May 22, 2018

Re: IFB FQ18102/KKB
Replacement of Chiller and Cooling Tower Accessories
At Eight (8) Metro-Rail Stations: DC, MD, and VA
Request for Clarification/Information Response

Dear Prospective Respondent:

In response to your Request for Clarification/Information, the response is provided to question.

WMATA appreciates your interest in its procurement process and we look forward to receiving your bid on or before June 6, 2018.

As always, should you require further assistance, kindly contact Kamoru Banjo of the Office of Procurement and Materials by email at kkbanjo@wmata.com.

Sincerely,

Sherreen N. Tolliver
Contracting Officer
Office of Procurement and Materials

Washington Metropolitan Area Transit Authority

600 Fifth Street, NW
Washington, D.C. 20001
202/962-1234

By Metrorail:
Judiciary Square-Red Line
Gallery Place-Chinatown
Red, Green and Yellow Lines

A District of Columbia Maryland and Virginia Transit Partnership

Solicitation FQ18102/KKB; Replacement of Chiller and Cooling Accessories at Eight (8) Metro-Rail Stations: DC, MD, and VA
RFI Log Responses
RFI Responses/Clarifications-RFI No. 22 thru 52

RFI No.	Amendment No.	RFI Description	RFI Response
22		There is a common note on the electrical drawings that states “provide filters for VFD’s as required”. Please confirm that the required filters are shown on the riser and no additional filters will be required. If addition filters are required, please indicate them on the risers, floor plans and equipment schedules.	Dwgs E-602 (Electrical One Line diagrams) show the line and load reactors (filters). NO additional filters are required.
23		D04 Federal Center: E-102 keynote 6 states we are to provide new wiring; however there is no information on the type, gauge or quantity of the wire. a. In addition, the note and floor plans don’t indicate where this equipment is fed from. Please provide this information.	See revised dwg CWPD2-E-102.
24		D04 Federal Center: Drawing E-103 keynote 2 states we are to provide line and load reactors for the existing VFD’s for the cooling tower fans; however, drawing E-602 does not show these reactors, nor does the equipment list on E-603. If these are required, please show them on the floor plan, riser and equipment list.	See revised dwg CWPD2-E-103.

RFI No.	Amendment No.	RFI Description	RFI Response
25		D04 Federal Center: Drawing E-602: Assuming the (2) 20HP motors to the bottom left of the riser are the CT fans, they are shown with what appears to be an existing size 2 combo starter; however E-103 keynote 2 states the CT fans have existing VFD's. Please indicate the actual existing condition (starters or VFD's), and indicate any/all new work that is required.	The actual existing condition are the VFD's. the contractor to install the line and load reactors and utilize new wiring to match the existing from the wireway to the CT fan motors. See revised dwg CWPD2-E-602 & CWPD2-E-103.
26		D04 Federal Center: New panel CP3 is not shown on the riser on drawing E-602. Please show this panel and feeder on the riser.	See revised dwg CWPD2-E-602.
27		D04 Federal Center: The FCU shown on E-602 is not shown on the floor plans. Please indicate the location of the FCU and its control box on the floor plans.	FCU was a typo it should have been AHU; See revised dwg CWPD2-E-602, additionally, see Mechanical floor plan for AHU location .
28		D04 Federal Center: Panel CP2 is shown as 120/240V 1P on drawing E-602; however it's shown as 120/208V 3P on E-603. Please confirm this panel is 120/240V 1P.	Panel CP2 is shown as 120/240V, 1 PH; See revised dwg CWPD2-E-602 & CWPD2-E-603.
29		D04 Federal Center:	This will be a new panel. See revised Dwg CWPD2-E-603, Note 1.

RFI No.	Amendment No.	RFI Description	RFI Response
		Panel CP2 on E-603 has a total of (8) circuits with sheet note 1, which indicate we are to provide a 20A 1P breaker. Please confirm this is a new panel as indicated by the equipment list on E-603. a. If this is an existing panel that is to receive (8) new 20A 1P breakers; please indicate the existing panel/breaker manufacturer, type and AIC rating.	
30		A09 Bethesda: E-102 keynote 4 states we are to provide new wiring; however there is no information on the type, gauge or quantity of the wire. a. In addition, the note and floor plans don't indicate where this equipment is fed from. Please provide this information.	See revised Dwg. CWPA5-E-102.
31		A09 Bethesda: Drawing E-102, sheet notes 3 and 4 indicate relocating light fixtures and/or ~~controls~~ conduits, as well as providing new light fixture(s). None of these fixtures and/or controls are shown, nor has a fixture schedule been provided for new light fixtures. E-100 sheet note 5 tells us to reference as-built drawing FA11-E-33; however with no column lines on that drawing or on E-100, it's hard to determine what light fixtures are to be removed and relocated. Please indicate the existing light fixtures that are to	New maintenance platform will be installed in the area shown on the dwg; therefore the lighting fixtures relocation and the new fixture installation would have to be determined after said platform is designed. The attached AS BUILT dwg ST-E-16 indicate the type of fixture required; contractor to provide similar/equal.

RFI No.	Amendment No.	RFI Description	RFI Response
		be removed on the demo plans, and relocated on the new work plans. a. In addition, please provide a light fixture schedule for the new fixture(s), and indicate them on the floor plans.	
32		A09 Bethesda: Sheet note 3 on E-103 states that the contractor is to utilize conduits in existing ductbank. Of the 620' total, how much of this conduit is existing, and where is it located?	All field verification measurements should have been made during site survey.
33		A09 Bethesda: Drawing E-602 shows a new 500A breaker going into what we're assuming is the switchboard. Please indicate the manufacturer/type or switchboard and breaker, along with the AIC rating. a. In addition, this switchboard is not shown on the floor plans. Please show where it's located on the floor plans.	All field verification measurements should have been made during site survey.
34		A09 Bethesda: Drawing E-602: The existing 125A breaker in MCC feeder the CTF appears to have new ground fault	The new breaker shall be provided with GFP.

RFI No.	Amendment No.	RFI Description	RFI Response
		protection. If this is the case, please verify the circuit breaker needs to be replaced with a circuit breaker that has this capability.	
35		A09 Bethesda: Drawing E-603 shows existing panel CPL that is to receive (5) new 20A 1P breakers. Please indicate the manufacturer/type of panel/breaker, as well as the AIC rating.	Manufacturer: FPE AIC rating: 10,000A
36		A09 Bethesda: Drawing E-603: Panel CP appears to be new, which is also indicated on drawing E-102; however this panel is not shown on the equipment list on E-603. Please confirm this is a new panel. a. Also, confirm this new panel is to utilize the existing feeder from the old CP panel. b. In addition, sheet note 2 states we are to provide a 20A 3P breaker in spaces 25, 27 and 29 of panel CP. The schedule shows (3) spaces. Please verify what is required for circuits 25, 27 and 29.	Panel CP is existing. schedule was added to indicate ckts 25, 27, 29 to feed the FCU. See revised dwg. CWPA5-E-603.
37		A10 Medical Center: Keynote 4 on E-602 states we are to provide a new 450A breaker in the existing switchboard MDPC.	Match existing. Per site survey information the existing is 30Kaic @ 480V. Field verification was available during site survey.

RFI No.	Amendment No.	RFI Description	RFI Response
		Please indicate the AIC rating for this switchboard/breaker.	
38		E04 Columbia Heights: E-102 keynote 3 states we are to provide new wiring; however there is no information on the type, gauge or quantity of the wire. a. In addition, the note and floor plans don't indicate where this equipment is fed from. Please provide this information.	See revised Dwg CWPE3-E-102.
39		E04 Columbia Heights: Drawing E-103 appears to show new combo motor starters for CT-1 and CT-2; however plan note 2 on E-601 shows these as existing disconnects to remain, and E- 602 mirrors the condition shown on E-601. No new starters/disconnects are shown on the equipment list (E-603) for the CT's. Please indicate what the device is, and if it's existing or new. a. If it's new, please show it on the riser, floor plan and equipment list.	There are no motor starters; these should have been shown as existing disconnects. See revised Dwg CWPE3-E-103 & CWPE3-E-602.
40		E04 Columbia Heights: Plan note 3 on E-602 states we are to remove load wires from circuits 32, 34 and 36 in panel NANS;	Panel NANS schedule is not shown on dwg CWPE3-E-603; the 24 ckt panel is NANSS. See Sheet Note 1 on dwg CWPE3-E-603, but

RFI No.	Amendment No.	RFI Description	RFI Response
		however panel NANS is only shown as a 24 pole panel on E-603. Please indicate the proper size of the panel, and ensure the panel schedule reflects the actual existing condition. a. This new 50A 3P breaker is to feed new panel NANS1 per plan note 3-D. Please indicate the panel/breaker manufacturer, type and AIC rating.	it should have said PANEL NANS in lieu of NANSS. See revised Dwg CWPE3-E-602. Square D breaker, 14,000 AIC
41		E04 Columbia Heights: Sheet note 2 on E-602 states “run all cables in an existing 2” GRS conduit”. Please indicate what feeders/circuits this note applies to.	Note 2 will be deleted. See revised Dwg CWPE3-E-602.
42		E04 Columbia Heights: Sheet note 1 on E-603 states existing panel NANS is located in room C113 which is adjacent to the chiller plan (room C119). Please show this on the floor plans or provide a reference distance for circuits/feeders.	AS BUILT dwg E3a-E-28 will be provided to show location of Panel NANS.
43		G02 Capitol Heights: E-102 keynote 4 states we are to provide new wiring; however there is no information on the type, gauge or quantity of the wire.	All unit heaters will be fed from Panel RSPO; the wiring will be indicated on the dwgs. However, from RSPO panel schedule ckts # 2, 6, 7 & 8 are identified as “UNIT HEATER”. Contractor to determine which ckt is feeding each Unit Heater.

RFI No.	Amendment No.	RFI Description	RFI Response
		a. In addition, the note and floor plans don't indicate where this equipment is fed from. Please provide this information.	See revised Dwg CWPG2-E-103.
44		G02 Capitol Heights: E-103 keynote 3 states we are to provide new wiring; however there is no information on the type, gauge or quantity of the wire. a. In addition, the note and floor plans don't indicate where this equipment is fed from. Please provide this information.	See revised Dwg CWPG2-E-103.
45		G02 Capitol Heights: E-602: The feeder for new panel RSPA1 is not shown. Please show the feeder for this new panel.	Panel RSPA1 is not fed from the MCC, it will be fed from Panel RSPA. See Sheet Notes 1 thru 4 on CWPG2-E-603
46		G02 Capitol Heights: E-602: We are to provide a new 500A breaker in the existing switchboard. Please indicate the manufacture/type of switchboard/breakers and the AIC rating.	This information would have been available during site survey.
47		G02 Capitol Heights: E-603: We are to provide new breakers in existing panels RSPA and RSPO per sheet notes 1, 2 and	Both are GE Panels RSPO – 22,000 AIC for 2 & 3 poles 14,000 AIC for 1 pole RSPA – 10,000 AIC

RFI No.	Amendment No.	RFI Description	RFI Response
		4. Please indicate the manufacturer/type of panel/breakers and the AIC rating.	
48		G02 Capitol Heights: E-603 panel RSPA, circuits 38, 40 and 42: The feeder size is not indicate in the schedule to feed panel RSPA1. Please indicate the feeder size required.	See revised Dwg CWPG2-E-603.
49		K02 Clarendon: E-102 keynote 2 states we are to provide new wiring; however there is no information on the type, gauge or quantity of the wire. a. In addition, the note and floor plans don't indicate where this equipment is fed from. Please provide this information.	See revised Dwg CWPG2-E-102.
50		K02 Clarendon: E-602: The feeder for new panel LA appears to be existing. Please confirm we are to utilize the existing feeder for the new panel. a. The equipment schedule on E-603, item 4 indicates a new 100A panel. We are assuming this is panel LA.	Panels L & LA are both existing-to-remain. Distribution panel will be deleted from Equipment Schedule. Both panels are made by GE Panel L is rated 35,000 AIC Panel LA is rated 10,000 AIC

RFI No.	Amendment No.	RFI Description	RFI Response
		i. Sheet note 1 on E-603 states we are to provide (6) new 20A 1P breakers. If this is a new panel, these will be furnished with the panel. 1. If this is an existing panel to receive new breaker, please indicate the manufacturer/type of panel/breakers and AIC rating.	
51		K02 Clarendon: E-602: We are to provide a (2) new 450A breakers in the existing switchboard. Please indicate the manufacture/type of switchboard/breakers and the AIC rating.	This information was available during site survey.
52		K02 Clarendon: Sheet note 2 on E-603 states we are to provide a new 20A 3P breaker in panel L. Please indicate the manufactures of the panel/breaker and the AIC rating.	See RFI No. 50 above

NOTWASHINGTON METROPOLITAN TRANSIT AUTHORITY
600 FIFTH STREET, NW
WASHINGTON, DC 20001

Tender Number:	IFB-FQ18102/KKB
Date of Issuance:	May 22, 2018
Tender Due Date:	May 16, 2018
Revised Tender Opening Date:	June 6, 2018

AMENDMENT NO. 04
TO
INVITATION FOR BIDS
FOR
Replacement of Chiller and Cooling Tower Accessories at Eight (8) Metro-rail Stations:
DC, MD, and VA
IFB-FQ18102/KKB

TO WHOM IT MAY CONCERN:

The Invitation for Bids Documents accompanying IFB FQ18102/KKB requesting proffers for above procurement action are herewith changed in part as listed below. The changes are bolded and denoted with **##** signs.

1. SECTION 01000, SCOPE OF WORK

DELETE	SUBSTITUTE	DESCRIPTION
Section 01000, Scope Work, Pages 01000-4 thru 01000-27.	Section 01000, Scope of Work Pages 01000-4 thru 01000-27. Amendment No. 4	Directed to Place Horn and Strobe at Each entrance for the Chiller Plant.

2. SECTION 15625, CHILLER

DELETE	SUBSTITUTE	DESCRIPTION
Section 15625, Chiller Pages 15625-3 to 15625-8	Section 15625, Chiller Pages 15625-3 to 15625-8, Amendment No. 4	Indicated on how to rig the equipment in and out of the Mechanical/Chiller Plant rooms.

3. CONTRACT DRAWINGS

DELETE	SUBSTITUTE	DESCRIPTION
Drawing Nos.CWPA-5-E-100, Sheet No. 48 of 173; CWPA5-E-102, Sheet No. 50 of 173; CWPA5-E-603, Sheet No. 54 of 173; CWPD2-E-102, Sheet No. 88 of 173; CWPD2 -E-103, Sheet 89 of 173;	Drawing Nos.CWPA-5-E-100, Sheet No. 48 of 173; CWPA5-E-102, Sheet No. 50 of 173; CWPA5-E-603, Sheet No. 54 of 173; CWPD2-E-102, Sheet No. 88 of 173; CWPD2 -E-103, Sheet 89 of 173; CWPD2	Revised to include missing information

CWPD2-E-602, Sheet 91 of 173; CWPD2-E-603, Sheet 92 of 173; CWPE3-E-101, Sheet No. 106 of 173; CWPE3-E-102, Sheet 107 of 173; CWPE3-E-602, Sheet No. 110 of 173; CWPE3-E-603, Sheet No. 111 of 173; CWPG2-E-102, Sheet No.126 of 173;CWPG2-E-103; Sheet No.127 of 173; CWPG2-E-603, Sheet No. 130 of 173; CWPK1-E-102, Sheet No. 145 of 173; CWPK1-E-603, Sheet No. 149 of 173.	-E-602, Sheet 91 of 173; CWPD2-E-603, Sheet 92 of 173; CWPE3-E-101, Sheet No. 106 of 173; CWPE3-E-102, Sheet 107 of 173; CWPE3-E-602, Sheet No. 110 of 173; CWPE3-E-603, Sheet No.111 of 173; CWPG2-E-102, Sheet No. 126 of 173; CWPG2-E-603, Sheet No. 127 of 173; CWPG2-E-603, Sheet No. 130 of 173; CWPK1-E-102, Sheet No. 145 of 173; CWPK1-E-603, Sheet No. 149 of 173. Amendment No. 04

4 CONTRACT DRAWINGS

DELETE	SUBSTITUTE	DESCRIPTION
Drawings Set 20 of 29, Drawing No. CWPG2-M-601, Sheet No. 121 of 173	No Replacement	Duplicative Sheet
Drawings Set 21 of 29, Drawing No. CWPG2E-103, Sheet No. 127 of 173	No Replacement	Duplicative Sheet
Drawings Set 9 of 29, Drawing No. CWPA6-M-100, Sheet No. 55 of 173	No Replacement	Duplicative Sheet
Drawings Set 10 of 29, Drawing No. CWPA6-M-500, Sheet No. 61 of 173	No Replacement	Duplicative Sheet
Delete Drawings Set 11 of 29 in its entirety	No Replacement	Duplicative Sheet
Drawings Set 12 of 29, Drawing No. CWPA6-E-100, Sheet No. 67 of 173	No Replacement	Duplicative Sheet
Drawings Set 19 of 29, Drawing No. CWPA6-E-100, Sheet No. 115 of 173	No Replacement	Duplicative Sheet
Drawings Set 22 of 29, Drawing No. CWPK1-M-102, Sheet No. 133 of 173	No Replacement	Duplicative Sheet

5. There are no further changes.

6. THE SOLICITATION PROVISIONS ENTITLED "SOLICITATION AMENDMENT" IS APPLICABLE TO THIS AMENDMENT. THE CHANGES SET FORTH ARE HEREWITH INCORPORATED INTO THE ABOVE CITED SOLICITATION. THE HOUR AND DATE

SPECIFIED FOR RECEIPT OF PROFFERS IS EXTENDED FROM MAY 23, 2018 TO JUNE 6, 2018 AT 2:00 PM EST.

7. Acknowledgement: Bidders are required to acknowledge receipt of this amendment on Bid Form in the space provided. Failure to acknowledge all Amendments may cause the proffer to be considered non-responsive to the invitation for bids, which may cause its rejection.

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Issued By: _____

Sherreen N. Tolliver, Contracting Officer, Office of Procurement and Materials

8) Provide and Install maintenance and safety platform (low and high) around the cooling tower, if not installed already. Coordinate with WMATA and cooling tower manufacturer for installation.

x. Install a new utility sink, permanent eye wash station, associated instantaneous water heater, backflow preventer, associated piping and valves. Drain piping on floor shall be protected with proper measures to prevent tripping.
y. Provide unit heaters for space heating.
z. Paint chiller plant floors and equipment pads with battle ship grey or equal. Provide safety lines and tripping hazard lines that shall be painted yellow or red.
aa. Provide Maintenance and Repair and Testing and Operations manuals for all systems and components, individually for each location.
bb. Train WMATA personnel on system operations and maintenance at the manufacturer's facility for at least two, eight-hour days.
cc. Test and Balance the water system in accordance with NEBB or AABC.
dd. ## Place Horn and Strobe at each entrance for the Chiller Plant. ##

3. **CWPA5 – BETHESDA (A09) CHILLER PLANT**

a. Remove and dispose one water cooled chiller as indicated on the drawings. Removal shall include the chiller, chiller supports, starter, wiring, conduit, disconnect, all applicable Automated Energy Management System (AEMS) sensors, and controls. If the work to remove and replace chillers and associated equipment will disturb suspect asbestos-containing materials (e.g., thermal system insulations), the Contractor must first sample the suspect materials and submit the samples to a NVLAP-accredited laboratory for analysis using Polarized Light Microscopy (PLM). Results of laboratory analyses must be submitted to WMATA for review before work can proceed.
b. Removal of the chiller shall include R-134A refrigerant evacuation and recovery performed according to Federal and jurisdictional requirements. Submit to WMATA: Certifications for technicians performing removal and replacement of chillers, and maintain certificates for inspection while the work is being performed. Only technicians with Universal certification may perform the work related to refrigerant handling. The recovery and recycling equipment used on site must be certified by an approved EPA equipment testing organization as being capable of achieving the level of evacuation needed for the chillers. Contractor upon evacuating and recovering the refrigerant, the refrigerant shall be cleaned, recycled and returned to WMATA in appropriately marked recovery cylinders or tanks meeting DOT specifications. If the Contractor reclaims the refrigerant, only certified reclaimers shall be used; Contractor shall provide WMATA the copy of reclaimer certification. If WMATA decides the R-134A Refrigerant should change ownership, submit to WMATA documents certifying transfer of refrigerant ownership.
c. Remove and dispose of chilled water and condenser water pumps. Removal shall include the pumps, chilled water pump motors, pump supports, vibration isolators, immediate piping and valves, motor starters, wiring, conduit, disconnects, all AEMS sensors, and controls.
d. Provide and install one new 350 ton oil less, water-cooled chiller. Installation shall include all related pipe fittings, valves, insulation, piping support, vibration isolation, unit mounted starter, disconnects, conduit, wiring, and controls. Replace all isolation valves on the chiller side as indicated on the drawings.
e. Provide and install two new chilled water pumps, two new condenser water pumps with variable frequency drive (VFD) motors. New installation shall include the pumps,

inverter duty rated motors, associated disconnects, conduit, power wiring, control wiring, pump supports, vibration isolators, immediate piping, flexible connectors, strainers, valves and controls.

f. Provide and Install chilled water pumps VFDs, condenser water pumps VFDs, all associated disconnects, conduit, power and control wiring.
g. Integrate each pump VFD with the chiller control systems. Pump control features shall include soft-start and off modes. Frequency adjustment shall be used for flow balancing and shall not be varied during normal operation.
h. Provide and install WMATA chilled water and condenser water systems, including piping, water chemical sensors, flow switch and pH probes.
i. Provide and install a Chiller Plant Control Panel (CPCP). The CPCP shall be provided by the contractor and built as per the CPCP drawings provided by WMATA. The CPCP shall include two Hach Inductive Conductivity sensor – 3725E2T, sensor module for conductivity-9013000, and a convertible Digital Differential pH sensor (chilled water loop only) product number DPC1R2A. Two HACH SC200 Controllers shall be installed to accept the input probes and control chemical injection. Hach controller shall include a RS485 communications card. CPCP shall include Automatic Direct Productivity 3000 PAC Controller, Modbus capable Input and Output Cards.
j. Provide and install a third- party water treatment system for the chilled and condenser water systems. The water treatment system shall include web based remote monitoring, control, and reporting. Contractor shall coordinate with other related WMATA projects involving replacement of water treatment system.
k. Provide and install a new expansion tank and air separator on the chilled water return loop, including supports.
l. Provide and install outdoor air temperature, relative humidity and inside space air temperature sensors and interface with Chiller Plant Control Panel; Automation Direct Productivity 3000 PAC. Contractor to install P3-08RTD input module in Productivity 3000 PAC to accept input from RTD temperature sensors.
m. Provide and install refrigerant detection, alarm system and interface with the exhaust system.

    1) Remove and replace chiller room exhaust fans and associated ductwork.
    2) Remove power wiring and conduit for the two exhaust fans.
    3) Remove existing ventilation control system.
    4) Remove existing refrigerant monitoring control system, sensors, and devices.
    5) Provide and install new Sherlock 402 Refrigerant Monitor panel with optional strobe light.
    6) Provide and install new Sherlock refrigerant sensors for R-134A.
    7) Provide and install one strobe light at the front entrance doors to the chiller room.
    8) Provide and install a combination audible alarm and strobe assembly within the chiller room.
    9) Provide and install all necessary power and control wiring.
    10) Provide and install fan, fan controller to integrate with the refrigerant monitoring panel and chiller plant control panel, motor operated dampers, ductwork, grilles, sensors and associated controls.
    11) Provide and install space thermostats, conduit and associated wiring for new exhaust fans.

n. Provide and install one chilled water and one condenser water flow monitoring system. Siemens Sitrans FUS 1010 or approved equal.

o. Provide and install chilled water fan coil unit connected to the chilled water supply and return system to serve the chiller plant mechanical equipment room. Provide and install one new AEMS sensor and controls. Replace the outside air intake louver and damper.
p. Provide and install any other equipment and components required by chiller and cooling tower manufacturers to ensure a satisfactory performance of the manufacturer's system.
q. Provide, install and coordinate with WMATA on a new ModBus communication cards and control, Microtech II, on new replacement chiller to allow for remote monitoring and control of equipment.
r. Repair and/or modify existing housekeeping pads as needed for new chiller and pumps.
s. Provide and install components for cooling towers as listed.

