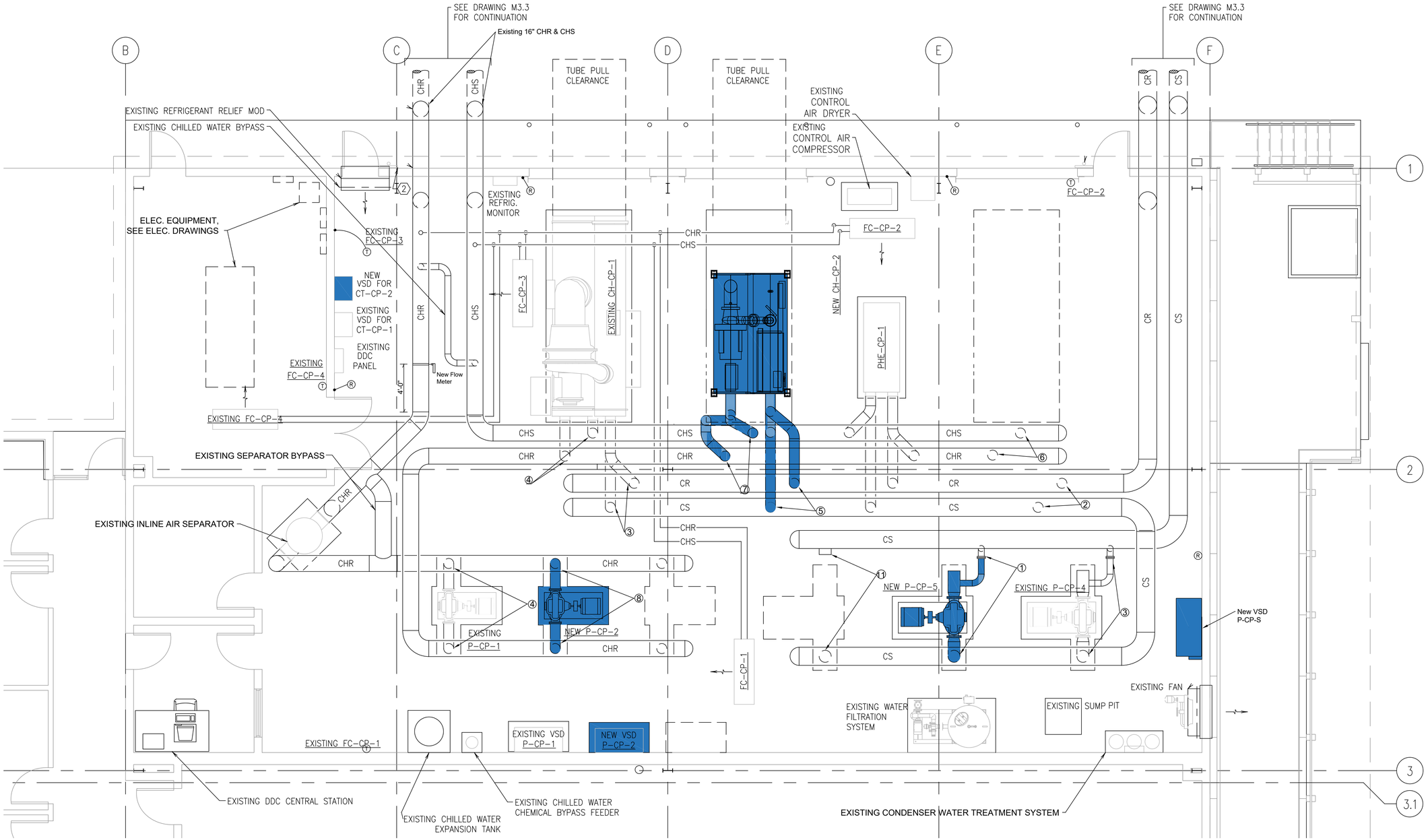

GENERAL NOTES THIS SHEET:

1. EXISTING 10" STUB-OUT W/ SHUT-OFF VALVE AND BLIND FLANGE. CONNECT NEW 10" CS AND EXTEND AND CONNECT TO NEW P-CP-5 CONDENSER WATER PUMP
2. EXISTING 10" STUB-OUT WITH SHUT-OFF VALVE AND BLIND FLANGE FOR FUTURE CHILLER INSTALLATION
3. EXISTING 10" SHUT-OFF VALVE
4. EXIST 8" SHUT-OFF VALVE
5. EXISTING 10" STUB-OUT W/ SHUT-OFF VALVE AND BLIND FLANGE. CONNECT NEW 10" CS & CR AND EXTEND AND CONNECT TO NEW CHILLER CH-CP-2. SEE CHILLER SCHEMATIC DIAGRAM FOR VALVES AND ACCESSORIES.
6. EXISTING 8" STUB-OUT WITH SHUT-OFF VALVE AND BLIND FLANGE FOR FUTURE CHILLER INSTALLATION.
7. EXISTING 8" STUB-OUT WITH SHUT-OFF VALVE AND BLIND FLANGE. CONNECT NEW 8" CHS AND CHR AND EXTEND AND CONNECT TO NEW CHILLER CH-CP-2. SEE CHILLER SCHEMATIC DIAGRAM FOR VALVES AND ACCESSORIES.
8. EXISTING 8" STUB-OUT WITH SHUT-OFF VALVE AND BLIND FLANGE. CONNECT NEW 8" CHR AND EXTEND AND CONNECT TO P-CP-2 CHILLED WATER PUMP.
9. EXISTING 10" STUB-OUT WITH SHUT-OFF VALVE AND BLIND FLANGE. CONNECT
10. EXISTING 10" STUB-OUT WITH SHUT-OFF VALVE AND BLIND FLANGE FOR FUTURE CONDENSER WATER PUMP INSTALLATION.

1

1 / M3.1 CENTRAL CHILLER PLANT PART PLAN

SCALE: 1/4" = 1'

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No.	Revision Note	Date

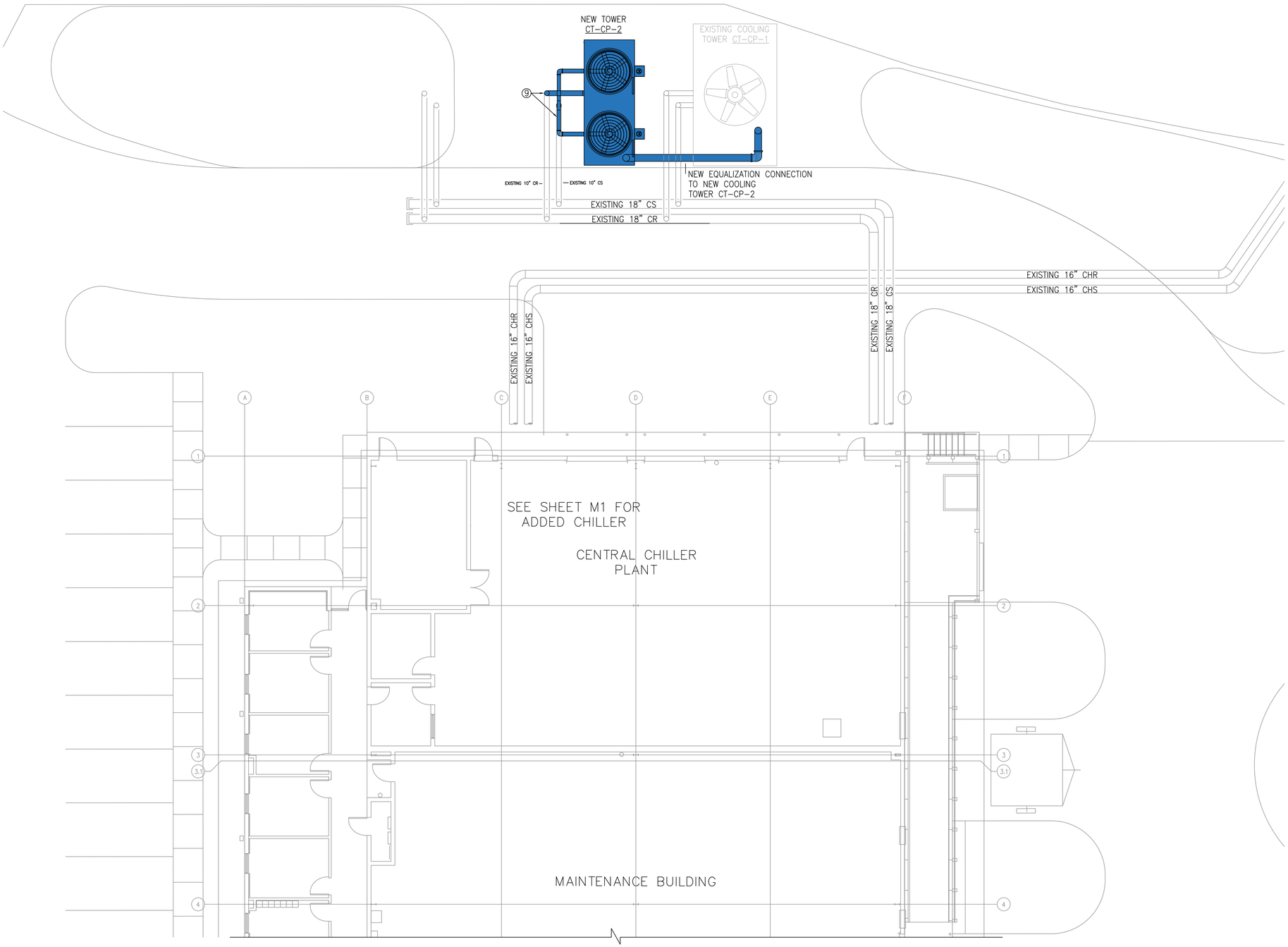
Project

University of South Carolina Beaufort
HH Gateway Campus Chiller Replacement
Project No. H36-I316
One University Blvd.
Bluffton, SC 29909
(843) 208-8000

