



UNIVERSITY OF ARKANSAS



NCHP Modernization Chiller Replacement

Contract #RA1194053

Condenser Water Pumps Pre-Purchase Package

Submitted by:



AEI Project No. 19223-00

June 19, 2026

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SECTION 23 0510 MOTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Work under this section is subject to requirements of the Contract Documents including the GENERAL CONDITIONS, SUPPLEMENTAL GENERAL CONDITIONS, and sections under Division 01 - GENERAL REQUIREMENTS.

1.2 SUBMITTALS

- A. Submit in accordance with Division 01 - Submittals.
- B. Shop drawings including, but not limited to, the following:
 - 1. Manufacturer
 - 2. HP, voltage, phase, hertz, RPM
 - 3. Motor type
 - 4. Enclosure type
 - 5. Frame type and size
 - 6. Insulation class
 - 7. NEMA design designation
 - 8. Service factor
 - 9. Rating for inverter duty
 - 10. All bearing types and locations
 - 11. Nominal efficiency at full load
 - 12. Power factor at full load
 - 13. Full load AMPS
 - 14. Weight
 - 15. Shaft grounding brush for motors driven by VFDs.
 - 16. Drawing schematics for the motor indicating dimensions and all components (interior and exterior to the casing).
 - 17. All other appropriate data

1.3 PRODUCT CRITERIA

- A. All motors covered by this specification shall conform to all applicable requirements of latest edition of NEMA, IEEE, ANSI and NEC standards and shall be listed by UL where applicable for service specified.
- B. Select motors so they do not exceed nameplate rating nor operate into service factor to meet specified duty.
- C. All motors shall have totally enclosed fan cooled (TEFC) enclosures.
- D. Motors shall be compatible with starters specified hereinafter or under electrical sections of specifications.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Siemens, Toshiba, GE, ABB, TECO.

2.2 MATERIALS

- A. All material shall be new and guaranteed for service intended.

2.3 MOTORS

- A. Motors 1/2 HP and below shall be NEMA rated 115 volt, single phase, 60 cycle. Motors 3/4 HP and larger shall be NEMA rated 460 volt, 3 phase, 60 cycle or as scheduled on the drawings.
- B. Refer to equipment schedules and specification sections for specific voltages required.
- C. Motors shall be 4 pole (approximately 1750 rpm) unless otherwise noted or scheduled.
- D. Single phase motors shall be furnished with built-in thermal overload protection.
- E. Use NEMA Design B motors, normal starting torque with Class F insulation unless specified otherwise or unless manufacturer of equipment on which motor is being used has different requirements. Motors shall have 1.15 service factor in 40°C maximum ambient temperature.
- F. Motor Bearing:
 - 1. Motor shall have ball bearings with ANSI/AFBMA L-10 rating of 200,000 hours.
 - 2. Motors ≥100HP shall have insulated bearings on both the non-drive end and the drive end side of the motor.
- G. Motors Driven by Variable Frequency Drives (VFD):
 - 1. Motors driven by variable frequency drives (VFD) shall comply with the latest NEMA MG-1, Section IV, Part 31 unless otherwise noted. Starter winding insulation shall be designed to operate under maximum voltage peak of not less than 1600 volts with time rise not greater than 0.1 micro-seconds. Motors shall have corona gas resistant stator insulation. Motors shall be rated for 90° C temperature rise with 40° C ambient. Insulation shall be class F or class H.
 - 2. Motors shall be listed as "Inverter Duty or Inverter Duty Rated". Motors listed only as "suitable for use with inverter" is not acceptable for this project.
 - 3. Motors shall have service factor not less than 1.0 when rated for inverter duty.
 - 4. Additional Grounding:
 - a. Furnish each motor with grounding brush similar to AEGIS Shaft Grounding Ring on the DE (Driven Equipment) side of the motor to prevent bearing from shaft current. Soft carbon brushes are not acceptable. Shaft grounding ring shall be maintenance free. Grounding brush shall be installed on motor prior to installation in the field. Provide/confirm grounded connection between shaft grounding ring to motor casing. Provide sticker by grounding brush manufacturer on outside of motor casing for visual inspection.
 - b. Provide dedicated ground connection between the casing and the grounding lug in the terminal box.