1) Remove and dispose of cooling tower fan motors, related starters and controls. Modify existing cooling tower Control Panel to adopt new variable frequency drive controller(s).
2) Remove and dispose of existing tower water treatment components.
3) Provide and install two cooling tower inverter-rated fan motor, as shown in the drawings.
4) Replace the belt-driven fan drive assembly with a direct drive assembly, include mounting hardware for the Cooling Tower.
5) Replace the motor of the Cooling Tower fans (two). Motor shall be inverter duty type to match the variable frequency drive controller, including disconnects, conduit, power and control wiring.
6) Integrate tower fan VFD with the cooling tower controller. Tower fan control features shall include soft-start, load modulation, and off modes. Modulation will be controlled based on the condenser water temperature.
7) Replace existing plastic air intake louvers and inside fill on each cooling tower.
8) Provide and Install maintenance and safety platform (low and high) around the cooling tower, if not installed already. Coordinate with WMATA and cooling tower manufacturer for installation.

t. Install a new utility sink, permanent eye wash station, associated instantaneous water heater, backflow preventer, associated piping and valves. Drain piping on floor shall be protected with proper measures to prevent tripping.
u. Provide unit heaters for space heating.
v. Paint chiller plant floors and equipment pads with battle ship grey or equal. Provide safety lines and tripping hazard lines that shall be painted yellow or red.
w. Provide and Install new service platform to access the large ventilation fan units (serving the traction power room) in the chiller room. Contractor shall field verify and relocate piping, electrical conduit, wiring, lighting fixtures, and associated materials to accommodate the structural platform.
x. Provide Maintenance and Repair and Testing and Operations manuals for all systems and components, individually for each location.
y. Train WMATA personnel on system operations and maintenance at the manufacturer's facility for at least two, eight-hour days.
z. Test and Balance the water system in accordance with NEBB or AABC.
aa. ## Place Horn and Strobe at each entrance for the Chiller Plant. ##

4. **CWPA6 – MEDICAL CENTER (A10) CHILLER PLANT**

a. Remove and dispose one water cooled chiller as indicated on the drawings. Removal shall include the chiller, chiller supports, starter, wiring, conduit, disconnect, all

applicable Automated Energy Management System (AEMS) sensors, and controls If the work to remove and replace chillers and associated equipment will disturb suspect asbestos-containing materials (e.g., thermal system insulations), the Contractor must first sample the suspect materials and submit the samples to a NVLAP-accredited laboratory for analysis using Polarized Light Microscopy (PLM). Results of laboratory analyses must be submitted to WMATA for review before work can proceed.

b. Removal of the chiller shall include R-134A refrigerant evacuation and recovery performed according to Federal and jurisdictional requirements. Submit to WMATA: Certifications for technicians performing removal and replacement of chillers, and maintain certificates for inspection while the work is being performed. Only technicians with Universal certification may perform the work related to refrigerant handling. The recovery and recycling equipment used on site must be certified by an approved EPA equipment testing organization as being capable of achieving the level of evacuation needed for the chillers. Contractor upon evacuating and recovering the refrigerant, the refrigerant shall be cleaned, recycled and returned to WMATA in appropriately marked recovery cylinders or tanks meeting DOT specifications. If the Contractor reclaims the refrigerant, only certified reclaimers shall be used; Contractor shall provide WMATA the copy of reclaimer certification. If WMATA decides the R-134A Refrigerant should change ownership, submit to WMATA documents certifying transfer of refrigerant ownership.
c. Remove and dispose of chilled water and condenser water pumps. Removal shall include the pumps, chilled water pump motors, pump supports, vibration isolators, immediate piping and valves, motor starters, wiring, conduit, disconnects, all AEMS sensors, and controls.
d. Provide and install one new oil less, water-cooled chiller. Installation shall include all related pipe fittings, valves, insulation, piping support, vibration isolation, unit mounted starter, disconnects, conduit, wiring, and controls. Replace all isolation valves on the chiller side as indicated on the drawings.
e. Provide and install two new chilled water pumps, two new condenser water pumps with variable frequency drive (VFD) motors. New installation shall include the pumps, inverter duty rated motors, associated disconnects, conduit, power wiring, control wiring, pump supports, vibration isolators, immediate piping, flexible connectors, strainers, valves and controls.
f. Provide and Install chilled water pumps VFDs, condenser water pumps VFDs, all associated disconnects, conduit, power and control wiring.
g. Integrate each pump VFD with the chiller control systems. Pump control features shall include soft-start and off modes. Frequency adjustment shall be used for flow balancing and shall not be varied during normal operation.
h. Provide and install WMATA chilled water and condenser water systems, including piping, water chemical sensors, flow switch and pH probes.
i. Provide and install a Chiller Plant Control Panel (CPCP). The CPCP shall be provided by the contractor and built as per the CPCP drawings provided by WMATA. The CPCP shall include two Hach Inductive Conductivity sensor – 3725E2T, sensor module for conductivity-9013000, and a convertible Digital Differential pH sensor (chilled water loop only) product number DPC1R2A. Two HACH SC200 Controllers shall be installed to accept the input probes and control chemical injection. Hach controller shall include a RS485 communications card. CPCP shall include Automatic Direct Productivity 3000 PAC Controller, Modbus capable Input and Output Cards.
j. Provide and install a third- party water treatment system for the chilled and condenser water systems. The water treatment system shall include web based remote

monitoring, control, and reporting. Contractor shall coordinate with other related WMATA projects involving replacement of water treatment system.

k. Provide and install a new expansion tank and air separator on the chilled water return loop, including supports.
l. Provide and install outdoor air temperature, relative humidity and inside space air temperature sensors and interface with Chiller Plant Control Panel; Automation Direct Productivity 3000 PAC. Contractor to install P3-08RTD input module in Productivity 3000 PAC to accept input from RTD temperature sensors.
m. Provide and install an interface between the refrigerant detection/ exhaust system installed as part of WMATA contract FQ14114.
n. Provide and install one chilled water and one condenser water flow monitoring system. Siemens Sitrans FUS 1010 or approved equal.
o. Provide and install chilled water fan coil unit connected to the chilled water supply and return system to serve the chiller plant mechanical equipment room. Provide and install one new AEMS sensor and controls. Replace the outside air intake louver and damper.
p. Provide and install any other equipment and components required by chiller and cooling tower manufacturers to ensure a satisfactory performance of the manufacturer's system.
q. Provide, install and coordinate with WMATA on a new ModBus communication cards and control, Microtech II, on new replacement chiller to allow for remote monitoring and control of equipment.
r. Repair and/or modify existing housekeeping pads as needed for new chiller and pumps.
s. Provide and install components for cooling towers as listed.

    1) Remove and dispose of cooling tower fan motors, related starters and controls. Modify existing cooling tower Control Panel to adopt new variable frequency drive controller(s).
    2) Remove and dispose of existing tower water treatment components.
    3) Provide and install two cooling tower inverter-rated fan motor, as shown in the drawings.
    4) Replace the belt-driven fan drive assembly with a direct drive assembly, include mounting hardware for the Cooling Tower.
    5) Replace the motor of the Cooling Tower fans (two). Motor shall be inverter duty type to match the variable frequency drive controller, including disconnects, conduit, power and control wiring.
    6) Integrate tower fan VFD with the cooling tower controller. Tower fan control features shall include soft-start, load modulation, and off modes. Modulation will be controlled based on the condenser water temperature.
    7) Replace existing plastic air intake louvers and inside fill on each cooling tower.
    8) Provide and Install maintenance and safety platform (low and high) around the cooling tower, if not installed already. Coordinate with WMATA and cooling tower manufacturer for installation.

t. Install a new utility sink, permanent eye wash station, associated instantaneous water heater, backflow preventer, associated piping and valves. Drain piping on floor shall be protected with proper measures to prevent tripping.
u. Provide unit heaters for space heating.
v. Paint chiller plant floors and equipment pads with battle ship grey or equal. Provide safety lines and tripping hazard lines that shall be painted yellow or red.
w. Provide Maintenance and Repair and Testing and Operations manuals for all systems and components, individually for each location.

x. Train WMATA personnel on system operations and maintenance at the manufacturer's facility.
y. Test and Balance the water system in accordance with NEBB or AABC.
z. ## Place Horn and Strobe at each entrance for the Chiller Plant. ##

5. **CWPD2 – FEDERAL CENTER SW (D04) CHILLER PLANT**

a. Remove and dispose two water cooled chiller as indicated on the drawings. Removal shall include the chiller, chiller supports, starter, wiring, conduit, disconnect, all applicable Automated Energy Management System (AEMS) sensors, and controls. If the work to remove and replace chillers and associated equipment will disturb suspect asbestos-containing materials (e.g., thermal system insulations), the Contractor must first sample the suspect materials and submit the samples to a NVLAP-accredited laboratory for analysis using Polarized Light Microscopy (PLM). Results of laboratory analyses must be submitted to WMATA for review before work can proceed
b. Removal of the chiller shall include R-134A refrigerant evacuation and recovery performed according to Federal and jurisdictional requirements. Submit to WMATA: Certifications for technicians performing removal and replacement of chillers, and maintain certificates for inspection while the work is being performed. Only technicians with Universal certification may perform the work related to refrigerant handling. The recovery and recycling equipment used on site must be certified by an approved EPA equipment testing organization as being capable of achieving the level of evacuation needed for the chillers. Contractor upon evacuating and recovering the refrigerant, the refrigerant shall be cleaned, recycled and returned to WMATA in appropriately marked recovery cylinders or tanks meeting DOT specifications. If the Contractor reclaims the refrigerant, only certified reclaimers shall be used; Contractor shall provide WMATA the copy of reclaimer certification. . If WMATA decides the R-134A Refrigerant should change ownership, submit to WMATA documents certifying transfer of refrigerant ownership.
c. Remove and dispose of chilled water and condenser water pumps. Removal shall include the pumps, chilled water pump motors, pump supports, vibration isolators, immediate piping and valves, motor starters, wiring, conduit, disconnects, all AEMS sensors, and controls.
d. Provide and install two new oil less, water-cooled chiller. Installation shall include all related pipe fittings, valves, insulation, piping support, vibration isolation, unit mounted starter, disconnects, conduit, wiring, and controls. Replace all isolation valves on the chiller side as indicated on the drawings.
e. Provide and install four new chilled water pumps, four new condenser water pumps with variable frequency drive (VFD) motors. New installation shall include the pumps, inverter duty rated motors, associated disconnects, conduit, power wiring, control wiring, pump supports, vibration isolators, immediate piping, flexible connectors, strainers, valves and controls.
f. Re-use existing chilled water pumps VFDs, condenser water pumps VFDs, all associated disconnects, conduit, power and control wiring.
g. Integrate each pump VFD with the chiller control systems. Pump control features shall include soft-start and off modes. Frequency adjustment shall be used for flow balancing and shall not be varied during normal operation.
h. Provide and install WMATA chilled water and condenser water systems, including piping, water chemical sensors, flow switch and pH probes.
i. Provide and install a Chiller Plant Control Panel (CPCP). The CPCP shall be provided by the contractor and built as per the CPCP drawings provided by WMATA. The CPCP shall include two Hach Inductive Conductivity sensor – 3725E2T, sensor module for

conductivity-9013000, and a convertible Digital Differential pH sensor (chilled water loop only) product number DPC1R2A. Two HACH SC200 Controllers shall be installed to accept the input probes and control chemical injection. Hach controller shall include a RS485 communications card. CPCP shall include Automatic Direct Productivity 3000 PAC Controller, Modbus capable Input and Output Cards.

j. Provide and install a third- party water treatment system for the chilled and condenser water systems. The water treatment system shall include web based remote monitoring, control, and reporting. Contractor shall coordinate with other related WMATA projects involving replacement of water treatment system.
k. Provide and install a new expansion tank and air separator on the chilled water return loop, including supports.
l. Provide and install outdoor air temperature, relative humidity and inside space air temperature sensors and interface with Chiller Plant Control Panel; Automation Direct Productivity 3000 PAC. Contractor to install P3-08RTD input module in Productivity 3000 PAC to accept input from RTD temperature sensors.
m. Provide and install refrigerant detection, alarm system and interface with the exhaust system.

    1) Remove and replace chiller room supply fan. Provide new chiller room exhaust fans and associated ductwork.
    2) Remove power wiring and conduit for the fan.
    3) Remove existing ventilation control system.
    4) Remove existing refrigerant monitoring control system, sensors, and devices.
    5) Provide and install new Sherlock 402 Refrigerant Monitor panel with optional strobe light.
    6) Provide and install new Sherlock refrigerant sensors for R-134A.
    7) Provide and install one strobe light at the front entrance doors to the chiller room.
    8) Provide and install a combination audible alarm and strobe assembly within the chiller room.
    9) Provide and install all necessary power and control wiring.
    10) Provide and install supply fan, exhaust fan, controllers to integrate with the refrigerant monitoring panel and chiller plant control panel, motor operated dampers, ductwork, grilles, sensors and associated controls.
    11) Provide and install space thermostats, conduit and associated wiring for new exhaust fans.

n. Provide and install one chilled water and one condenser water flow monitoring system. Siemens Sitrans FUS 1010 or approved equal.
o. Provide and install chilled water fan coil unit connected to the chilled water supply and return system to serve the chiller plant mechanical equipment room. Provide and install one new AEMS sensor and controls. Replace the outside air intake louver and damper.
p. Provide and install any other equipment and components required by chiller and cooling tower manufacturers to ensure a satisfactory performance of the manufacturer's system.
q. Provide, install and coordinate with WMATA on a new ModBus communication cards and control, Microtech II, on new replacement chiller to allow for remote monitoring and control of equipment.
r. Repair and/or modify existing housekeeping pads as needed for new chiller and pumps.
s. Provide and install components for cooling towers as listed.

1) Remove and dispose of cooling tower fan motors, related starters and controls. Modify existing cooling tower Control Panel to adopt new variable frequency drive controller(s).
2) Remove and dispose of existing tower water treatment components.
3) Provide and install two cooling tower inverter-rated fan motor, as shown in the drawings.
4) Replace the belt-driven fan drive assembly with a direct drive assembly, include mounting hardware for the Cooling Tower.
5) Replace the motor of the Cooling Tower fans (two). Motor shall be inverter duty type to match the variable frequency drive controller, including disconnects, conduit, power and control wiring.
6) Integrate tower fan VFD with the cooling tower controller. Tower fan control features shall include soft-start, load modulation, and off modes. Modulation will be controlled based on the condenser water temperature.
7) Replace existing plastic air intake louvers and inside fill on each cooling tower.
8) Provide and Install maintenance and safety platform (low and high) around the cooling tower, if not installed already. Coordinate with WMATA and cooling tower manufacturer for installation.

t. Install a new utility sink, permanent eye wash station, associated instantaneous water heater, backflow preventer, associated piping and valves. Drain piping on floor shall be protected with proper measures to prevent tripping.
u. Provide unit heaters for space heating.
v. Paint chiller plant floors and equipment pads with battle ship grey or equal. Provide safety lines and tripping hazard lines that shall be painted yellow or red.
w. Provide Maintenance and Repair and Testing and Operations manuals for all systems and components, individually for each location.
x. Train WMATA personnel on system operations and maintenance at the manufacturer's facility.
y. Test and Balance the water system in accordance with NEBB or AABC.
z. ## Place Horn and Strobe at each entrance for the Chiller Plant. ##

6. **CWPE3 – COLUMBIA HEIGHTS (E04) CHILLER PLANT**

a. Remove and dispose one water cooled chiller as indicated on the drawings. Removal shall include the chiller, chiller supports, starter, wiring, conduit, disconnect, all applicable Automated Energy Management System (AEMS) sensors, and controls If the work to remove and replace chillers and associated equipment will disturb suspect asbestos-containing materials (e.g., thermal system insulations), the Contractor must first sample the suspect materials and submit the samples to a NVLAP-accredited laboratory for analysis using Polarized Light Microscopy (PLM). Results of laboratory analyses must be submitted to WMATA for review before work can proceed.
b. Removal of the chiller shall include R-134A refrigerant evacuation and recovery performed according to Federal and jurisdictional requirements. Submit to WMATA: Certifications for technicians performing removal and replacement of chillers, and maintain certificates for inspection while the work is being performed. Only technicians with Universal certification may perform the work related to refrigerant handling. The recovery and recycling equipment used on site must be certified by an approved EPA equipment testing organization as being capable of achieving the level of evacuation needed for the chillers. Contractor upon evacuating and recovering the refrigerant, the refrigerant shall be cleaned, recycled and returned to WMATA in appropriately marked recovery cylinders or tanks meeting DOT specifications. If the Contractor reclaims the

refrigerant, only certified reclaimers shall be used; Contractor shall provide WMATA the copy of reclaimer certification. If WMATA decides the R-134A Refrigerant should change ownership, submit to WMATA documents certifying transfer of refrigerant ownership.

c. Remove and dispose of chilled water and condenser water pumps. Removal shall include the pumps, chilled water pump motors, pump supports, vibration isolators, immediate piping and valves, motor starters, wiring, conduit, disconnects, all AEMS sensors, and controls.
d. Provide and install one new oil less, water-cooled chiller. Installation shall include all related pipe fittings, valves, insulation, piping support, vibration isolation, unit mounted starter, disconnects, conduit, wiring, and controls. Replace all isolation valves on the chiller side as indicated on the drawings.
e. Provide and install two new chilled water pumps, two new condenser water pumps with variable frequency drive (VFD) motors. New installation shall include the pumps, inverter duty rated motors, associated disconnects, conduit, power wiring, control wiring, pump supports, vibration isolators, immediate piping, flexible connectors, strainers, valves and controls.
f. Provide and Install chilled water pumps VFDs, condenser water pumps VFDs, all associated disconnects, conduit, power and control wiring.
g. Integrate each pump VFD with the chiller control systems. Pump control features shall include soft-start and off modes. Frequency adjustment shall be used for flow balancing and shall not be varied during normal operation.
h. Provide and install WMATA chilled water and condenser water systems, including piping, water chemical sensors, flow switch and pH probes.
i. Provide and install a Chiller Plant Control Panel (CPCP). The CPCP shall be provided by the contractor and built as per the CPCP drawings provided by WMATA. The CPCP shall include two Hach Inductive Conductivity sensor – 3725E2T, sensor module for conductivity-9013000, and a convertible Digital Differential pH sensor (chilled water loop only) product number DPC1R2A. Two HACH SC200 Controllers shall be installed to accept the input probes and control chemical injection. Hach controller shall include a RS485 communications card. CPCP shall include Automatic Direct Productivity 3000 PAC Controller, Modbus capable Input and Output Cards.
j. Provide and install a third- party water treatment system for the chilled and condenser water systems. The water treatment system shall include web based remote monitoring, control, and reporting. Contractor shall coordinate with other related WMATA projects involving replacement of water treatment system.
k. Provide and install a new expansion tank and air separator on the chilled water return loop, including supports.
l. Provide and install outdoor air temperature, relative humidity and inside space air temperature sensors and interface with Chiller Plant Control Panel; Automation Direct Productivity 3000 PAC. Contractor to install P3-08RTD input module in Productivity 3000 PAC to accept input from RTD temperature sensors.
m. Provide and install an interface between the refrigerant detection/ exhaust system installed as part of WMATA contract FQ14114.
n. Provide and install one chilled water and one condenser water flow monitoring system. Siemens Sitrans FUS 1010 or approved equal.
o. Provide and install chilled water fan coil unit connected to the chilled water supply and return system to serve the chiller plant mechanical equipment room. Provide and install one new AEMS sensor and controls. Replace the outside air intake louver and damper.

p. Provide and install any other equipment and components required by chiller and cooling tower manufacturers to ensure a satisfactory performance of the manufacturer's system.
q. Provide, install and coordinate with WMATA on a new ModBus communication cards and control, Microtech II, on new replacement chiller to allow for remote monitoring and control of equipment.
r. Repair and/or modify existing housekeeping pads as needed for new chiller and pumps.
s. Provide and install components for cooling towers as listed.

1) Remove and dispose of cooling tower fan motors, related starters and controls. Modify existing cooling tower Control Panel to adopt new variable frequency drive controller(s).
2) Remove and dispose of existing tower water treatment components.
3) Provide and install two cooling tower inverter-rated fan motor, as shown in the drawings.
4) Replace the belt-driven fan drive assembly with a direct drive assembly, include mounting hardware for the Cooling Tower.
5) Replace the motor of the Cooling Tower fans (two). Motor shall be inverter duty type to match the variable frequency drive controller, including disconnects, conduit, power and control wiring.
6) Integrate tower fan VFD with the cooling tower controller. Tower fan control features shall include soft-start, load modulation, and off modes. Modulation will be controlled based on the condenser water temperature.
7) Replace existing plastic air intake louvers and inside fill on each cooling tower.
8) Provide and Install maintenance and safety platform (low and high) around the cooling tower, if not installed already. Coordinate with WMATA and cooling tower manufacturer for installation.

t. Install a new utility sink, permanent eye wash station, associated instantaneous water heater, backflow preventer, associated piping and valves. Drain piping on floor shall be protected with proper measures to prevent tripping.
u. Provide unit heaters for space heating.
v. Paint chiller plant floors and equipment pads with battle ship grey or equal. Provide safety lines and tripping hazard lines that shall be painted yellow or red.
w. Provide Maintenance and Repair and Testing and Operations manuals for all systems and components, individually for each location.
x. Train WMATA personnel on system operations and maintenance at the manufacturer's facility.
y. Test and Balance the water system in accordance with NEBB or AABC.
z. ## Place Horn and Strobe at each entrance for the Chiller Plant. ##

7. **CWPG2 – CAPITOL HEIGHTS (G02) CHILLER PLANT**

a. Remove and dispose one water cooled chiller as indicated on the drawings. Removal shall include the chiller, chiller supports, starter, wiring, conduit, disconnect, all applicable Automated Energy Management System (AEMS) sensors, and controls. If the work to remove and replace chillers and associated equipment will disturb suspect asbestos-containing materials (e.g., thermal system insulations), the Contractor must first sample the suspect materials and submit the samples to a NVLAP-accredited laboratory for analysis using Polarized Light Microscopy (PLM). Results of laboratory analyses must be submitted to WMATA for review before work can proceed.

b. Removal of the chiller shall include R-134A refrigerant evacuation and recovery performed according to Federal and jurisdictional requirements. Submit to WMATA: Certifications for technicians performing removal and replacement of chillers, and maintain certificates for inspection while the work is being performed. Only technicians with Universal certification may perform the work related to refrigerant handling. The recovery and recycling equipment used on site must be certified by an approved EPA equipment testing organization as being capable of achieving the level of evacuation needed for the chillers. Contractor upon evacuating and recovering the refrigerant, the refrigerant shall be cleaned, recycled and returned to WMATA in appropriately marked recovery cylinders or tanks meeting DOT specifications. If the Contractor reclaims the refrigerant, only certified reclaimers shall be used; Contractor shall provide WMATA the copy of reclaimer certification. If WMATA decides the R-134A Refrigerant should change ownership, submit to WMATA documents certifying transfer of refrigerant ownership.
c. Remove and dispose of chilled water and condenser water pumps. Removal shall include the pumps, chilled water pump motors, pump supports, vibration isolators, immediate piping and valves, motor starters, wiring, conduit, disconnects, all AEMS sensors, and controls.
d. Provide and install one new oil less, water-cooled chiller. Installation shall include all related pipe fittings, valves, insulation, piping support, vibration isolation, unit mounted starter, disconnects, conduit, wiring, and controls. Replace all isolation valves on the chiller side as indicated on the drawings.
e. Provide and install two new chilled water pumps, two new condenser water pumps with variable frequency drive (VFD) motors. New installation shall include the pumps, inverter duty rated motors, associated disconnects, conduit, power wiring, control wiring, pump supports, vibration isolators, immediate piping, flexible connectors, strainers, valves and controls.
f. Provide and Install chilled water pumps VFDs, condenser water pumps VFDs, all associated disconnects, conduit, power and control wiring.
g. Integrate each pump VFD with the chiller control systems. Pump control features shall include soft-start and off modes. Frequency adjustment shall be used for flow balancing and shall not be varied during normal operation.
h. Provide and install WMATA chilled water and condenser water systems, including piping, water chemical sensors, flow switch and pH probes.
i. Provide and install a Chiller Plant Control Panel (CPCP). The CPCP shall be provided by the contractor and built as per the CPCP drawings provided by WMATA. The CPCP shall include two Hach Inductive Conductivity sensor – 3725E2T, sensor module for conductivity-9013000, and a convertible Digital Differential pH sensor (chilled water loop only) product number DPC1R2A. Two HACH SC200 Controllers shall be installed to accept the input probes and control chemical injection. Hach controller shall include a RS485 communications card. CPCP shall include Automatic Direct Productivity 3000 PAC Controller, Modbus capable Input and Output Cards.
j. Provide and install a third- party water treatment system for the chilled and condenser water systems. The water treatment system shall include web based remote monitoring, control, and reporting. Contractor shall coordinate with other related WMATA projects involving replacement of water treatment system.
k. Provide and install a new expansion tank and air separator on the chilled water return loop, including supports.
l. Provide and install outdoor air temperature, relative humidity and inside space air temperature sensors and interface with Chiller Plant Control Panel; Automation Direct

Productivity 3000 PAC. Contractor to install P3-08RTD input module in Productivity 3000 PAC to accept input from RTD temperature sensors.

m. Provide and install refrigerant detection, alarm system and interface with the exhaust system.

1) Remove and replace chiller room exhaust fans and associated ductwork.
2) Remove power wiring and conduit for the two exhaust fans.
3) Remove existing ventilation control system.
4) Remove existing refrigerant monitoring control system, sensors, and devices.
5) Provide and install new Sherlock 402 Refrigerant Monitor panel with optional strobe light.
6) Provide and install new Sherlock refrigerant sensors for R-134A.
7) Provide and install one strobe light at the front entrance doors to the chiller room.
8) Provide and install a combination audible alarm and strobe assembly within the chiller room.
9) Provide and install all necessary power and control wiring.
10) Provide and install exhaust fans, fan controller to integrate with the refrigerant monitoring panel and chiller plant control panel, motor operated dampers, ductwork, grilles, sensors and associated controls.
11) Provide and install space thermostats, conduit and associated wiring for new exhaust fans.

n. Provide and install one chilled water and one condenser water flow monitoring system. Siemens Sitrans FUS 1010 or approved equal.

o. Provide and install chilled water fan coil unit connected to the chilled water supply and return system to serve the chiller plant mechanical equipment room. Provide and install one new AEMS sensor and controls. Replace the outside air intake louver and damper.

p. Provide and install any other equipment and components required by chiller and cooling tower manufacturers to ensure a satisfactory performance of the manufacturer's system.

q. Provide, install and coordinate with WMATA on a new ModBus communication cards and control, Microtech II, on new replacement chiller to allow for remote monitoring and control of equipment.

r. Repair and/or modify existing housekeeping pads as needed for new chiller and pumps.

s. Provide and install components for cooling towers as listed.