Sheet Title

Chiller Replacement
Central Plant

Essex Project #	Sheet #
17109	M1
Date: May 19, 2017	
Scale: 3/8" = 1'-0"	



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No.	Revision Note	Date

Project

University of South Carolina Beaufort
HH Gateway Campus Chiller Replacement
Project No. H36-I316
One University Blvd.
Bluffton, SC 29909
(843) 208-8000

Sheet Title

Cooling Tower Addition
Central Plant

Essex Project #	Sheet #
17109	M2
Date: May 19, 2017	
Scale: 1/8" = 1'-0"	

MAGNETIC BEARING CENTRIFUGAL CHILLER SCHEDULE

NO.	CAPACITY TONS	MAXIMUM KW/TON AT FULL LOAD	IPLV.IP (NOTE 1)	EVAPORATOR						CONDENSER					VIBRATION ISOLATION		NOTES
				EWT °F	LWT °F	GPM		MAXIMUM PRESS. DROP, FT. WG	NO. OF PASSES	EWT °F	LWT °F	GPM	MAXIMUM PRESS. DROP, FT. WG	NO. OF PASSES	TYPE	MINIMUM STATIC DEFLECTION, IN.	
						DESIGN	MINIMUM										
CH-CP-2	450	0.55	0.323	54	44	1077	751.3	8.88	2	85	94.3	1354	5.51	2	LS	1.0	2,3

NOTES:
1. PER AHRI 550/590-(I-P)
2. REFER TO THE ELECTRICAL DRAWINGS FOR EQUIPMENT ELECTRICAL CHARACTERISTICS.
3. MINIMUM EVAPORATOR GPM IS BASED ON CHILLER PROVIDED BY YORK. IF CONTRACTOR PROVIDES CHILLER BY OTHER MANUFACTURER, THEN THE CONTRACTOR SHALL VERIFY THE MINIMUM EVAPORATOR GPM AND RESIZE THE MINIMUM FLOW BYPASS CONTROL VALVE AND ITS ASSOCIATED PIPING ACCORDINGLY.
4. PROVIDE INERTIA BASE AND VIBRATION ISOLATION. SEE SPECIFICATIONS.

PUMP SCHEDULE

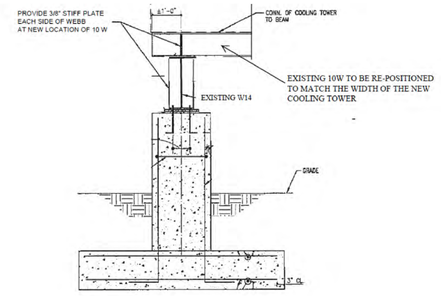
NO.	SERVICE	TYPE (NOTE 1)	GPM	TOTAL DYNAMIC HEAD, FT. WG	MINIMUM EFFICIENCY, PERCENT	RPM	MINIMUM MOTOR HP	VIBRATION ISOLATION			NOTES
								TYPE	MINIMUM STATIC DEFLECTION, IN.	INERTIA BASE	
P-CP-2	CHILLED WATER	D	1500	210	80	1750	125	FS	1.0	YES	2,3
P-CP-5	CONDENSER WATER	D	2250	85	80	1750	75	FS	1.0	YES	2,3

NOTES:
1. PUMP TYPE: D DOUBLE SUCTION
2. REFER TO THE ELECTRICAL DRAWINGS FOR THE EQUIPMENT ELECTRICAL CHARACTERISTICS.
3. PROVIDE VARIABLE SPEED DRIVE.
4. PROVIDE 4" HIGH CONCRETE PAD SIZED TO MEET CHILLER MANUFACTURER'S LAYOUT. ATTACH PAD TO FLOOR SLAB WITH $\frac{3}{8}$" DOWELS ON 12" CENTERS BOTH WAYS EPOXY GLUED INTO FLOOR SLAB.

COOLING TOWER SCHEDULE

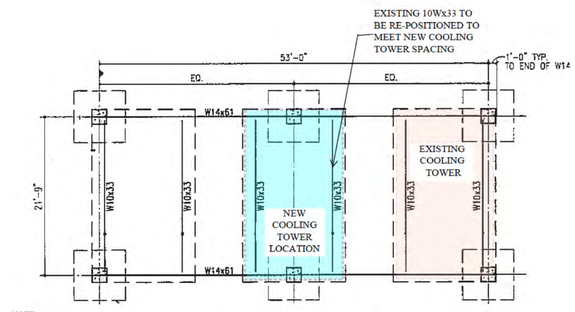
NO.	EWT °F	LWT °F	GPM	MINIMUM MOTOR HP	VIBRATION ISOLATION		NOTES
					TYPE	MIN. STATIC DEFLECTION, IN.	
CT-CP-2	95	85	1350	2 @ 15	LS	2.0	1,2,3,4

NOTES:
1. ENTERING AIR WET BULB: 80°F.
2. PROVIDE ELECTRIC BASIN HEATERS: 2@10 kW EACH.
3. PROVIDE VARIABLE SPEED DRIVES.
4. REFER TO THE ELECTRICAL DRAWINGS FOR THE EQUIPMENT ELECTRICAL CHARACTERISTICS.



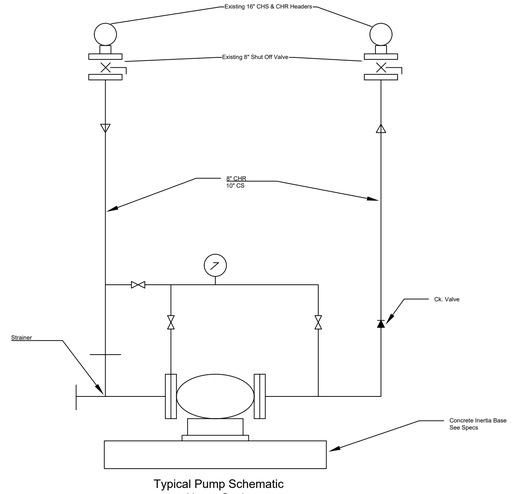
TYPICAL COOLING TOWER PIER
NOT TO SCALE

NOTES:
1. ALL STEEL MEMBERS TO BE GALVANIZED.



NOTE:
1. ALL STEEL MEMBERS SHOWN ARE EXISTING.
2. PROVIDE STIFF PLATES IN THE WEBB OF THE W14x61 AT NEW LOCATION OF THE 10Wx33. SEE COOLING TOWER PIER DETAIL.
3. PROVIDE GALVANIZED COATING ON ANY EXPOSED STEEL.

COOLING TOWER LAYOUT PLAN
NOT TO SCALE



Typical Pump Schematic
Not to Scale

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No.	Revision Note	Date

Project
University of South Carolina Beaufort
HH Gateway Campus Chiller Replacement
Project No. H36-I316
One University Blvd.
Bluffton, SC 29909
(843) 208-8000

Sheet Title
Chiller Replacement
Central Plant

Essex Project # 17109
Date May 12, 2017
Scale
Sheet # M3

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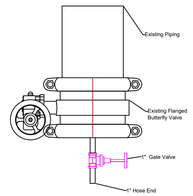


GENERAL NOTES THIS SHEET:

1. REMOVE EXISTING BLIND FLANGE AND INSTALL TEMPORARY BLIND FLANGE WITH 1" HOSE END BLOW DOWN DRAIN.
2. OPEN B'FLY VALVE AND BLOW DOWN DRAIN TO BLOW OUT ALL SEDIMENT AND SLUDGE IN TURNED DOWN STUB-OUT.
3. AFTER BLOW DOWN CLOSE B'FLY VALVE, REMOVE TEMPORARY BLIND FLANGE WITH BLOW DOWN VALVE AND CONNECT THE NEW CHILLED WATER AND CONDENSER WATER SUPPLY OR RETURN PIPE.