- c. For motors 100HP and larger, provide “HF bonding strap” which is a braided straps of 100mm wide copper, bare flat conductor cable with protective jacket. Bond motor casing to local structural steel.

- H. Full load nominal efficiency of motors 1 HP and larger, except special-purpose motors including 2-speed or multi-speed motors, inverter duty motors and rewind motors, shall be premium efficiency and shall meet or exceed value listed below when tested in accordance with IEEE Standard 112 Method B as defined by NEMA Standard MG 1-12.6C.

Enclosed Motors

HP	900 RPM (8 pole)	1200 RPM (6 pole)	1800 RPM (4 pole)	3600 RPM (2 pole)
1	-	82.5	85.5	78.5
1-1/2	-	87.5	86.5	85.5
2	-	88.5	86.5	86.5
3	-	89.5	89.5	88.5
5	-	89.5	89.5	89.5
7-1/2	-	91.7	91.7	91.0
10	-	91.7	91.7	91.7
15	-	92.4	92.4	91.7
20	-	92.4	93.0	92.4
25	-	93.0	93.6	93.0
30	-	93.6	93.6	93.0
40	-	94.1	94.1	93.6
50	-	94.1	94.5	94.1
60	-	94.5	95.0	94.1
75	-	95.0	95.4	94.5
100	94.1	95.4	95.4	95.0
125	94.5	95.4	95.4	95.4
150	94.5	95.8	95.8	95.4
200	-	95.8	96.2	95.8
250	-	95.6	96.2	95.9
300	-	95.6	96.2	95.9
400	-	95.6	96.2	95.9

- I. Single phase motors for hard starting applications including outdoor applications shall be capacitor start type. Motors for fans and pumps located indoor may be split phase or permanent split-capacitor. Motors shall be equipped with permanently lubricated and sealed ball bearings and to be selected for quiet operation. Motors 1/8 HP and below may be shaded pole type with permanently oiled unit bearings.

- J. Motors 3 horsepower and larger shall be cast iron construction.

2.4 ACCESSORIES

A. Motor Heater

1. Provide motor heater for motors located outside that are 150 hp and larger.
2. Applies to Condenser Water Pump motors.
3. Motor heater shall be fed from auxiliary control circuit from VFD serving motor.
4. Controlled by local thermostat.

B. Winding Temperature Sensors:

1. Provide winding temperature sensors for motors 100hp and larger.
2. Wire sensors to microprocessor based monitoring and protection system located within VFD enclosure to provide temperature display, alarming and automatic pump shutdown functions.
3. Six (6) elements, two (2) in each phase, shall be embedded in the calculated hottest portion of the stator winding. Each lead and each terminal shall be clearly and individually identified. All elements shall be grounded.
4. Sensors are to be resistance thermometer (RTD) elements, platinum wire, 100 ohms, at 0°C, tip sensitive-probe type, 3 lead type with stainless steel armor shielding for use with General Electric "IRT" or Westinghouse "CT" or "DT3" thermal relays.
5. Motor vendor shall provide recommended trip setting for thermal relays.
6. Provide drawings showing the location and number of each sensing element in the stator winding.

C. Auxiliary Enclosure

1. Provide a separate auxiliary enclosure to terminate low voltage devices, such as RTD's and motor heaters.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install materials in accordance with drawings, approved shop drawings and manufacturer's recommendations.
- B. Coordinate control of motor heater circuit to energize when motor is not running with VFD manufacturer. Local thermostat shall be in series to provide additional control for energizing motor heater.

END OF SECTION

SECTION 23 2123 PUMPS

PART 1 - GENERAL

1.1 RELATED WORK

- A. Section 23 0510 - Motors
- B. Section 23 0550 - Vibration Isolation.
- C. Section 23 2120 - Piping Specialties
- D. Section 26 2923 - Variable Frequency Drive (VFD) System

1.2 REFERENCE

- A. The Work under this Section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 1 General Requirements.

1.3 SUBMITTALS

- A. Shop Drawings including, but not limited to, the following:
 - 1. Manufacturer's name and model number.
 - 2. Identification as referenced in the Documents.
 - 3. Capacities/ratings.
 - 4. Pump curves with operating point clearly indicated (parallel operation and single pump operation)
 - 5. Motor data (refer to Section 23 0510- Motors).
 - 6. Seals.
 - 7. Materials of construction.
 - 8. Dimensions and weights.
 - 9. Manufacturer's installation instructions.
 - 10. All other appropriate data.
- B. Complete equipment data sheet attached at end of this Section for each piece of equipment and submit with shop drawings. Shop drawings will be returned without review if data sheets are not provided for each piece of equipment and if data sheet is not filled out completely.

