ROCKFORD BOARD OF EDUCATION
INVITATION FOR BID ON SUPPLIES, MATERIALS, EQUIPMENT OR SERVICES FOR SCHOOL DISTRICT NO. 205 ROCKFORD, ILLINOIS

IFB No. **24-05 HVAC Upgrades at Kennedy MS & Jefferson HS**

DATE: **September 7, 2023**

RE: **ADDENDUM NO. 2**

To All Bidders:

Included are modifications, clarifications and/or corrections for the Project Manual and are hereby made a part of the contract documents. Please attach this addendum to the Project Manual(s) in your possession. Please note the receipt of this addendum on the bid form. Bidders shall review changes to all portions of this work as changes to one portion may affect the work of another.

If you plan to hand deliver your IFB submission on the due date, please note you must check in on the 1st floor prior to coming to the bid opening. Please allow time for this as late submission will not be accepted.

Refer all questions relative to the business aspect, Instructions to Bidders, Special Conditions, and questions concerning the technical aspect of the documents to the Director of Purchasing by email at purchasingdeptstaff@rps205.com.

ROCKFORD BOARD OF EDUCATION

By: Dane Youngblood
Director of Purchasing

ADDENDUM #2

DATE: Sept 7, 2023

PROJECT: IFB #24-04
RPS 205 ESSER HVAC Improvements:
2405 - Kennedy MS HVAC Revisions
2403 - Jefferson High School Chiller Replacement
IMEG #21002885.13, and 21002885.15

BID DUE DATE: Sept 12, 2023

DESIGNERS: IMEG Corp.
623 26th Avenue
Rock Island, IL 61201
Phone: 309-788-0673
Fax: 309-786-5967

TO: All Contract Document Holders of Record.

This Addendum forms a part of the bidding and construction documents. This Addendum supersedes and supplements all portions of the original bidding and construction documents dated August 15, 2023, with which it conflicts. Please attach this Addendum to the Project Manual(s) in your possession.

ACKNOWLEDGE RECEIPT OF THIS ADDENDUM IN THE SPACE PROVIDED ON THE BID FORM. FAILURE TO DO SO MAY SUBJECT BIDDER TO DISQUALIFICATION.

A. PROCUREMENT AND CONTRACTING REQUIREMENTS

No changes this Addendum.

B. DRAWINGS

Kennedy MS HVAC Revisions

1. Drawing M307 – HVAC ENLARGED PLANS
   a. **ADD** note to provide guard rail on two RTUs.

Jefferson HS HVAC Revisions

2. Drawing M300 – MECHANICAL ENLARGED PLANS
   a. **REVISE** horn and strobe note.
3. Drawing M301 – MECHANICAL ENLARGED PLANS
   a. **REVISE** cooling tower existing support note.
   b. **ADD** 6” decoupler as shown.
4. Drawing M500 – MECHANICAL DIAGRAMS
   a. **ADD** balance valves as shown.
   b. **ADD** decoupler.
   c. **ADD** btuh meter and associated sensors.
   d. **REMOVE** flow meters on chiller piping.
   e. **REVISE** pipe routing as shown.

5. Drawing M600 – MECHANICAL SCHEDULES
    a. **ADD** note to cooling tower.
    b. **REVISE** area served on pump schedule for clarity.
6. Drawing M700 – MECHANICAL CONTROLS
    a. **ADD** decoupler.
    b. **ADD** btuh meter and associated sensors points.
    c. **REMOVE** flow meters on chiller piping.
    d. **REVISE** routing as shown.
    e. **REVISE** sequence of operation for chiller, pump, and cooling tower.
    f. **ADD** differential pressure sensor in secondary piping.
    g. **ADD** cooling tower water level alarms.
    h. **ADD** VFD control.

END OF ADDENDUM #2

CMP/lah
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Enclosures: M307, M300, M301, M500, M600, M700

KEYNOTES: (#)

1. M.C. SHALL PROVIDE CURB ADAPTER FOR EXISTING CURB AND NEW RTU. COORDINATE RTU CONNECTIONS WITH EXISTING ROOF PENETRATIONS AND CURB ADAPTER. PROVIDE NEW TRAP AS REQUIRED BY MFR AND EXTEND TO EXISTING DRAIN.
2. M.C. SHALL REPLACE MINIMAL PORTION OF EXISTING DUCTWORK AS REQUIRED FOR NEW SENSORS INSTALLATION ONLY. COORDINATE SPACE REQUIREMENTS WITH TCC. REFER TO M701 FOR RTU CONTROL REQUIREMENTS.

(1)
(2)
RTU-6

(1)
(2)
RTU-5

PROVIDE 4' HIGH GUARD RAIL ON EDGE OF ROOF EXTENDING 2' BEYOND UNIT ON BOTH SIDES. SECURE GUARD RAIL AS RECOMMENDED BY MANUFACTURER. (1)

(1)
(2)
RTU-7

PROVIDE 4' HIGH GUARD RAIL ON EDGE OF ROOF EXTENDING 2' BEYOND UNIT ON BOTH SIDES. SECURE GUARD RAIL AS RECOMMENDED BY MANUFACTURER. (1)

NORTH

1 ROOF PLAN - VENTILATION - EAST

1/8" = 1'-0"

IMEG
623 26TH AVENUE
QUAD CITIES, IL
61201
PH: 309.788.0673
FAX: 309.786.5967
www.imegcorp.com