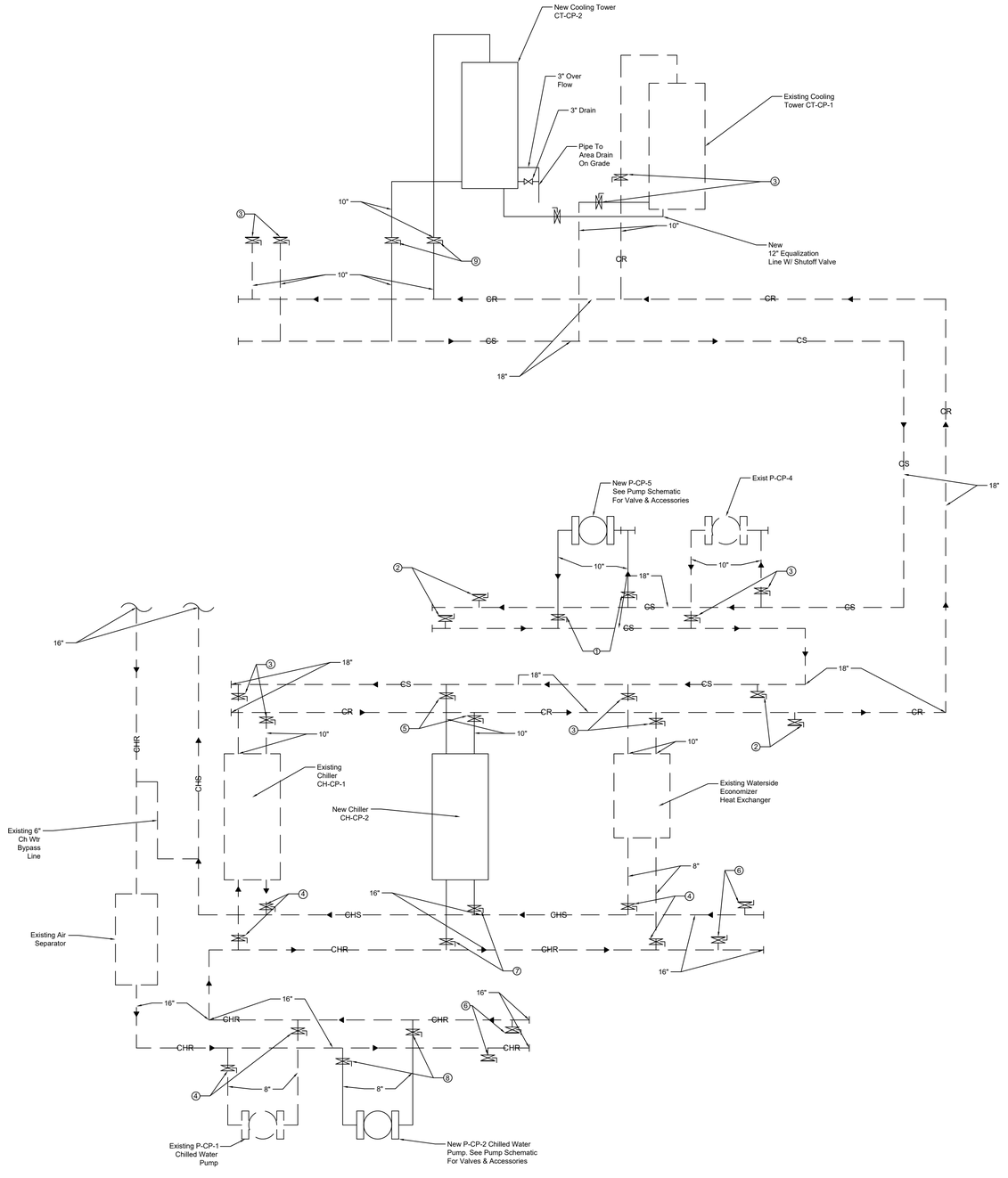
1 / M1 BLOW DOWN VALVE

NO SCALE

1. EXISTING CONDENSER WATER PUMP CONNECTION TO PIPING. CONNECT NEW CONDENSER WATER PUMP IN THE SAME WAY.

2. TYPICAL BLIND FLANGE VALVE INSIDE CHILLER PLANT

3. TYPICAL BLIND FLANGE VALVE AT COOLING TOWER



2 / M1 REFRIGERATION PIPING DIAGRAM

NO SCALE

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No.	Revision Note	Date

Project

University of South Carolina Beaufort
HH Gateway Campus Chiller Replacement
Project No. H36-I316
One University Blvd.
Bluffton, SC 29909
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Sheet Title

Chiller Replacement
Central Plant

Essex Project #	Sheet #
17109	M4
Date: May 19, 2017	
Scale	

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CHILLED WATER PLANT
OPERATIOIN AND CONTROL STRATEGY

The chilled water plant operating and control system shall provide operations and control as hereinafter described to maximize the chiller plant operating efficiency in accordance with the following operating and control strategies.

CHILLER PLANT ENABLE/DISABLE:

The chiller plant shall be enabled and disabled manually by an operator command (SYSTEM-EN). When the chiller plant is disabled, all devices shall be commanded off. All isolation valves shall close. The CHW bypass valve (CHWBPYV-O) shall open.

WATERSIDE ECONOMIZER:

When conditions become suitable to allow the water side economizer to handle the cooling load, the Chiller Selector is disabled and begins to stage off the chillers. When the last chiller is off, the HX Selector is enabled. Once the condenser water temperature is less than or equal to the Economizer CHWS-T setpoint the heat exchangers may cycle on or off to satisfy the cooling load. If the CHWST-T becomes sufficiently warm for long enough (CHWS-T wait time) or the conditions change making the waterside economizer unsuitable the system begins to transition back to mechanical cooling (Warm CW-T state). Upon entering this state, tower fans are turned off so that the CWS-T becomes warm enough to start the chillers. The building cooling load is calculated using the chilled water temperature difference (PCHWR-T minus PCHWS-T) and the primary chilled water flow input (PCHW-F). The percent load is the percentage of the current building load to the total chiller plant load available. In freezing weather conditions, the outdoor air economizer lockout setpoint (OA ECON LO SP) defaulted to 32°F (adjustable) will disable the waterside operation until OA-T rises above setpoint plus a differential (4°F).

CHILLER CONTROL:

The CPO application is designed to maximize the chiller plant's operating efficiency. This application when enabled, maintains at least one device on (to maintain the minimum or base load defaulted to 0.1 tons), determines the percent load of the system and maximizes the plant efficiency by choosing the most efficient device (or combination of devices) available to meet the required load. The selected combination produces the largest adjusted efficiency. Efficiencies are calculated based on the individual device's coefficient of performance (COP), percent load, required capacity, and rated flow. The building cooling load is calculated using the chilled water temperature difference (PCHWR-T minus PCHWS-T) and the primary chilled water flow input (PCHW-F). The percent load is the percentage of the current building load to the total chiller plant available. The chillers (CHx-EN) shall be controlled via their own internal controls to maintain a chilled water supply temperature. The chilled water (CHW) system consists of two, variable speed driven, chillers. Each chiller shall be equipped with a 2-position chilled water isolation valve (CHxCHWISOV-C). Each chiller shall be equipped with a 2-position (or modulating to act as a 2-position) condenser water isolation valve (CHxCWISOV-C). Chiller runtime (CHx-RUNTIME) will be totalized and monitored from the FMS system. The chillers, operating order shall be determined by, an operator rank number. If a device failure is detected (CHLR x-Enabled) or becomes unavailable for maintenance (CHx-MS), it will be shut down in an orderly manner and the next available device in the sequence shall be started.

PRIMARY CHILLED WATER PUMP CONTROL:

The CPO application is designed to maximize the pumping efficiency by, choosing the most efficient pump (or combination of pumps) available. In general, when enabled, the application determines the combination that best meets the requirements and turns on/off the appropriate pumps (PCHWPx-C) in an orderly manner to arrive at the desired combination. The best combination produces the largest adjusted efficiency. Efficiencies are calculated based on the device efficiency, percent load, required capacity and rated flow. The required flow (current load) can be determined based on the affinity law of the pumps, which states that the current flow produced by a pump is directly proportional to it's speed. Therefore the CPO application uses the speed (PCHWPx-O) of the currently operating pumps (for single value, all pumps run at the same speed), this required flow is then used to compare the various combination options available. The application determines the combination of pumps that provides this flow at the highest adjusted efficiency. The new combination, which is based off individual pump efficiencies, obeys the rules regarding valid device combinations, and provides the highest adjusted efficiency. There are two variable speed driven, primary CHW pumps piped to a common header, so that any CHW pump shall be capable of running with any chiller or heat exchanger. The CHW system is piped in a variable primary flow configuration, with a 2-way, CHW bypass valve (CHWBYPV-O) across the chillers and pumps to maintain minimum flow (PCHW-F) through the operating chillers. The CHW pumps, operating order shall be determined by, equalization of run-time. The CPO program shall totalize run-hours for each CHW pump (PCHWP x-Runtime) and adjust the operating order. If a device failure is detected (PCHWP x-Enabled), it will be shut down in an orderly manner and the next available device in the sequence shall be started. A frequency converter fault (PCHWPx-FAULT) input shall shut the primary chilled water pump down and generate an alarm at the OWS. The next available primary chilled water pump shall be enabled.

PRIMARY CHILLED WATER LOOP PRESSURE CONTROL:

The CHW pump speed (PCHWPx-O) shall be controlled to maintain the specified Building-Loop differential pressure setpoint (CHWDP-SP) per existing as sensed by the (4) building pressure sensors. Building-Loop differential-pressure (CHW-DP) error shall be taken into account, when adding pumps. To insure stable system flow, the rate at which CHW pump speed may change shall be limited to 10% per minute (adj.). In order to insure stable and reliable operation, the plant CHW loop differential-pressure sensor's setpoint shall be reset to achieve the desired Building-Loop differential pressure sensor's setpoint.

CONDENSER WATER PUMP CONTROL:

The CPO application is designed to maximize the pumping efficiency by, choosing the most efficient pump (or combination of pumps) available. In general, when enabled, the application determines the combination that best meets the requirements and turns on/off the appropriate pumps (CWPx-C) in an orderly manner to arrive at the desired combination. The best combination produces the largest adjusted efficiency. Efficiencies are calculated based on the device efficiency, percent load, required capacity and rated flow. The required flow (current load) can be determined based on the affinity law of the pumps, which states that the current flow produced by a pump is directly proportional to it's speed. Therefore the CPO application uses the speed (CWPx-O) of the currently operating pumps (for single value, all pumps run at the same speed), this required flow is then used to compare the various combination options available. The application determines the combination of pumps that provides this flow at the highest adjusted efficiency. The new combination, which is based off individual pump efficiencies, obeys the rules regarding valid device combinations, and provides the highest adjusted efficiency. There are two variable speed driven, CW pumps piped to a common header, so that any CW pump or group of pumps, based on energy/maintenance cost optimization algorithms, shall be capable of running with any chiller or heat exchanger and CT combination. The CW pumps, operating order shall be determined by, equalization of run-time. The CPO program shall totalize run-hours for each CW pump (CWP x-Runtime) and adjust the operating order. If a device failure is detected (CWP x-Enabled) or becomes unavailable for maintenance (CWPx-LO), it will be shut down in an orderly manner and the next available device in the sequence shall be started. A frequency converter fault (CWPx-FAULT) input shall shut the condenser water pump down and generate an alarm at the OWS. The next available condenser water pump shall be enabled.