1.4 DESIGN CRITERIA

- A. Pump sizes, capacities, pressures and operating characteristics shall be as scheduled.
- B. Pumps shall meet or exceed operating efficiencies scheduled.
- C. Furnish pumps complete with motors, impellers, drive assemblies, bearings and accessories as hereinafter specified. Furnish pump couplings with OSHA compliant coupling guards.
- D. Select motor with sufficient horsepower rating for non-overloading operation over entire pump curve.

- E. Furnish each pump and motor with nameplate giving manufacturer's name, serial number of pump, capacity in GPM and head in feet at design condition, horsepower, voltage, frequency, speed and full load current.
- F. Test pumps hydraulically at 150% of rated pressure per Hydraulic Institute Standards, clean and paint before shipment. Manufacturer shall certify all pump ratings.
- G. Pumps shall operate without objectionable noise or vibration.
- H. After completion of balancing, if water balancing results in pump discharge balancing valve being closed 50% or more, replace or trim impeller so that balancing valve is opened at least 75% to maintain design flow rate. Where pumps are driven by VFDs, balancing should be performed with pumps at design speed.
- I. Furnish one spare seal for each pump to Owner in labeled protective packaging.

1.5 FACTORY TESTING

- A. Pump manufacturer shall conduct factory performance testing of completely assembled pump, drive line, motor, and frame base plate unit before shipment for all water system pumps above 25 HP.
- B. After testing is complete and before pump is shipped, manufacturer shall submit to Engineer for final acceptance, 6 original test reports which present all measured test data. Each original report shall be signed by authorized factory pump Design/Pump Test Engineer.

1.6 TRAINING

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain pumps as specified below:
 - 1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining pumps.
 - 2. Review data in maintenance manuals.
 - 3. Schedule training with Owner with at least seven days advance notice.

PART 2 - PRODUCTS

2.1 VERTICAL TURBINE PUMPS (CONDENSER WATER)

- A. Acceptable manufacturers: Goulds, Weir Floway, IDP, Deming, Weinman, or Fairbanks Morse.
- B. Pumps shall be vertical mounted and product lubricated with fabricated steel discharge heads, ANSI Class 150 raised face flanges, steel sole plates, cast iron bowl units, dynamically balanced double keyed bronze enclosed impellers, replaceable bronze bowl bearings, neoprene line shaft bearings, bronze wearing rings on bowls, suction bells, galvanized steel inlet basket strainers, and pressure gauge connection.
- C. Pumps shall be designed and tested to Hydraulic Institute Standards.
- D. Pump motors shall have weatherproof enclosures suitable for outdoor installation.
- E. Pump shall be furnished with stainless steel pump shafts and flanged schedule 40S carbon steel pump columns.