1) Remove and dispose of cooling tower fan motor's, related starters and controls. Modify existing cooling tower Control Panel to adopt new variable frequency drive controller(s).
2) Remove and dispose of existing tower water treatment components.
3) Provide and install two cooling tower inverter-rated fan motor, as shown in the drawings.
4) Replace the belt-driven fan drive assembly with a direct drive assembly, include mounting hardware for the Cooling Tower.
5) Replace the motor of the Cooling Tower fans (two). Motor shall be inverter duty type to match the variable frequency drive controller, including disconnects, conduit, power and control wiring.
6) Integrate tower fan VFD with the cooling tower controller. Tower fan control features shall include soft-start, load modulation, and off modes. Modulation will be controlled based on the condenser water temperature.
7) Replace existing plastic air intake louvers and inside fill on each cooling tower.

8) Provide and Install maintenance and safety platform (low and high) around the cooling tower, if not installed already. Coordinate with WMATA and cooling tower manufacturer for installation.

t. Install a new utility sink, permanent eye wash station, associated instantaneous water heater, backflow preventer, associated piping and valves. Drain piping on floor shall be protected with proper measures to prevent tripping.
u. Provide unit heaters for space heating.
v. Paint chiller plant floors and equipment pads with battle ship grey or equal. Provide safety lines and tripping hazard lines that shall be painted yellow or red.
w. Provide Maintenance and Repair and Testing and Operations manuals for all systems and components, individually for each location.
x. Train WMATA personnel on system operations and maintenance at the manufacturer's facility.
y. Test and Balance the water system in accordance with NEBB or AABC.
z. ## Place Horn and Strobe at each entrance for the Chiller Plant. ##

8. **CWPK1 – CLARENDON (K02) CHILLER PLANT**

a. Remove and dispose two water cooled chiller as indicated on the drawings. Removal shall include the chiller, chiller supports, starter, wiring, conduit, disconnect, all applicable Automated Energy Management System (AEMS) sensors, and controls. If the work to remove and replace chillers and associated equipment will disturb suspect asbestos-containing materials (e.g., thermal system insulations), the Contractor must first sample the suspect materials and submit the samples to a NVLAP-accredited laboratory for analysis using Polarized Light Microscopy (PLM). Results of laboratory analyses must be submitted to WMATA for review before work can proceed.
b. Removal of the chiller shall include R-134A refrigerant evacuation and recovery performed according to Federal and jurisdictional requirements. Submit to WMATA: Certifications for technicians performing removal and replacement of chillers, and maintain certificates for inspection while the work is being performed. Only technicians with Universal certification may perform the work related to refrigerant handling. The recovery and recycling equipment used on site must be certified by an approved EPA equipment testing organization as being capable of achieving the level of evacuation needed for the chillers. Contractor upon evacuating and recovering the refrigerant, the refrigerant shall be cleaned, recycled and returned to WMATA in appropriately marked recovery cylinders or tanks meeting DOT specifications. If the Contractor reclaims the refrigerant, only certified reclaimers shall be used; Contractor shall provide WMATA the copy of reclaimer certification. . If WMATA decides the R-134A Refrigerant should change ownership, submit to WMATA documents certifying transfer of refrigerant ownership.
c. Remove and dispose of chilled water and condenser water pumps. Removal shall include the pumps, chilled water pump motors, pump supports, vibration isolators, immediate piping and valves, motor starters, wiring, conduit, disconnects, all AEMS sensors, and controls.
d. Provide and install one new oil less, water-cooled chiller. Installation shall include all related pipe fittings, valves, insulation, piping support, vibration isolation, unit mounted starter, disconnects, conduit, wiring, and controls. Replace all isolation valves on the chiller side as indicated on the drawings.
e. Provide and install four new chilled water pumps, four new condenser water pumps with variable frequency drive (VFD) motors. New installation shall include the pumps, inverter duty rated motors, associated disconnects, conduit, power wiring, control

wiring, pump supports, vibration isolators, immediate piping, flexible connectors, strainers, valves and controls.

f. Provide and Install chilled water pumps VFDs, condenser water pumps VFDs, all associated disconnects, conduit, power and control wiring.
g. Integrate each pump VFD with the chiller control systems. Pump control features shall include soft-start and off modes. Frequency adjustment shall be used for flow balancing and shall not be varied during normal operation.
h. Provide and install WMATA chilled water and condenser water systems, including piping, water chemical sensors, flow switch and pH probes.
i. Provide and install a Chiller Plant Control Panel (CPCP). The CPCP shall be provided by the contractor and built as per the CPCP drawings provided by WMATA. The CPCP shall include two Hach Inductive Conductivity sensor – 3725E2T, sensor module for conductivity-9013000, and a convertible Digital Differential pH sensor (chilled water loop only) product number DPC1R2A. Two HACH SC200 Controllers shall be installed to accept the input probes and control chemical injection. Hach controller shall include a RS485 communications card. CPCP shall include Automatic Direct Productivity 3000 PAC Controller, Modbus capable Input and Output Cards.
j. Provide and install a third- party water treatment system for the chilled and condenser water systems. The water treatment system shall include web based remote monitoring, control, and reporting. Contractor shall coordinate with other related WMATA projects involving replacement of water treatment system.
k. Provide and install a new expansion tank and air separator on the chilled water return loop, including supports.
l. Provide and install outdoor air temperature, relative humidity and inside space air temperature sensors and interface with Chiller Plant Control Panel; Automation Direct Productivity 3000 PAC. Contractor to install P3-08RTD input module in Productivity 3000 PAC to accept input from RTD temperature sensors.
m. Provide and install an interface between the refrigerant detection/ exhaust system installed as part of WMATA contract FQ14114.
n. Provide and install one chilled water and one condenser water flow monitoring system. Siemens Sitrans FUS 1010 or approved equal.
o. Provide and install chilled water fan coil unit connected to the chilled water supply and return system to serve the chiller plant mechanical equipment room. Provide and install one new AEMS sensor and controls. Replace the outside air intake louver and damper.
p. Provide and install any other equipment and components required by chiller and cooling tower manufacturers to ensure a satisfactory performance of the manufacturer's system.
q. Provide, install and coordinate with WMATA on a new ModBus communication cards and control, Microtech II, on new replacement chiller to allow for remote monitoring and control of equipment.
r. Repair and/or modify existing housekeeping pads as needed for new chiller and pumps.
s. Provide and install components for cooling towers as listed.

    1) Remove and dispose of cooling tower fan motors, related starters and controls. Modify existing cooling tower Control Panel to adopt new variable frequency drive controller(s).
    2) Remove and dispose of existing tower water treatment components.
    3) Provide and install two cooling tower inverter-rated fan motor, as shown in the drawings.

4) Replace the belt-driven fan drive assembly with a direct drive assembly, include mounting hardware for the Cooling Tower.
5) Replace the motor of the Cooling Tower fan's (two). Motor shall be inverter duty type to match the variable frequency drive controller, including disconnects, conduit, power and control wiring.
6) Integrate tower fan VFD with the cooling tower controller. Tower fan control features shall include soft-start, load modulation, and off modes. Modulation will be controlled based on the condenser water temperature.
7) Replace existing plastic air intake louvers and inside fill on each cooling tower.
8) Provide and Install maintenance and safety platform (low and high) around the cooling tower, if not installed already. Coordinate with WMATA and cooling tower manufacturer for installation.

t. Install a new utility sink, permanent eye wash station, associated instantaneous water heater, backflow preventer, associated piping and valves. Drain piping on floor shall be protected with proper measures to prevent tripping.
u. Provide unit heaters for space heating.
v. Paint chiller plant floors and equipment pads with battle ship grey or equal. Provide safety lines and tripping hazard lines that shall be painted yellow or red.
w. Provide Maintenance and Repair and Testing and Operations manuals for all systems and components, individually for each location.
x. Train WMATA personnel on system operations and maintenance at the manufacturer's facility.
y. Test and Balance the water system in accordance with NEBB or AABC.
z. ## Place Horn and Strobe at each entrance for the Chiller Plant. ##

9. **CWPK2 – BALLSTON (K04) CHILLER PLANT**

a. Remove and dispose two water cooled chiller as indicated on the drawings. Removal shall include the chiller, chiller supports, starter, wiring, conduit, disconnect, all applicable Automated Energy Management System (AEMS) sensors, and controls. If the work to remove and replace chillers and associated equipment will disturb suspect asbestos-containing materials (e.g., thermal system insulations), the Contractor must first sample the suspect materials and submit the samples to a NVLAP-accredited laboratory for analysis using Polarized Light Microscopy (PLM). Results of laboratory analyses must be submitted to WMATA for review before work can proceed.
b. Removal of the chiller shall include R-134A refrigerant evacuation and recovery performed according to Federal and jurisdictional requirements. Submit to WMATA: Certifications for technicians performing removal and replacement of chillers, and maintain certificates for inspection while the work is being performed. Only technicians with Universal certification may perform the work related to refrigerant handling. The recovery and recycling equipment used on site must be certified by an approved EPA equipment testing organization as being capable of achieving the level of evacuation needed for the chillers. Contractor upon evacuating and recovering the refrigerant, the refrigerant shall be cleaned, recycled and returned to WMATA in appropriately marked recovery cylinders or tanks meeting DOT specifications. If the Contractor reclaims the refrigerant, only certified reclaimers shall be used; Contractor shall provide WMATA the copy of reclaimer certification. If WMATA decides the R-134A Refrigerant should change ownership, submit to WMATA documents certifying transfer of refrigerant ownership.
c. Remove and dispose of chilled water and condenser water pumps. Removal shall include the pumps, chilled water pump motors, pump supports, vibration isolators,

immediate piping and valves, motor starters, wiring, conduit, disconnects, all AEMS sensors, and controls.

d. Provide and install one new oil less, water-cooled chiller. Installation shall include all related pipe fittings, valves, insulation, piping support, vibration isolation, unit mounted starter, disconnects, conduit, wiring, and controls. Replace all isolation valves on the chiller side as indicated on the drawings.
e. Provide and install four new chilled water pumps, four new condenser water pumps with variable frequency drive (VFD) motors. New installation shall include the pumps, inverter duty rated motors, associated disconnects, conduit, power wiring, control wiring, pump supports, vibration isolators, immediate piping, flexible connectors, strainers, valves and controls.
f. Provide and Install chilled water pumps VFDs, condenser water pumps VFDs, all associated disconnects, conduit, power and control wiring.
g. Integrate each pump VFD with the chiller control systems. Pump control features shall include soft-start and off modes. Frequency adjustment shall be used for flow balancing and shall not be varied during normal operation.
h. Provide and install WMATA chilled water and condenser water systems, including piping, water chemical sensors, flow switch and pH probes.
i. Provide and install a Chiller Plant Control Panel (CPCP). The CPCP shall be provided by the contractor and built as per the CPCP drawings provided by WMATA. The CPCP shall include two Hach Inductive Conductivity sensor – 3725E2T, sensor module for conductivity-9013000, and a convertible Digital Differential pH sensor (chilled water loop only) product number DPC1R2A. Two HACH SC200 Controllers shall be installed to accept the input probes and control chemical injection. Hach controller shall include a RS485 communications card. CPCP shall include Automatic Direct Productivity 3000 PAC Controller, Modbus capable Input and Output Cards.
j. Provide and install a third- party water treatment system for the chilled and condenser water systems. The water treatment system shall include web based remote monitoring, control, and reporting. Contractor shall coordinate with other related WMATA projects involving replacement of water treatment system.
k. Provide and install a new expansion tank and air separator on the chilled water return loop, including supports.
l. Provide and install outdoor air temperature, relative humidity and inside space air temperature sensors and interface with Chiller Plant Control Panel; Automation Direct Productivity 3000 PAC. Contractor to install P3-08RTD input module in Productivity 3000 PAC to accept input from RTD temperature sensors.
m. Provide and install an interface between the refrigerant detection/ exhaust system installed as part of WMATA contract FQ14114.
n. Provide and install one chilled water and one condenser water flow monitoring system. Siemens Sitrans FUS 1010 or approved equal.
o. Provide and install chilled water fan coil unit connected to the chilled water supply and return system to serve the chiller plant mechanical equipment room. Provide and install one new AEMS sensor and controls. Replace the outside air intake louver and damper.
p. Provide and install any other equipment and components required by chiller and cooling tower manufacturers to ensure a satisfactory performance of the manufacturer's system.
q. Provide, install and coordinate with WMATA on a new ModBus communication cards and control, Microtech II, on new replacement chiller to allow for remote monitoring and control of equipment.
r. Repair and/or modify existing housekeeping pads as needed for new chiller and pumps.

s. Provide and install components for cooling towers as listed.

1) Remove and dispose of cooling tower fan motors, related starters and controls. Modify existing cooling tower Control Panel to adopt new variable frequency drive controller(s).
2) Remove and dispose of existing tower water treatment components.
3) Provide and install two cooling tower inverter-rated fan motor, as shown in the drawings.
4) Replace the belt-driven fan drive assembly with a direct drive assembly, include mounting hardware for the Cooling Tower.
5) Replace the motor of the Cooling Tower fans (two). Motor shall be inverter duty type to match the variable frequency drive controller, including disconnects, conduit, power and control wiring.
6) Integrate tower fan VFD with the cooling tower controller. Tower fan control features shall include soft-start, load modulation, and off modes. Modulation will be controlled based on the condenser water temperature.
7) Replace existing plastic air intake louvers and inside fill on each cooling tower.
8) Provide and Install maintenance and safety platform (low and high) around the cooling tower, if not installed already. Coordinate with WMATA and cooling tower manufacturer for installation.

t. Install a new utility sink, permanent eye wash station, associated instantaneous water heater, backflow preventer, associated piping and valves. Drain piping on floor shall be protected with proper measures to prevent tripping.
u. Provide unit heaters for space heating.
v. Paint chiller plant floors and equipment pads with battle ship grey or equal. Provide safety lines and tripping hazard lines that shall be painted yellow or red.
w. Provide Maintenance and Repair and Testing and Operations manuals for all systems and components, individually for each location.
x. Train WMATA personnel on system operations and maintenance at the manufacturer's facility.
y. Test and Balance the water system in accordance with NEBB or AABC.
z. ## Place Horn and Strobe at each entrance for the Chiller Plant. ##

1.02 QUALITY ASSURANCE

A. Qualifications of Manufacturer:

1. Equipment shall have been produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.
2. Minimum expected life of this equipment shall be 10 years. All equipment furnished shall be heavy duty, commercial type. Ready availability of spare and repair parts will be important criteria in evaluating manufacturer's proposals. Maintainability and ease of service are additional important evaluation criteria.
3. The COR reserves the right to inspect materials, and their sources, workmanship, and construction methods at any time, at the Manufacturer's shop or fabricating facility. The AR further reserves the right to be present for any or all shop tests of components, assemblies, or systems. Contractor shall notify the COR 2 weeks in advance of any tests.
4. The Authority shall have final approval of the equipment manufacturer.

B. Manufacturer's Representative:

1. Installation: Provide a qualified manufacturer's representative at site to supervise work related to equipment installation, check-out, and start-up operations at each location.

C. Equipment Warranty:

1. All major equipment shall be provided with five year warranty on entire parts and labor.
2. All major equipment manufacturers shall have a local factory service within 100 miles of jobsite for regular maintenance.

D. Within the five years warrant, provide yearly maintenance contracts for all major equipment and control systems. Yearly maintenance requirements shall be coordinated with the owner.

E. Reference Codes and Specifications:

1. Codes and regulations of the District of Columbia.
2. Code and regulations of Maryland.
3. Code and regulations of Virginia.
4. Discipline specific 2015 International Code Council.

1.03 **SUBMITTALS:**

A. Submit the following for approval in accordance with Section 2, Special Conditions and with the additional requirements as specified for each:

1. Shop Drawings and Manufacturer's Literature:

a. Show details of construction and interfacing with other trades.
b. Bar graph progress and delivery schedule.
c. Provide manufacturer’s product literature for all installed items.

2. Design drawings for additional equipment-related structural work:

a. Show details of construction and interfacing with other trades.

3. Operation and Maintenance Manual:

a. Provide complete parts, operating, and maintenance manual covering equipment at time of installation including, but not limited to:

1) Description of system and components.
2) Schematic diagrams of electrical, plumbing, and drainage systems.
3) Manufacturer's printed operating and maintenance instructions.
4) List of original manufacturer's parts, including suppliers' part numbers and cuts, recommended spare parts, stock quantity, and local parts and service source.

a) Assemble and provide four (4) copies of manual, per location, in 8-1/2 by 11 inch format. Foldout diagrams and illustrations are acceptable.
b) Provide electronic files for manual using MSWord 2016 for text and Auto CAD Latest Version /Group 4 (PDF) Format for Drawings and Diagrams.

1.04 **PRODUCT DELIVERY, STORAGE, AND HANDLING:**

A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during shipment and storage.

1.05 **OPERATION AND MAINTENANCE TRAINING:**

A. Upon completion of the equipment installation and ten days before start-up, a qualified representative of the manufacturer shall be present for a minimum of three (3), eight (8) hour working days to instruct personnel in the operation and proper care of the equipment at each location.

1. Instructional period: Three consecutive man-days (regular working hours) minimum. A minimum of one day to be devoted to hands-on demonstration of the equipment operation, trouble analysis, repair, adjustment and maintenance.
2. Train personnel in preventive maintenance, operation of systems and to recognize malfunctions.
3. Provide complete printed operating instructions in manual or handbook form, completely and clearly indexed for ready reference during actual operation and for use as text during instruction of operating personnel.

a. Include descriptions of systems, background information and complete procedures for adjustment, calibration, replacement and repair of components in the system(s).

1.06 LABELING:

A. Manufacturer shall securely attach in a prominent location on each major item of equipment a non-corrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.

B. Label all added/modified piping as to its function and flow direction.

C. Label all new/modified circuits in power panels.

PART 2 – PRODUCTS

2.01 MAJOR EQUIPMENT SELECTION

A. All water-cooled chillers shall be selected and installed as specified in Section 15625.

B. Chilled water and condenser water pumps shall be selected and installed as specified in Section 15185.

C. All refrigerant monitoring and safety equipment shall be selected and installed as called out on drawings and per manufacturers instructions.

D. All Cooling towers shall be per Section 15640.

E. All other ancillary components for a complete functional system shall be per corresponding specifications and drawings.

2.02 MISCELLANEOUS

A. All facilities restoration work shall be performed as specified in Section 02205.

B. All demolition work shall be performed as specified in Section 02220.

C. All field painting shall be performed as specified in Section 09920.

D. HVAC motors and variable frequency drives shall be selected and installed as specified in Section 16225 and 16480.

E. All mechanical equipment and piping shall have vibration isolation as specified in Section 15070.

F. All mechanical equipment and piping shall be identified as specified in Section 15075.

G. All equipment and piping insulation shall be selected and installed as specified in Section 15080.

H. Water treatment system shall be selected and installed as specified in Section 15186A.

I. All piping shall be selected, installed and tested as specified in Section 15205.

J. All air conditioning systems shall be selected, installed and tested as specified in Section 15733A.

K. All heating equipment shall be selected, installed and tested as specified in Section 15765.

L. All ductwork shall be selected, installed and tested as specified in Section 15810.

M. All fans shall be selected, installed and tested as specified in Section 15830.

N. Chiller plant monitoring shall be selected and installed as specified in Section 15900A.

O. All systems shall be tested and balanced in accordance with Section 15950.

P. All wiring and equipment shall comply with grounding and bonding requirements as specified in Section 16060.

Q. All wire and cable shall be selected, installed, and tested as specified in Section 16120.

R. All raceways, boxes and cabinets shall be selected, installed and tested as specified in Section 16130.

S. All motors shall be selected, installed and tested as specified in Section 16225 except as noted above. All motor enclosures shall be rated “water-proof”.

T. All motor starters and control center components shall be installed and tested as specified in Section 16425.

U. All circuit breakers, panel boards, and load centers shall be selected, installed and tested as specified in Section 16440 except as noted above.

PART 3 – EXECUTION

3.01 SITE PREPARATION

A. Provide scoping and design documentation (drawings) for construction of required equipment supports and other mounts not originally specified in this document.

B. Coordinate the installation of equipment supports with the demolition and reconstruction work of the HVAC, plumbing, and electrical contractors.

3.02 INSPECTION

A. Check location of rough-in work and utility stub-outs to assure match with the equipment to be installed.

B. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all items.

C. Report in writing to the COR any damaged, missing or incomplete scheduled equipment and improper rough-in work or utility stub-outs.

3.03 INSTALLATION

A. The Contractor shall be responsible for complete operational equipment installation.

B. Work shall be performed under the direct supervision of Construction Superintendent. He shall coordinate the installation of scheduled equipment with the Contracting Officer Representative (COR).

C. Install equipment in accordance with plans, shop drawings and manufacturer's instructions:

1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb and at right angles to adjacent work.
2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
3. Anchorage: Use fastenings as specified herein. Attach equipment securely to prevent damage resulting from inadequate fastenings. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.
4. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.04 TESTING

A. Specification Compliance: After final connections are made and prior to authorizing payment, specified equipment and systems shall be satisfactorily tested for compliance with all specified features.

B. Malfunctions during testing shall be corrected within five days and retested. Malfunctions during second testing shall be corrected within five days and retested.

C. Inadequate Performance: If equipment fails the third test, the Authority may elect to have all equipment installed by this contract removed from site at no cost or obligation to the Authority.

3.05 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing or installation debris from job site.

D. Notify AR for scheduling of acceptance inspections.

3.06 WARRANTY

A. In addition to the requirements of the General Provisions, the equipment shall be guaranteed against defective parts and faulty workmanship for a period of two (2) years after substantial completion inspection (SCI). This requirement is for all new equipment installation excluding all Chillers.

1. Chillers: Provide five (5) year parts, labor and refrigerant warranty and routine service requirement for the new chillers during the warranty period.
2. Cooling Tower: Provide five (5) year parts, labor and routine service requirement for the new cooling tower during the warranty period.

3.07 PERSONNEL

A. The Contractor will perform all services using factory-trained technicians who have required Federal and jurisdictional certifications and specialize in HVAC, refrigeration and electronic system maintenance and repair service.

3.08 REPAIR SERVICE

A. The Contractor will perform all services during its regular working hours unless otherwise specified. Any services requested or agreed to by the Authority that are outside the Scope of Work will be performed by the Contractor as a contract modification.

3.09 REPORTS

A. The Contractor will provide the COR with a detailed report of the services performed on each inspection. Report shall be submitted to COR, shall include equipment log readings taken during inspection, condition of equipment, recommended repairs and/or services performed.

3.10 ADDITIONAL SERVICES

A. Additional services will be furnished upon request and proper authorization from the Authority. All additional services will be requested in writing according to contract modification procedures.

3.11 EMERGENCY SERVICE

A. Emergency service will be available, for the chillers under the five year warranty only, on a 7 day, 24-hour basis at no additional cost.

3.12 SCOPE OF SERVICE

A. Contractor will perform the following services pursuant to the terms of this contract:

1. Perform five monthly inspections and one annual shutdown service on the equipment listed as water cooled chillers between May 15 and October 15.
2. Complete seasonal start-up services as described below once per year prior to May 15.

B. In addition, the following service applies to the air conditioning equipment listed as both water cooled and air-cooled chillers:

1. Parts and Labor Coverage - furnish all labor, parts, and supplies necessary to make repairs, adjustments and routine maintenance.
2. Miscellaneous Parts Coverage - provide coverage for miscellaneous replacement of relays, controls, for control panels.
3. Provide MOD-BUS communication service for the duration of the Agreement.

C. Contractor Maintenance Service shall include:

1. Furnish all labor, parts, refrigerant, oil, and material needed to maintain the equipment in good operating condition. Perform service during normal working hours, unless otherwise specified herein, and the maintenance service shall be in accordance with the scope previously stated. Annually brush clean the water side of water cooled condensers and air side of air cooled condensers with procedures determined by the equipment manufacturer.
2. Maintain the following items related to the Equipment:

   a. Electric wiring from the starter to its respective motor on unit mounted starters only.
   b. Refrigerant piping between two or more pieces of Equipment, if installed per manufacturer's recommendations.
   c. Insulation on the refrigerant piping and Equipment if disturbed to perform service.
   d. The pressure and temperature controls, thermometers, gauges, control devices, thermostats and manual valves located on the Equipment.
   e. Starters. (Excludes line side damage.)

3. Provide a written report to the Authority about the condition of the Equipment and any recommendations for enhancements to maintain capacity, reliability, and efficiency.
4. The following tasks are performed during the annual inspection once each year during a shutdown period in order to properly evaluate equipment status and prepare unit for the next cooling season:

   a. Test for refrigerant leaks including relief valve piping outlets.
   b. Check main starter, control panel, and frequency drives.
   c. Inspect and tighten electrical connections.
   d. Check relays, operating, and safety controls.
   e. Check flow switch operation.
   f. Measure and record water side pressure drops across vessels.
   g. Perform equipment monitoring system check, log, and last fault analyses. Analyze performance, trend log if necessary.
   h. Download latest software version if applicable.
   i. Check compressor readouts.
   j. Inspect vibration eliminators and inspect water piping for leaks.
   k. Check head pressure control operation for tower fans or bypass valve.
   l. Check minimum condenser water temperature operation.
   m. Manually clean water side of condenser. (Removal of one head only.)
   n. Head removal by Contractor.

5. The following tasks are performed during seasonal startups:

   a. Review manufacturer’s recommendations for startup.
   b. Check auxiliary equipment operation.
   c. Download latest software version if applicable.
   d. Check relays, operating, and safety controls.
   e. Start chilled water pump(s).
   f. Start condenser water pump(s) and cooling tower.

g. Start water chiller.