ROCKFORD PUBLIC SCHOOLS

ESSER HVAC Improvements - Kennedy Middle School

520 Pierpont Ave, Rockford, IL 61101

ROCKFORD PUBLIC SCHOOLS #205

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KEY PLAN

AGENCY APPROVAL

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REVISIONS

No.	Date	Revision / Issue
1	09/07/2023	Addendum 2

SHEET INFORMATION

Issue	**BID DOCUMENTS**
Date	**AUGUST 15, 2023**
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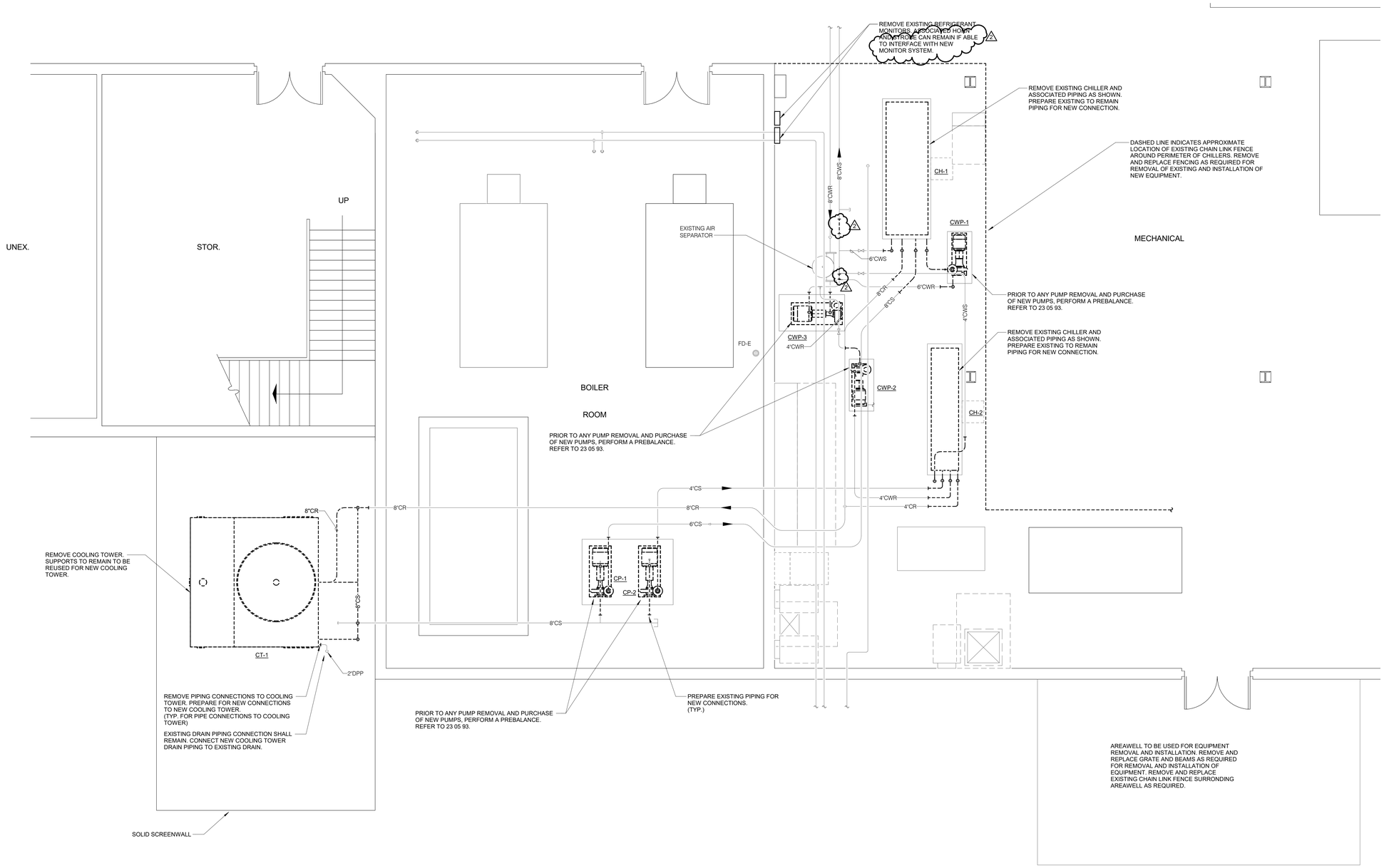
Drawn	**Author**
Checked	**Checker**
Approved	**Approver**

SHEET TITLE
HVAC ENLARGED PLANS

SCALE
Scale: **1/8" = 1'-0"**

SHEET NUMBER
M307

21002885.13 9/7/2023 10:39:52 AM ESSER HVAC Improvements - Kennedy Middle School



NORTH 1 **BASEMENT DEMOLITION PLAN - PIPING - ENLARGED**
1/4" = 1'-0"

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PH: 309.788.0673
FAX: 309.786.5967
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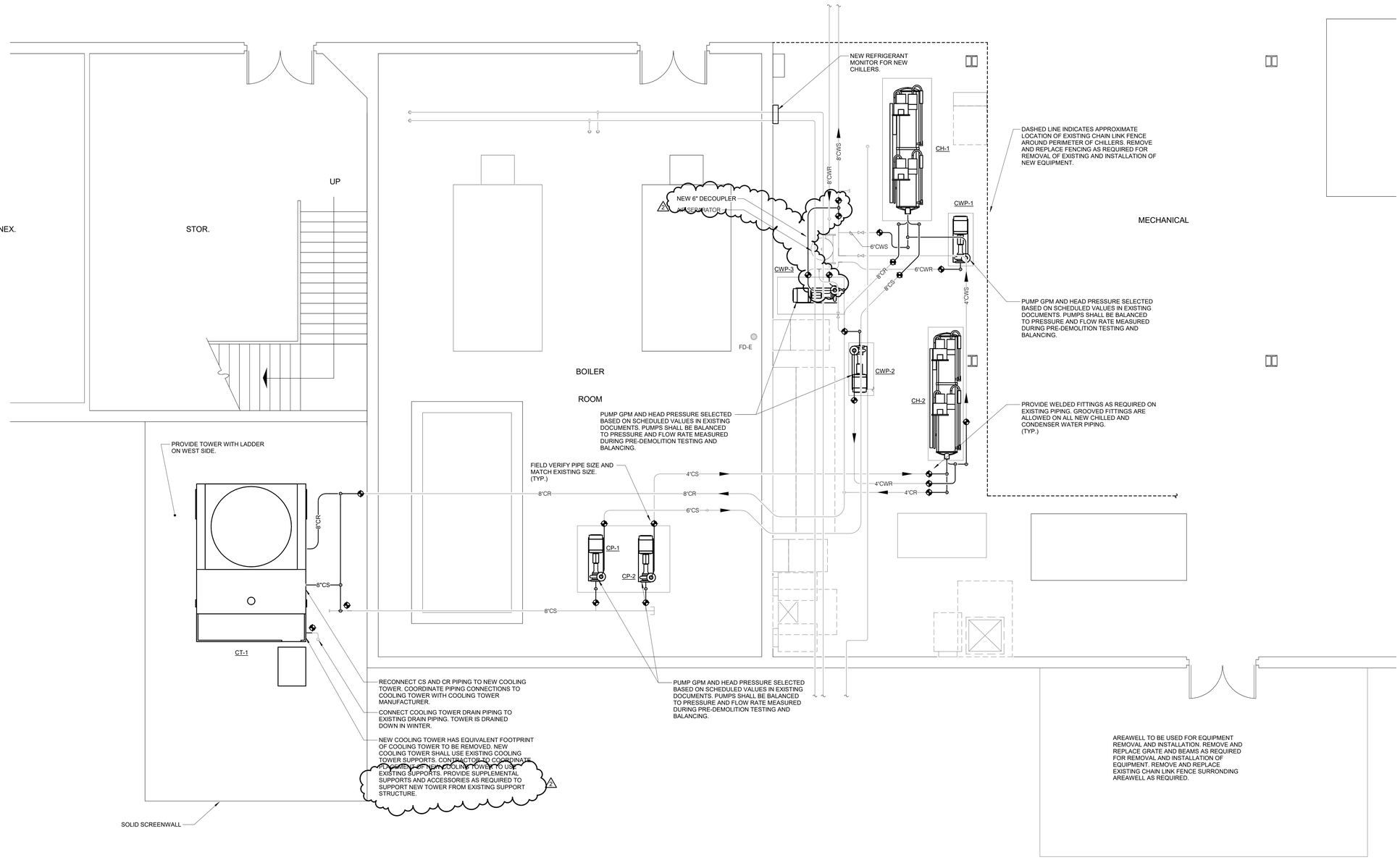
SHEET TITLE
MECHANICAL ENLARGED PLANS

