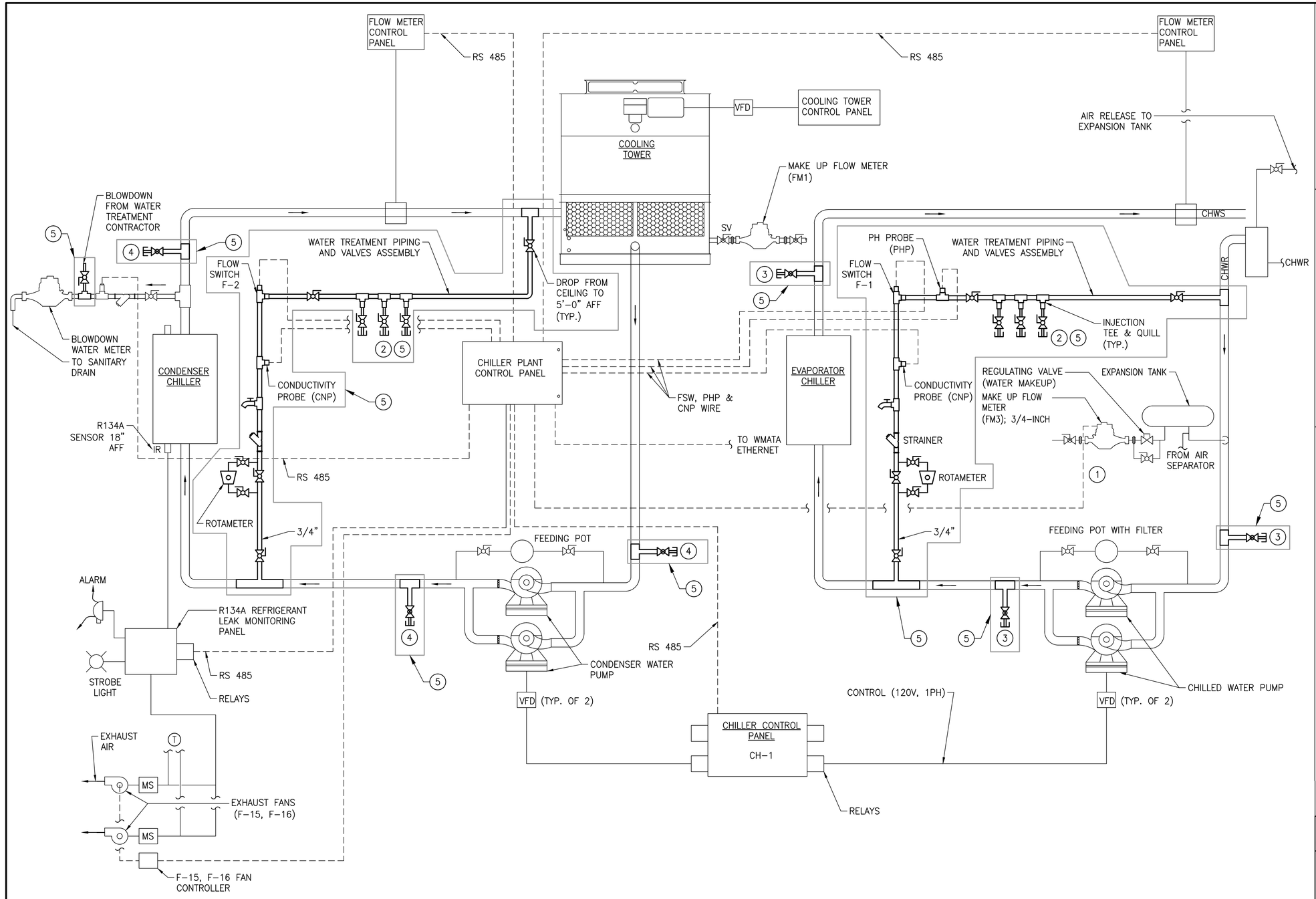
DEPARTMENT OF DESIGN AND CONSTRUCTION SERVICES
OFFICE OF INFRASTRUCTURE RENEWAL PROGRAM GROUP

APPROVED 03/2018 DATE
MARK MAGNUSSEN
MANAGER, ENV. PLANNING AND COMP

APPROVED 03/2018 DATE
GRAHAM SPILLER
GFP DEPUTY PROGRAM MANAGER

REPLACEMENT OF CHILLERS
AND COOLING TOWER ACCESSORIES AT EIGHT METRO-RAIL STATIONS
CWPA5 - BETHESDA (A09)
MECHANICAL SEQUENCE OF OPERATION

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	NONE	CWPA5-M-610	46 of 173



GENERAL NOTES:

A. CONTRACTOR SHALL FIELD VERIFY EXACT LOCATION AND QUANTITIES OF EQUIPMENT, PIPING, VALVES, DUCTWORK, ELECTRICAL AND CONTROL WIRING PRIOR TO DEMOLITION. ITEMS SHOWN ON THIS PLAN ARE APPROXIMATE.