6. The following tasks shall be performed during monthly maintenance inspections:

a. Log all operating conditions after unit stabilizes.
b. Review operating procedures with chiller operator.
c. Review owner's log for trends.
d. Inspect chiller for leaks.
e. Inspect starter for burns and discoloration.
f. Run chiller and log readings, analyze performance.
g. Record unusual noises and vibrations.
h. Record refrigerant level in sight glass.
i. Review chiller operation with chiller operator.
j. Test for refrigerant leaks including relief valve piping outlets.
k. Check main starter and control panel.
l. Check relays, operating, and safety controls.
m. Check flow switch operation.
n. Perform equipment monitoring system check, log, and last fault analysis, analyze performance.

D. Authority agrees to:

1. Designate a representative in its employ to receive instructions in the operation of the equipment. Such representative shall have authority to carry out recommendations received from manufacturer in conjunction with the performance of this Agreement.
2. Allow Contractor to start and stop the Equipment in order to perform services specified in this Agreement.
3. Operate the Equipment in accordance with manufacturer's instruction, and to notify Contractor promptly of any change in the usual operating conditions.
4. Provide reasonable means of access to the Equipment, including any required removal, replacement and refinishing of the building structure.
5. Permit the use by Contractor of the usual building maintenance materials and tools.
6. Employ only Contractor personnel or persons authorized by Contractor to perform all work on the Equipment, except for operation of same.

END OF SECTION

C. **## The Contractor shall have the required means and methods to remove the existing concrete access panels and beams to rig all equipment in and out of the mechanical/chiller plant rooms. ##**

PART 2 – PRODUCTS

2.01 PRODUCTS AND MATERIALS:

A. General Requirements:

1. Provide complete water-cooled, semi-hermetic, oil-free, magnetic bearing, centrifugal compressor water chiller as specified herein. Supply chiller with full operating charge of HFC-134a Refrigerant. In design and purchase of equipment, provide for interchangeability of items of piping equipment, subassemblies, parts, motors, starters and relays. Each compressor shall have an integrated variable-frequency drive operating in concert with inlet guide vanes for optimized full and part load efficiency. On two-compressor units, the evaporator and condenser refrigerant sides and the expansion valve shall be common and the chiller shall be capable of running on one compressor with the other compressor or any of its auxiliaries inoperable or removed.

B. Centrifugal Compressors:

1. The unit shall utilize two magnetic bearing, oil-free, semi-hermetic centrifugal compressors.
2. Single-stage, statically and dynamically balanced impeller.
3. Casing fabricated of cast iron, aluminum or steel plate with split sections gasketed and bolted.
4. Impeller wheel constructed of aluminum alloy or other material that has been demonstrably successful in use.
5. Impeller shaft fabricated of heat-treated alloy steel with sufficient rigidity for proposed operation at specified operating speeds.
6. 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. Movable inlet guide vanes and variable compressor speed acting together, shall provide unloading. The chiller controls shall coordinate compressor speed and guide vane position to optimize chiller efficiency. Capacity reduction designed to provide automatic capacity modulation from 100 percent capacity to 10-percent capacity without cycling.
7. Capacity-control system actuated by temperature of water leaving evaporator.
8. Transducers for remote surveillance and control by Chiller plant monitoring panel system and capability to send signal to the AEMS as shown and in accordance with Section 15900A.

C. Water Cooler/ Evaporator:

1. Removable bundle-type copper tube, constructed of seamless copper tubing minimum 0.035-inch wall thickness, plain or with integral fins individually replaceable and rolled or brazed into copper or steel-tube sheets, with baffles and tube supports of copper or steel.
2. Complete refrigerant-feed control, designed to control feed to evaporator at each level of load range from 100 percent to 10 percent of package water-chilling capacity without use of hot-gas bypass.
3. Performance based on water velocity of minimum three fps and maximum ten fps throughout full length of tubes and fouling factor of 0.00025 for individual machine.

4. Water spaces in coolers designed for minimum 150-psi working pressure; tested in accordance with ASME Code.
5. Water spaces not subject to the ASME Code due to size or other limitations, tested at pressure of not less than 1-1/2 times working pressure.
6. Re-seating type spring loaded pressure relief valves according to ASHRAE-15 safety code shall be furnished. The evaporator shall be provided with single or multiple valves.
7. Provide factory-mounted and wired, thermal-dispersion water flow switches on each vessel to prevent unit operation with no or low water flow. Paddle and pressure differential type switches are not acceptable due to high rates of failure and false indications from these types of flow indicators.

D. Insulation:

1. Each water-chilling unit provided with insulation as specified in Section 15080.

E. Condenser:

1. Shell-and-tube type permitting tubes to be cleaned from each end by removing water-box cover plates or head.
2. The tubes shall be individually replaceable and secured to the intermediate supports without rolling or expanding to facilitate replacement if required.
3. Tubes fabricated of seamless copper tubing, minimum 0.035-inch wall thickness, with integral fins individually replaceable and rolled or brazed into copper or steel-tubed sheets.
4. Performance based on rate of water flow specified and water velocity of 3-fps minimum and 10-fps maximum throughout full length of tubes and fouling factor of 0.00075.
5. Water spaces in condenser designed for minimum 150-psi working pressure; tested in accordance with requirements of ASME Code.
6. Refrigerant side of shell tested at 1-1/2 times refrigerant saturation pressure.
7. Re-seating type spring loaded pressure relief valves according to ASHRAE-15 safety code shall be furnished. The evaporator shall be provided with single or multiple valves.
8. Provide factory-mounted and wired, thermal-dispersion water flow switches on each vessel to prevent unit operation with no or low water flow. Paddle and pressure differential type switches are not acceptable due to high rates of failure and false indications from these types of flow indicators.

F. Compressor Drive Motor:

1. Squirrel-cage induction, refrigerant gas-cooled, rated at 460 volts, three-phase and 60 Hertz and in accordance with Section 16225.
2. The motor shall be of the semi-hermetic type, of sufficient size to efficiently fulfill compressor horsepower requirements. It shall be liquid refrigerant cooled with internal thermal sensing devices in the stator windings. The motor shall be compatible with variable frequency drive operation.
3. Motor starter conforming to recommendations of water-chiller manufacturer and as specified in Section 16425.
4. Wiring as recommended by compressor manufacturer to provide complete automatic operation of centrifugal refrigeration system.

G. Controls, Control Panel and Gauges:

1. Provide a microprocessor control panel which can monitor and display various chiller parameters and alarms, with a touchscreen operator interface and an unit controller. As a minimum, monitor the following points at the Chiller plant monitoring panel:

a. Analog points:

1)	Chilled water enter temperature	DEG F
2)	Chilled water leaving temperature	DEG F
3)	Condenser water entering temperature	DEG F
4)	Condenser water leaving temperature	DEG F
5)	Condenser water pressure	PSI
6)	Chilled water pressure	PSI
7)	Condenser refrigerant pressure	PSI
8)	Evaporator refrigerant pressure	PSI
9)	Percent of 100% speed (per compressor)	%
10)	Chiller KW demand	KW
11)	Chiller efficiency	KW/TON
12)	Chilled water flow	GPM
13)	Condenser water flow	GPM
14)	Refrigerant Purge Air Pressure	PSI
15)	Condenser water pressure flow differential	PSI
16)	Chiller Oil Pressure	PSI
17)	Outdoor Temperature	Degree F
18)	Outdoor Humidity	0-100%
19)	Chiller Plant Space Temperature	Deg F
20)	Chiller Voltage	V

b. Status Points (Contact Closure):

1) Chiller Motor ON/OFF
2) Condenser Water Pump ON/OFF
3) Chilled Water Pump ON/OFF
4) Cooling Tower Fan ON/OFF
5) Chiller Refrigerant Purge Air Pump ON/OFF
6) Chiller NORMAL/ ABNORMAL
7) Chiller Condenser Water Flow NORMAL/ ABNORMAL
8) Control Air Pressure NORMAL/ ABNORMAL
9) Chiller Plant Space Temperature NORMAL/ ABNORMAL
10) Condenser Water Pumps HOA Selector
11) Switch AUTO/HAND
12) Chilled Water Pumps HOA AUTO/HAND
13) Selector Switch
14) Cooling Tower Fans HOA AUTO/HAND
15) Selector Switch

c. Control Points (Contact Closure):

1) Chiller Motor ON/OFF
2) Condenser Water Pumps ON/OFF
3) Chilled Water Pumps ON/OFF
4) Cooling Tower Fans ON/OFF and speed control based on condenser water temperature.

d. Alarm points:

1) Chiller bearing temperature
2) Compressor failure

e. In addition, for future interface with an Energy Management System, provide a 4-20 mA signal output for each analog point and a dry contact closure for each alarm point.

2. Capacity-control mechanism to be integral part of packaged water chiller maintaining leaving water temperature within 0.75 degrees F of setting temperature from 100 percent to 10 percent of chiller capacity.
3. Control mechanism: Compressor stopped when chiller output drops below 10 percent and automatically restarted when leaving water rises to preset temperature.
4. Timing device: Restarting unit limited to four starts per hour, minimum 15 minutes apart.
5. Modulating chilled-water operating control having adjustable throttling range, with means of calibration by adjusting chilled-water temperature control point. Solid-state electronic control.
6. Control panel provided on each unit with compressor-operating control, START/STOP switch and the gauges and protective devices as per paragraph G-1.
7. Signal lights for protective devices.
8. Alarm-circuit terminals in basic chiller-package control panel designed to actuate alarm device in event of machine cutout of protective devices.
9. The chiller shall be capable of automatic control of: evaporator and condenser pumps (primary and standby), cooling tower fan cycling control and a tower modulating bypass valve or cooling tower fan variable frequency drive.

H. Evacuation System:

1. Manually started and stopped evacuation system when positive-pressure refrigerant is used and chiller package is not designed to permit pumpdown storage and isolation of entire charge in condenser.
2. Motor-driven, air-cooled or water-cooled reciprocating condensing unit and receiver of sufficient capacity to store entire refrigerant charge of largest water-chilling system.
3. Receiver in accordance with ASME Code, mounted on floor brackets and provided with rupture members and dual relief valves in series.
4. Entire system completed with valves, piping and controls so that evacuation system may be utilized for pumpout, without temporary piping or wiring.

I. Receiver, Refrigerant:

1. Horizontal liquid receiver designed, fitted and rated in accordance with ASME Code.
2. Each receiver having storage capacity 25 percent minimum in excess of that required for fully charged system.
3. Inner surfaces thoroughly cleaned by sandblasting.
4. Each receiver equipped with inlet, outlet drip pipe, drain plug, purging valve, relief valves of capacity and setting in accordance with ANSI B9.1 and two bulls-eye liquid sight glasses.
5. Sight glasses installed in same vertical plane, 90 degrees apart, perpendicular to the axis of the receiver and not over 3-inches horizontally from drip pipe measured along axis of receiver.
6. Receiver constructed and tested in accordance with ASME Code.

J. Starter:

1. Motor starters: Section 16425.

K. Tools:

1. One complete set of special tools as recommended by manufacturer for field maintenance of system.

L. Factory Wiring:

1. In accordance with manufacturer's standard practice.

M. Nameplates:

1. Securely attached to each chiller showing manufacturer's name, model number and serial number.

N. Power Connection:

1. Provide single point power connection with non-metal compressor conduits and disconnect switch.

O. Vibration Isolation:

1. Provide as required in specification section 15070.

P. Refrigerant Leak Detection System:

1. Provide refrigerant leak detection sensors suitable for R-134A per ASHRAE-15 requirements and code compliance.
2. Provide refrigerant leak detection panel, quantity as required for a complete functional system, with a capability to provide audible and visual alarm and integrated to the exhaust system.

PART 3 – EXECUTION

3.01 INSTALLATION:

A. Fit equipment and appurtenances within space provided and make readily serviceable. Install per manufacturer's requirements, shop drawings, and contract documents.

B. Provide concrete pads, platforms and hangars necessary for proper installation of equipment.

C. Install chillers on concrete pads 4-inches minimum height in accordance with Sections 03100 and 03300.

D. Install chillers on vibration Isolators in accordance with Section 15070.

E. Coordinate work with other trades.

F. Mount tools on tool board in equipment room, as directed.

G. For piping system installation, see Section 15205.

H. For water treatment installation, see Section 15186A.

I. For conduit, raceways and cabinets installation, see Section 16130.

J. For wire cable, and busways, installation, see Section 16120.

3.02 FIELD SERVICES:

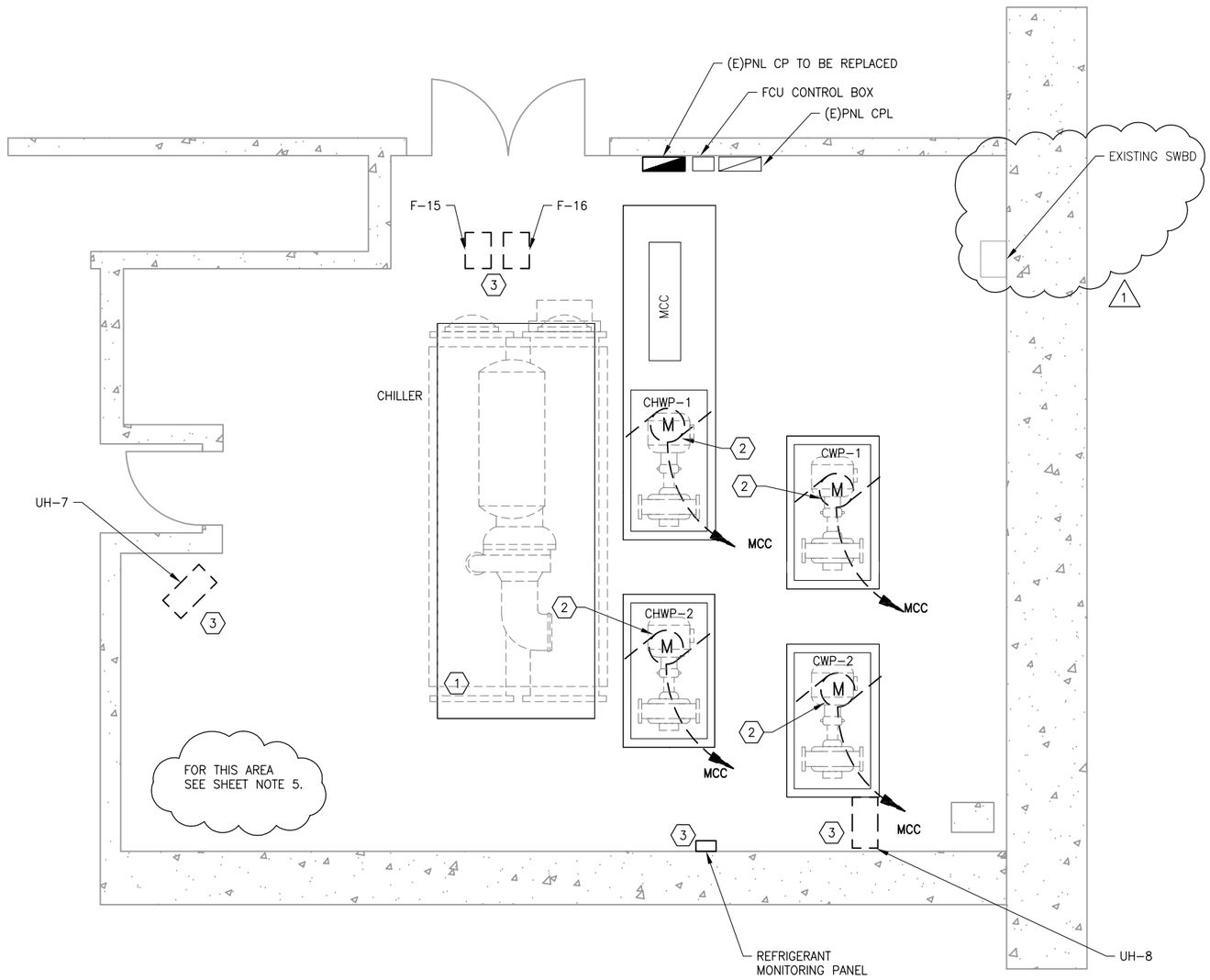
A. Semi-Hermetic Units: Obtain on-site services for two man-days (regular working hours) of manufacturer's engineering representative to advise on the following:

1. Pressure test on semi-hermetic water-chilling unit for leaks.
2. Evacuation and dehydration of machine to minus 12F wet bulb or to absolute pressure of not over 0.204-inch of mercury for 24 hours minimum.
3. Charging machine with refrigerant.
4. Starting machine and instructing representative of the Authority as to its proper care and operation. Provide factory startup personnel to ensure proper operation of the unit, but in no case for less than two full working days. During the period of start-up, the start-up technician shall instruct the owner's representative in proper care and operation of the unit.

B. Open Units: Obtain on-site services for two man-days (regular working hours) of manufacturer's engineering representative to advise on the following:

1. Erection, alignment, testing and dehydrating.
2. Charging machine with refrigerant.
3. Starting machine and instructing Authority personnel in proper care and operation of machine.

END OF SECTION



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 GRAHAM SPILLER No. 24687 05/17/2018 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
05/16/2018	1	REVISED PER BID RFIS

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

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

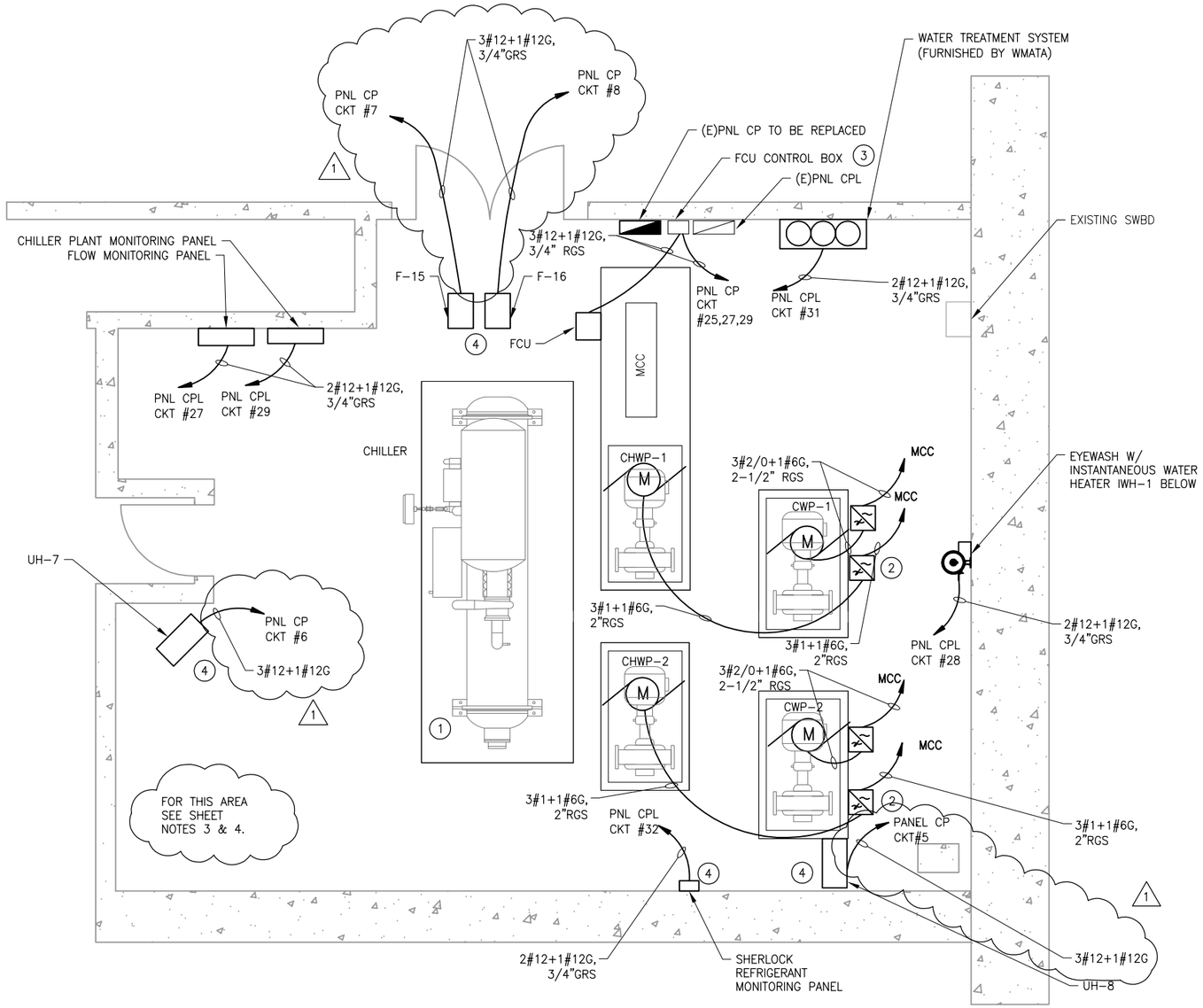
APPROVED 03/2018 DATE
MARK MAGNUSSEN
MANAGER, ENV. PLANNING AND COMP

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)
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

AMENDMENT No.4



1 ELECTRICAL PLAN - NEW WORK (CHILLER ROOM)
CWPA5-E-102

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

KEYNOTES:

1. CHILLER VFD/DISCONNECT SUPPLIED WITH CHILLER INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR.
2. PROVIDE AND INSTALL VFD/DISCONNECT FOR CHILLED WATER AND CONDENSER WATER PUMPS. PROVIDE AND INSTALL WIRING FROM MOTOR TO VFD AND FROM VFD TO MCC.
3. FCU CONTROL BOX SUPPLIED WITH FCU, INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR.
4. REUSE EXISTING CKTS & CONDUITS, USE NEW WIRES.

SHEET NOTES:

1. PROVIDE FILTERS FOR VFD'S AS REQUIRED.
2. ALL WIRING FOR VFD'S SHALL BE VFD RATED CABLES.
3. THE CONTRACTOR SHALL RELOCATE LIGHTING FIXTURE AND/OR CONDUITS AS NECESSARY TO ACCOMMODATE THE NEWLY DESIGNED VENTILATION UNIT MAINTENANCE PLATFORM.
4. INSTALL NEW LIGHTING FIXTURE AT CEILING ABOVE THE NEWLY INSTALLED VENTILATION UNIT MAINTENANCE PLATFORM.

GFP A Gannett Fleming/Parsons JOINT VENTURE

STATE OF MARYLAND UGUVAN KHAN 05/17/2018 No. 24681 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

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NUMBER	TITLE

REVISIONS

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WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

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)
ELECTRICAL PLAN - NEW WORK

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	3/8"=1'-0"	CWPA5-E-102	50 of 173

AMENDMENT No.4

PANEL: CPL

MAIN BUS: 100A
208/120 VOLT
ENCLOSURE: NEMA 1

MAIN DEVICE: 50A
3 PHASE, 4 WIRE + GROUND
MOUNTING: SURFACE

NEUTRAL BUS: 100%
RMS AIC: 10,000A
LOCATION: CHILLER ROOM

LOAD DESCRIPTION	LOAD VA	WIRE CKT	WIRE GND	RCWY SIZE	C/B TRIP	C/B PL	CKT NMBR	PHASE KVA A	PHASE KVA B	PHASE KVA C	CKT NMBR	C/B PL	C/B TRIP	RCWY SIZE	WIRE GND	WIRE CKT	LOAD VA	LOAD DESCRIPTION
REC	300	12	12	3/4"	30	1	1	1300			2	1	20	3/4"	10	10	1000	LIGHTS INSIDE VU 05, 06
CHILLER OIL WATER	–	12	12	3/4"	30	1	3		600		4	1	20	3/4"	12	12	600	AEMS RTUS
SPARE	–	12	12	3/4"	20	1	5			1200	6	1	20	3/4"	12	12	–	SPARE
SPARE	–	12	12	3/4"	20	1	7	1000			8	1	20	3/4"	12	12	1000	COLD WATER PIPE HEAT TRACING
SPARE	–	12	12	3/4"	20	1	9		700		10	1	20	3/4"	12	12	–	COLD WATER NORTH CHILLER
RECEPTACLES	700	12	12	3/4"	20	1	11			700	12	1	20	–	–	–	–	SPARE
SPARE	–	–	–	–	20	1	13	1200			14	1	20	–	–	–	500	RECEPTACLES
SPARE	–	–	–	–	20	–	15		1000		16	1	20	–	–	–	–	RECEPTACLES
SPARE	–	–	–	–	20	–	17			–	18	–	–	–	–	–	–	RECEPTACLES
RECEPTACLES	–	12	12	3/4"	20	–	19				20	–	–	–	–	–	–	RECEPTACLES
A.C SWITCH GEAR HEATER	–	12	12	3/4"	20	–	21				22	–	–	–	–	–	–	AIR DRYER
A.C SWITCH GEAR HEATER	–	12	12	3/4"	20	–	23				24	–	–	–	–	–	–	AC-13 40A
PEPCO MET CAB	–	12	12	3/4"	20	–	25				26	–	20	–	–	–	–	SPARE
(1) FLOW MONITORING PANEL	20	12	12	3/4"	20	–	27				28	–	20	3/4"	12	12	–	INSTANTANEOUS WATER HEATER (1)
(1) CHILLER PLANT MONITORING PANEL	20	12	12	3/4"	20	–	29				30	–	20	–	–	–	–	SPARE
(1) NALCO CONDENSER WATER TREATMENT PACKAGE	20	12	12	3/4"	20	–	31				32	–	20	3/4"	12	12	–	REFRIGERANT LEAK DETECTION SYSTEM,INCLUDING IR SENSORS (1)
SPARE	–	–	–	–	20	–	33				34	–	20	–	–	–	–	SPARE
SPARE	–	–	–	–	20	–	35				36	–	20	–	–	–	–	SPARE

NOTES:

CONNECTED LOAD: 9,812VA
DEMAND LOAD: 9,812VA

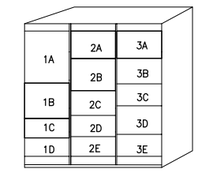
MOTOR CONTROL CENTER: CHILLER

800 AMPS, 480/277V, 3ø, 4W, GND BUS

LOCATION: CHILLER PLANT
AVAILABLE SHORT CIRCUIT: 28,000 AMPS RMS SYM
ENCLOSURE TYPE: NEMA 12

SEC. NO.	ITEM NO.	CIRCUIT BREAKER POLES	CIRCUIT BREAKER FRAMES AMP.	CIRCUIT BREAKER TRIP AMP.	MCP CONTIN. RATING AMP.	CONNECTED LOAD KVA	HP OR KW	DESCRIPTION	CONTROL DIAGRAM DWG NO.
1	1A	3	–	–	–	–	–	MAIN BREAKER	
	1B	3	200	125	–	–	40HP	CHILLER WATER PUMP	
	1C	3	200	125	–	–	40HP	CHILLER WATER PUMP	
	1D	–	–	–	–	–	–	SPACE	
2	2A	3	200	150	–	–	50HP	CONDENSER WATER PUMP	
	2B	3	200	150	–	–	50HP	CONDENSER WATER PUMP	
	2C	3	100	50	–	–	–	SPARE	
	2D	3	100	100	–	–	–	PANEL CP	
	2E	3	100	100	–	–	–	SPARE	
3	3A	3	200	125	–	–	40HP	COOLING TOWER FAN	
	3B	3	100	50	–	–	25HP	AIR COMPRESSOR	
	3C	3	100	50	–	–	–	VU #5	
	3D	3	100	50	–	–	–	VU #6	
	3E	3	–	–	–	–	–	SPACE	

ELEVATION



MANUFACTURER: CULTER-HAMMER
FREEDOM SERIES 2100

SHEET NOTES:

(1) PROVIDE 20A, 1 POLE CIRCUIT BREAKER TO MATCH EXISTING AND WIRE TO IT THE NEW LOAD.