CONDENSER WATER LOOP PRESSURE CONTROL:

The CW pump speed (CWPx-O) shall be controlled to maintain design CW differential pressure as determined by the chiller optimation application or the heat exchanger optimation application, down to 80% (adj.) Of design speed. If the condenser water flow falls below the minimum flow setpoint the application will increase the speed to maintain the minimum flow setpoint.

CONDENSER WATER SYSTEM:

When in waterside economizer operation the CT bypass valve (CTV-O) will never modulate. The CT bypass valve is either fully open to the tower (in Start HX, HX Control, and CHWS-T Timing states) or full closed to the tower (in the Warm CW-T state). Whenever a chiller is started, a CT cell shall be enabled. CT fans shall be sequenced to minimize the sum of the chiller and CT fan power consumption at all load conditions. The optimal CT airflow rate shall be determined by an algorithm using the following information:

- Chiller part-load ratio (CPLR) - defined as the current chiller capacity [tons] / design chiller capacity [tons].
- Chiller and CT fan power consumption at design conditions [kw].
- Average relative change in chiller power consumption for each degree change in CW supply temperature [kw/deg f (kw/deg c)]. Normal range is 0.01 to 0.03 kw/deg f (0.018 to 0.054 kw/deg c), depending on chiller design.
- CT range [deg f (deg c)] and approach [deg f (deg c)] at design conditions.

The information described above is readily obtainable (often included in the equipment submittal), or alternatively is available from the chiller and tower manufacturers. The chiller part-load ratio (CPLR) is obtained by measuring the chiller capacity directly. In addition to minimizing power consumption, this open-loop approach responds very quickly to load changes, while providing control stability which reduces CT motor and drive wear. For additional technical details, refer to (Braun and Diderrich, 1990) or the Ashrae HVAC applications handbook. In accordance with the fan laws, the % output command to each CT fan will equal the % of design CT airflow rate calculated by the optimization algorithm. The CW supply temperature (CWS-T) must be kept above a minimum limit (CW-SP, 55°F adj. for the existing YORK YT chiller and 34°F for the new Magnetic Bearing Chiller), to prevent surge and other chiller problems at all load conditions. The condenser water (CW) system consists of three individual cooling tower (CT) cells, with common sump and VSD-Driven fan (CTx-C, CTx-O). The cooling towers, operating order shall be determined by, equalization of run-time. The CPO program shall totalize run-hours for each cooling tower (TWR x-Runtime) and adjust the operating order. If a device failure is detected (TWR x-Enabled), it will be shut down in an orderly manner and the next available device in the sequence shall be started. A frequency converter fault (CTx-FAULT) input shall shut the cooling tower fan down and generate an alarm at the OWS. The next available cooling tower fan shall be enabled. A tower-vibration (CTxVIB-A) switch shall shut the cooling tower fan down and generate an alarm at the OWS. The next available cooling tower fan shall be enabled.

INITIAL CHILLER START-UP:

The following sequence applies to the specific case when the CPO needs to start the first chiller.

- Command isolation valves to fully open position.
- Once valve positions have been proven fully open, command corresponding pump to start.
- Prove pump running status. After a 60 second (adj.) Stabilization delay, command 1st chiller to start.

ADDING ADDITIONAL CHILLERS:

A pull-down routine shall load-limit the chiller (through it's current-limit setpoint) to maintain an operator-adjustable kw setpoint for 10 minutes (adj.). At the conclusion of pull-down routine, the following conditions shall result in the start-up of an additional chiller. All chillers will share the load equally (same CHW setpoint flow proportioned to the design chiller capacity) and, after an initial start-up period, shall ramp up together. The minimum number of VSD-Driven chillers will operate to stay within the optimal part-load ratio (PLR) range, 30-80% (adj.). The PLR shall be adjusted in real time, based on changes in CW supply temperature or CHW setpoint changes. This relationship shall be obtained from the chiller manufacturer for the specific models present in the chiller plant. As the operating chillers' PLR rises above 80% (adj. By the chiller's operating algorithm), an additional chiller shall be added. The chiller optimization program shall determine this PLR value, using data gathered directly from the system supply and return temperatures, and system flow meter. Or - if the CHW supply temperature rises 3°F(1.7 deg c) (adj.) Above the setpoint for an adjustable period (typ. 20 minutes).

- When the CPO program has determined that an additional chiller is needed, the following sequence will be followed:
- After an adjustable period (typ. 1 minute), the next available CHW pump, if needed, and CW pump shall be commanded to start.
- Once the status of the pumps has been proven, the respective CHW and CW isolation valves shall be commanded to open. The CHW valve shall be commanded to open slowly, over 90 seconds (adj.) to avoid nuisance trips of operating chillers. The chiller shall then be commanded to start. The operating chillers' current-limit-setpoints shall be released, allowing them to load-up as required.

STOPPING ADDITIONAL CHILLERS AND CHILLER PLANT SHUTDOWN:

When the FMS determines that the operating chillers have a PLR of less than 30% (adj.), the chiller with the highest operator ranking or run-time shall be shutdown, unless shutting down a chiller will cause flow rates in remaining chillers to exceed their maximum values. The chiller shall receive a stop command, and the CHW and CW pumps will continue to run for an additional 2 minutes (adj.). After the CW pump has been proven off, the CT isolation valve shall be commanded to close.

HEAT EXCHANGER CONTROL:

The Heat Exchanger provides chilled water to the building. Cooling Towers are modulated to control the CWS-T to the Economizer CWS-T setpoint to meet the building load. When CHWS-T begins to get sufficiently warm for an extended time (CHWS-T Wait Time) the system begins to transition back to mechanical cooling. The waterside economizer (HX) system consists of one heat exchanger. Each Heat Exchanger shall be equipped with a 2-position chilled water isolation valve (HXxCHWISOV-C).

INITIAL HEAT EXCHANGER START-UP:

The following sequence applies to the specific case when the CPO needs to start the first heat exchanger. The Heat Exchanger(s) will become suitable for operation when the outside air temperature is below the Economizer Enable Setpoint (ECON EN STPT). The Heat Exchanger will become unsuitable for operation when the outside air temperature is above the Economizer Enable Setpoint (ECON EN STPT) plus a differential (2°F). After the last chiller turns off, the heat exchanger is enabled and its dedicated pump is turned on. After the pump delay timer expires the heat exchanger enters the control mode. Once the chiller pump down time expires, the chiller(s) dedicated pump(s) are commanded off. Simultaneous with the disabling of the chillers, the pump selector begins to send the actual required flow (sum of chillers and HX) to the pumps. After a pump delay time, the HX Isolation vales open. The chiller and heat exchanger isolation valves remain open until the valve stroke time expires, the heat exchanger control mode is enabled. Once the chiller pump down time plus the chiller delay time expires, the chiller isolation valves will close. Water flow is now routed exclusively through the heat exchanger.

TRANSITIONING BACK TO CHILLER CONTROL

When CHWS-T has stayed warm for a sufficient time period or the economizer has become unsuitable the system will begin to transition back to chiller control. The pump selector begins to send the actual required flow (sum of chillers and HX) to the chiller system. Tower fan(s) are turned off. The cooling tower bypass valve is opened. So that the CWS-T becomes warm enough to open the chiller(s) isolation valves(s). Once the chiller system is in control again the heat exchangers are disabled and their isolation valves are closed. When the last heat exchanger is off, all flow is now routed exclusively through the chiller(s). After the heat exchanger isolation valve(s) stroke time expires. The heat exchanger required flow value will now drop to zero.

ADDITIONAL POINTS MONITORED BY THE FMS:

- Chiller n Status (CHn-S)
- Refrigerant Monitor Panel Alarm (REFRIG-A)
- Tower n Vibration Alarm (CTnVIB-A)

FNAME
REVDATE
USER

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No.	Revision Note	Date

USCB SAND SHARKS

Project
University of South Carolina Beaufort
HH Gateway Campus Chiller Replacement
Project No. H36-I316
One University Blvd.
Bluffton, SC 29909
(843) 208-8000

Sheet Title
Chiller Replacement
Central Plant

Essex Project # 17109	Sheet # M5
Date May 19, 2017	
Scale	

ELECTRICAL NOTES AND SPECIFICATIONS:

1. ELECTRICAL INSTALLATION SHALL BE PERFORMED IN ACCORDANCE WITH THE PRESENTLY EFFECTIVE VERSION OF THE NATIONAL ELECTRIC CODE AND ALL OTHER APPLICABLE STATE OR LOCAL CODES, LAWS, AND ORDINANCES. WHERE ONE CODE DIFFERS FROM ANOTHER, THE MORE STRINGENT SHALL APPLY.

2. THE WORD "CONTRACTOR" AS USED IN THE "ELECTRICAL SCOPE OF WORK" SHALL MEAN THE ELECTRICAL SUBCONTRACTOR.

3. WHEREVER ON THE ELECTRICAL DRAWINGS THE WORD "PROVIDE" IS USED IT SHALL BE INFERRED TO MEAN "FURNISH AND INSTALL", UNLESS NOTED OTHERWISE.

4. THE CONTRACTOR SHALL OBTAIN ALL LICENSES, PERMITS, INSPECTIONS, AND CERTIFICATES OF APPROVAL FROM ALL AUTHORITIES HAVING JURISDICTION AND SHALL PAY ALL FEES REQUIRED FOR THE EXECUTION OF THIS WORK. SATISFACTORY EVIDENCE OF COMPLIANCE WITH THE REQUIREMENTS AND ALL CERTIFICATES OF INSPECTION SHALL BE DELIVERED TO THE OWNER PROMPTLY UPON REQUEST. THE CONTRACTOR SHALL ALSO PAY FOR ANY REQUIRED TEST(S) AND PROVIDE ALL NECESSARY LABOR, MATERIALS, AND EQUIPMENT REQUIRED TO PERFORM THE TEST(S).