B. REFER TO LEGEND SHEET FOR GENERAL ABBREVIATIONS AND SYMBOLS.

KEYNOTES:

1. COMMUNICATIONS WIRING SHALL BE IN RIGID CONDUIT FROM FLOW METER MONITORING PANEL TO THE CHILLER PLANT CONTROL PANEL, UTILIZING BELDEN 89842 MULTI-CONDUCTOR – LOW CAPACITANCE COMPUTER AND COMPUTER POS CABLE OR EQUIVALENT.
2. TAPS FOR FUTURE CHEMICAL INJECTION PUMPS.
3. TAPS FOR CHILLED WATER SYSTEM WATER MONITORING/TREATMENT.
4. TAPS FOR CONDENSER WATER SYSTEM WATER MONITORING/TREATMENT.
5. REFER TO WMATA REFERENCE DRAWINGS DD-ME-HVAC-007, DD-ME-HVAC-008, AND DD-ME-HVAC-009.

LEGEND:

- GATE VALVE (GV)
- GLOBE VALVE (GB)
- BALL VALVE (1/4 TURN) SHUT OFF TYPE (SV), NORMALLY OPEN, UNLESS OTHERWISE NOTED
- STRAINER (STN)
- SAMPLE PET COCK (SPC)
- SOLENOID VALVE (SOL)
- IR — REFRIGERANT GAS LEAK SENSOR
- MS — MOTOR STARTER (FOR FANS)
- VFD — VARIABLE FREQUENCY DRIVE CONTROLLER
- FSW — FLOW SWITCH
- FLOW METER (FM 1 TO 3) PULSE OUTPUT
- FLOW METER — FLOW METER (FM 4 & 5) ULTRASONIC FLOW METER
- CENTRIFUGAL PUMP

A Gannett Fleming/Parsons JOINT VENTURE

STATE OF MARYLAND — KRISHNAN VISWANATHAN — No. 041715 — PROFESSIONAL ENGINEER

State of Maryland 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. 041715, Expiration Date: 03/08/2020

03/29/2018

DESIGNED	B. VISWANATHAN	01/17/18 DATE
DRAWN	D. ROMNESS	01/18/18 DATE
CHECKED	R. SILVA	03/23/18 DATE

REFERENCE DRAWINGS

NUMBER	TITLE

REVISIONS

DATE	NUM	DESCRIPTION
03/30/2018	0	FINAL CONTRACT DRAWINGS

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

DEPARTMENT OF DESIGN AND CONSTRUCTION SERVICES
OFFICE OF INFRASTRUCTURE RENEWAL PROGRAM GROUP

APPROVED Mark H. Magnussen 03/2018 DATE
MARK MAGNUSSEN
MANAGER, ENV. PLANNING AND COMP

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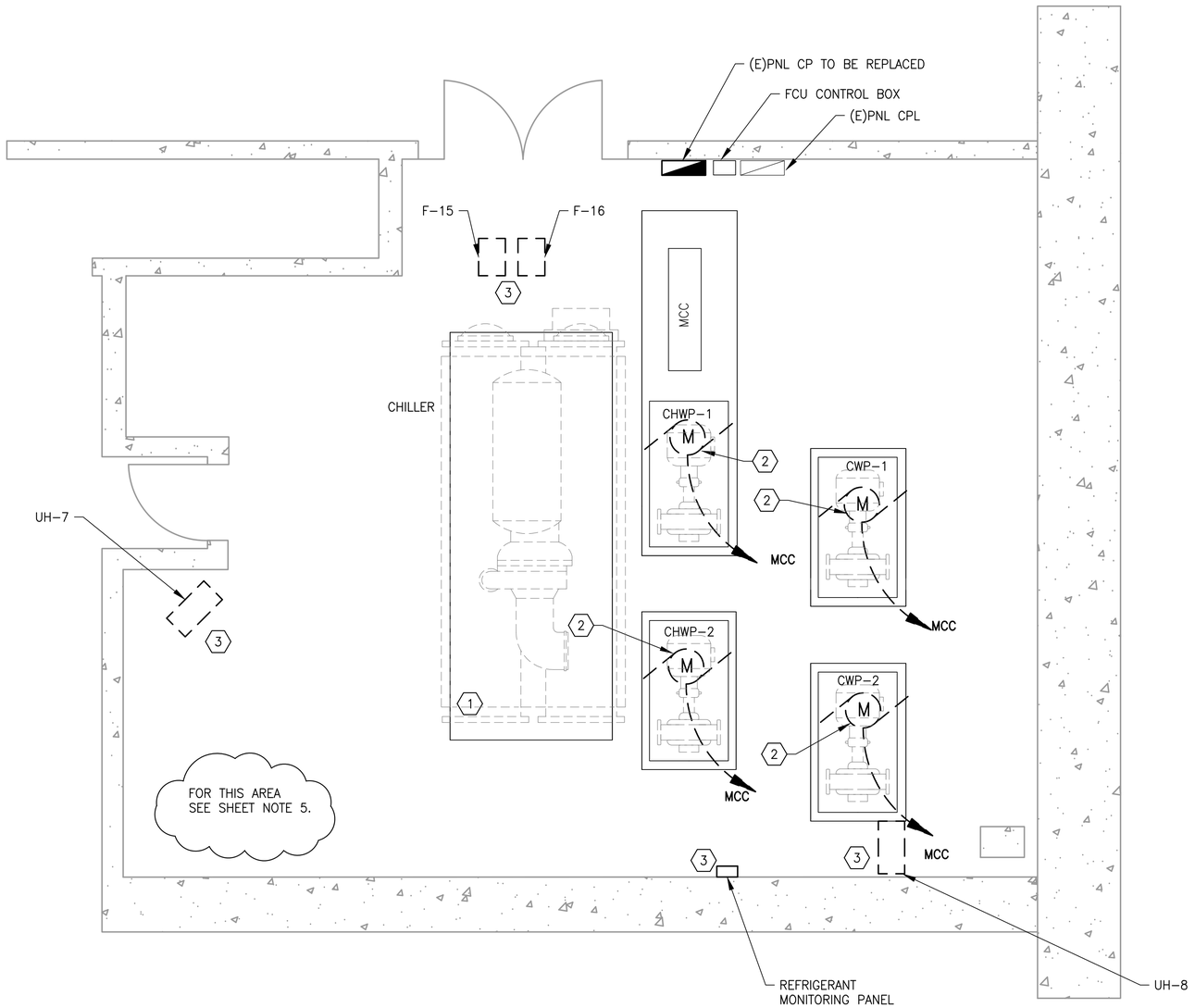
GRAHAM SPILLER
GFP DEPUTY PROGRAM MANAGER