(2) INSTALL 20A, 3P CIRCUIT BREAKER IN PANEL CP IN BUSSED SPACES 25, 27 AND 29. AND WIRE NEWLY INSTALLED FCU TO IT.

ELECTRICAL EQUIPMENT SCHEDULE

ITEM	QTY	DESCRIPTION
1	6	REACTOR/FILTER 480V, 3PH, 37A, 25HP, 60HZ, NEMA 4X ENCLOSURE
2	4	REACTOR/FILTER 480V, 3PH, 52A, 40HP, 60HZ, NEMA 4X ENCLOSURE
3	2	VFD,480V, 3PH, 25HP, 60HZ, NEMA 4X ENCLOSURE WITH BYPASS AND REACTOR/FILTERS
4	3	VFD,480V, 3PH, 40HP, 60HZ, NEMA 4X ENCLOSURE WITH BYPASS AND REACTOR/FILTERS
5	3	MCC BUCKET TO MATCH EXISTING WITH 125AT/200AF BREAKER
6	2	MCC BUCKET TO MATCH EXISTING WITH 150AT/200AF BREAKER
7	LOT	#1 AWG RHW-2 WIRE (VFD RATED)
8	LOT	#1 AWG RHW-2 WIRE
9	LOT	#6 AWG RHW-2 WIRE (GND)
10	LOT	#12 AWG RHW-2 WIRE
11	LOT	#2/0 AWG RHW-2 WIRE (VFD RATED)
12	LOT	#2/0 AWG RHW-2 WIRE
13	LOT	250 KCMIL RHW-2 WIRE
14	LOT	3/4" GRS CONDUIT
15	LOT	1" GRS CONDUIT
16	LOT	2" GRS CONDUIT
17	LOT	2" LTFC
18	LOT	2-1/2" GRS CONDUIT
19	LOT	2-1/2" LTFC
20	LOT	4" GRS CONDUIT
21	1	SWBD POWER CIRCUIT BREAKER TO MATCH EXISTING 500AT/800AF

PANEL: CP

MAIN BUS: 100A
480/277 VOLT
ENCLOSURE: NEMA 1

MAIN DEVICE: 50A
3 PHASE, 4 WIRE + GROUND
MOUNTING: SURFACE

NEUTRAL BUS: 100%
RMS AIC: 10,000A
LOCATION: CHILLER ROOM

LOAD DESCRIPTION	LOAD VA	WIRE CKT	WIRE GND	RCWY SIZE	C/B TRIP	C/B PL	CKT NMBR	PHASE KVA A	PHASE KVA B	PHASE KVA C	CKT NMBR	C/B PL	C/B TRIP	RCWY SIZE	WIRE GND	WIRE CKT	LOAD VA	LOAD DESCRIPTION
PANEL CPL TRANSFORMER	–	12	12	3/4"	20	3	1	–			2	3	20	3/4"	12	12	–	IT-2
							3		–		4							
							5			–	6							
AC-1	–	12	12	3/4"	20	3	7	–			8	1	20	3/4"	12	12	–	COLD WATER HEATER
							9		–		10	3	20	3/4"	12	12	–	CP#6 H.T. #7
							11			–	12							
EHU-5	–	12	12	3/4"	20	3	13	–			14	3	20	3/4"	12	12	–	CP#8 H.T. #16
							15		–		16							
							17			–	18							
CP#7 FAN-15	–	12	12	3/4"	20	3	19	–			20	3	20	3/4"	12	12	–	LOAD CENTER(AC-18)
							21		–		22							
							23			–	24							
FCU	–	12	12	3/4"	20	3	25	–			26							
							27		–		28	1	–	–	–	–	–	SPACE
							29			–	30	1	–	–	–	–	–	SPACE

(1)

NOTES:

CONNECTED LOAD: – VA
DEMAND LOAD: – VA

GFP A Gannett Fleming/Parsons JOINT VENTURE

STATE OF MARYLAND — JOAHAN KHAN — 05/17/2018 — No. 24687 — 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

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WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

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

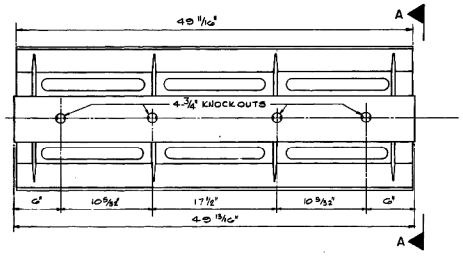
APPROVED 03/2018
MARK MAGNUSSEN DATE
MANAGER, ENV. PLANNING AND COMP

APPROVED 03/2018
GRAHAM SPILLER DATE
GFP DEPUTY PROGRAM MANAGER

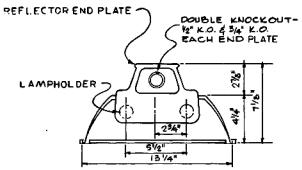
REPLACEMENT OF CHILLERS
AND COOLING TOWER ACCESSORIES AT EIGHT METRO-RAIL STATIONS
CWPA5 - BETHESDA (A09)
ELECTRICAL EQUIPMENT AND PANEL SCHEDULE

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	NONE	CWPA5-E-603	54 of 173

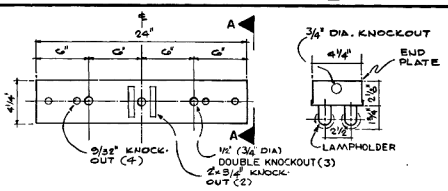
AMENDMENT No.4



PLAN VIEW

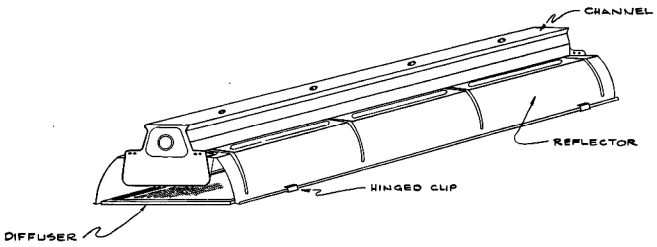


SECTION A-A



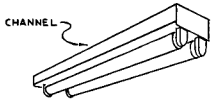
PLAN VIEW

SECTION A-A



FIXTURE TYPE 1 WITHOUT DIFFUSER

FIXTURE TYPE 2 WITH DIFFUSER



FIXTURE TYPE 3

FIXTURE TYPE 1

WITHOUT DIFFUSER

USE IN CLEANER'S ROOMS, MECH. EQUIPMENT ROOMS, WATER SERVICE ROOM, MAINTENANCE ROOM, OPERATIONS ROOM, TRAIN CONTROL AND COMMUNICATION ROOMS, A.C. SWITCHBOARD AND TRANSFORMER ROOM, BATTERY ROOM, D.C. BREAKER ROOM, TRACTION POWER SUBSTATION ROOM, TRAINMEN'S LOCKER ROOM, WASH ROOM AND BUS DRIVER'S WASH ROOM.

FIXTURE TYPE 2

WITH DIFFUSER

USE IN STAFF WASH ROOMS, DISPATCH ROOM AND TRAINMEN'S ROOM.

FIXTURE TYPE 3

USE IN BELL SYSTEM ROOM, WHEN THIS ROOM IS TYPICAL NOMINAL 3'-0" x 3'-0" SIZE. IF ROOM IS 60 SQ. FT. OR LARGER, USE FIXTURE 1.

SERVICE ROOM LIGHT FIXTURE

NOT TO SCALE

DESIGNED	E. FEAK	12-3-59 DATE
DRAWN	PRYOR	12-3-59 DATE
CHECKED		DATE
APPROVED		12-14-59 DATE

REFERENCE DRAWINGS

NUMBER	DESCRIPTION

REVISIONS

DATE	BY	DESCRIPTION
4 1 74		REV. PER STANDARD SPECIFICATION 1

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

APPROVED BY

DE LEUW, CATHER & COMPANY
GENERAL ENGINEERING CONSULTANT

HARRY WEESE & ASSOCIATES
GENERAL ARCHITECTURAL CONSULTANT

APPROVED

STANDARD ELECTRICAL DRAWING

FLUORESCENT FIXTURES SERVICE ROOMS

SECTION No. FA11

SCALE	DRAWING NO.	
NOT TO SCALE	ST-E-16	M334-221

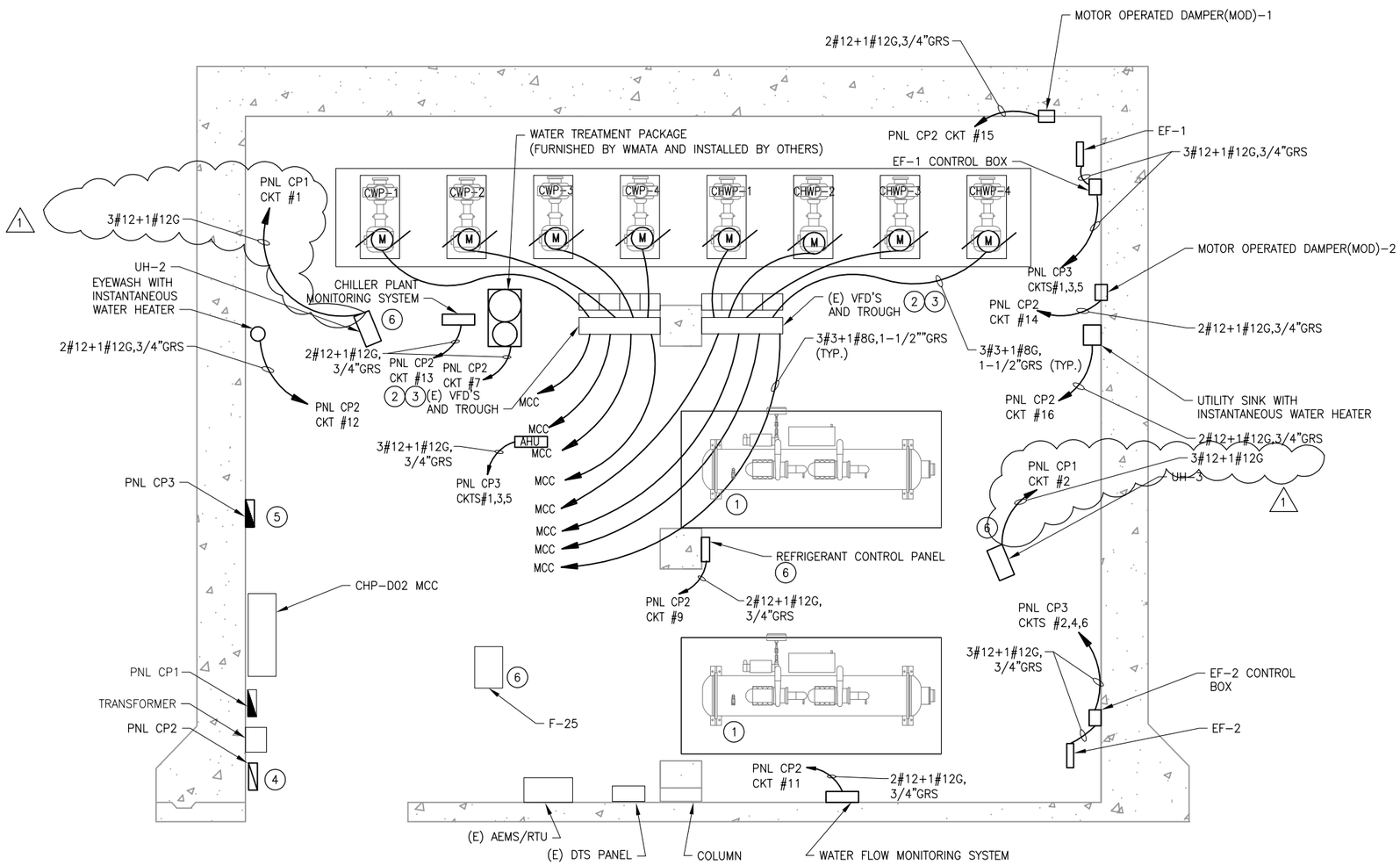
AMENDMENT No.4

KEYNOTES:

1. CHILLER VFD/DISCONNECT SUPPLIED WITH CHILLER, INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR.
2. THE VFD'S FOR CHILLED WATER AND CONDENSER WATER PUMPS ARE EXISTING. PROVIDE AND INSTALL WIRING FROM MOTOR TO VFD AND FROM VFD TO MCC.
3. PROVIDE LINE AND LOAD REACTORS FOR EACH VFD AND MOUNT IN A CONVENIENT PLACE.
4. PROVIDE 100A, 120/240, 18CKT DISTRIBUTION PANEL(CP2).
5. PROVIDE 100A, 277/480, 12CKT DISTRIBUTION PANEL(CP3).
6. RECONNECT POWER TO NEW EQUIPMENTS, USE EXISTING CKTS AND CONDUITS. PROVIDE NEW WIRING.

SHEET NOTES:

1. PROVIDE FILTERS FOR VFD'S AS REQUIRED.
2. ALL WIRING FOR VFD'S SHALL BE VFD RATED CABLES.
3. RUN NEW RGS FROM CABLE TROUGH AND STOP AT A CONVENIENT PLACE NEAR MOTOR. CONTINUE WITH LTFC TO MOTOR.



1 ELECTRICAL PLAN - NEW WORK (CHILLER ROOM)
CWPD2-E-102

SCALE: 1/4" = 1'-0"

GFP A Gannett Fleming/Parsons JOINT VENTURE

DISTRICT OF COLUMBIA
UDAYAN KHAN
No. 8758
05/17/2018
LICENSED
PROFESSIONAL ENGINEER

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

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WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

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

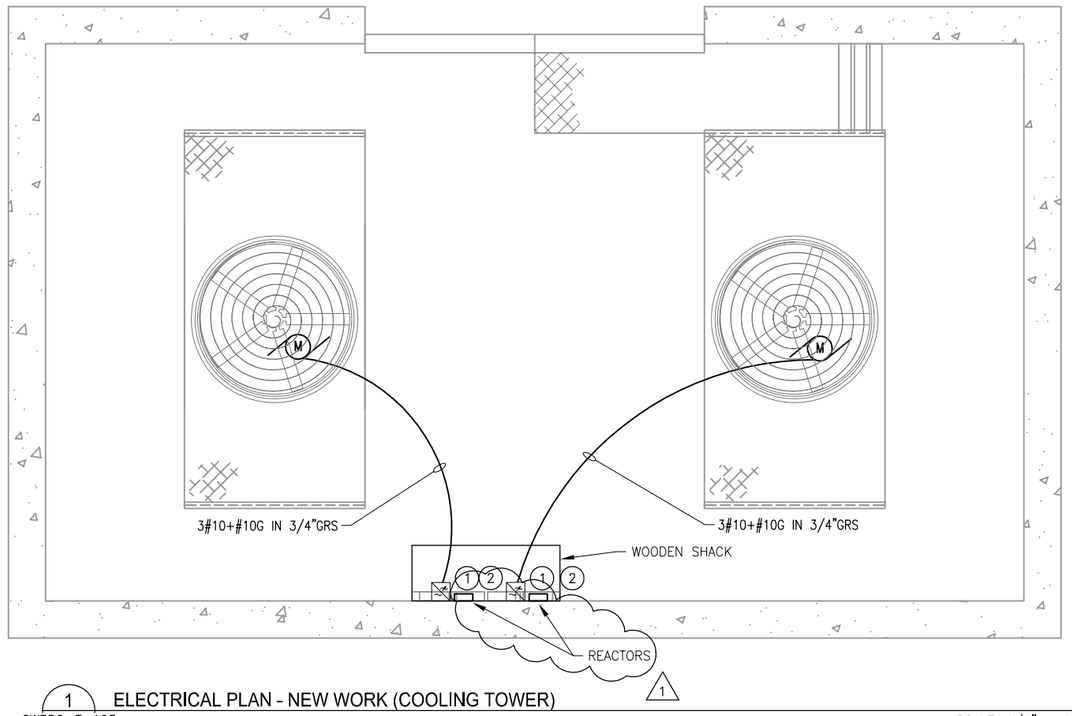
APPROVED 03/2018
MARK MAGNUSSEN DATE
MANAGER, ENV. PLANNING AND COMP

APPROVED 03/2018
GRAHAM SPILLER DATE
GFP DEPUTY PROGRAM MANAGER

REPLACEMENT OF CHILLERS
AND COOLING TOWER ACCESSORIES AT EIGHT METRO-RAIL STATIONS
CWP D2 - FEDERAL CENTER SW(D04)
ELECTRICAL PLAN - NEW WORK

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	1/4" = 1'-0"	CWPD2-E-102	88 of 173

AMENDMENT No.4



1 ELECTRICAL PLAN - NEW WORK (COOLING TOWER)
CWPD2-E-103

SCALE: 1/4" = 1'-0"

KEYNOTES:

1. NEW COOLING TOWER FAN MOTOR TO BE PROVIDED BY MECHANICAL.
2. PROVIDE LINE AND LOAD REACTORS FOR THE EXISTING VFD'S.

SHEET NOTES:

1. PROVIDE FILTERS FOR VFD'S AS REQUIRED.
2. ALL WIRING FOR VFD'S SHALL BE VFD RATED CABLES.
3. THE CHILLER PLANT IS APPROX. 40' UNDERGROUND. THE COOLING TOWER IS LOCATED ON THE STREET LEVEL, A FEW BLOCKS AWAY. APPROXIMATE DISTANCE 500'.

GFP A Gannett Fleming/Parsons JOINT VENTURE

DISTRICT OF COLUMBIA
UDAYAN KHAN
No. 8758
05/17/2018
LICENSED
PROFESSIONAL ENGINEER

DESIGNED	B. IDILBI	09/30/17 DATE
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05/16/2018	1	REVISED PER BID RFI'S

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

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

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

APPROVED 03/2018
GRAHAM SPILLER DATE
GFP DEPUTY PROGRAM MANAGER

REPLACEMENT OF CHILLERS
AND COOLING TOWER ACCESSORIES AT EIGHT METRO-RAIL STATIONS
CWP D2 - FEDERAL CENTER SW(D04)
ELECTRICAL PLAN - NEW WORK

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	1/4" = 1'-0"	CWPD2-E-103	89 of 173

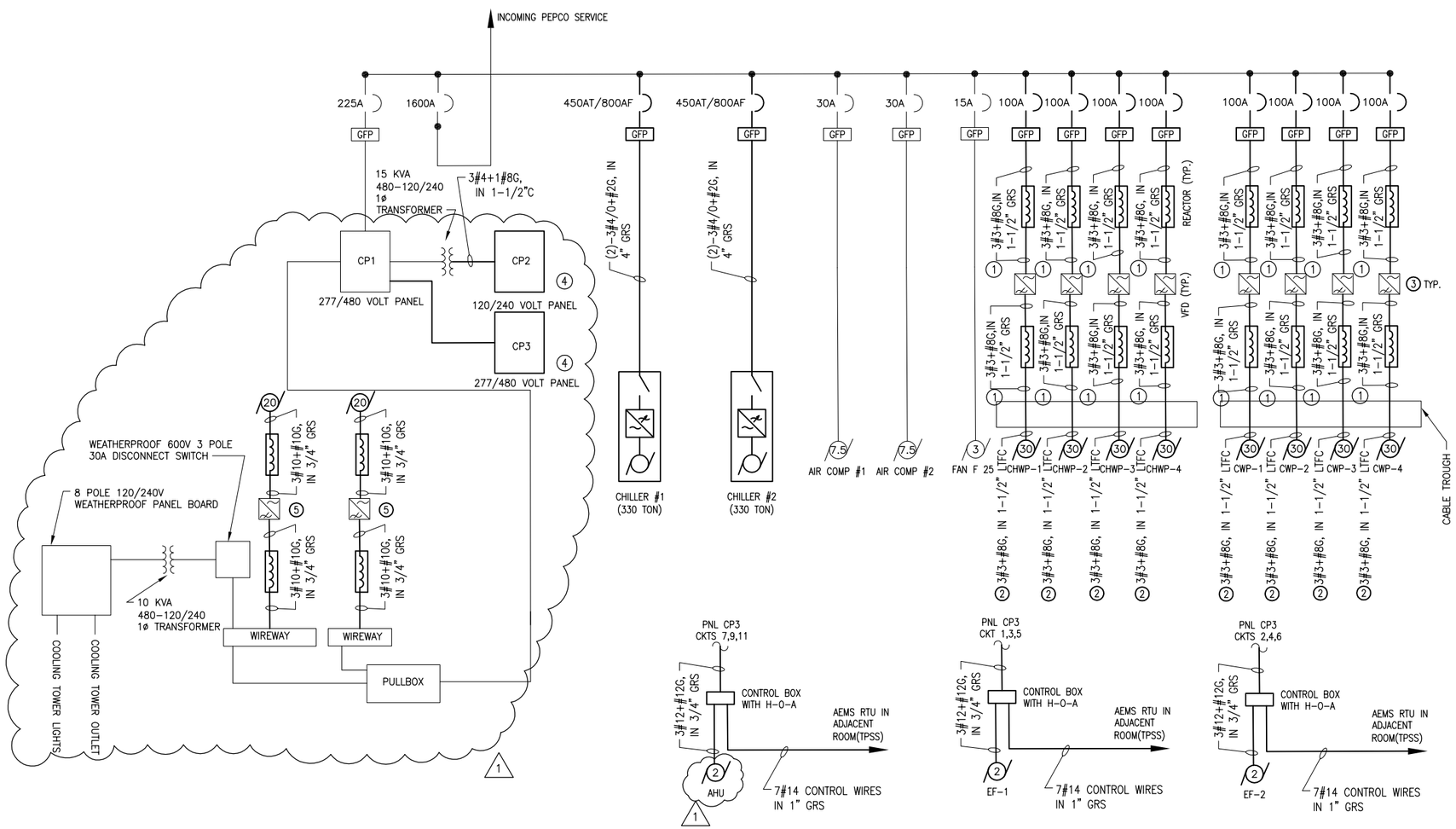
AMENDMENT No.4

SHEET NOTES:

1. PROVIDE NEW CIRCUIT WITH GROUND FAULT PROTECTION IN EXISTING MCC.

PLAN NOTES:

1. LINE AND LOAD REACTORS FOR EACH VFD SHALL BE PROVIDED AND MOUNTED ABOVE THE VFD IN A SINGLE NEMA 4X ENCLOSURE
2. RUN NEW RGS FROM CABLE TROUGH AND STOP NEAR MOTOR. RUN LTFC FROM RGS TO MOTOR.
3. EXISTING VFD'S TO REMAIN
4. PROVIDE DISTRIBUTION PANELS CP2 AND CP3.
5. PROVIDE NEW WIRING FROM WIREWAY TO REACTORS, UFD AND CT FAN MOTOR.