5. ALL WORK SHALL BE PERFORMED IN A NEAT, CLEAN, AND ORDERLY MANNER. ALL WIRING AND RACEWAYS SHALL BE CONCEALED TO THE GREATEST EXTENT POSSIBLE.

6. THE CONTRACTOR SHALL SUPPLY ALL MATERIAL, EQUIPMENT, TOOLS, TRANSPORTATION, AND SUPERVISION TO PROVIDE A COMPLETE AND SATISFACTORILY OPERATING ELECTRICAL SYSTEM. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR STORING AND HANDLING ALL MATERIALS; THIS INCLUDES ANY OWNER SUPPLIED MATERIAL, FIXTURES OR EQUIPMENT.

7. ALL MATERIAL, EQUIPMENT, AND FIXTURES SHALL BE SPECIFICATION GRADE, NEW, AND U.L. LISTED FOR THE PURPOSE FOR WHICH IT IS USED.

8. THE ENTIRE ELECTRICAL SYSTEM SHALL BE FREE OF IMPROPER GROUNDS, SHORT OR OPEN CIRCUITS AND BE TESTED PRIOR TO ENERGIZING THE SYSTEM. ANY DEFECTS DISCOVERED DURING TESTING SHALL BE CORRECTED BY THE CONTRACTOR.

9. CONTRACTOR SHALL GUARANTEE ELECTRICAL WORK FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE BY THE OWNER. CONTRACTOR SHALL FURNISH A WRITTEN COPY OF THE GUARANTEE TO THE OWNER. CONTRACTOR SHALL SUPPLY ALL LABOR AND MATERIALS REQUIRED TO PERFORM ANY WARRANTY WORK AT NO CHARGE TO THE OWNER.

10. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN ALL TEMPORARY LIGHTING AND POWER AS REQUIRED FOR ALL TRADES, INCLUDING ANY THREE-PHASE POWER REQUIRED, DURING THE COURSE OF THE PROJECT. TEMPORARY LIGHTING SHALL BE ADEQUATE ENOUGH TO ENSURE WORKER SAFETY AND SHALL COMPLY WITH OSHA STANDARDS. UPON COMPLETION OF THE PROJECT THE CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL TEMPORARY LIGHTING AND POWER.

11. ALL CONDUCTORS SHALL BE 75 DEGREE C, 600 VOLT, TYPE THWN/THHN INSULATION COPPER CONDUCTOR UNLESS NOTED OTHERWISE. ALL CONDUCTORS INSTALLED BELOW GRADE SHALL HAVE TYPE THWN INSULATION.

12. ALL BRANCH CIRCUIT WIRING SHALL BE A MINIMUM OF #12 AWG UNLESS NOTED OTHERWISE. ANY CIRCUIT INDICATED TO BE LARGER THAN #12 AWG SHALL BE SIZED AS INDICATED FOR THE ENTIRE LENGTH OF THE CIRCUIT.

13. UNLESS OTHERWISE NOTED ALL 120-VOLT, 20-AMP CIRCUIT WIRING UP TO 90 FEET SHALL BE #12 AWG; CIRCUITS EXCEEDING 90 FEET IN LENGTH FROM THE PANEL TO THE FURTHEST OUTLET OF POWER (RECEPTACLE, LIGHT FIXTURE, ETC.) SHALL UTILIZE #10 AWG CONDUCTORS.

14. ALL CONDUCTORS INSTALLED ABOVE GRADE SHALL BE IN RIGID GALVANIZED STEEL (RGS) CONDUIT AS PERMITTED BY THE NATIONAL ELECTRIC CODE.

15. ALL EXPOSED RACEWAYS SHALL BE RUN SO AS TO MINIMIZE THE NUMBER OF VERTICAL RUNS. ALL EXPOSED CONDUIT SHALL BE ROUTED TIGHT AGAINST THE STRUCTURE AND BE RUN PARALLEL AND PERPENDICULAR TO THE WALLS, CEILINGS, AND FLOORS, AS APPLICABLE.

16. ALL CONNECTIONS TO EQUIPMENT SUBJECT TO VIBRATION SUCH AS MECHANICAL EQUIPMENT, MOTORS, TRANSFORMERS, AND THE LIKE, SHALL BE MADE USING METALLIC FLEX. ALL OUTDOOR FLEX SHALL BE PVC COATED. NO METALLIC FLEX SHALL EXCEED 6 FEET IN LENGTH.

17. ALL INDOOR DISCONNECTS AND PANELS SHALL BE IN NEMA TYPE 1 ENCLOSURES, UNLESS NOTED OTHERWISE. ALL EXTERIOR DISCONNECTS, PANELS, METER CENTERS AND SIMILAR EQUIPMENT SHALL BE IN NEMA TYPE 3R ENCLOSURES UNLESS NOTED OTHERWISE. ALL EQUIPMENT SHALL HAVE THE APPROPRIATE VOLTAGE AND CURRENT RATINGS SUITABLE FOR THE APPLICATION. ALL DISCONNECTS/SAFETY SWITCHES SHALL BE TOTALLY ENCLOSED, HEAVY DUTY TYPE, AND BE HORSEPOWER RATED (IF APPLICABLE).

18. CONTRACTOR SHALL VERIFY ALL MECHANICAL EQUIPMENT ELECTRICAL SIZES AND LOCATIONS PRIOR TO ROUGH-IN AND INSTALLING FEEDER CIRCUITS. CONTRACTOR SHALL ALSO COORDINATE CIRCUIT BREAKER AND DISCONNECT TYPE AND SIZES REQUIRED WITH MECHANICAL CONTRACTOR PRIOR TO INSTALLATION. ANY DISCREPANCIES BETWEEN ACTUAL EQUIPMENT ELECTRICAL REQUIREMENTS AND THAT SHOWN ON THE DRAWINGS SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE ENGINEER.

19. ALL WORK SHALL BE GROUNDED IN ACCORDANCE WITH NATIONAL ELECTRIC CODE REQUIREMENTS. A COMPLETE EQUIPMENT GROUNDING SYSTEM, CONSISTING OF A GREEN INSULATED COPPER WIRE, SHALL BE INSTALLED IN EVERY CONDUIT REGARDLESS OF USE.

20. ALL PANELBOARDS SHALL HAVE THEIR SCHEDULES UPDATED, TYPED AND INSTALLED INSIDE THE FRONT COVER.

21. ALL ELECTRICAL EQUIPMENT (PANELBOARDS, SWITCHBOARDS, EQUIPMENT DISCONNECTS, ETC.) SHALL BE CLEARLY IDENTIFIED WITH LAMINATED PLASTIC NAMEPLATES. ENGRAVE EQUIPMENT DESIGNATION (NAME) AND IDENTIFYING INFORMATION (VOLTAGE, PHASE, FED FROM) AS SHOWN ON THE PLANS IN ¼" HIGH LETTERS. ALL EQUIPMENT NAMEPLATES SHALL BE WHITE WITH RAISED BLACK LETTERS EXCEPT THAT SERVING EMERGENCY EQUIPMENT SHALL BE WHITE WITH RAISED RED LETTERS. NAMEPLATES SHALL BE ATTACHED TO THE FRONT OF EQUIPMENT ENCLOSURES, WHERE CLEARLY VISIBLE, WITH ADHESIVE AS WELL AS TWO SCREWS IN OPPOSITE ENDS.

22. ALL PANELBOARDS, DISCONNECTS, TRANSFORMERS, CIRCUIT BREAKERS, AND OTHER ELECTRICAL EQUIPMENT SHALL BE MANUFACTURED BY SIEMENS, SQUARE-D, GENERAL ELECTRIC, OR EATON CORPORATION. ALL EQUIPMENT PROVIDED ON A PROJECT SHALL BE OF THE SAME MANUFACTURER.

23. ALL CONDUIT RUNS AS SHOWN ON THE PLANS ARE DIAGRAMMATIC ONLY; EXACT ROUTING AND METHOD OF SUPPORT SHALL BE DETERMINED IN THE FIELD.

24. ALL WORK UNDER THIS SECTION SHALL BE COORDINATED IN THE FIELD WITH THE GENERAL CONTRACTOR AND ALL OTHER TRADES TO ELIMINATE ANY INTERFERENCES WITH DUCTWORK, PIPING, STRUCTURAL MEMBERS, ETC. CONFLICTS BETWEEN EQUIPMENT AND/OR MATERIAL LOCATIONS THAT ARISE SHALL BE CORRECTED BY THE CONTRACTOR AS DIRECTED BY THE ARCHITECT-ENGINEER AT NO ADDITIONAL COST TO THE OWNER.

25. THE WORK OF THIS DIVISION SHALL ALSO INCLUDE THOSE ITEMS NOT SPECIFICALLY MENTIONED OR DESCRIBED BUT WHICH ARE NECESSARY TO PRODUCE A COMPLETE AND OPERABLE ELECTRICAL SYSTEM THAT CONFORMS TO THE DESIGN INTENT. SUCH ITEMS INCLUDE BUT ARE NOT LIMITED TO: FITTINGS, BOXES, CONNECTORS, WIRE NUTS, BLANK COVERS, STRAPPING, FASTENERS, ETC.