REPLACEMENT OF CHILLERS AND COOLING TOWER ACCESSORIES AT EIGHT METRO-RAIL STATIONS
CWPA5 - BETHESDA (A09)
CHILLER PLANT MONITORING DIAGRAM

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	NONE	CWPA5-M-611	47 of 173



1 ELECTRICAL PLAN - DEMOLITION (CHILLER ROOM)
CWPA5-E-100

SCALE: 3/8" = 1'-0"

KEYNOTES:

1. EXISTING CHILLER STARTER EQUIPMENT TO BE DEMOLISHED BY MECHANICAL.
2. EXISTING PUMP MOTOR TO BE DEMOLISHED BY MECHANICAL.
3. FAN-15, FAN-16, UH-7 AND UH-8 AND REFRIGERANT MONITORING PANEL TO BE DEMOLISHED.

SHEET NOTES:

1. ALL SHOWN EQUIPMENT IS EXISTING TO REMAIN UNLESS NOTED OTHERWISE.
2. REMOVE AND DISPOSE OF ALL ELECTRICAL CONDUIT, WIRING AND EQUIPMENT ASSOCIATED WITH EXISTING WATER TREATMENT EQUIPMENT.
3. REMOVE AND DISPOSE OF DEMOLISHED EQUIPMENT ALONG WITH ASSOCIATED WIRING.
4. FOR EQUIPMENT TO BE DEMOLISHED: ALL EXISTING CONDUIT AND WIRING SHALL BE REMOVED. PERMISSION TO USE EXISTING CONDUIT (WIRES REMOVED) SHALL BE REQUESTED FROM AR.
5. THE CONTRACTOR SHALL RELOCATE LIGHTING FIXTURE AND/OR CONDUITS AS NECESSARY TO ACCOMMODATE THE NEWLY DESIGNED VENTILATION UNIT MAINTENANCE PLATFORM. REFER TO AS BUILT DWG FA11-E-33.

GFP A Gannett Fleming/Parsons JOINT VENTURE

STATE OF MARYLAND · USAMAH KHAN · 24687 · 03/29/2018 · PROFESSIONAL ENGINEER

State of Maryland 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. 024687, Expiration Date: 03/15/2020

DESIGNED	B. IDILBI	09/30/17 DATE
DRAWN	J. ZHU	09/30/17 DATE
CHECKED	D. KHAN	03/23/18 DATE

REFERENCE DRAWINGS

NUMBER	TITLE

REVISIONS

DATE	NUM	DESCRIPTION
03/30/2018	0	FINAL CONTRACT DRAWINGS

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

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GFP DEPUTY PROGRAM MANAGER

REPLACEMENT OF CHILLERS AND COOLING TOWER ACCESSORIES AT EIGHT METRO-RAIL STATIONS
CWPA5 - BETHESDA (A09)
ELECTRICAL PLAN - DEMOLITION

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	3/8"=1'-0"	CWPA5-E-100	48 of 173