B ELECTRICAL SINGLE LINE DIAGRAM - NEW WORK

CWPD2-E-602

SCALE: NONE

GFP A Gannett Fleming/Parsons JOINT VENTURE

DISTRICT OF COLUMBIA — DOAYAN KHAN — No. 8758 — 05/17/2018 — LICENSED PROFESSIONAL ENGINEER

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

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WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

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
CWP D2 - FEDERAL CENTER SW(D04)
ELECTRICAL SINGLE LINE DIAGRAM - NEW WORK

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	NONE	CWPD2-E-602	91 of 173

AMENDMENT No.4

NOTE:1

PANEL: CP2

MAIN BUS:100A
208/120 VOLT
ENCLOSURE: NEMA 1

MAIN DEVICE:50A
1 PHASE, 2 WIRE + GROUND
MOUNTING:SURFACE

NEUTRAL BUS: 100%
RMS AIC: 10,000A
LOCATION: CHILLER PLANT

LOAD DESCRIPTION	LOAD VA	WIRE CKT	WIRE GND	RCWY SIZE	C/B TRIP	C/B PL	CKT NMBR	PHASE KVA		CKT NMBR	C/B PL	C/B TRIP	RCWY SIZE	WIRE GND	WIRE CKT	LOAD VA	LOAD DESCRIPTION
AIR COOLER	300	12	12	3/4"	30	1	1			2	1	20	3/4"	10	10	1000	FLOAT SWITCHES
AIR COMPRESSOR	–	12	12	3/4"	30	1	3			4	1	20	3/4"	12	12	600	CHEMICAL TREATMENT
WATER TREATMENT	200	12	12	3/4"	20	1	5			6	1	20	–	–	–	–	SPARE
CONDENSER WATER TREATMENT PACKAGE	–	12	12	3/4"	20	1	7			8	1	20	3/4"	12	12	1000	AHU
REFRIGERANT LEAK DETECTION SYSTEM,INCLUDING IR SENSORS	700	12	12	3/4"	20	1	9			10	1	20	3/4"	12	12	–	AHU
FLOW MONITORING PANEL	700	12	12	3/4"	20	1	11			12	1	20	3/4"	12	12	–	INSTANTANEOUS WATER HEATER
CHILLER PLANT MONITORING PANEL	700	12	12	3/4"	20	1	13			14	1	20	3/4"	12	12	–	MOD–2
MOD–1	–	12	12	3/4"	20	1	15			16	1	20	3/4"	12	12	–	INSTANTANEOUS WATER HEATER
SPARE	–	–	–	–	20	1	17			18	1	20	–	–	–	–	SPARE

NOTES:

CONNECTED LOAD: 9,812VA
DEMAND LOAD: 9,812VA

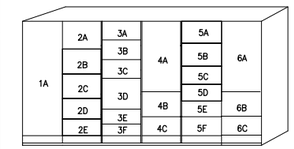
1

MOTOR CONTROL CENTER: CHILLER
800 AMPS, 480/277V, 3ø, 4W, GND BUS

LOCATION: CHILLER PLANT
AVAILABLE SHORT CIRCUIT: 28,000 AMPS RMS SYM
ENCLOSURE TYPE: NEMA 12

SEC. NO.	ITEM NO.	CIRCUIT BREAKER POLES	CIRCUIT BREAKER FRAMES AMP.	CIRCUIT BREAKER TRIP AMP.	MCP CONTIN. RATING AMP.	CONNECTED LOAD KVA	HP OR KW	DESCRIPTION	CONTROL DIAGRAM DWG NO.
1	1A	3	1600	1600	–	–	–	MAIN LUGS	
2	2A	3	100	15	–	100	3HP	FAN F25	
	2B	3	100	100	–	–	30HP	CHILLER WATER PUMP #1	
	2C	3	100	100	–	–	30HP	CHILLER WATER PUMP #2	
	2D	3	100	100	–	–	30HP	CHILLER WATER PUMP #3	
	2E	3	100	100	–	–	30HP	CHILLER WATER PUMP #4	
3	3A	3	300	225	–	–	–	MAIN BREAKER FOR PANEL CP1	
	3B	3	–	–	–	–	–	SPACE	
	3C	3	–	–	–	–	–	SPACE	
	3D	3	–	–	–	–	–	SPACE	
	3E	3	100	30	–	100	7.5HP	AIR COMPRESSOR 2	
	3F	3			–	–	–	SPACE	
4	4A	3	800	450	–	–	–	CHILLER #1	
	4B	3			–	–	–	SPACE	
	4C	3	100	30	–	100	7.5HP	AIR COMPRESSOR 1	
5	5A	3	100	100	–	–	30HP	CONDENSER WATER PUMP #1	
	5B	3	100	100	–	–	30HP	CONDENSER WATER PUMP #2	
	5C	3	100	100	–	–	30HP	CONDENSER WATER PUMP #3	
	5D	3	100	100	–	–	30HP	CONDENSER WATER PUMP #4	
	5E	–	–	–	–	–	–	SPACE	
	5F	–	–	–	–	–	–	SPACE	
6	6A	3	800	450	–	–	–	CHILLER #2	
	6B	–	–	–	–	–	–	SPACE	
	6C	–	–	–	–	–	–	SPACE	

ELEVATION



MANUFACTURER: CULTER–HAMMER
FREEDOM SERIES 2100

SHEET NOTE: 1

1. INSTALL NEW DISTRIBUTION PANEL CP2, 120/240V, 18CKTS.
2. INSTALL NEW DISTRIBUTION PANEL CP3, 277/480V, 12 CKTS.
3. IN PANEL CP1, INSTALL 1–3P, 50A CIRCUIT BREAKER IN AVAILABLE BUSSED SPACE AND WIRE TO IT THE NEWLY INSTALLED PNL CP3.

ELECTRICAL EQUIPMENT SCHEDULE

ITEM	QTY	DESCRIPTION
1	8	MCC BUCKET TO MATCH EXISTING WITH 100AT/100AF BREAKER
2	2	MCC BUCKET TO MATCH EXISTING WITH 450AT/800AF BREAKER
3	16	REACTOR/FILTER 480V, 3PH, 40A, 30HP, 60HZ, NEMA 4X ENCLOSURE
4	LOT	#2 AWG RHW–2 WIRE (GND)
5	LOT	#3 AWG RHW–2 WIRE (VFD RATED)
6	LOT	#3 AWG RHW–2 WIRE
7	LOT	#4 AWG RHW–2 WIRE
8	LOT	#8 AWG RHW–2 WIRE (GND)
9	LOT	#10 AWG RHW–2 WIRE (VFD RATED)
10	LOT	#10 AWG RHW–2 WIRE
11	LOT	#10 AWG RHW–2 WIRE (GND)
12	LOT	#12 AWG RHW–2 WIRE
13	LOT	#12 AWG RHW–2 WIRE (GND)
14	LOT	#4/0 AWG RHW–2 WIRE
15	LOT	3/4" GRS CONDUIT
16	LOT	1" GRS CONDUIT
17	LOT	1–1/2" GRS CONDUIT
18	LOT	1–1/2" LTFC
19	LOT	4" GRS CONDUIT
20	1	100A, 120/240V, 1PH, 18CKT DISTRIBUTION PANEL(CP2). WITH 50A MAIN BREAKER
21	1	100A, 277/480V, 3PH, 12CKT DISTRIBUTION PANEL(CP3). WITH 50A MAIN BREAKER
22	4	REACTOR/FILTER 480V, 3PH, 27A, 20HP, 60HZ, NEMA 4X ENCLOSURE

1

NOTE: 2

PANEL:CP3

MAIN BUS:100A
480/277 VOLT
ENCLOSURE: NEMA 1

MAIN DEVICE:50A
3 PHASE, 4 WIRE + GROUND
MOUNTING:SURFACE

NEUTRAL BUS: 100%
RMS AIC: 10,000A
LOCATION: CHILLER PLANT

LOAD DESCRIPTION	LOAD VA	WIRE CKT	WIRE GND	RCWY SIZE	C/B TRIP	C/B PL	CKT NMBR	PHASE KVA A	PHASE KVA B	PHASE KVA C	CKT NMBR	C/B PL	C/B TRIP	RCWY SIZE	WIRE GND	WIRE CKT	LOAD VA	LOAD DESCRIPTION
EF–1	–	12	12	3/4"	20	3	1	–			2							
							3		–		4	3	20	3/4"	12	12	–	EF–2
							5			–	6							
FCU	–	12	12	3/4"	20	3	7	–			8	1	20	–	–	–	–	SPARE
							9		–		10	1	20	–	–	–	–	SPARE
							11			–	12	1	20	–	–	–	–	SPARE

NOTES:

CONNECTED LOAD: –VA

B ELECTRICAL PNL , EQUIP'T SCHEDULES AND MCC SCHEDULE
CWPD2–E–603

SCALE: NONE

GFP A Gannett Fleming/Parsons JOINT VENTURE

DISTRICT OF COLUMBIA
UDAYAN KHAN
No. 8758
05/17/2018
LICENSED
PROFESSIONAL ENGINEER

DESIGNED	B. IDILIBI	09/30/17 DATE
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APPROVED 03/2018
MARK MAGNUSSEN DATE
MANAGER, ENV. PLANNING AND COMP

APPROVED 03/2018
GRAHAM SPILLER DATE
GFP DEPUTY PROGRAM MANAGER

REPLACEMENT OF CHILLERS
AND COOLING TOWER ACCESSORIES AT EIGHT METRO-RAIL STATIONS
CWP D2 - FEDERAL CENTER SW(D04)
ELECTRICAL EQUIPMENT AND PANEL SCHEDULE

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	NONE	CWPD2-E-603	92 of 173

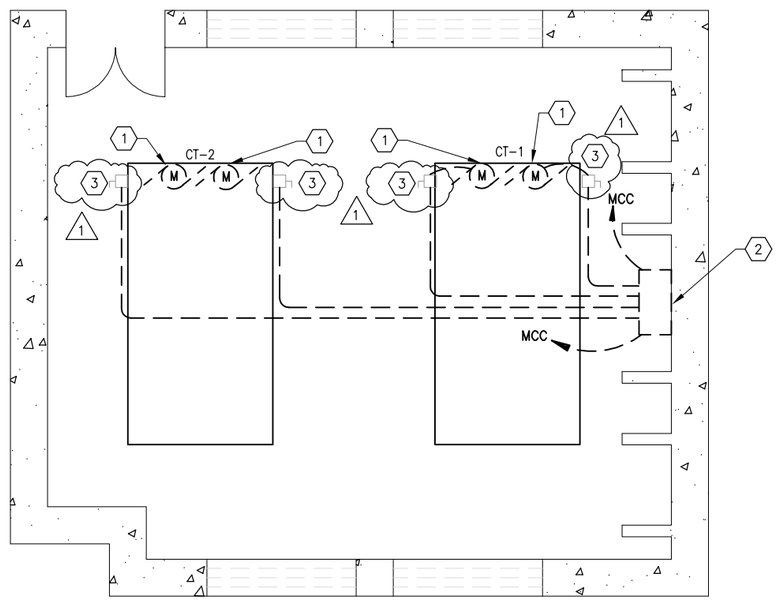
AMENDMENT No.4

KEYNOTES:

1. EXISTING COOLING TOWER FAN MOTORS TO BE DEMOLISHED BY MECHANICAL
2. EXISTING CONTROL PANEL TO BE DEMOLISHED.
3. DISCONNECTS ARE EXISTING TO REMAIN.

SHEET NOTES:

1. ALL SHOWN EQUIPMENT IS EXISTING TO REMAIN UNLESS NOTED OTHERWISE.
2. REMOVE AND DISPOSE OF DEMOLISHED EQUIPMENT ALONG WITH ASSOCIATED WIRING.



1 ELECTRICAL PLAN - DEMOLITION (COOLING TOWER)
CWPE3-E-101

SCALE: 1/4" = 1'-0"

GFP A Gannett Fleming/Parsons JOINT VENTURE

DISTRICT OF COLUMBIA
DOAYAN KHAN
No. 8758
05/17/2018
LICENSED
PROFESSIONAL ENGINEER

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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
CWP E3 - COLUMBIA HEIGHTS (E04)
ELECTRICAL PLAN - DEMOLITION

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	1/4"=1'-0"	CWPE3-E-101	106 of 173

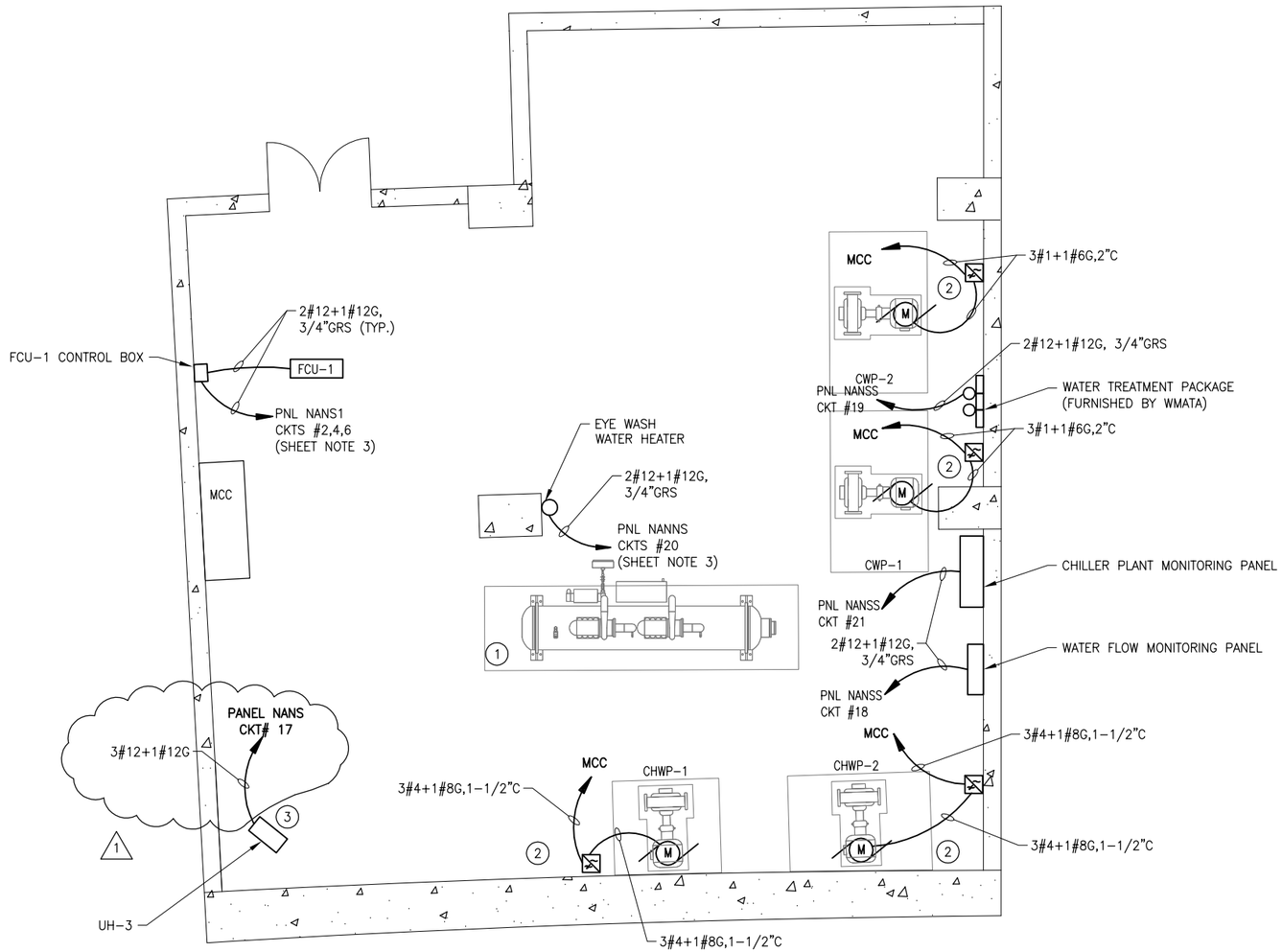
AMENDMENT No.4

KEYNOTES:

1. CHILLER VFD/DISCONNECT SUPPLIED WITH CHILLER, INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR.
2. PROVIDE AND INSTALL VFD/DISCONNECT FOR CHILLED WATER AND CONDENSER WATER PUMPS. PROVIDE AND INSTALL WIRING FROM MOTOR TO VFD AND FROM VFD TO MCC.
3. USE EXISTING CKT AND CONDUIT. PROVIDE NEW WIRING.

SHEET NOTES:

1. PROVIDE FILTERS FOR VFD'S AS REQUIRED.
2. ALL WIRING FOR VFD'S SHALL BE VFD RATED CABLES.
3. PANELS NANS AND NANSS ARE LOCATED IN THE NORTH MECHANICAL ROOM WHICH IS ADJACENT TO THE CHILLER PLANT. THE NEW PANEL NANS1 SHALL BE LOCATED ADJACENT TO NANS TO THE LEFT. SEE WMATA AS BUILT DWG E3A-E-28.



1 ELECTRICAL PLAN - NEW WORK (CHILLER ROOM)
CWPE3-E-102

SCALE: 1/4" = 1'-0"

A Gannett Fleming/Parsons JOINT VENTURE

DISTRICT OF COLUMBIA — QDAYAN KHAN — No. 6758 — 05/17/2018 — LICENSED PROFESSIONAL ENGINEER

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

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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
CWP E3 - COLUMBIA HEIGHTS (E04)
ELECTRICAL PLAN - NEW WORK

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	1/4"=1'-0"	CWPE3-E-102	107 of 173

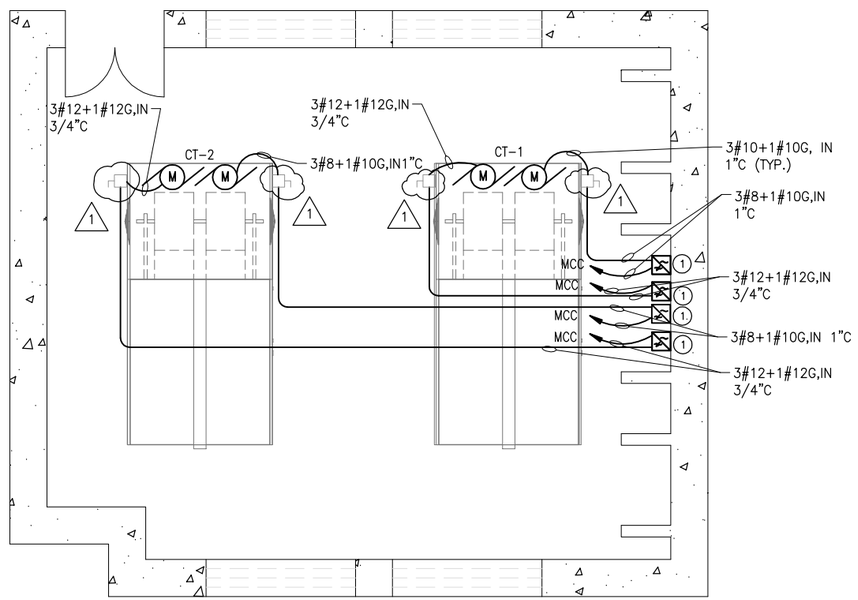
AMENDMENT No.4

KEYNOTES:

1. PROVIDE VFD'S WITH LINE AND LOAD REACTORS.

SHEET NOTES:

1. PROVIDE FILTERS FOR VFD'S AS REQUIRED.
2. ALL WIRING FOR VFD'S SHALL BE VFD RATED CABLES.
3. THE CHILLER PLANT FLOOR IS APPROXIMATELY 40' UNDERGROUND.
   THE CHILLER PLANT TO THE HIGHLAND PARK APARTMENTS IS ROUGHLY 210'.
   THE COOLING TOWER SITS ON THE ROOF OF THE HIGHLAND PARK APARTMENTS WHICH IS 8 STORIES TALL APPROXIMATE DISTANCE 500'.



1 ELECTRICAL PLAN - NEW WORK (COOLING TOWER)
CWPE3-E-103 SCALE: 1/4" = 1'-0"

GFP A Gannett Fleming/Parsons JOINT VENTURE

DISTRICT OF COLUMBIA
ZUDAYAN KHAN
No. 8758
05/17/2018
LICENSED
PROFESSIONAL ENGINEER

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GRAHAM SPILLER DATE
GFP DEPUTY PROGRAM MANAGER

REPLACEMENT OF CHILLERS
AND COOLING TOWER ACCESSORIES AT EIGHT METRO-RAIL STATIONS
CWP E3 - COLUMBIA HEIGHTS (E04)
ELECTRICAL PLAN - NEW WORK

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	1/4"=1'-0"	CWPE3-E-103	108 of 173

AMENDMENT No.4

SHEET NOTES:

1. PROVIDE NEW CIRCUIT WITH GROUND FAULT PROTECTION IN EXISTING MCC.

1

PLAN NOTES:

(1) LINE AND LOAD REACTORS FOR EACH VFD SHALL BE MOUNTED IN A SINGLE NEMA 4X ENCLOSURE

(2) RUN NEW RGS FROM CABLE TROUGH AND STOP NEAR MOTOR. RUN LTFC FROM RGS TO MOTOR.

(3) A. IN PANEL NANS REMOVE LOAD WIRES TO CKTS 32,34,36.

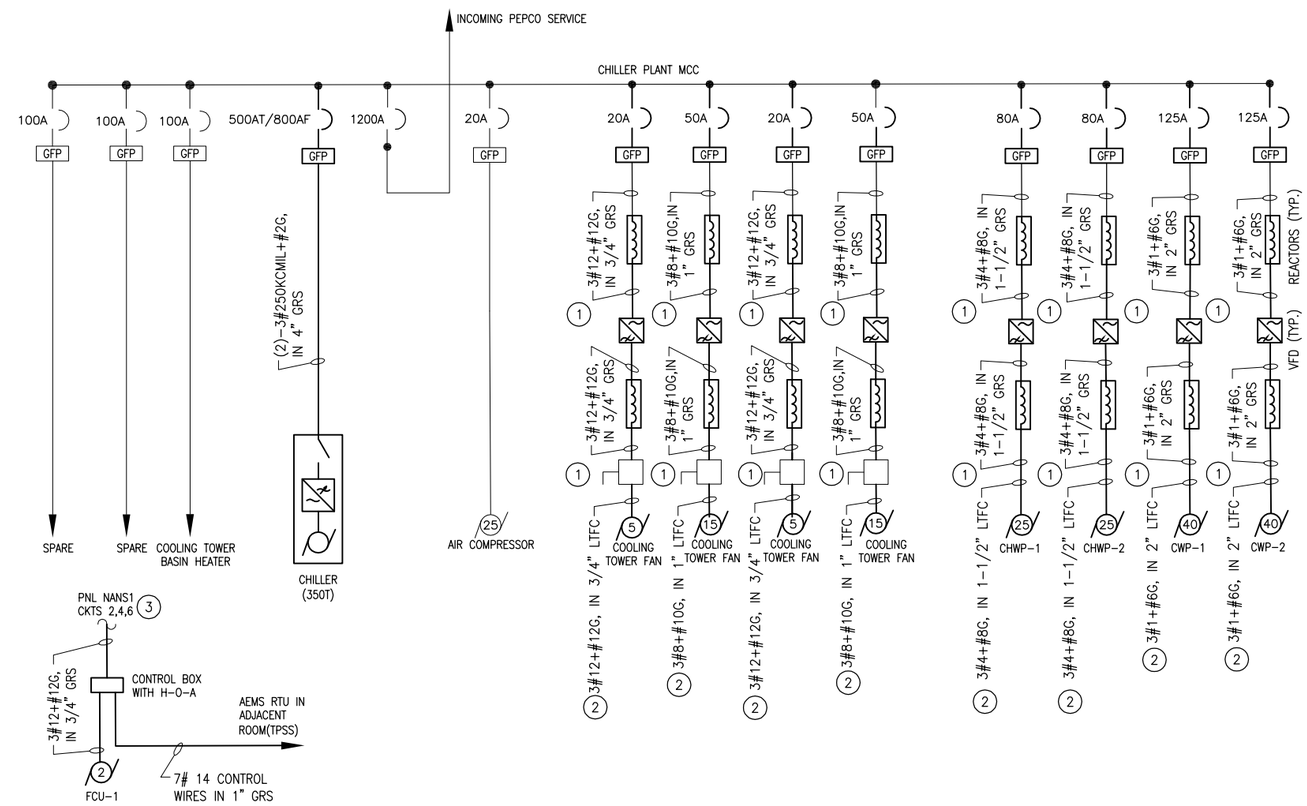
B. INSTALL NEW 50A, 3P CKT BREAKER IN POSITIONS 32,34,36.