- F. Pump discharge head and sole plate shall be cleaned, primed and provided with high performance enamel finish. Column pipe and bowl assembly exterior shall be cleaned and primed with rust inhibiting coating prior to shipment.
- G. Pumps shall be furnished with mechanical type shaft seals with stainless steel rings, ceramic seats and Plan 13 water flush package.
- H. Maximum column section length shall be 10'-0". Refer to drawings for overall pump column length (bottom of sole plate to bottom of strainer).
- I. The electric motor shall be vertical solid shaft squirrel cage induction design. Enclosure shall meet NEMA weather protected type 1 design with stainless steel screens. Motor shall be rated for operation with variable frequency drive and shall have Class B or Class F insulation with temperature rise as specified by NEMA standards for class of insulation used and shall have a 1.15 service factor. Motors shall be listed as "Inverter Duty or Inverter Duty Rated". Motors listed only as "suitable for use with inverter" is not acceptable for this project. Refer to Section 23 0510 Motors for additional requirements, inclusive of accessories within Paragraph 2.4. Any conflicting motor specifications listed herein supersede Section 23 0510.
- J. Motor thrust bearing shall be chosen to handle the continuous down thrust as specified by the pump manufacturer with an AFBMA B-10 one-year minimum or five-year average life under design conditions. Provisions shall be made for momentary up thrust equal to 30% of rated down thrust.\$
- K. Pumps shall be suitable for operation on VFD with a speed range of 50% to 100%.
- L. Refer to the drawings for additional information.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install pumps, piping and supports in strict accordance with manufacturer's instructions to avoid any stress and misalignment.
- B. Piping connections to pumps shall not create stress on pump casing. After final connections are completed, Contractor shall remove bolts from flanged connections at pumps. Piping shall remain aligned with pump connections after bolts have been removed. If piping becomes misaligned after bolts have been removed, or if bolts cannot be removed by hand, Contractor shall revise piping to align piping with pump connection. Piping/pump alignment verification shall be completed in the presence of the Owner's representative. If after completion of the strain-free verification the piping system must be disassembled at any point in the system, the strain-free verification shall be repeated.
- C. Coordinate size and location of concrete bases and anchor bolts with Division 3 Contractor. Set base mounted pumps on concrete bases, or concrete inertia base, level and bolt down prior to grouting. Fill entire base with non-shrinking grout. Use end caps during grouting to prevent overflow when end caps are not integral with base plates.
- D. Fill under base plates of vertical turbine pumps with non-shrinking grout in accordance with manufacturer's recommendation and Hydraulic Institute Standards.
- E. Align flexible coupled pumps after base grouting is complete. Align pump and motor in all four planes: vertical angular, horizontal angular, vertical parallel and horizontal parallel. Alignment shall be within the recommended value by manufacturer, but not over 1/64" for parallel

alignment and 1/64" per inch of coupler radius for angular alignment. Record and submit all results of alignment procedure to Engineer. After alignment is complete, pin pump and motor to base.

- F. Where pump connection size and indicated line sizes are not identical, provide necessary concentric reducers/increasers for vertical piping at pump connection and eccentric reducers/increasers for horizontal piping at pump connection. Install eccentric reducers/increasers with top of pipe level. Valves and piping specialties shall be full line size as indicated on drawings.

3.2 STARTUP

- A. Verify that piping system has been flushed, cleaned and filled.
- B. Prime pump, vent air from casing and verify that rotation is correct. To avoid damage to mechanical seals, never start or run pump in dry condition.
- C. Verify lubrication of motor and pump bearings and lubricate properly in accordance with manufacturer's recommendation and Section 23 0510, Part 3, under LUBRICATION.
- D. Perform field mechanical balancing, if necessary, to meet vibration tolerance specified in Section 23 0550 - Vibration Isolation.

END OF SECTION

Pump Data Sheet

General

Project

Identification

Service

Location

Type

Manufacturer

Model Number

Performance

Capacity (Flow)

Head (Feet)

Max. Net Positive Suction Head Req. (Feet)

Efficiency (%)

Horsepower required for non-overloading
operation over entire pump curve

Physical Characteristics

Suction Size

Discharge Size

Casing Material

Impeller Material

Shaft Sleeve Material

Shaft Material

Seal Type

Seal Face Material

Seal Seat Material

Bearing Assembly Material

Working Pressure & Continuous Operating Temp.