26. ALL LIGHT SWITCHES AND RECEPTACLES SHALL BE BY THE SAME MANUFACTURER, CARRY THE APPROPRIATE VOLTAGE RATING AND CURRENT RATING (MINIMUM 20A), AND HAVE A GROUND SCREW. DEVICE COLOR SHALL BE SELECTED BY THE ARCHITECT UNLESS STATED WITH THE DEVICE. RECEPTACLES SHALL BE MOUNTED 18 INCHES ABOVE FINISHED FLOOR AND SWITCHES SHALL BE MOUNTED 42" TO THE BOTTOM OF THE BOX ABOVE FINISHED FLOOR, UNLESS NOTED OTHERWISE. DEVICES SHALL BE MANUFACTURED BY PASS AND SEYMOUR, LEVITON, ARROW-HART, OR A SIMILAR MANUFACTURER.

27. THE CONTRACTOR SHALL ADHERE TO EQUIPMENT MANUFACTURER'S INSTALLATION INSTRUCTIONS AND RECOMMENDATIONS WHEN INSTALLING EQUIPMENT. IF A CONFLICT EXISTS BETWEEN THESE DRAWINGS AND THE EQUIPMENT MANUFACTURER'S INSTRUCTIONS THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND AWAIT CLARIFICATION IN WRITING.

28. ALL SPLICES SHALL BE MADE IN APPROPRIATE JUNCTION BOXES. SPLICES IN CONDUCTOR SIZE AWG #10 OR SMALLER MAY BE MADE USING SPRING-LOCK CONNECTORS (WIRE-NUTS). SPLICES IN CONDUCTORS LARGER THAN AWG #10 SHALL BE MADE USING COMPRESSION TYPE CONNECTORS OR INSULATED TERMINAL BLOCKS SUCH AS THOSE MANUFACTURED BY POLARIS.

29. OUTLET BOXES FOR RECEPTACLES, LIGHT FIXTURES, LIGHT SWITCHES AND OTHER SIMILAR DEVICES SHALL BE FIRMLY ATTACHED TO STUDS OR OTHER STRUCTURAL MEMBERS. ALL BOXES SHALL BE LEVEL AND PLUMB. BOXES INTENDED TO SUPPORT CEILING FANS OR LARGE LIGHTING FIXTURES SHALL BE ADEQUATELY BLOCKED FOR SUPPORT AND BE LISTED FOR THE PURPOSE.

30. CONTRACTOR SHALL SUBMIT MANUFACTURER'S DATA SHEETS FOR MATERIALS AND EQUIPMENT TO THE ENGINEER FOR REVIEW AND APPROVAL.

31. PRODUCTS USED ON THIS PROJECT SHALL BE MANUFACTURED BY COMPANIES REGULARLY ENGAGED IN THE PRODUCTION OF SIMILAR PRODUCTS WITH A MINIMUM HISTORY OF THREE YEARS SUCCESSFUL PRODUCTION.

32. CONTRACTOR SHALL FURNISH THE OWNER A COMPLETE BOUND SET OF EQUIPMENT CATALOG SHEETS, MANUFACTURER'S SPECIFICATIONS AND SERVICE, AND OPERATING INSTRUCTIONS ON EQUIPMENT FURNISHED UNDER THIS DIVISION UPON COMPLETION OF WORK UNDER THIS DIVISION.

33. CONTRACTOR SHALL PROVIDE ONE SET OF 'AS-BUILT' DRAWINGS TO THE OWNER UPON COMPLETION OF CONSTRUCTION. THE AS-BUILT DRAWINGS SHALL BE CLEAN, LEGIBLE, NEAT, COMPILED IN AN ORDERLY MANNER, AND CONTAIN ALL WORK PERFORMED BY THE CONTRACTOR THAT DEVIATES FROM THE ORIGINAL CONTRACT DOCUMENTS.

34. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS TO DETERMINE EXACT EXTENT OF WORK TO BE PERFORMED PRIOR TO SUBMITTING BID.

35. BOXES SHALL BE GALVANIZED STEEL AND SHALL BE SIZED TO ACCOMMODATE WIRING, THE EQUIPMENT, OR APPARATUS TO BE INSTALLED AS REQUIRED BY NATIONAL ELECTRIC CODE.

36. WHERE MATERIAL IS CALLED OUT IN THE LEGEND BY MANUFACTURER, TYPE, OR CATALOG NUMBER, SUCH DESIGNATIONS ARE TO ESTABLISH STANDARDS OF DESIRED QUALITY. ACCEPTANCE OR REJECTION OF PROPOSED SUBSTITUTIONS SHALL BE SUBJECT TO THE APPROVAL OF THE ARCHITECT AND ENGINEER.

ELECTRICAL LEGEND

	DUPLEX RECEPTACLE; 20A-120V 2-POLE GROUNDING TYPE W/ WEATHERPROOF IN-USE COVERPLATE
$	SINGLE-POLE TOGGLE SWITCH; 20A 120V 2-POLE GROUNDING TYPE W/ WEATHERPROOF IN-USE COVERPLATE
XX/X/X	EQUIPMENT DISCONNECT - NONFUSED; 'XX/X/X' INDICATES FRAME SIZE/POLE/NEMA TYPE
VFD	VARIABLE FREQUENCY DRIVE PROVIDED BY MECHANICAL INSTALLED AND CONNECTED BY ELECTRICAL
(XX)	MOTOR; 'XX' REPRESENTS HORSEPOWER
- - - - - - -	'DASHED' LINES REPRESENT EXISTING EQUIPMENT, CONDUIT, CIRCUITING, ETC.

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No.	Revision Note	Date

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HH Gateway Campus Chiller Replacement
Project No. H36-I316
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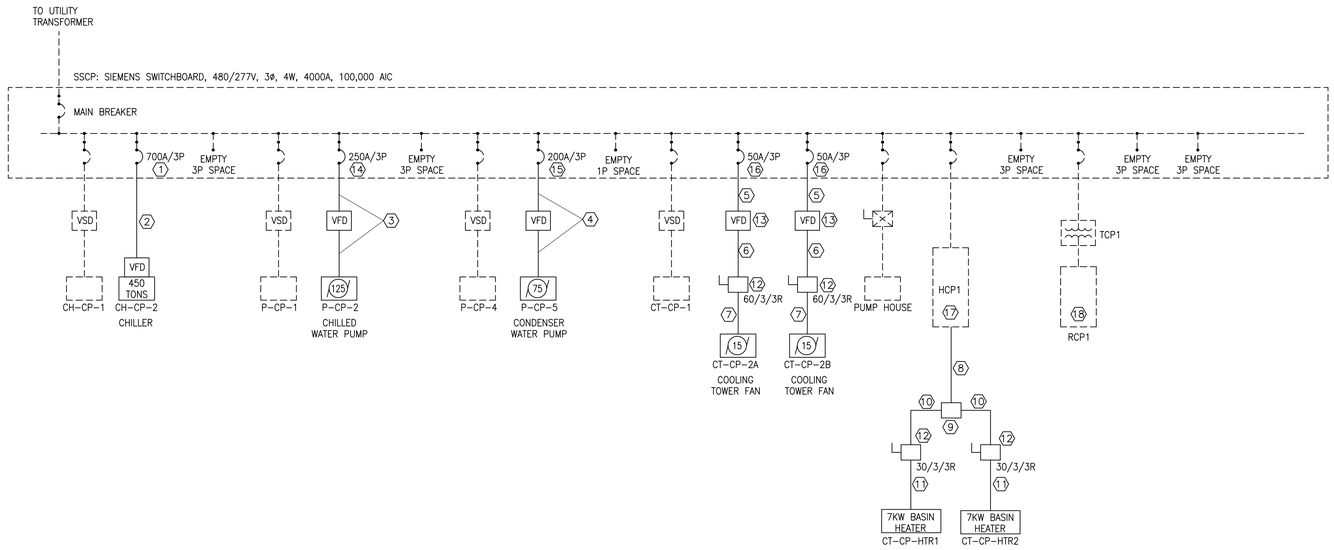
Sheet Title
ELECTRICAL SPECIFICATIONS & LEGEND

Essex Project # 17109	Sheet # E001
Date March 28, 2017	1 OF 3
Scale AS SHOWN	



ELECTRICAL RISER DIAGRAM GENERAL NOTES:

1. ALL FINAL CONNECTIONS TO MOTORS, VFD'S, DISCONNECTS LOCATED AT THE COOLING TOWER AND THE CHILLER CONTROLLER SHALL BE MADE USING FLEXIBLE METAL CONDUIT. ALL OUTDOOR FLEXIBLE CONDUIT SHALL BE PVC COATED LIQUID-TIGHT. NO FLEXIBLE CONDUIT SHALL EXCEED 6 FEET IN LENGTH. ALL FLEXIBLE CONDUIT SIZES SHALL BE THE SAME AS THE RIGID CONDUIT SYSTEM THEY ARE ASSOCIATED WITH.

2. ALL NEW BREAKERS SHOWN ARE TO BE INSTALLED IN EXISTING EMPTY SPACES. PROVIDE ALL REQUIRED LUG KITS, MOUNTING HARDWARE, ETC. FOR BREAKER INSTALLATION.

3. ANY POWER OUTAGES REQUIRED TO PERFORM THE ASSOCIATED SCOPE OF WORK SHALL BE COORDINATED WITH USCB FACILITIES MAINTENANCE PRIOR TO OCCURRING AND SHALL BE ASSUMED TO OCCUR AFTER NORMAL BUSINESS HOURS AND ON WEEKENDS.

4. ALL EXISTING CONDUITS INDICATED TO BE USED SHALL BE EXTENDED UP FROM WHERE THEY PENETRATE THE SLAB AND BE CONNECTED TO THE RESPECTIVE EQUIPMENT USING A CONDUIT OF THE SAME SIZE.