C. INSTALL A NEW DISTRIBUTION PANEL NANS1 IN A CLOSE PROXIMITY TO PANEL NANS.

D. FEED NEW PANEL NANS1 FROM PANEL NANS CKTS 32,34,36 WITH NEUTRAL AND GROUND WIRES (4#6+#10G IN 1-1/4" GRS).

E. RECONNECT LOAD WIRES REMOVED IN STEP 1 ABOVE TO CKTS 1,3,5 IN NEW PANEL NANS1.

F. CONNECT FCU-1 TO CKTS 2,4,6 IN NEW PANEL NANS1.



B ELECTRICAL SINGLE LINE DIAGRAM - NEW WORK
CWPE3-E-602

GFP A Gannett Fleming/Parsons JOINT VENTURE

DISTRICT OF COLUMBIA
UDAYAN KHAN
No. 8758
05/17/2018
LICENSED
PROFESSIONAL ENGINEER

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REPLACEMENT OF CHILLERS
AND COOLING TOWER ACCESSORIES AT EIGHT METRO-RAIL STATIONS
CWP E3 - COLUMBIA HEIGHTS (E04)
ELECTRICAL SINGLE LINE DIAGRAM - NEW WORK

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	AS NOTED	CWPE3-E-602	110 of 173

AMENDMENT No.4

PANEL: NANSS

MAIN BUS: 100A
208/120 VOLT
ENCLOSURE: NEMA 1

MAIN DEVICE: 50A
3 PHASE, 4 WIRE + GROUND
MOUNTING: SURFACE

NEUTRAL BUS: 100%
RMS AIC: 10,000A
LOCATION: NORTH MECHANICAL ROOM

	LOAD DESCRIPTION	LOAD VA	WIRE CKT	WIRE GND	RCWY SIZE	C/B TRIP	PL	CKT NMBR	PHASE KVA A	PHASE KVA B	PHASE KVA C	CKT NMBR	C/B PL	C/B TRIP	RCWY SIZE	WIRE GND	WIRE CKT	LOAD VA	LOAD DESCRIPTION	
	BATHROOM, ALCOVE RECEPT	300	12	12	3/4"	30	1	1	1300			2	1	20	3/4"	10	10	1000	REC. MECH. RM.	
	BATHROOM, ALCOVE FANS	–	12	12	3/4"	30	1	3		600		4	1	20	3/4"	12	12	600	AORA+CORR. RECEPT	
	EAST FUTURE REC.& FANS	200	12	12	3/4"	20	1	5			1200	6	1	20	3/4"	12	12	1000	CHILLER CONTROL PANEL	
	TPSS –U.L. REC.	–	12	12	3/4"	20	1	7	1000			8	1	20	3/4"	12	12	1000	CONTROL PANEL AC4	
	TPSS RM–U.L. REC.	700	12	12	3/4"	20	1	9		700		10	1	20	3/4"	12	12	1000	EF–7	
	CHILLER RM. REC.	700	12	12	3/4"	20	1	11			700	12	1	20	3/4"	12	12	1000	MURAL ILLUMINATION	
	VU1+2 CONTORL	700	12	12	3/4"	20	1	13	1200			14	1	–	–	–	–	–	SPACE	
	NEW 15KV	1000	12	12	3/4"	20	1	15		1000		16	1	–	–	–	–	–	SPACE	
	SERVICE LIGHT ACU3	700	12	12	3/4"	20	1	17			700	18	1	20	3/4"	12	12	–	FLOW MONITORING PANEL	NOTE 3
NOTE 3	CONDENSER WATER TREATMENT PACKAGE	–	12	12	3/4"	20	1	19	1200			20	1	20	3/4"	12	12	–	INSTANTANEOUS WATER HEATER	NOTE 3
NOTE 3	CHILLER PLANT MONITORING PANEL	–	12	12	3/4"	20	1	21		1000		22	1	20	–	–	–	–	SPARE	
	SPARE	–	–	–	–	20	1	23			700	24	1	20	–	–	–	–	SPARE	

NOTES:

CONNECTED LOAD: 9,812VA
DEMAND LOAD: 9,812VA

MOTOR CONTROL CENTER: CHILLER

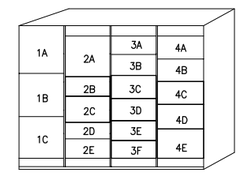
800 AMPS, 480/277V, 3ø, 4W, GND BUS

LOCATION: CHILLER PLANT
AVAILABLE SHORT CIRCUIT: 28,000 AMPS RMS SYM
ENCLOSURE TYPE: NEMA 12

SEC. NO.	ITEM NO.	CIRCUIT BREAKER POLES	CIRCUIT BREAKER FRAMES AMP.	CIRCUIT BREAKER TRIP AMP.	MCP CONTIN. RATING AMP.	CONNECTED LOAD KVA	HP OR KW	DESCRIPTION	CONTROL DIAGRAM DWG NO.
1	1A	–	–	–	–	–	–	SPACE	
	1B	3	1200	1200	–	–	–	MAIN BREAKER	
	1C	–	–	–	–	–	–	SPACE	
2	2A	3	800	500	–	–	–	CHILLER	
	2B	3	100	20	–	–	5HP	ROOF COOLING TOWER 1 FAN (5 HP)	
	2C	3	100	50	–	–	15HP	ROOF COOLING TOWER 1 FAN (15 HP)	
	2D	–	–	–	–	–	–	SPACE	
	2E	3	100	100	–	–	–	COOLING TOWER BASIN HEATER	
3	3A	3	100	100	–	–	–	SPARE	
	3B	3	100	100	–	–	–	SPARE	
	3C	3	200	125	–	–	40HP	CONDENSER WATER PUMP	
	3D	3	200	125	–	–	40HP	CONDENSER WATER PUMP	
	3E	3	100	20	–	–	5HP	ROOF COOLING TOWER 2 FAN (5 HP)	
	3F	3	100	50	–	–	15HP	ROOF COOLING TOWER 2 FAN (15 HP)	
4	4A	3	100	20	–	–	–	AIR COMPRESSOR	
	4B	–	–	–	–	–	–	SPACE	
	4C	3	100	80	–	–	25HP	CHILLER WATER PUMP	
	4D	3	100	80	–	–	25HP	CHILLER WATER PUMP	
	4E	–	–	–	–	–	–	SPACE	

ELEVATION

SECTION 1 | SECTION 2 | SECTION 3 | SECTION 4



MANUFACTURER: CULTER–HAMMER
FREEDOM SERIES 2100

SHEET NOTE:

1. PANEL NANS IS LOCATED IN ROOM C113 WHICH IS ADJACENT TO THE CHILLER PLANT(ROOM C119) 1
2. THE COOLING TOWER FAN MOTORS SHALL BE CONTROLLED BY HP–RATED VFD AND LINE & LOAD REACTORS.
3. PROVIDE NEW 20A CIRCUIT BREAKERS TO MATCH EXISTING AND WIRE TO NEW LOAD.
4. SEE PLAN NOTE 3 ON DWG CWPE3–E–602.

ELECTRICAL EQUIPMENT SCHEDULE

ITEM	QTY	DESCRIPTION	
1	2	MCC BUCKET TO MATCH EXISTING WITH 80AT/100AF BREAKER	
2	2	MCC BUCKET TO MATCH EXISTING WITH 125AT/200AF BREAKER	
3	1	MCC BUCKET TO MATCH EXISTING WITH 500AT/800AF BREAKER	
4	4	REACTOR/FILTER 480V, 3PH, 34A, 25HP, 60HZ, NEMA 4X ENCLOSURE	NOTE 2
5	4	REACTOR/FILTER 480V, 3PH, 52A, 40HP, 60HZ, NEMA 4X ENCLOSURE	
6	2	VFD,480V, 3PH, 25HP, 60HZ, NEMA 4X ENCLOSURE WITH BYPASS AND REACTOR/FILTERS	
7	2	VFD,480V, 3PH, 40HP, 60HZ, NEMA 4X ENCLOSURE WITH BYPASS AND REACTOR/FILTERS	NOTE 2
8	LOT	#1 AWG RHW–2 WIRE (VFD RATED)	
9	LOT	#1 AWG RHW–2 WIRE	
10	LOT	#2 AWG RHW–2 WIRE (GND)	
11	LOT	#4 AWG RHW–2 WIRE (VFD RATED)	
12	LOT	#4 AWG RHW–2 WIRE	
13	LOT	#6 AWG RHW–2 WIRE	
14	LOT	#6 AWG RHW–2 WIRE (GND)	
15	LOT	#8 AWG RHW–2 WIRE (VFD RATED)	
16	LOT	#8 AWG RHW–2 WIRE	
17	LOT	#8 AWG RHW–2 WIRE (GND)	
18	LOT	#10 AWG RHW–2 WIRE (GND)	
19	LOT	#12 AWG RHW–2 WIRE (VFD RATED)	
20	LOT	#12 AWG RHW–2 WIRE	
21	LOT	#12 AWG RHW–2 WIRE (GND)	
22	LOT	250 KCMIL RHW–2 WIRE	
23	LOT	3/4" GRS CONDUIT	
24	LOT	3/4" LTFC	
25	LOT	1" GRS CONDUIT	
26	LOT	1" LTFC	
27	LOT	1–1/4" GRS CONDUIT	
28	LOT	1–1/2" GRS CONDUIT	
29	LOT	1–1/2" LTFC	
30	LOT	2" GRS CONDUIT	
31	LOT	2" LTFC	
32	LOT	4" GRS CONDUIT	
33	2	MCC BUCKET TO MATCH EXISTING WITH 15 AT/100AF BREAKER	
34	2	MCC BUCKET TO MATCH EXISTING WITH 40 AT/100AF BREAKER	
35	4	REACTOR/FLITER, 480V , 3PH, 21A, 15HP, 60HZ, NEMA 4X ENCLOSURE.	
36	4	REACTOR/FLITER, 480V , 3PH, 21A, 5HP, 60HZ, NEMA 4X ENCLOSURE.	
37	2	VFD, 480V, 3PH, 15HP, 60HZ, NEMA 4X ENCLOSURE WITH BYPASS AND REACTOR/FLITER	
38	2	VFD, 480V, 3PH, 5HP, 60HZ, NEMA 4X ENCLOSURE WITH BYPASS AND REACTOR/FLITER	
39	1	3PHASE 4 WIRE, 50A, 277/480V DISTRIBUTION PANEL(NANS1)12 CKTS.	

PANEL: NANS1

MAIN BUS: 100A
480/277 VOLT
ENCLOSURE: NEMA 1

MAIN LUGS ONLY
3 PHASE, 4 WIRE + GROUND
MOUNTING: SURFACE

NEUTRAL BUS: 100%
RMS AIC: 10,000A
LOCATION: CHILLER PLANT

	LOAD DESCRIPTION	LOAD VA	WIRE CKT	WIRE GND	RCWY SIZE	C/B TRIP	PL	CKT NMBR	PHASE KVA A	PHASE KVA B	PHASE KVA C	CKT NMBR	C/B PL	C/B TRIP	RCWY SIZE	WIRE GND	WIRE CKT	LOAD VA	LOAD DESCRIPTION
NOTE 4	EXISTING LOAD	–	12	12	3/4"	20	3	1	–			2	3	20	3/4"	12	12	–	FCU
								3		–		4							
								5			–	6							
	SPARE	–	–	–	–	20	1	7	–			8	1	20	–	–	–	–	SPARE
	SPARE	–	–	–	–	20	1	9		–		10	1	20	–	–	–	–	SPARE
	SPARE	–	–	–	–	20	1	11			–	12	1	20	–	–	–	–	SPARE

NOTES:

CONNECTED LOAD: –VA

B ELECTRICAL PNL , EQUIP'T SCHEDULES AND MCC SCHEDULE
CWPE3–E–603

SCALE: NONE

GFP A Gannett Fleming/Parsons JOINT VENTURE

DISTRICT OF COLUMBIA — ODAYAN KHAN — No. 8758 — 05/17/2018 — LICENSED PROFESSIONAL ENGINEER

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
05/16/2018	1	REVISED PER BID RFIS

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

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

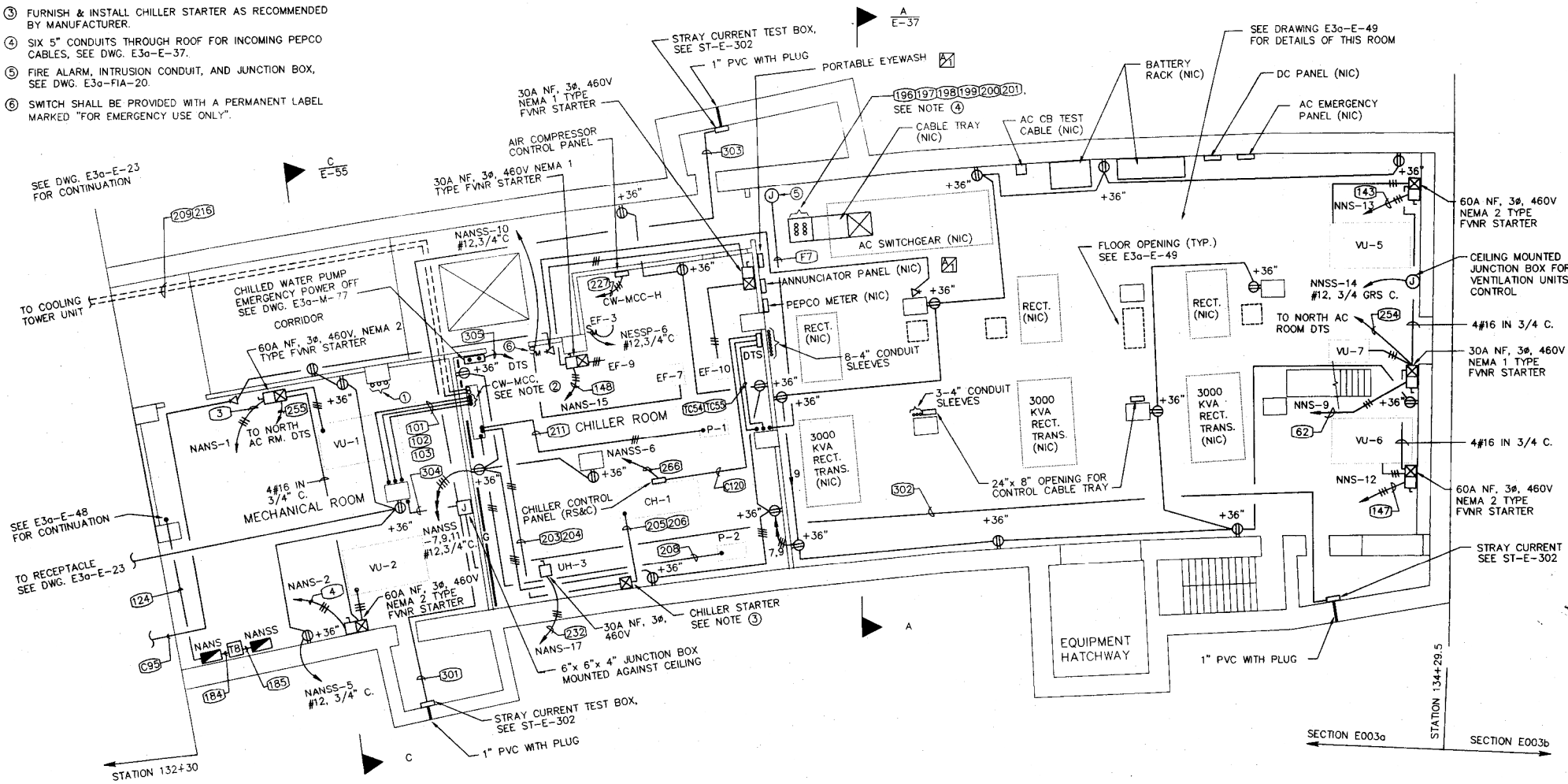
REPLACEMENT OF CHILLERS
AND COOLING TOWER ACCESSORIES AT EIGHT METRO-RAIL STATIONS
CWP E3 - COLUMBIA HEIGHTS (E04)
ELECTRICAL EQUIPMENT AND PANEL SCHEDULE

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	AS NOTED	CWPE3-E-603	111 of 173

AMENDMENT No.4

NOTES :

1. INCOMING PEPCO FEEDERS FOR NORTH AC SWITCHGEAR, SEE DETAIL 1 & 2 ON DWG. E3a-E-36.
2. SEE DWG. E3a-E-54 FOR CHILLER MOTOR CONTROL CENTER SINGLE LINE DIAGRAM.
3. FURNISH & INSTALL CHILLER STARTER AS RECOMMENDED BY MANUFACTURER.
4. SIX 5" CONDUITS THROUGH ROOF FOR INCOMING PEPCO CABLES, SEE DWG. E3a-E-37.
5. FIRE ALARM, INTRUSION CONDUIT, AND JUNCTION BOX, SEE DWG. E3a-FIA-20.
6. SWITCH SHALL BE PROVIDED WITH A PERMANENT LABEL MARKED "FOR EMERGENCY USE ONLY".



NORTH SERVICE ROOMS – MEZZANINE LEVEL – POWER

PLATFORM 132+30 to 134+30

DESIGNED	T.X.P.	3-4-94 DATE
DRAWN	H.T.H.	3-4-94 DATE
CHECKED	H.K.O.	3-12-94 DATE
APPROVED	H.K.O.	3-15-94 DATE

REFERENCE DRAWINGS

NUMBER	DESCRIPTION
ST-TC-7	DTS CABINET
E3a-E-36	PEPCO CONDUITS ENTRANCE
E3a-E-37	PEPCO CONDUIT ENTRANCE
E3a-M-12	NORTH MEZZANINE PLAN-HVAC
E3a-FIA-20	NORTH SERVICE ROOMS
ST-E-302	STRAY CURRENT TEST BOX

REVISIONS

DATE	BY	DESCRIPTION
5-2-94	TXP	ADDED NOTE FOR JUNCTION BOX
		RELOCATED TELEPHONE & ADDED EYEWASH

DISTRICT OF COLUMBIA HARRY K. OH No. 6898 REGISTERED PROFESSIONAL ENGINEER

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

COODDRY CARPENTER DIETZ AND ZACK SECTION DESIGNER ☐

OH & CHEN ASSOCIATES, P.A. MECHANICAL/ELECTRICAL ENGINEERS ☒

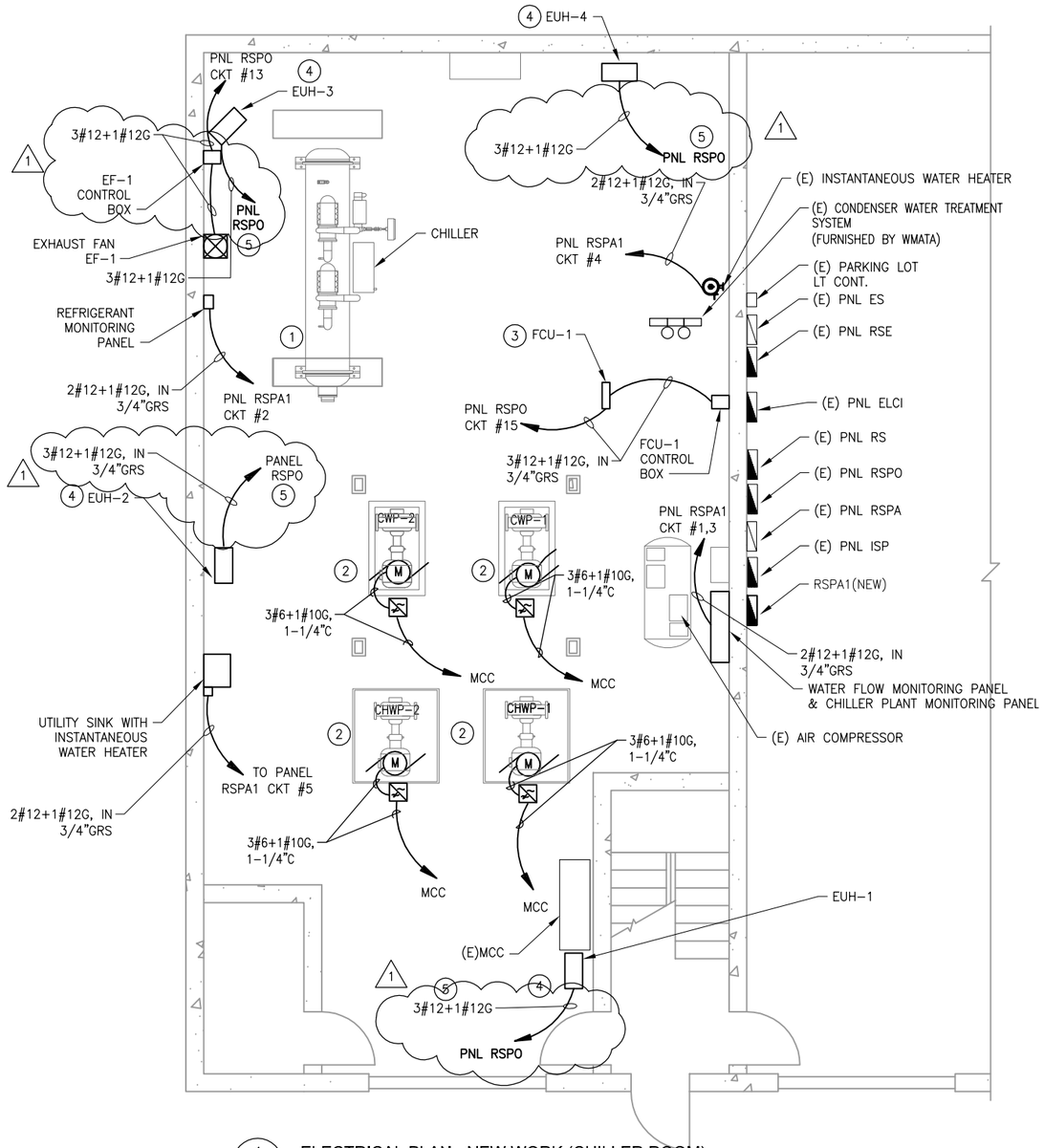
SUBMITTED BY

GREENBELT ROUTE
COLUMBIA HEIGHTS STATION
NORTH SERVICE ROOMS – MEZZANINE

SCALE 1/8"=1'-0" 10 2 4 6 8 10

DRAWING NO. E3a-E-28 M

AMENDMENT No.4



1 ELECTRICAL PLAN - NEW WORK (CHILLER ROOM)
CWPG2-E-102 SCALE: 1/4"=1'-0"

KEYNOTES:

1. CHILLER VFD/DISCONNECT SUPPLIED WITH CHILLER, INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR.
2. PROVIDE AND INSTALL VFD/DISCONNECT FOR CHILLED WATER AND CONDENSER WATER PUMPS. PROVIDE AND INSTALL WIRING FROM MOTOR TO VFD AND FROM VFD TO MCC.
3. PROVIDE AND INSTALL DISCONNECT SWITCH FOR FCU-1. PROVIDE AND INSTALL WIRING FROM FCU TO DISCONNECT AND DISCONNECT TO MCC-1.
4. USE EXISTING CKTS AND CONDUITS. PROVIDE NEW WIRING.
5. FROM RSPO PANEL SCHEDULE CKTS #2,6,7 AN 8 ARE IDENTIFIED AS "UNIT HEATER". CONTRACTOR TO DETERMINE WICH CKT IS FEEDING EACH UNIT HEATER.

SHEET NOTES:

1. PROVIDE FILTERS FOR VFD'S AS REQUIRED.
2. ALL WIRING FOR VFD'S SHALL BE VFD RATED CABLES.

A Gannett Fleming/Parsons JOINT VENTURE

STATE OF MARYLAND JIDAYAN KHAN 05/17/2018 24687 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
05/16/2018	1	REVISED PER BID RFI'S

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

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

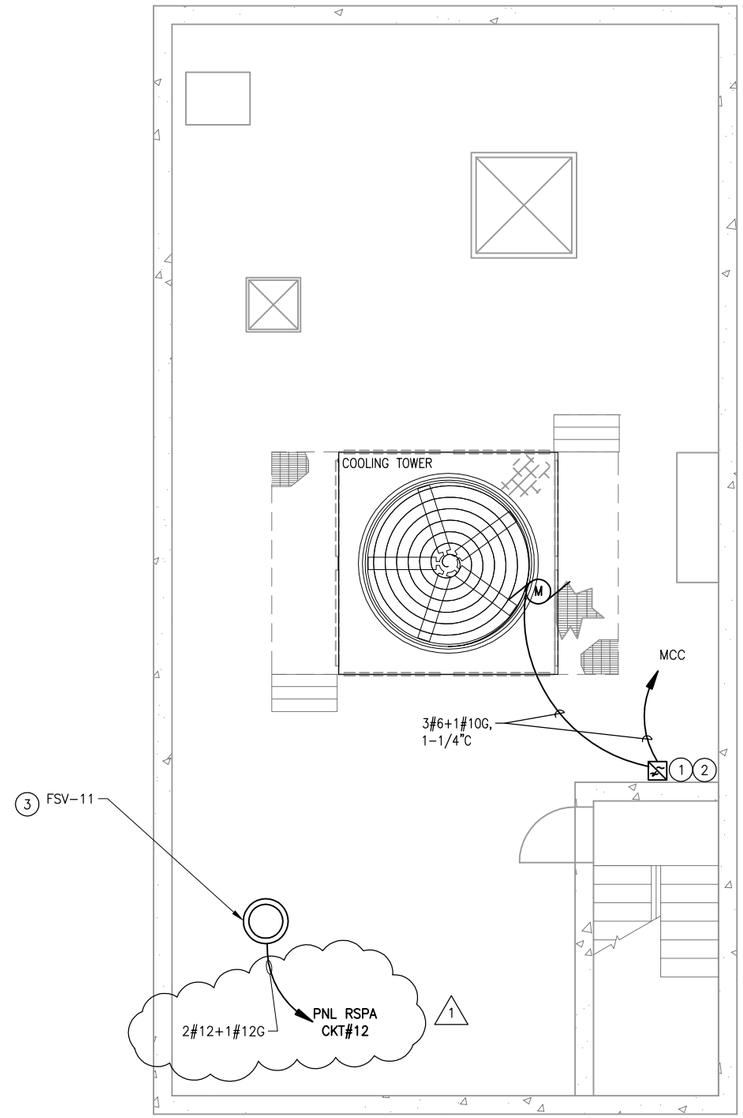
APPROVED 03/2018
MARK MAGNUSSEN DATE
MANAGER, ENV. PLANNING AND COMP

APPROVED 03/2018
GRAHAM SPILLER DATE
GFP DEPUTY PROGRAM MANAGER

REPLACEMENT OF CHILLERS
AND COOLING TOWER ACCESSORIES AT EIGHT METRO-RAIL STATIONS
CWPG2 - CAPITOL HEIGHTS (G02)
ELECTRICAL PLAN - NEW WORK

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	1/4"=1'-0"	CWPG2-E-102	126 of 173

AMENDMENT No.4



1 ELECTRICAL PLAN - NEW WORK (COOING TOWER)
CWPG2-E-103

SCALE: 1/4"=1'-0"

KEYNOTES:

1. UTILIZE EXISTING CONDUITS.
2. PROVIDE AND INSTALL VFD/DISCONNECT FOR COOLING TOWER MOTOR. PROVIDE AND INSTALL WIRING FROM MOTOR TO VFD AND FROM VFD TO MCC.
3. REUSE EXISTING CKT AND CONDUIT. PROVIDE NEW WIRING.

SHEET NOTES:

1. PROVIDE FILTERS FOR VFD'S AS REQUIRED.
2. ALL WIRING FOR VFD'S SHALL BE VFD RATED CABLES.
3. THE COOLING TOWER IS ON THE ROOF OF THE CHILLER PLANT DIRECTLY ABOVE THE CHILLER. THE CHILLER ROOF FLOOR IS 25' ABOVE THE CHILLER ROOM FLOOR.