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

SHEET NUMBER
M300



NORTH

1 BASEMENT PLAN - PIPING - ENLARGED

1/4" = 1'-0"

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SHEET TITLE

MECHANICAL ENLARGED PLANS

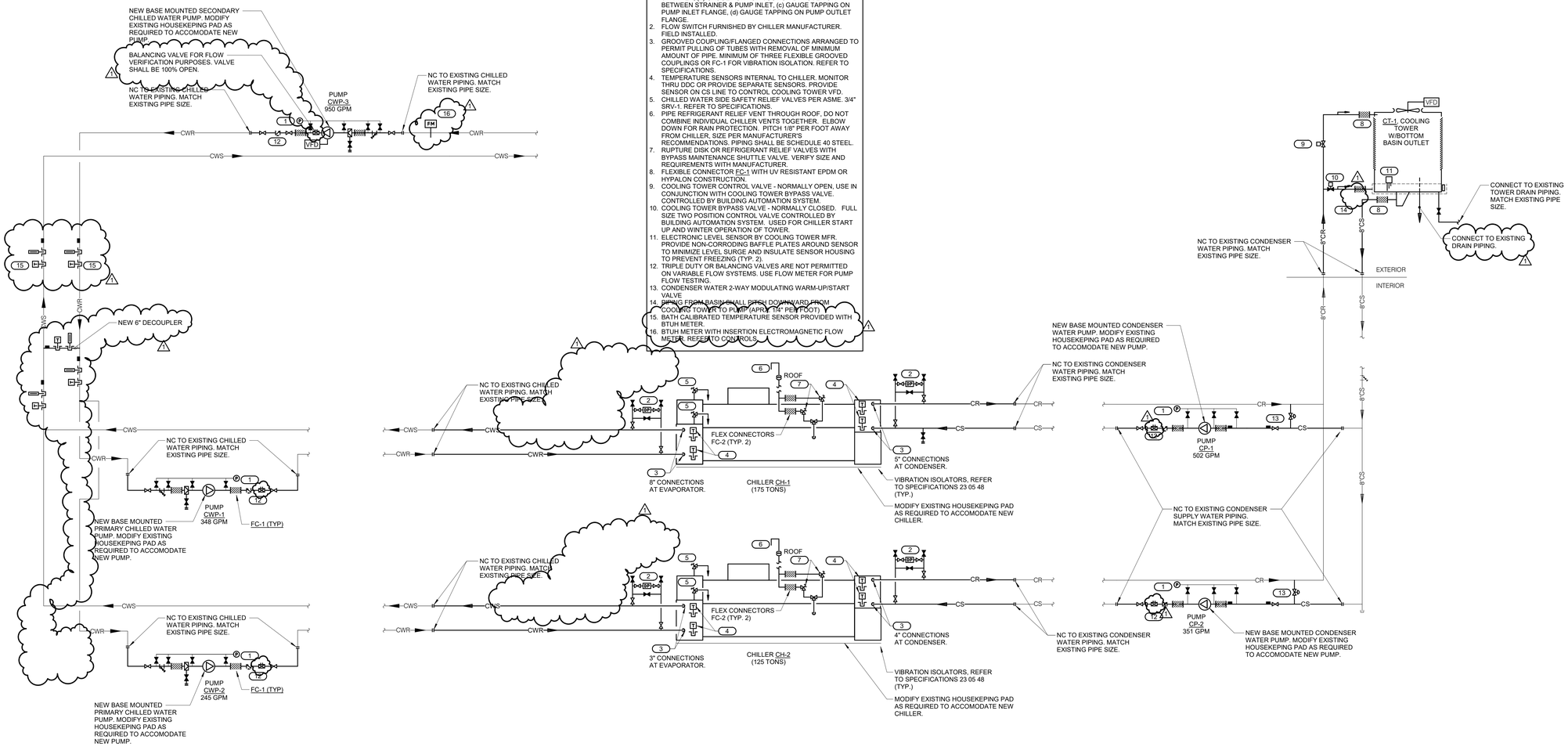
SCALE

Scale: **1/4" = 1'-0"**

SHEET NUMBER

M301

21002885.15 9/7/2023 1:37:13 PM ESSER HVAC Improvements - Jefferson High School Chiller Replacement



1 CHILLED WATER FLOW DIAGRAM - PRIMARY / SECONDARY SYSTEM

NO SCALE

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SHEET TITLE

MECHANICAL DIAGRAMS

SCALE

Scale: **12" = 1'-0"**

SHEET NUMBER

M500

CHILLER SCHEDULE - WATER COOLED (OWNER PROVIDED)

NOTES:
1.PROVIDE SHAFT GROUNDING AS REQUIRED IN THE MOTOR SPECIFICATION 23 05 13 .
2.REFER TO SPECIFICATION SECTION 23 64 16 FOR ADDITIONAL REQUIREMENTS.

TAG NAME	AREA SERVED	CAPACITY/PERFORMANCE					EVAPORATOR PERFORMANCE						CONDENSER PERFORMANCE					ELECTRICAL (NOTE 1)								MANUFACTURER	MODEL (NOTE 2)	NOTES
		DESIGN TONS	TON AT % LOAD BASED ON WATER CONDITIONS LISTED. 100	75	50	IPLV	EWT °F	LWT °F	GPM MINIMUM	GPM DESIGN	PRESS. DROP FT. HEAD	FOULING FACTOR	EWT °F	LWT °F	GPM DESIGN	PRESS. DROP FT. HEAD	FOULING FACTOR	VOLTAGE	PHASES	MCA	MOCP	DISCONNECT BY (NOTE A)	DISCONNECT TYPE (NOTE B)	CONTROLLER/ STARTER BY (NOTE A)	CONTROLLER/ STARTER TYPE (NOTE C)	SCCR			
CH-1	CHILLED WATER SYSTEM	175	188	141	94	0.57	56	44	158	348.0	10.00	0.0001	85	95	495	5.00	0.000250	460	3	196.0	350	MFR	F	MFR	VFD	6500	DAIKIN	WWVMNN	SCREW CHILLER - WATER COOLED
CH-2	CHILLED WATER SYSTEM	123	123	90	61	0.41	56	44	111	244.0	10.00	0.0001	85	95	348	6.50	0.000250	460	3	140.0	250	MFR	F	MFR	VFD	6500	DAIKIN	WWVJNN	SCREW CHILLER - WATER COOLED

COOLING TOWER SCHEDULE

NOTES:
1.PROVIDE SHAFT GROUNDING AS REQUIRED IN SPECS.
2.PROVIDE TOWER WITH ELECTRIC LEVEL CONTROLLER AND MAKE UP WATER SOLENOID.
3.NEW COOLING TOWER SHALL REUSE EXISTING COOLING TOWER SUPPORTS.
4.COOLING TOWER SHALL ALLOW FOR FLOW RATES DOWN TO 348 GPM.