5. ALL NEW CONDUIT SHALL BE RIGID GALVANIZED STEEL (RGS).

6. ALL NEW VFD'S ARE PROVIDED BY MECHANICAL AND INSTALLED AND CONNECTED BY ELECTRICAL. FIELD COORDINATE WITH MECHANICAL CONTRACTOR.

7. ALL EXISTING CONDUIT ROUTED BELOW GRADE APPEARS TO BE SCH 40 PVC TURNED UP IN RGS INSIDE THE BUILDING. SCHEDULE 40 PVC STUB-UPS EXIST AT CHILLER TOWER PAD OUTSIDE. CONDUITS SHALL BE CONVERTED AT THE SLAB TO RGS AND EXTENDED AS REQUIRED.

ELECTRICAL RISER DIAGRAM KEYED NOTES:

ALL KEYED NOTES ARE REPRESENTED BY A ⬡ SYMBOL:

1. PROVIDE SIEMENS TYPE SCND6 CIRCUIT BREAKER IN EXISTING EMPTY SPACE.

2. PROVIDE (2) RUNS OF (3) 350 KCMIL CU'S & (1) 1/0 AWG CU GROUND EACH IN (2) EXISTING 3" CONDUITS. THE OTHER EXISTING 3" CONDUITS SHALL REMAIN AS SPARES.

3. PROVIDE (3) #4/0 AWG CU'S & (1) #4 AWG CU GROUND IN EXISTING 2.5" CONDUIT FROM SWITCHBOARD SSCP TO VFD. PROVIDE (3) #4/0 AWG CU'S & (1) #4 AWG CU GROUND IN 2.5" CONDUIT ROUTED OVERHEAD FROM VFD TO PUMP. PROVIDE 1/2" ALL-THREAD AND 1.5" UNISTRUT FRAMING TO SUPPORT CONDUIT FROM STRUCTURE ABOVE. SEE POWER INSTALLATION PLAN.

4. PROVIDE (3) #2/0 AWG CU'S & (1) #6 AWG CU GROUND IN EXISTING 2" CONDUIT FROM SWITCHBOARD SSCP TO VFD. PROVIDE (3) #2/0 AWG CU'S & (1) #6 AWG CU GROUND IN 2" CONDUIT ROUTED ALONG THE FLOOR, UNDER CHILLED WATER PIPING, FROM VFD TO CONDENSER WATER PUMP. SEE POWER INSTALLATION PLAN.

5. PROVIDE (3) #8 AWG CU'S & (1) #10 AWG CU GROUND IN EXISTING 2" CONDUIT TO VFD.

6. PROVIDE (3) #8 AWG CU'S & (1) #10 AWG CU GROUND IN EXISTING 2" CONDUIT FROM VFD TO COOLING TOWER. EXISTING CONDUIT IS REQUIRED TO BE EXTENDED UP AND ALONG COOLING TOWER SUPPORT STRUCTURE TO COOLING TOWER. SEE ELECTRICAL PLANS FOR APPROXIMATE CONDUIT ROUTING.

7. PROVIDE (3) #8 AWG CU'S & (1) #10 AWG CU GROUND IN 3/4" CONDUIT FROM DISCONNECT TO COOLING TOWER FAN. MAKE FINAL CONNECTION TO FAN MOTOR USING LIQUIDTIGHT FLEXIBLE METAL CONDUIT.

8. PROVIDE (6) #10 AWG CU'S & (2) #10 AWG CU GROUNDS IN EXISTING 1.25" CONDUIT FROM PANEL TO JUNCTION BOX OUTSIDE AT COOLING TOWER. EXTEND EXISTING 1.25" CONDUIT UP TO JUNCTION BOX AT TOWER SUPPORT RACK WITH RIGID GALVANIZED STEEL CONDUIT.

9. PROVIDE A 12"X12"X6" NEMA 3R METALLIC JUNCTION BOX AT COOLING TOWER RACK AND EXTEND HEATER CIRCUITS TO DISCONNECT AT TOWER BASIN. HEATER CIRCUITS SHALL BE CONTINUOUS FROM BREAKER TO DISCONNECT; SPLICES ARE NOT ACCEPTABLE IN JUNCTION BOX; BOX SHOWN FOR PULLING WIRE AND SEPARATING CIRCUITING ONLY.

10. PROVIDE 3/4" CONDUIT WITH (4) #10 AWG CU'S FROM JUNCTION BOX TO HEATER DISCONNECT AT TOWER BASIN. WIRES SHALL BE CONTINUOUS AND FED THROUGH JUNCTION BOX FROM BREAKER IN PANEL TO DISCONNECT; DO NOT SPLICE.

11. PROVIDE 3/4" CONDUIT AND LIQUIDTIGHT FLEXIBLE METAL CONDUIT WITH (4) #10 AWG CU'S AND MAKE FINAL CONNECTIONS TO BASIN HEATER FROM DISCONNECT.

12. DISCONNECT SHALL BE LOCATED OUTSIDE AT COOLING TOWER FOR LOCAL MEANS OF DISCONNECT.

13. VFD LOCATED INSIDE BUILDING; SEE PLANS FOR LOCATION.

14. PROVIDE SIEMENS TYPE HHFD6 CIRCUIT BREAKER IN EXISTING EMPTY SPACE. INSTALL IN EMPTY SPACE ACROSS FROM EXISTING CHILLED WATER PUMP BREAKER.

15. PROVIDE SIEMENS TYPE HHFD6 CIRCUIT BREAKER IN EXISTING EMPTY SPACE. INSTALL IN EMPTY SPACE ACROSS FROM EXISTING CONDENSER WATER PUMP BREAKER.

16. PROVIDE SIEMENS TYPE CED6 CIRCUIT BREAKER IN EXISTING EMPTY SPACE IN SECTION 2 OF THE SWITCHBOARD.

17. CONNECT THE THREE PHASE WIRES SERVING CT-PC-HTR1 TO THE EXISTING 20A/3P BREAKER IN SPACES 14,16,18 IN PANEL HCP1. CONNECT THE THREE PHASE WIRES SERVING CT-PC-HTR2 TO THE EXISTING 20A/3P BREAKER IN SPACES 20,22,24 IN PANEL HCP1. PROVIDE UPDATED TYPED CIRCUIT DIRECTORY IN PANEL REFLECTING ADDED CIRCUITS.

18. CONNECT THE NEW COOLING TOWER PIPE HEAT TRACE WIRES TO THE EXISTING 20A/1P GFCI BREAKER IN SPACE 2 IN PANEL RCP1. CONNECT THE NEW COOLING TOWER CONVENIENCE RECEPTACLE WIRES TO THE EXISTING 20A/1P GFCI BREAKER IN SPACE 4 IN PANEL RCP1. BOTH CIRCUITS SHALL BE ROUTED SEPARATELY IN (2) EXISTING 3/4" CONDUITS ROUTED TO THE COOLING TOWER. SEE ELECTRICAL POWER PLAN FOR LOCATIONS. PROVIDE UPDATED TYPED CIRCUIT DIRECTORY IN PANEL REFLECTING ADDED CIRCUITS.

1 E100 PARTIAL ELECTRICAL RISER DIAGRAM – NEW & EXISTING
SCALE: NOT TO SCALE

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No.	Revision Note	Date

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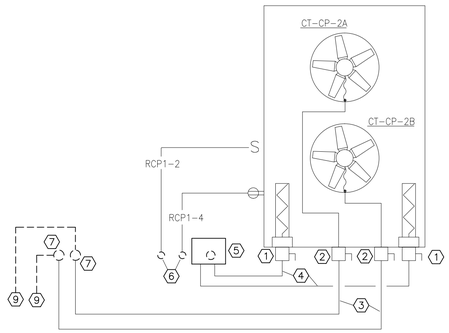
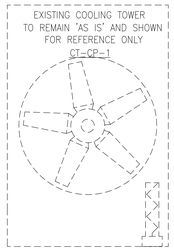
Sheet Title
ELECTRICAL RISER DIAGRAM

Essex Project #	Sheet #
17109	E100
Date: March 28, 2017	2 OF 3
Scale: AS SHOWN	





ELECTRICAL POWER PLAN GENERAL NOTES:

1. ALL CONDUIT ROUTING AND EQUIPMENT LOCATIONS SHALL BE COORDINATED WITH EXISTING CONDITIONS AND EQUIPMENT. EXISTING CONDUITS INDICATED BELOW SLAB SHALL BE EXTENDED AND USED FOR NEW CIRCUITS AS INDICATED. EXISTING CONDUIT PATHS HAVE BEEN FIELD VERIFIED TO EXIST; ALL INDOOR CONDUITS HAVE EXISTING PULL STRINGS INSTALLED. NO PULL STRINGS ARE INSTALLED IN EXTERIOR CONDUITS. CONTRACTOR TO FIELD VERIFY ANY ADDITIONAL EXISTING CONDITIONS AS REQUIRED.

2. FIELD COORDINATE THE LOCATION OF ALL NEW DISCONNECTS, VFD'S, ETC. WITH EXISTING EQUIPMENT, PIPING, ETC. AND ADJUST NEW EQUIPMENT LOCATIONS SUCH THAT EXISTING EQUIPMENT IS NOT AFFECTED BY THE SCOPE OF WORK. ADEQUATE WALL SPACE EXISTS FOR NEW EQUIPMENT WHERE SHOWN.

3. NEW VFD'S ARE PROVIDED BY MECHANICAL AND INSTALLED AND CONNECTED BY ELECTRICAL. FIELD COORDINATE WITH MECHANICAL CONTRACTOR.