A Gannett Fleming/Parsons JOINT VENTURE

STATE OF MARYLAND IDRAN KHAN 05/17/2018 No. 24687 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
05/16/2018	1	REVISED PER BID RFIS

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

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

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

APPROVED 03/2018
GRAHAM SPILLER DATE
GFP DEPUTY PROGRAM MANAGER

REPLACEMENT OF CHILLERS
AND COOLING TOWER ACCESSORIES AT EIGHT METRO-RAIL STATIONS
CWPG2 - CAPITOL HEIGHTS (G02)
ELECTRICAL PLAN - NEW WORK

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	1/4"=1'-0"	CWPG2-E-103	127 of 173

AMENDMENT No.4

PANEL: RSPA

MAIN BUS: 100A
208/120 VOLT
ENCLOSURE: NEMA 1

MAIN DEVICE: 50A
3 PHASE, 4 WIRE + GROUND
MOUNTING: SURFACE

NEUTRAL BUS: 100%
RMS AIC: 10,000A
LOCATION: ADJACENT TPSS ROOM

LOAD DESCRIPTION	LOAD VA	WIRE CKT	WIRE GND	RCWY SIZE	C/B TRIP	C/B PL	CKT NMBR	PHASE KVA A	PHASE KVA B	PHASE KVA C	CKT NMBR	C/B PL	C/B TRIP	RCWY SIZE	WIRE GND	WIRE CKT	LOAD VA	LOAD DESCRIPTION
S. WALL FIRST FL CONVEN OUT	300	12	12	3/4"	30	1	1	1300			2	1	20	3/4"	10	10	1000	CHILLER PLT CONVEN. OUT
RECT RM COLUMN CONVEN.OUT	–	12	12	3/4"	30	1	3		600		4	1	20	3/4"	12	12	600	CHILLER PLT CONVEN. OUT
RECT RM COLUMN CONVEN.OUT	200	12	12	3/4"	20	1	5			1200	6	1	20	3/4"	12	12	1000	CHILLER PLT CONVEN. OUT
E.WALL AC S/B RM.CPNVEN.OUT	–	12	12	3/4"	20	1	7	1000			8	1	20	3/4"	12	12	1000	W.WALL.AC S/B RM.CONVEN.OUT
TRANSF. ROOF CONVEN. OUT.	700	12	12	3/4"	20	1	9		700		10	1	20	3/4"	12	12	–	W.WALL.AC S/B RM.CONVEN.OUT
GFI TEST	700	12	12	3/4"	20	1	*			700	12	1	20	–	–	–	–	CHEMICAL PLT ROOF EXH FAN
CHILLER ROOF CONVEN. OUT.	700	–	–	–	20	1	11	1200			14	1	20	–	–	–	500	AC S/B ROOF EXH FAN
GFI TEST	1000	–	–	–	20	–	*		1000		16	1	20	–	–	–	–	CHEMICAL FEED PUMP
CHILLER COMP. OIL PUMP	–	–	–	–	–	–	13			–	17	1	–	–	–	–	–	ROLL UP ROOM CHILLER ROOM
ATC. CONTROL PNL SUPPLY	–	–	–	–	–	–	15				18	1	–	–	–	–	–	ROLL UP ROOM DC.RECT. ROOM
ATC S/G CUBICLE HEATERS	–	–	–	–	–	–	19				20	1	–	–	–	–	–	CONTROL PANEL
SPARE	–	–	–	–	–	–	21				22	1	–	–	–	–	–	EXISTING LOAD
CONTROL	–	–	–	–	–	–	23				24	1	–	–	–	–	–	EXISTING LOAD
EXISTING LOAD	–	12	12	3/4"	20		25				26	1	–	–	–	–	–	EXISTING LOAD
EXISTING LOAD	–	12	12	3/4"	20		27				28	1	–	–	–	–	–	EXISTING LOAD
EXISTING LOAD	–	12	12	3/4"	20		29				30	1	–	–	–	–	–	EXISTING LOAD
EXISTING LOAD	–	12	12	3/4"	20		31				32	1	–	–	–	–	–	XFMR #4 CNTR HTR(AC-14)
EXISTING LOAD	–	12	12	3/4"	20		33				34	1	–	–	–	–	–	XFMR #1 CNTR HTR(AC-15)
EXISTING LOAD	–	12	12	3/4"	20		35				36	1	–	–	–	–	–	XFMR #2 CNTR HTR(AC-16)
EXISTING LOAD	–	–	–	–	–	–	37				38							
INVERTER HEATER	–	–	–	–	–	–	39				40	3	50	1-1/4"	10	6	–	RSPA1 NOTES 2&3
AC SWGR HEATER (AC-9)	–	–	–	–	20		41				42							

NOTE 1

NOTES:

CONNECTED LOAD: 9,812VA
DEMAND LOAD: 9,812VA

PANEL: RSPO

MAIN BUS: 100A
480/277 VOLT
ENCLOSURE: NEMA 1

MAIN DEVICE: 50A
3 PHASE, 4 WIRE + GROUND
MOUNTING: SURFACE

NEUTRAL BUS: 100%
RMS AIC: 10,000A
LOCATION: ADJACENT TPSS ROOM

	LOAD DESCRIPTION	LOAD VA	WIRE CKT	WIRE GND	RCWY SIZE	C/B TRIP	C/B PL	CKT NMBR	PHASE KVA A	PHASE KVA B	PHASE KVA C	CKT NMBR	C/B PL	C/B TRIP	RCWY SIZE	WIRE GND	WIRE CKT	LOAD VA	LOAD DESCRIPTION
	SPARE	–	–	–	–	20	3	1	–	–	–	2	3	20	3/4"	12	12	600	UNIT HEATER
	AIR COMPRESSOR	700	12	12	3/4"	20	3	3	–	–	–	4	3	20	3/4"	12	12	–	PANEL RSPA
	SPARE	–	–	–	–	20	3	5	–	–	–	6	3	20	3/4"	12	12	–	UNIT HEATER
	UNIT HEATER	–	12	12	3/4"	20	3	7	–	–	–	8	3	20	3/4"	12	12	–	UNIT HEATER
	UNIT HEATER	–	12	12	3/4"	20	3	9	–	–	–	10	3	20	3/4"	12	12	–	UNIT HEATER
	UNIT HEATER	–	12	12	3/4"	20	3	11	–	–	–	12	3	20	3/4"	12	12	–	ISO XFER IT-2
												14	1	20	–	–	–	–	SPARE
NOTE 4	EXHAUST FAN (EF-1)	–	12	12	3/4"	20	3	13	–	–	–	16	3	20	–	–	–	–	SPARE
NOTE 4	UNIT (FCU) FOR COOLING	–	12	12	3/4"	20	3	15	–	–		20	1	–	–	–	–	–	SPACE
											–	22	1	–	–	–	–	–	SPACE

NOTES:

CONNECTED LOAD: – VA
DEMAND LOAD: – VA

MOTOR CONTROL CENTER: CHILLER

600 AMPS, 480/277V, 3ø, 4W, GND BUS

LOCATION: CHILLER PLANT
AVAILABLE SHORT CIRCUIT: 28,000 AMPS RMS SYM
ENCLOSURE TYPE: NEMA 12

SEC. NO.	ITEM NO.	CIRCUIT BREAKER POLES	CIRCUIT BREAKER FRAMES AMP.	CIRCUIT BREAKER TRIP AMP.	MCP CONTIN. RATING AMP.	CONNECTED LOAD KVA	HP OR KW	DESCRIPTION	CONTROL DIAGRAM DWG NO.
1	1A	3	1200	1200	–	–	–	MAIN LUGS	
	1B	3	100	60	–	–	20HP	CHILLER WATER PUMP	
	1C	3	100	60	–	–	20HP	CHILLER WATER PUMP	
	1D	–	–	–	–	–	–	SPACE	
	1E	3	100	60	–	–	20HP	COOLING TOWER FAN FEEDER	
2	2A	3	100	60	–	–	20HP	CONDENSER WATER PUMP	
	2B	3	100	60	–	–	20HP	CONDENSER WATER PUMP	
	2C	3	100	20	–	–	–	EXISTING LOAD	
	2D	–	–	–	–	–	–	SPACE	
	2E	–	–	–	–	–	–	SPACE	
	2F	–	–	–	–	–	–	SPACE	

ELEVATION

MANUFACTURER: CULTER-HAMMER
FREEDOM SERIES 2100

NOTE 3

PANEL: RSPA1

MAIN BUS: 100A
208/120 VOLT
ENCLOSURE: NEMA 1

MAIN DEVICE 50A
3 PHASE, 4 WIRE + GROUND
MOUNTING: SURFACE

NEUTRAL BUS: 100%
RMS AIC: 10,000A
LOCATION: ADJACENT TPSS ROOM

LOAD DESCRIPTION	LOAD VA	WIRE CKT	WIRE GND	RCWY SIZE	C/B TRIP	C/B PL	CKT NMBR	PHASE KVA A	PHASE KVA B	PHASE KVA C	CKT NMBR	C/B PL	C/B TRIP	RCWY SIZE	WIRE GND	WIRE CKT	LOAD VA	LOAD DESCRIPTION
CHILLER PLANT MONITORING PANEL	–	12	12	3/4"	20	1	1	–			2	1	20	3/4"	12	12	–	REFRIGERANT LEAK DETECTION SYSTEM
FLOW MONITORING PANEL	–	12	12	3/4"	20	1	3		–		4	1	20	3/4"	12	12	–	INSTANTANEOUS WATER HEATER
UTILITY SINK WITH WATER HTR	–	12	12	3/4"	20	1	5			–	6	1	20	–	–	–	–	SPARE
SPARE	–	–	–	–	20	1	7	–			8	1	20	–	–	–	–	SPARE
SPARE	–	–	–	–	20	1	9		–		10	1	20	–	–	–	–	SPARE
SPARE	–	–	–	–	20	1	11			–	12	1	20	–	–	–	–	SPARE

NOTES:

CONNECTED LOAD: –VA

ELECTRICAL EQUIPMENT SCHEDULE

ITEM	QTY	DESCRIPTION
1	5	MCC BUCKET TO MATCH EXISTING WITH 60AT/100AF BREAKER
2	10	REACTOR/FILTER 480V, 3PH, 27A, 20HP, 60HZ, NEMA 4X ENCLOSURE
3	5	VFD,480V, 3PH, 20HP, 60HZ, NEMA 4X ENCLOSURE WITH BYPASS AND REACTOR/FILTERS
4	LOT	#2 AWG RHW-2 WIRE (GND)
5	LOT	#6 AWG RHW-2 WIRE (VFD RATED)
6	LOT	#6 AWG RHW-2 WIRE
7	LOT	#10 AWG RHW-2 WIRE (GND)
8	LOT	#12 AWG RHW-2 WIRE
9	LOT	#12 AWG RHW-2 WIRE (GND)
10	LOT	250 KCMIL RHW-2 WIRE
11	LOT	3/4" GRS CONDUIT
12	LOT	1" GRS CONDUIT
13	LOT	1-1/4" GRS CONDUIT
14	LOT	1-1/4" LTFC
15	LOT	4" GRS CONDUIT
16	1	3P, 50A MCB (RSPA1 FEEDER)
17	1	3P, 4 WIRE, 100A, 208/120V DISTRIBUTION PANEL(RSPA1) 12CKTS, 50A MAIN DEVICE.
18	1	SWBD POWER CIRCUIT BREAKER TO MATCH EXISTING 500AT/800AF

SHEET NOTES:

1. RELOCATE CKT 38 AND ITS LOAD TO BUSSED SPACE 41.
2. INSTALL 3 POLE, 50A CKT BREAKER IN BUSED SPACES 38, 40 &42.
3. INSTALL NEW DISTRIBUTION PANEL RSPA1, 208/120V, 12 CKTS.
4. IN PANEL RSPO INSTALL 2-3 POLE, 20A CIRCUIT BREAKERS IN POSITION #13, # 15 AND WIRE THEM TO EF-1 CONTROL BOX AND FCU-1 CONTROL BOX.

GFP A Gannett Fleming/Parsons JOINT VENTURE

STATE OF MARYLAND — SHIVAN KHAN — 05/17/2018 — 24687 — 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
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05/16/2018	1	REVISED PER BID RFIS

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

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
CWPG2 - CAPITOL HEIGHTS (G02)
ELECTRICAL EQUIPMENT AND PANEL SCHEDULE

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	AS NOTED	CWPG2-E-603	130 of 173

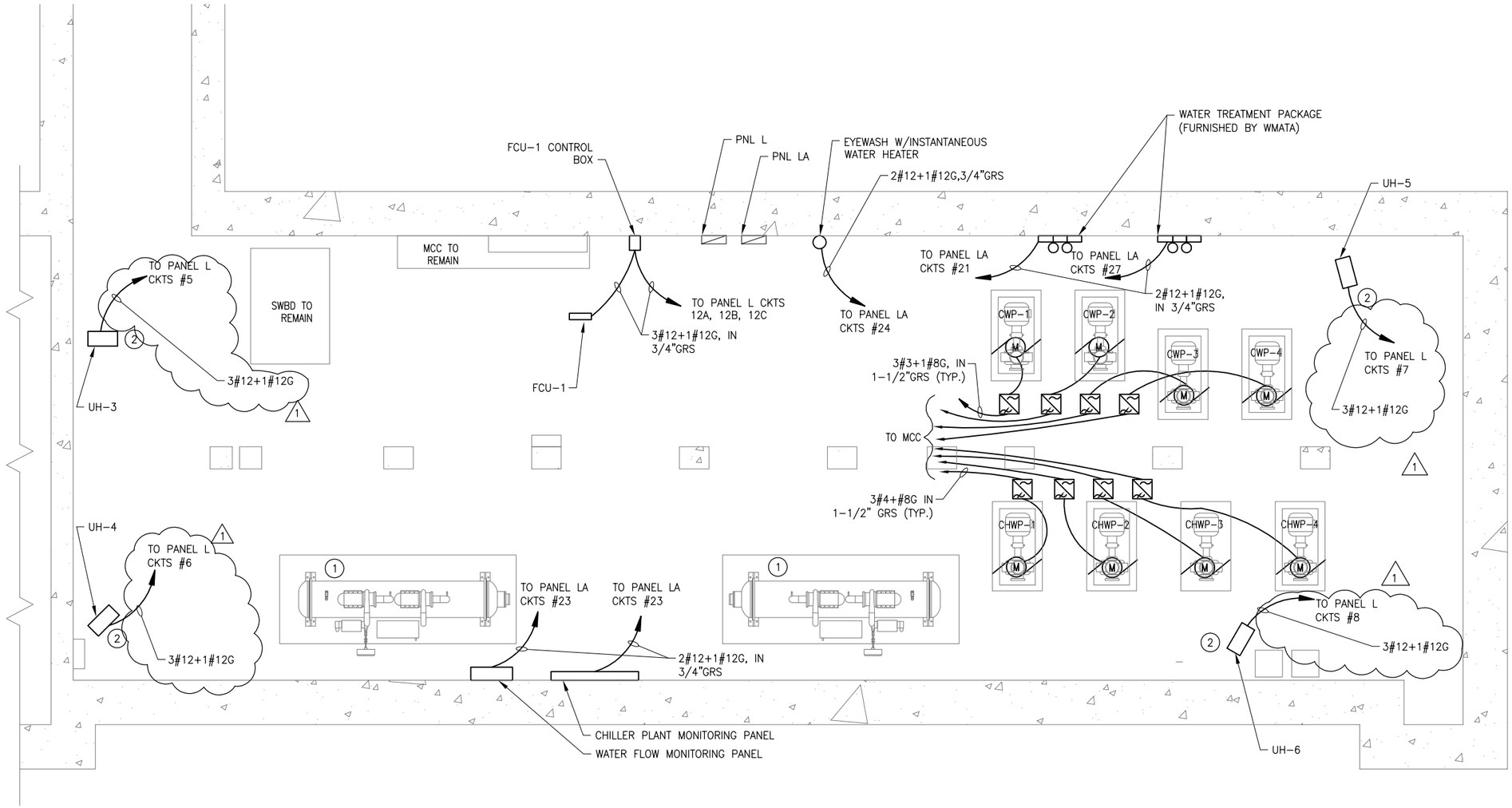
AMENDMENT No.4

KEYNOTES:

1. CHILLER VFD/DISCONNECT SUPPLIED WITH CHILLER, INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR.
2. REUSE EXISTING CKTS AND CONDUITS. PROVIDE NEW WRING.

SHEET NOTES:

1. PROVIDE FILTERS FOR VFD'S AS REQUIRED.
2. ALL WIRING FOR VFD'S SHALL BE VFD RATED CABLES.



1 ELECTRICAL PLAN - NEW WORK (CHILLER ROOM)
CWPK1-E-102

SCALE: 1/4"=1'-0"

GFP A Gannett Fleming/Parsons JOINT VENTURE

COMMONWEALTH OF VIRGINIA
UDAYAN KHAN
Lic. No. 024056
05/17/2018
PROFESSIONAL ENGINEER

DESIGNED	B. IDILBI	09/30/17 DATE
DRAWN	J. ZHU	09/30/17 DATE
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WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

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

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

APPROVED 03/2018
GRAHAM SPILLER DATE
GFP DEPUTY PROGRAM MANAGER

REPLACEMENT OF CHILLERS
AND COOLING TOWER ACCESSORIES AT EIGHT METRO-RAIL STATIONS
CWPK1 - CLARENDON (K02)
ELECTRICAL PLAN - NEW WORK

M NO.	CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
M1304	FQ-18102	1/4"=1'-0"	CWPK1-E-102	145 of 173

AMENDMENT No.4

PANEL: LA

MAIN BUS: 100A
208/120 VOLT
ENCLOSURE: NEMA 1

MAIN DEVICE: 50A
3 PHASE, 4 WIRE + GROUND
MOUNTING: SURFACE

NEUTRAL BUS: 100%
RMS AIC: 10,000A
LOCATION: CHILLER ROOM

	LOAD DESCRIPTION	LOAD VA	WIRE CKT	WIRE GND	RCWY SIZE	C/B TRIP	PL	CKT NMBR	PHASE KVA A	PHASE KVA B	PHASE KVA C	CKT NMBR	C/B PL	C/B TRIP	RCWY SIZE	WIRE GND	WIRE CKT	LOAD VA	LOAD DESCRIPTION	
	RECEPTS– VENT SHAFT	300	12	12	3/4"	30	1	1	1300			2	1	20	3/4"	10	10	1000	RECEPTACLES	
	UNIT HEATER CONTROL POWER	–	12	12	3/4"	30	1	3		600		4	1	20	3/4"	12	12	600	RECEPTACLES	
	RECEPTACLES	200	12	12	3/4"	20	1	5			1200	6	1	20	3/4"	12	12	1000	TCC #1 &C.M. #1	
	SPARE	–	–	–	–	20	1	7	1000			8	1	20	3/4"	12	12	1000	TCC #2 &C.M. #2	
	RECEPTACLES	700	12	12	3/4"	20	1	9		700		10	1	20	3/4"	12	12	–	HONEYWELL CONTROLS	
	LIGHTS– FAN SHAFT	700	12	12	3/4"	20	1	11			700	12	1	20	–	–	–	–	SPARE	
	LIGHTS– FAN SHAFT	700	12	12	3/4"	20	1	13	1200			14	1	20	3/4"	12	12	500	APPAR.CONTROL PANEL	
	HEAT TRACE TAPE	1000	12	12	3/4"	20	1	15		1000		16	1	20	3/4"	12	12	–	AEM & RTU	
	HONEYWELL	–	12	12	3/4"	20	1	17			–	18	1	20	3/4"	12	12	–	SWITCHGEAR HEATER	
	NEUTRAL SITE GPS	–	12	12	3/4"	20	1	19	–			20	1	20	–	–	–	–	SPARE	
NOTE 1	CONDENSER WATER TREATMENT PACKAGE	–	12	12	3/4"	20	1	21		–		22	1	20	3/4"	12	12	–	CHILLER PLANT MONITORING PANEL	NOTE 1
NOTE 1	FLOW MONITORING PANEL	–	12	12	3/4"	20	1	23			–	24	1	20	3/4"	12	12	–	INSTANTANEOUS WATER HEATER	NOTE 1
NOTE 1	UNIT(FCU) FOR COOLING	–	12	12	3/4"	20	1	25	–			26								
NOTE 1	CONDENSER WATER TREATMENT PACKAGE	–	12	12	3/4"	20	1	27		–		28	3	50	1¼"	10	6	–	MAIN	
	SPARE	–	–	–	–	20	1	29			–	30								

NOTES:

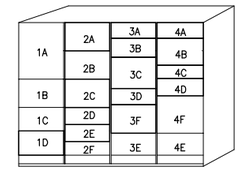
CONNECTED LOAD: 9,812VA
DEMAND LOAD: 9,812VA

MOTOR CONTROL CENTER: CHILLER
800 AMPS, 480/277V, 3ø, 4W, GND BUS

LOCATION: CHILLER PLANT
AVAILABLE SHORT CIRCUIT: 28,000 AMPS RMS SYM
ENCLOSURE TYPE: NEMA 12

SEC. NO.	ITEM NO.	CIRCUIT BREAKER POLES	CIRCUIT BREAKER FRAMES AMP.	CIRCUIT BREAKER TRIP AMP.	MCP CONTIN. RATING AMP.	CONNECTED LOAD KVA	HP OR KW	DESCRIPTION	CONTROL DIAGRAM DWG NO.
1	1A	3	–	–	–	–	–	MAIN LUGS	
	1B	–	–	–	–	–	–	SPACE	
	1C	–	–	–	–	–	–	SPACE	
	1D	3	100	80	–	–	25HP	CHILLER WATER PUMP FEEDER	
2	2A	3	100	100	–	–	–	480 V WELDER	
	2B	–	–	–	–	–	–	SPACE	
	2C	3	100	80	–	–	25HP	CHILLER WATER PUMP FEEDER	
	2D	3	100	80	–	–	25HP	CHILLER WATER PUMP FEEDER	
	2E	3	100	80	–	–	25HP	CHILLER WATER PUMP FEEDER	
	2F	–	–	–	–	–	–	SPACE	
3	3A	3	100	50	–	–	–	TOWER FAN CHILLER #1	
	3B	3	100	60	–	–	20HP	COOLING TOWER 1B FAN	
	3C	3	100	60	–	–	20HP	COOLING TOWER 1A FAN	
	3D	3	100	7	–	100	2HP	FAN #21	
	3F	3	100	7	–	100	2HP	FAN #22	
	3E	–	–	–	–	–	–	SPACE	
4	4A	3	100	100	–	–	30HP	CONDENSER WATER PUMP	
	4B	3	100	100	–	–	30HP	CONDENSER WATER PUMP	
	4C	3	100	100	–	–	30HP	CONDENSER WATER PUMP	
	4D	3	100	100	–	–	30HP	CONDENSER WATER PUMP	
	4E	–	–	–	–	–	–	SPACE	
	4F	–	–	–	–	–	–	SPACE	

ELEVATION



MANUFACTURER: CULTER–HAMMER
FREEDOM SERIES 2100

SHEET NOTE:

1. PROVIDE 20A SINGLE POLE, CIRCUIT BREAKER TO MATCH EXISTING AND WIRE NEW LOAD.
2. PROVIDE NEW, 20A, 3POLE, CIRCUIT BREAKER AND INSTALL IT IN PANEL L CKTS 12A,12B,12C. WIRE FCU CONTROL BOX TO IT.

ELECTRICAL EQUIPMENT SCHEDULE

ITEM	QTY	DESCRIPTION
1	2	MCC BUCKET TO MATCH EXISTING WITH 60AT/100AF BREAKER
2	4	MCC BUCKET TO MATCH EXISTING WITH 80AT/100AF BREAKER
3	4	MCC BUCKET TO MATCH EXISTING WITH 100AT/100AF BREAKER
5	4	REACTOR/FILTER 480V, 3PH, 27A, 20HP, 60HZ, NEMA 4X ENCLOSURE
6	8	REACTOR/FILTER 480V, 3PH, 34A, 25HP, 60HZ, NEMA 4X ENCLOSURE
7	8	REACTOR/FILTER 480V, 3PH, 40A, 30HP, 60HZ, NEMA 4X ENCLOSURE
8	2	VFD,480V, 3PH, 20HP, 60HZ, NEMA 4X ENCLOSURE WITH BYPASS AND REACTOR/FILTERS
9	4	VFD,480V, 3PH, 25HP, 60HZ, NEMA 4X ENCLOSURE WITH BYPASS AND REACTOR/FILTERS
10	4	VFD,480V, 3PH, 30HP, 60HZ, NEMA 4X ENCLOSURE WITH BYPASS AND REACTOR/FILTERS
11	LOT	#1 AWG RHW–2 WIRE (VFD RATED)
12	LOT	#1 AWG RHW–2 WIRE
13	LOT	#2 AWG RHW–2 WIRE (GND)
14	LOT	#3 AWG RHW–2 WIRE (VFD RATED)
15	LOT	#3 AWG RHW–2 WIRE
16	LOT	#4 AWG RHW–2 WIRE (VFD RATED)
17	LOT	#4 AWG RHW–2 WIRE
18	LOT	#8 AWG RHW–2 WIRE (GND)
19	LOT	#10 AWG RHW–2 WIRE (GND)
20	LOT	#12 AWG RHW–2 WIRE
21	LOT	#4/0 RHW–2 WIRE
22	LOT	3/4" GRS CONDUIT
23	LOT	1" GRS CONDUIT
24	LOT	1–1/2" GRS CONDUIT
25	LOT	1–1/2" LTFC
26	LOT	2–1/2" GRS CONDUIT
27	LOT	4" GRS CONDUIT
28	2	SWBD POWER CIRCUIT BREAKER TO MATCH EXISTING 450AT/800AF

1

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M1304	FQ-18102	AS NOTED	CWPK1-E-603	149 of 173

AMENDMENT No.4