TAG NAME	AREA SERVED	GPM	CONDENSING WATER EWT °F	CONDENSING WATER LWT °F	AMBIENT CONDITIONS DB °F	AMBIENT CONDITIONS WB °F	FAN DATA NUMBER OF FANS	FAN DATA HP EACH	ELECTRICAL (NOTE 1) VOLTAGE	PHASES	DISCONNECT BY (NOTE A)	DISCONNECT TYPE (NOTE B)	CONTROLLER/ STARTER BY (NOTE A)	CONTROLLER/ STARTER TYPE (NOTE C)	MAX. DIMENSIONS (FT) LENGTH	WIDTH	HEIGHT	MANUFACTURER	MODEL	NOTES
CT-1	CONDENSER SYSTEM	850	95.0	85.0	80.0	75.0	2	3	460	3	E.C.	F	E.C.	VFD	12	12	15	BAC	SERIES 1500 XES15E	NOTE 2, 3

PUMP SCHEDULE

NOTES:
1.PROVIDE SHAFT GROUNDING AS REQUIRED IN THE MOTOR SPECIFICATION 23 05 13.

TAG NAME	AREA SERVED	GPM	PUMP FT. HEAD AT DESIGN	MINIMUM PUMP EFFICIENCY %	IMPELLER SIZE (IN)	INLET SIZE (IN)	ELECTRICAL BHP	ELECTRICAL HP (NOTE E)	ELECTRICAL RPM	ELECTRICAL VOLTAGE	ELECTRICAL PHASES	DISCONNECT BY (NOTE A)	DISCONNECT TYPE (NOTE B)	CONTROLLER/ STARTER BY (NOTE A)	CONTROLLER/ STARTER TYPE (NOTE C)	MANUFACTURER	MODEL	NOTES
CP-1	CONDENSER SYSTEM	502.0	66.00	80	9.000	4	10.6	15	1770	460	3	E.C.	F	E.C.	FV	B & G	e-1510 3BD	NOTE 1
CP-2	CONDENSER SYSTEM	351.0	52.00	75	7.750	4	5.98	7.5	1770	460	3	E.C.	F	E.C.	FV	B & G	e-1510 3BD	NOTE 1
CWP-1	PRIMARY CHILLED WATER SYSTEM	348.0	16.00	75	6.875	6	1.92	3	1150	460	3	E.C.	F	E.C.	FV	B & G	e-1510 5A	NOTE 1
CWP-2	PRIMARY CHILLED WATER SYSTEM	245.0	18.00	75	7.250	6	1.5	2	1170	460	3	E.C.	F	E.C.	FV	B & G	e-1510 3BD	NOTE 1
CWP-3	SECONDARY CHILLED WATER SYSTEM	950.0	86.00	80	10.375	6	25	30	1770	460	3	E.C.	F	E.C.	VFD	B & G	e-1510 5EB	NOTE 1

SCHEDULE GENERAL NOTES:

A. DISCONNECT AND CONTROLLER STARTER FURNISHED AND INSTALLED BY:
MFR = MANUFACTURER
EC = ELECTRICAL CONTRACTOR.
MC = FURNISHED BY MECHANICAL CONTRACTOR, INSTALLED BY ELECTRICAL CONTRACTOR.
MFR/EC = FURNISHED LOOSE BY MANUFACTURER INSTALLED BY ELECTRICAL CONTRACTOR.
ATC = AUTOMATIC TEMPERATURE CONTROL CONTRACTOR

B. DISCONNECT TYPE:
CB = CIRCUIT BREAKER
F = FUSED
NF = NON-FUSED

C. CONTROLLER STARTER TYPE:
FV = FULL VOLTAGE
WYE = WYE-DELTA
SS = SOLID STATE (SOFT START)
MS = MANUAL STARTER
VFD = VARIABLE FREQUENCY DRIVE
VFD/B = VARIABLE FREQUENCY DRIVE WITH BYPASS
YD = WYE - DELTA

D. FAN RPM SHALL NOT EXCEED 110% OF SCHEDULED VALUE, WITH THE SCHEDULED WHEEL TYPE. SUBSTITUTION OF BI OR BIA FANS FOR FC IS ACCEPTABLE IF EFFICIENCY IS NOT LOWER.