4. ALL NEW CONDUIT SHALL BE RIGID GALVANIZED STEEL.

ELECTRICAL POWER PLAN KEYED NOTES:

ALL KEYED NOTES ARE REPRESENTED BY A ⬡ SYMBOL:

1. PROVIDE NON-FUSED DISCONNECT PER ELECTRICAL RISER DIAGRAM FOR COOLING TOWER BASIN HEATERS. FIELD COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR.

2. PROVIDE NON-FUSED DISCONNECT PER ELECTRICAL RISER DIAGRAM FOR COOLING TOWER FANS. FIELD COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR.

3. PROVIDE CONDUIT AND WIRE PER ELECTRICAL RISER DIAGRAM FOR COOLING TOWER FANS AND ROUTE ALONG STRUCTURAL STEEL SUPPORT FOR COOLING TOWER.

4. PROVIDE CONDUIT AND WIRE PER ELECTRICAL RISER DIAGRAM FOR COOLING TOWER BASIN HEATERS AND ROUTE ALONG STRUCTURAL STEEL SUPPORT FOR COOLING TOWER.

5. PROVIDE JUNCTION BOX ABOVE EXISTING 1.25" CONDUIT FOR BASIN HEATER CIRCUITS. PROVIDE BOX, CONDUIT AND WIRE PER ELECTRICAL RISER DIAGRAM. SUPPORT BOX FROM COOLING TOWER STRUCTURAL STEEL.

6. EXTEND EXISTING 3/4" CONDUITS STUBBED UP ABOVE CONCRETE PAD FROM PANEL RCP1 WITH 3/4" RGS CONDUIT AND (3) #10 AWG CU'S FROM PANEL TO DEVICE AT TOWER BASIN. WIRES SHALL BE CONTINUOUS FROM BREAKER IN PANEL TO DEVICE. ROUTE CONDUITS ALONG COOLING TOWER STRUCTURAL STEEL.

7. EXISTING 2" CONDUITS STUBBED UP FROM BELOW CONCRETE PAD FOR COOLING TOWER FAN CIRCUITS. PROVIDE CONDUIT AND WIRE PER ELECTRICAL RISER DIAGRAM AND EXTEND AS SHOWN. FAN CIRCUITS SHALL BE CONTINUOUS FROM VFD TO DISCONNECT.

8. EXISTING (4) 3" CONDUITS ROUTED UNDER FLOOR TO SWITCHBOARD SSCP. EXTEND UP TO CHILLER CONTROLLER AND PROVIDE CONDUIT AND WIRE PER ELECTRICAL RISER DIAGRAM. CONDUITS NOT USED TO REMAIN AS "SPARE".

9. EXISTING 2" CONDUIT BELOW SLAB TO BE USED FOR NEW FEEDER AS SHOWN. ONE CONDUIT RUNS FROM VFD LOCATION TO 'SSCP' AND THE OTHER RUNS OUT TO THE COOLING TOWER PAD. SEE ELECTRICAL RISER DIAGRAM.

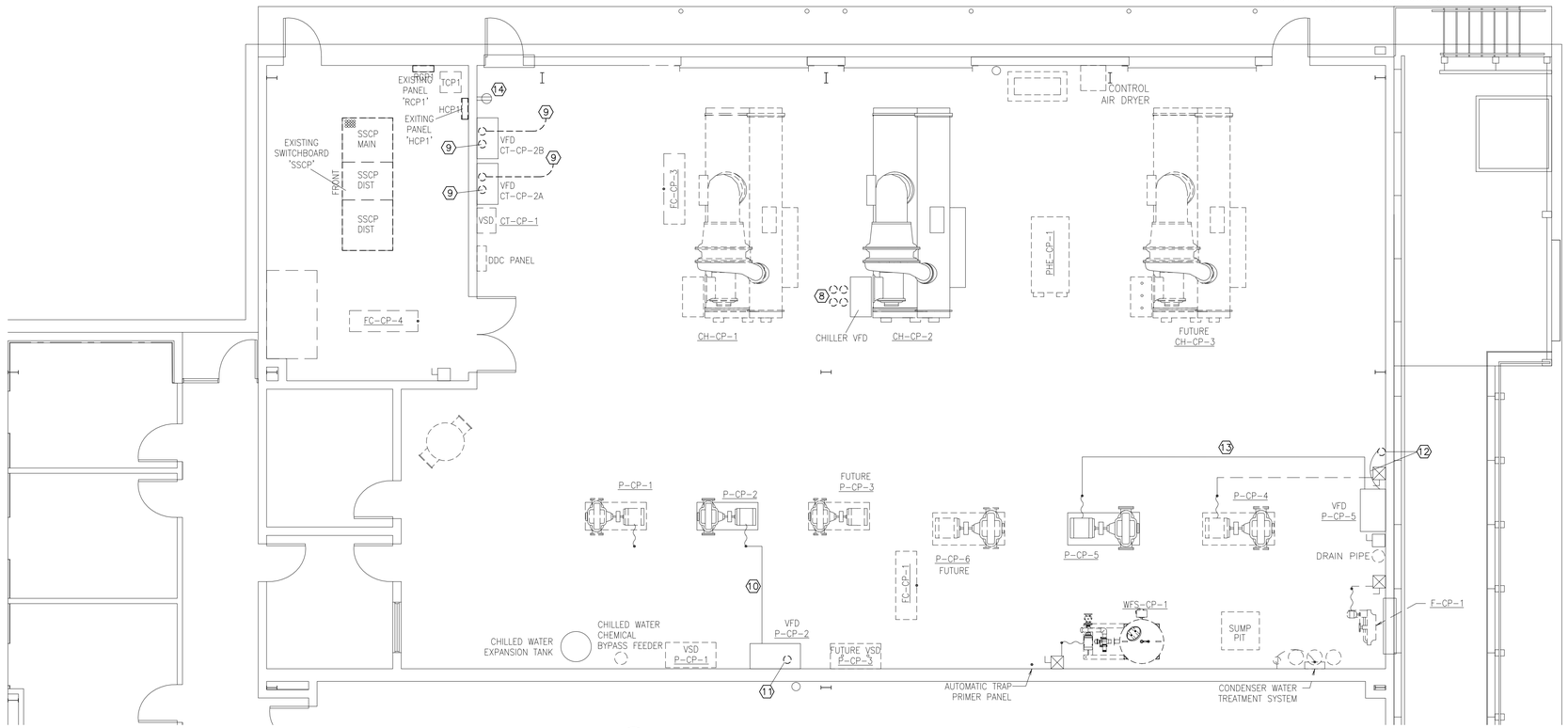
10. NEW 2.5" RGS CONDUIT REQUIRED TO BE RUN OVERHEAD FROM VFD TO PUMP. SUPPORT CONDUIT FROM BUILDING STRUCTURAL STEEL ABOVE USING 1/2" THREADED ROD AND 1.5" UNI-STRUT. PROVIDE ALL NUTS, BOLTS, HARDWARE, FASTENERS, ETC. AS REQUIRED TO SUPPORT CONDUIT FROM STRUCTURE. CONDUIT SHALL BE KEPT A MINIMUM OF 12 FEET AFF, AT THE SAME ELEVATION AS THE SUSPENDED CHILLED WATER PIPING, TO ALLOW SUFFICIENT GROUND CLEARANCE FROM BELOW. PROVIDE WIRE AND CONDUIT PER RISER DIAGRAM.

11. EXISTING 2.5" CONDUIT ROUTED UNDER FLOOR TO SWITCHBOARD SSCP. EXTEND CONDUIT UP TO CHILLED WATER PUMP VFD. WIRES SHALL BE CONTINUOUS FROM SWITCHBOARD TO VFD. PROVIDE CONDUIT AND WIRE PER ELECTRICAL RISER DIAGRAM.

12. EXISTING 2" CONDUIT ROUTED UNDER FLOOR TO SWITCHBOARD SSCP. EXTEND CONDUIT TO NEW CONDENSER WATER PUMP VFD USING 2" CONDUIT. WIRES SHALL BE CONTINUOUS FROM SWITCHBOARD TO VFD. PROVIDE CONDUIT AND WIRE PER ELECTRICAL RISER DIAGRAM.

13. PROVIDE NEW 2" RGS CONDUIT ALONG FLOOR FROM VFD TO PUMP. SUPPORT CONDUIT USING 1.5" UNI-STRUT ANCHORED TO FLOOR. PROVIDE ALL BOLTS, HARDWARE, FASTENERS, ETC. AS REQUIRED TO SUPPORT CONDUIT FROM STRUCTURE. CONDUIT SHALL BE ROUTED BELOW THE CHILLED WATER PIPING RUN ALONG THE FLOOR THIS AREA. PROVIDE WIRE AND CONDUIT PER RISER DIAGRAM.

14. RELOCATED EXISTING RECEPTACLE. DEVICE WAS ORIGINALLY LOCATED ADJACENT TO CT-CP-1 VSD. PROVIDE 4" SQUARE JUNCTION BOX AT CEILING WITH BLANK COVER AND EXTEND 3/4" EMT CONDUIT WITH (3) #12 AWG CU'S TO NEW DEVICE LOCATION AS SHOWN, ON SAME WALL, TO PREVENT INTERFERENCE WITH NEW EQUIPMENT. RE-INSTALL EXISTING RECEPTACLE. NEW AND EXISTING CONDUIT IS SURFACE MOUNTED ON CMU WALL.



1 / E101 ELECTRICAL INSTALLATION PLAN – NEW WORK
SCALE: 3/16" = 1'-0"

ESSEX
DATA-DRIVEN SUSTAINABILITY

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General Notes

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No.	Revision Note	Date

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Sheet Title
ELECTRICAL INSTALLATION PLAN

Essex Project #	Sheet #
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Date: March 28, 2017	3 OF 3
Scale: AS SHOWN	