E. NO EQUIPMENT SHALL BE SELECTED ABOVE 90% OF MOTOR NAME PLATE RATING.

F. MUST BE WITHIN +/- 10% OF SCHEDULED RPM.

G. CURB TYPE:
MFR = STANDARD CURB BY MANUFACTURER
GC = BY GENERAL CONTRACTOR
SAC = SOUND ATTENUATOR CURB

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61201
PH: 309.788.0673
FAX: 309.786.5967
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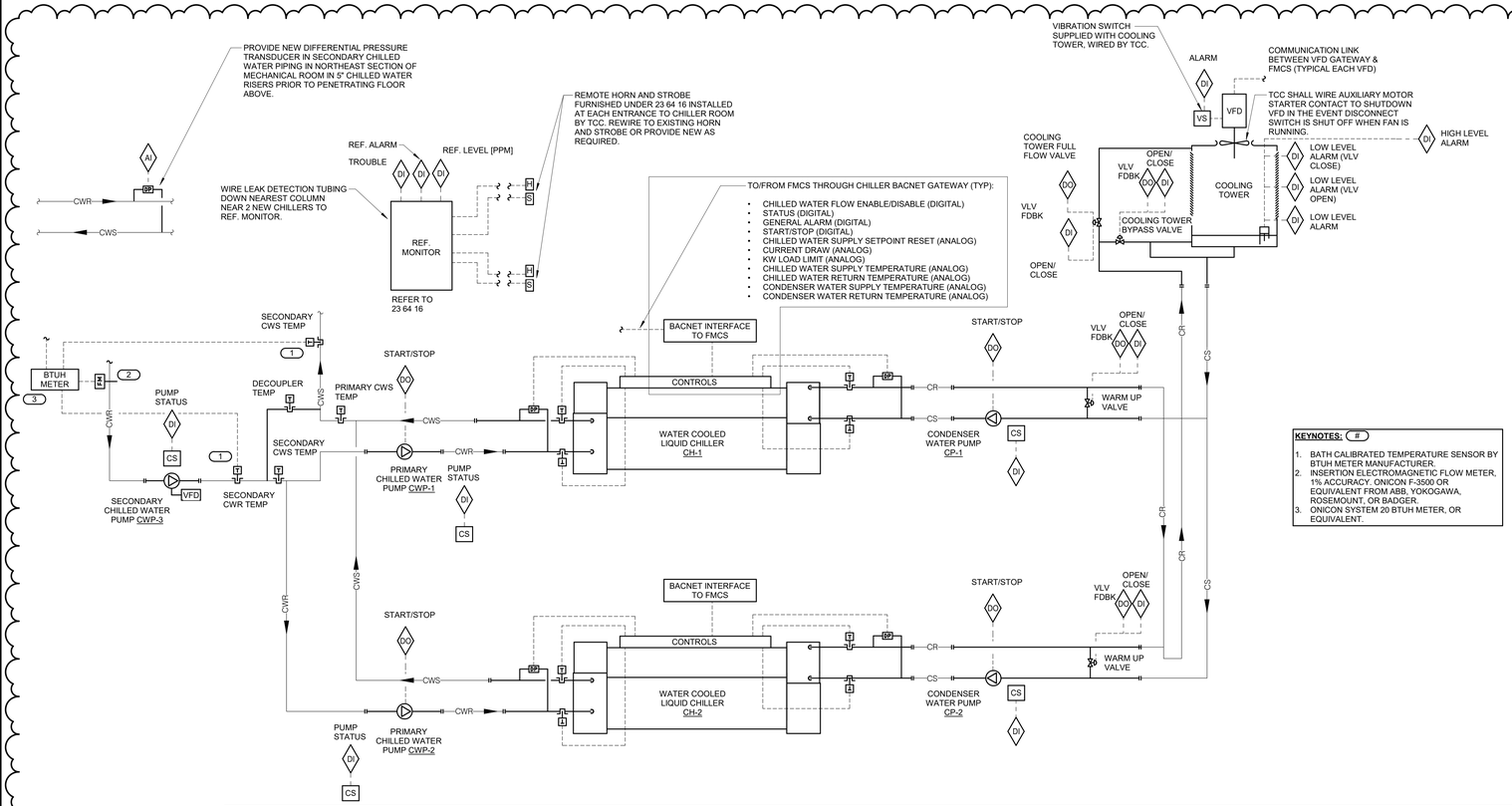
SHEET TITLE
MECHANICAL SCHEDULES

SCALE
Scale:

SHEET NUMBER
M600



KEYNOTES: (#)

1. BATH CALIBRATED TEMPERATURE SENSOR BY BTUH METER MANUFACTURER.
2. INSERTION ELECTROMAGNETIC FLOW METER, 1% ACCURACY. ONICON F-3500 OR EQUIVALENT FROM ABB, YOKOGAWA, ROSEMOUNT, OR BADGER.
3. ONICON SYSTEM 20 BTUH METER, OR EQUIVALENT.

TEMPERATURE CONTROL GENERAL NOTES:

1. REFER TO EQUIPMENT SCHEDULES TO CROSS REFERENCE WHICH CONTROL DIAGRAMS APPLY TO WHICH ITEMS OF EQUIPMENT.
2. EACH D.I., D.O., A.I. AND A.O. POINT SHOWN FOR ALL CONTROL DIAGRAMS SHALL BE DISCRETE FROM ALL OTHER POINTS EXCEPT AS SPECIFICALLY NOTED.
3. ALL WIRING, CONTROL COMPONENTS, DEVICES AND PROGRAMMING SHOWN ON THESE CONTROL DRAWINGS SHALL BE PROVIDED BY THE TCC UNLESS SPECIFICALLY NOTED OTHERWISE.
4. ALL ACTUATORS SHALL BE OF THE ELECTRICAL TYPE FOR THIS PROJECT UNLESS AN ACTUATOR IS SPECIFICALLY INDICATED ON THE DRAWINGS OR SPECIFICATIONS TO BE PNEUMATIC.
5. ALL MODULATING DAMPER AND VALVE ACTUATORS SHOWN WITH POSITION FEEDBACK SHALL HAVE THE VALVE POSITION DISPLAYED ON GRAPHICAL SCREEN ADJACENT TO THE DAMPER/VALVE COMMAND SIGNAL. DISPLAYED VALVE POSITION SHALL BE FROM THE FEEDBACK DEVICE/CIRCUIT (OUTPUT SIGNAL FROM THE FMCS TO THE ACTUATOR IS NOT ACCEPTABLE)
6. MODULATING SIGNALS SHALL BE DISPLAYED AS % OPEN (SIGNALS DISPLAYED AS % CLOSED ARE NOT ACCEPTABLE).
7. PRESSURE TRANSMITTERS WHOSE SIGNAL IS UTILIZED FOR MAINTAINING DUCT STATIC PRESSURE SHALL BE WIRED DIRECTLY TO THE CONTROLLER THAT MODULATES FAN SPEED. SIGNAL SHALL BE COMPLETELY INDEPENDENT OF THE FMCS NETWORK.
8. PRESSURE TRANSMITTERS WHOSE SIGNAL IS UTILIZED FOR MAINTAINING DIFFERENTIAL PRESSURE OF ANY PUMPED WATER SYSTEM (E.G. SECONDARY CHILLED WATER AND THE LIKE) SHALL BE WIRED DIRECTLY TO THE CONTROLLER THAT MODULATES PUMP SPEED. SIGNAL SHALL BE COMPLETELY INDEPENDENT OF THE FMCS NETWORK.
9. ALL CONTROL COMPONENTS SUCH AS RELAYS, SWITCHES, DDC CONTROLLERS, ETC. SHALL BE MOUNTED IN STEEL ENCLOSURES WITH STEEL MOUNTING BACKPLATES PER SPECIFICATION 23 09 00.
10. EACH CONTROL PANEL SHALL HAVE A LAMINATED COPY OF THE APPLICABLE SEQUENCE OF OPERATION AND CONTROL DIAGRAM INDICATING THE POINTS, COMPONENTS AND OPERATION OF EQUIPMENT ASSOCIATED WITH EACH PANEL. REFER TO SECTION 23 09 00 FOR ADDITIONAL REQUIREMENTS.
11. TCC SHALL EXTEND CONTROL SIGNAL FROM ADDRESSABLE RELAY DEVICE SERVING EACH AIR HANDLING UNIT. REFER TO ELECTRICAL DRAWINGS FOR LOCATIONS. TCC SHALL EXTEND AND TERMINATE WIRING AS REQUIRED FOR EQUIPMENT SHUTDOWN.
12. TCC SHALL PROVIDE POWER SUPPLIES FOR ALL 24VAC POWER REQUIREMENTS TO INCLUDE, BUT NOT LIMITED TO, CONTROLLERS, VALVE ACTUATORS, BUILDING PRESSURE SENSORS, AND OTHER CONTROL COMPONENTS AND DEVICES. REFER TO CONTROLS SPECIFICATIONS FOR POWER SUPPLY REQUIREMENTS. PROVIDE LOW VOLTAGE WIRING FROM POWER SUPPLIES TO ALL CONTROLLERS, MONITORS, COMPONENTS AND DEVICES REQUIRING 24 VAC POWER. ADDITIONAL POWER SUPPLIES NOT SHOWN AND REQUIRED FOR A COMPLETE AND OPERATIONAL SYSTEM SHALL BE PROVIDED BY THE TEMPERATURE CONTROL CONTRACTOR. THE TEMPERATURE CONTROL CONTRACTOR SHALL PROVIDE FINANCIAL PROVISIONS WITHIN THEIR BID FOR THE ELECTRICAL CONTRACTOR TO PROVIDE BRANCH POWER TO THE ADDITIONAL POWER SUPPLIES. COORDINATE THE LOCATION OF ADDITIONAL POWER SUPPLY CABINET WITH THE ELECTRICAL CONTRACTOR.
13. TO PREVENT GENERATOR OVERLOADING, TCC SHALL PROGRAM A STAGGERED START TIME FOR ALL MECHANICAL EQUIPMENT THAT IS CONTROLLED BY FMCS TO INCLUDE, BUT NOT LIMITED TO PUMPS, AND CHILLERS. THE FIRST EQUIPMENT SHALL START 2 MINUTES (ADJ.) FROM THE TIME THE FMCS RECEIVES THE SIGNAL THAT THE TRANSFER SWITCH CHANGED TO EMERGENCY POWER SOURCE WITH ALL EQUIPMENT BEING ENERGIZED WITHIN A 20 MINUTE (ADJ.) TIME SPAN. COORDINATE ORDER OF EQUIPMENT STAGING WITH OWNER'S REPRESENTATIVE.
14. CONTROL DIAGRAMS ARE SCHEMATIC IN NATURE AND DO NOT SHOW ALL REQUIRED CONTROL DEVICES AND COMPONENTS. REFER TO FLOOR PLANS, FLOW DIAGRAMS AND DETAILS FOR ADDITIONAL CONTROL DEVICES, COMPONENTS AND REQUIREMENTS NOT SHOWN ON THESE CONTROL DRAWINGS.
15. TCC SHALL PROVIDE ALL CONTROL COMPONENTS AND ACCESSORIES AS REQUIRED FOR EQUIPMENT TO BE CONTROLLED AS DESCRIBED IN THE SEQUENCE OF OPERATION REGARDLESS OF WHETHER ALL CONTROL COMPONENTS OR POINTS ARE SHOWN IN THE ASSOCIATED CONTROL DIAGRAM.
16. COORDINATE DDC CONTROL PANEL EMERGENCY POWER SUPPLY REQUIREMENT WITH ELECTRICAL CONTRACTOR. ALL CONTROLS ASSOCIATED WITH MECHANICAL SYSTEM REQUIRING EMERGENCY POWER SHALL BE CONNECTED TO THE EMERGENCY POWER SYSTEM.

<u>SEQUENCE OF OPERATION</u>
FMCS SHALL INTERFACE WITH ALL EXISTING CHILLER PLANT SENSORS, DEVICES, AND EQUIPMENT IN ADDITION TO THE NEW SENSORS, DEVICES, AND EQUIPMENT SHOWN IN THIS CONTROL DIAGRAM AS REQUIRED TO ACHIEVE THIS SEQUENCE OF OPERATION. A FACTORY MOUNTED CHILLER CONTROL PANEL SHALL BE PROVIDED BY THE CHILLER MANUFACTURER. ALL AVAILABLE DATA PROVIDED/MONITORED BY THE CHILLER CONTROL PANEL SHALL BE AVAILABLE TO AND MONITORED BY THE FMCS SYSTEM.

CHILLER PLANT OPERATION SHALL BE MANUALLY ENABLED/DISABLED AT THE FMCS OPERATOR WORKSTATION GRAPHICAL SCREEN. PROVIDE A GRAPHICAL BUTTON TO ENABLE OR DISABLE THE CHILLER PLANT.

WHENEVER CHILLED WATER PLANT IS ENABLED, THE FMCS SHALL CONTROL THE CHILLERS, COOLING TOWER, PUMPS, AND ASSOCIATED EQUIPMENT TO PRODUCE 44F (ADJ.) CHILLED WATER.

<u>CHILLER STARTING</u>
WHEN THE FMCS INDEXES A CHILLER TO RUN THE FOLLOWING SHALL OCCUR:
- THE FMCS SYSTEM SHALL OPERATE THE CONDENSER FILL VALVE BASED ON WATER LEVELS ESTABLISHED BY THE SENSORS LOCATED IN THE COOLING TOWER SUMP (REFER TO COOLING TOWER WATER LEVEL CONTROL IN THE COOLING TOWER CONTROL SECTION). ONCE THE REQUIRED COOLING TOWER SUMP WATER LEVEL IS ESTABLISHED, THE FMCS SYSTEM SHALL START THE CONDENSER WATER PUMP.
- UPON PROOF OF FLOW IN THE EVAPORATOR AND CONDENSER BARREL THE FMCS SHALL INDEX CHILLER TO START
- CHILLER SHALL START AFTER ALL INTERNAL SAFETIES ARE SATISFIED

<u>CHILLER STOPPING:</u>
WHEN THE FMCS INDEXES THE CHILLER TO STOP THE FOLLOWING SHALL OCCUR:
- FMCS SHALL INDEX CHILLER TO STOP
- AFTER A TIME DELAY OF 5 MIN. (ADJ.) FMCS SHALL SHUTDOWN CONDENSER AND PRIMARY CHILLED WATER PUMP.

<u>CHILLER STAGING:</u>
ONE CHILLER SHALL BE DESIGNATED AS THE LEAD CHILLER AND ONE CHILLER SHALL BE DESIGNATED AS THE LAG CHILLER. WHENEVER THE CHILLED WATER SYSTEM IS ENABLED, THE LEAD CHILLER SHALL BE ENABLED.

FMCS SHALL ENABLE THE LAG CHILLER IF THE SECONDARY BTUH METER LOAD EXCEEDS 115 TONS (ADJ.) FOR MORE THAN 10 MINUTES (ADJ.) OR IF THE DECOUPLER TEMPERATURE RISES MORE THAN 2F (ADJ.) ABOVE THE CHILLED WATER TEMPERATURE SETPOINT FOR MORE THAN 10 MINUTES (ADJ.).

FMCS SHALL DISABLE THE LAG CHILLER IF THE SECONDARY BTUH METER LOAD DROPS BELOW 100 TONS (ADJ.) FOR MORE THAN 10 MINUTES (ADJ.) AND THE SECONDARY CHILLED WATER FLOW RATE IS BELOW 200 GPM (ADJ.).

FMCS SHALL AUTOMATICALLY SWITCH THE "LEAD" AND "LAG" CHILLER ONCE EVERY TWO WEEKS (ADJ.) ON TUESDAY (ADJ.) AT 10:30 AM (ADJ.).

FMCS SHALL HAVE THE ABILITY TO MANUALLY SET EITHER CHILLER TO "OUT OF SERVICE". WHEN A CHILLER IS SET AS "OUT OF SERVICE", THE FCMS SHALL NOT ATTEMPT TO OPERATE THAT CHILLER.

<u>FREEZE PROTECTION OF OUTDOOR PIPING:</u>
PER OWNER'S MAINTENANCE PLAN, TOWER IS DRAINED AT END OF COOLING SEASON.

<u>CHILLER SAFETIES:</u>
CONTRACTOR PROVIDING FMCS SHALL COORDINATE ALL SAFETY AND INTERLOCK REQUIREMENTS WITH CHILLER MANUFACTURER. CONTRACTOR SHALL PROVIDE THE INSTALLATION AND WIRING OF CHILLED WATER FLOW SWITCHES, AND OTHER COMPONENTS PROVIDED WITH CHILLER AS REQUIRED FOR PROPER OPERATION.

<u>COOLING TOWER WATER LEVEL CONTROL:</u>
WHEN THE WATER LEVEL IS AT THE "OPERATING LEVEL", THE MAKE-UP WATER CONTROL VALVE SHALL BE CLOSED. AS THE WATER LEVEL DROPS TO "LOW LEVEL", THE LEVEL SENSOR SHALL SEND A SIGNAL TO THE FMCS SYSTEM TO OPEN THE MAKE-UP WATER CONTROL VALVE. IF THE WATER LEVEL DROPS TO THE "ALARM LEVEL", THE FMCS SYSTEM SHALL SEND AN ALARM TO THE OPERATOR INTERFACE.

THE TCC SHALL PROVIDE NECESSARY RELAYS, WIRING AND COMPONENTS REQUIRED TO CONNECT THE FMCS SYSTEM TO THE EXISTING BLOWDOWN WATER METER (FURNISHED AND INSTALLED BY CHEMICAL TREATMENT SUPPLIER) TO PROVIDE BLOWDOWN CONSUMPTION INFORMATION.

<u>CONDENSER WATER START-UP:</u>
UPON INITIAL SYSTEM START-UP, THE CHILLER CONTROL PANEL SHALL SEQUENCE THE COND WARM-UP VALVE(S) AND COOLING TOWER FULL FLOW VALVE(S) AND BYPASS VALVE(S) TO WARM UP CONDENSER WATER SYSTEM FOR PROPER CHILLER OPERATION. FIRST THE CONTROL PANEL SHALL WARM UP THE CONDENSER LOOP TO 55°F (ADJ. CONFIRM TEMP WITH CHILLER MANUFACTURER), THEN CONDENSER WATER SHALL BE PERMITTED TO FLOW THROUGH THE COOLING TOWERS.

WHEN THE CONDENSER WATER SUPPLY TEMPERATURE IS ABOVE 55°F (ADJ.) (REFER TO CONDENSER WATER TEMPERATURE RESET) THE FMCS SYSTEM SHALL CALL FOR COOLING TOWER OPERATION.

<u>COOLING TOWER FAN OPERATION:</u>
ONCE CONDENSER WATER FLOW IS PROVEN, THE FMCS SYSTEM SHALL START THE COOLING TOWER FAN VIA THE VFD. THE FMCS SYSTEM SHALL/STOP THE COOLING TOWER FAN WHEN THE VFD IS OPERATING AT MINIMUM SPEED AND CONDENSER WATER SUPPLY TEMPERATURE IS 5°F BELOW SETPOINT FOR 10 MINUTES (ADJ). OR IF CONDENSER WATER FLOW IS NOT PROVEN.

THE PURPOSE OF THE COOLING TOWER FAN SPEED CONTROL IS TO MAINTAIN THE OPTIMAL CONDENSER WATER SUPPLY TEMPERATURE SETPOINT. THE FMCS SYSTEM SHALL CONTROL THE COOLING TOWER FAN VFD USING A 4-20MA OUTPUT.

THE CONDENSER WATER SUPPLY TEMPERATURE SETPOINT SHALL BE 75F (ADJ.).

INSTALL A VIBRATION SWITCH TO STOP OPERATION OF THE COOLING TOWER FAN IF THE SWITCH IS ACTIVATED AND SEND AN ALARM TO THE FMCS.

<u>CONDENSER SUMP CLEANING SYSTEM:</u>
FMCS SHALL INTERFACE WITH EXISTING SAND FILTER SYSTEM. SYSTEM SHALL ALLOW FOR OPERATOR TO MANUALLY ENTER THE NUMBER OF HOURS (DURATION) THE SAND FILTER WILL RUN. GRAPHICAL SCREEN SHALL ALSO ALLOW FOR OPERATOR TO MANUALLY SELECT EITHER A "DAILY", "WEEKLY" OR "MONTHLY" MODE (FREQUENCY) OF OPERATION. IF THE FREQUENCY IS SET TO "DAILY" (ADJ.) AND THE DURATION IS SET TO 2 HOURS (ADJ.), THEN THE SAND FILTER SHALL RUN FOR THE SET DURATION EACH DAY STARTING AT 8 AM (ADJ.). IF THE FREQUENCY IS SET TO "WEEKLY" (ADJ.) AND THE DURATION IS SET TO 2 HOURS (ADJ.), THEN THE SAND FILTER SHALL RUN FOR THE SET DURATION EACH TUESDAY (ADJ.) STARTING AT 8 AM (ADJ.). IF THE FREQUENCY IS SET TO "MONTHLY" (ADJ.) AND THE DURATION IS SET TO 2 HOURS (ADJ.), THEN THE SAND FILTER SHALL RUN FOR THE SET DURATION ON THE FIRST TUESDAY (ADJ.) OF EACH MONTH STARTING AT 8 AM (ADJ.).

<u>COOLING TOWER FILL/DRAIN CONTROL:</u>
- FILLING AND DRAINING OPERATION SHALL BE CONTROLLED BY OPENING/CLOSING MANUAL VALVES.
- WHEN A COOLING TOWER IS DISABLED/DRAINED, THE FMCS SHALL DISABLE WATER LEVEL CONTROL (INCLUDING ASSOCIATED ALARMS).
- WHEN A COOLING TOWER IS FILLED/ENABLED, THE FMCS SHALL ENABLE WATER LEVEL CONTROLS (INCLUDING ASSOCIATED ALARMS).

<u>CONDENSER WATER PUMP CONTROL:</u>
FMCS SHALL START/STOP EACH CONDENSER PUMP WHEN ITS RESPECTIVE CHILLER IS ENABLED. REFER TO CHILLER STOPPING AND CHILLER STARTING SECTIONS.

<u>PRIMARY WATER PUMP CONTROL:</u>
FMCS SHALL START/STOP EACH PRIMARY PUMP WHEN ITS RESPECTIVE CHILLER IS ENABLED. REFER TO CHILLER STOPPING AND CHILLER STARTING SECTIONS.

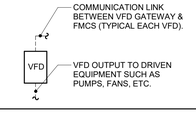
<u>SECONDARY WATER PUMP CONTROL:</u>
WHEN EITHER CHILLER IS ENABLED, THE SECONDARY PUMP SHALL BE ENABLED. WHEN BOTH CHILLERS ARE DISABLED, THE SECONDARY PUMP SHALL BE DISABLED.
REFER TO CHILLER STOPPING AND CHILLER STARTING SECTIONS.

WHEN SECONDARY PUMP IS ENABLED, FMCS SHALL MODULATE VFD SPEED AS REQUIRED TO MAINTAIN THE SYSTEM DIFFERENTIAL PRESSURE SETPOINT.

<u>WATER LOOP LOAD CALCULATION & DISPLAY:</u>
CALCULATE AND DISPLAY THE CHILLED WATER LOOP TONNAGE ON THE FMCS COMPUTER CHILLER PLANT GRAPHICAL SCREEN UTILIZING THE ENTERING AND LEAVING CHILLED WATER TEMPS AND THE FLOW RATE AS DETERMINED BY THE FLOW METER.

<u>ALARMS, INTERLOCKS AND SAFETIES:</u>
AN ALARM SHALL BE INDICATED AT THE FMCS WHEN THE FOLLOWING OCCUR:
- AN ALARM IS INDICATED AT THE CHILLER CONTROL PANEL.
- IF SECONDARY CHILLED WATER SUPPLY TEMPERATURE IS MORE THAN 5°F (ADJ.) ABOVE OR BELOW SETPOINT FOR MORE THAN 10 MINUTES (ADJ.).
- SHOULD THE FMCS COMMAND A PRIMARY OR CONDENSER WATER TO OPERATE AND THE PUMP FAILS TO DO SO AS DETERMINED BY THE ASSOCIATED CURRENT SENSOR STATUS, AN ALARM SHALL BE INDICATED AT THE FMCS OPERATOR WORKSTATION.
- AN ALARM CONDITION OCCUR AT ANY VFD.
- IF SYSTEM DIFFERENTIAL PRESSURE IS NOT MAINTAINED FOR MORE THAN 15 MINUTES (ADJ.).

1 WATER COOLED CHILLERS CONTROL DIAGRAM
NO SCALE



<u>SEQUENCE OF OPERATION:</u>
FMCS SHALL CONTROL EACH VFD AS DESCRIBED IN THE SEQUENCE OF OPERATION OF THE EQUIPMENT. DRIVE SHALL BE EQUIPPED BY THE VFD MANUFACTURER WITH A COMMUNICATION CARD THAT IS COMPATIBLE WITH THE FMCS CONTROL SYSTEM. TCC SHALL PROVIDE COMMUNICATIONS WIRING AND PROGRAMMING AS REQUIRED FOR THE FMCS TO COMMUNICATE WITH EACH VFD AS DESCRIBED BELOW.

THE FOLLOWING VFD CONTROL PANEL POINTS (TO INCLUDE BUT NOT LIMITED TO) SHALL BE CONTROLLED BY THE FMCS AND DISPLAYED ON THE OPERATOR WORKSTATION (OWS) GRAPHICAL SCREEN:
- SYSTEM STATUS: [ENABLE/DISABLE]
- SPEED SET ADJUSTMENT: [%]
- CURRENT LIMIT: [AMPS]

THE FOLLOWING VFD CONTROL PANEL POINTS (TO INCLUDE BUT NOT LIMITED TO) SHALL BE MONITORED BY THE FMCS AND DISPLAYED ON THE OPERATOR WORKSTATION (OWS) GRAPHICAL SCREEN:
- SYSTEM STATUS: [DISABLED/MANUAL OPERATION/REMOTE OPERATION/AUTO/FAULT]
- INPUT SPEED: [0 - 100%]
- OUTPUT SPEED: [0 - 100%]
- CURRENT: [AMPS]
- POWER: [kW]
- DRIVE TEMPERATURE: [°F]
- RUN HOURS: [NUMERICAL]
- DIAGNOSTIC AND FAULT CODES: [NUMERICAL]
- BYPASS OPERATION: [ENABLED/DISABLED]

TCC SHALL PROVIDE A CURRENT SENSING RELAY ON ANY VFD EQUIPPED WITH A BYPASS WHERE THE VFD STATUS OUTPUT DOES INDICATE THE MOTOR IS RUNNING WHEN THE VFD IS OPERATING IN BYPASS MODE.

<u>ALARMS, INTERLOCKS & SAFETIES:</u>
AN ALARM SHALL BE INDICATED TO THE FMCS OPERATOR WORKSTATION IN THE EVENT A FAULT OR ERROR CONDITION OCCURS AT ANY VFD.

TCC SHALL PROGRAM VFD TO ENSURE MOTOR RPM DOES NOT DROP BELOW MINIMUM REQUIRED BY MOTOR MANUFACTURER.

2 VFD CONTROL
NO SCALE

IMEG
623 26TH AVENUE
QUAD CITIES, IL
61201
PH: 309.788.0673
FAX: 309.786.5967
www.imegcorp.com

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KEY PLAN

AGENCY APPROVAL

REFERENCE SCALE IN INCHES
0 1 2

REVISIONS

No.	Date	Revision / Issue
1	09/07/2023	Addendum 2

SHEET INFORMATION

Issue	BID DOCUMENTS
Date	AUGUST 15, 2023
Job Number	21002885.15
Drawn	Author
Checked	Checker
Approved	Approver

SHEET TITLE
MECHANICAL CONTROLS

SCALE
Scale: 12" = 1'-0"

SHEET NUMBER
M700