Maximum Intermittent Temperature

Motor

Manufacturer

Horsepower

Voltage

Phase

Hertz

PM

Motor Type

Enclosure Type

Frame Type

Insulation Class

NEMA Design Designation

Service Factor

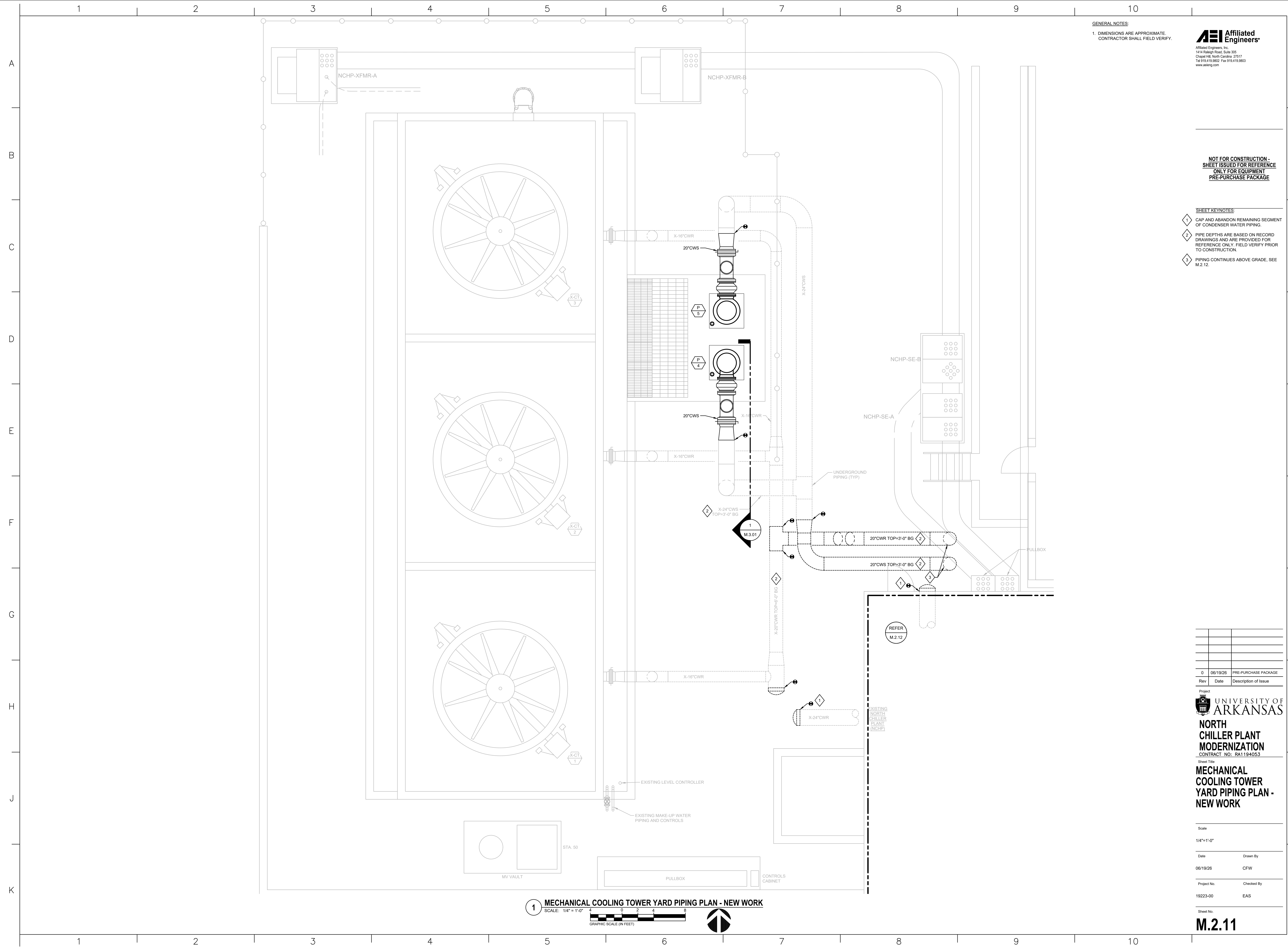
Nominal Efficiency

Nominal Power Factor

Full Load Amps

Variable Frequency Drive Driven (Yes or No)

Miscellaneous



GENERAL NOTES:
1. DIMENSIONS ARE APPROXIMATE.
CONTRACTOR SHALL FIELD VERIFY.

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**NOT FOR CONSTRUCTION -
SHEET ISSUED FOR REFERENCE
ONLY FOR EQUIPMENT
PRE-PURCHASE PACKAGE**

- SHEET KEYNOTES:**
- 1 CAP AND ABANDON REMAINING SEGMENT
OF CONDENSER WATER PIPING.
 - 2 PIPE DEPTHS ARE BASED ON RECORD
DRAWINGS AND ARE PROVIDED FOR
REFERENCE ONLY. FIELD VERIFY PRIOR
TO CONSTRUCTION.
 - 3 PIPING CONTINUES ABOVE GRADE. SEE
M.2.12.

Rev	Date	Description of Issue
0	06/19/26	PRE-PURCHASE PACKAGE

Project
**UNIVERSITY OF
ARKANSAS**

**NORTH
CHILLER PLANT
MODERNIZATION**
CONTRACT NO: RA1194053

Sheet Title
**MECHANICAL
COOLING TOWER
YARD PIPING PLAN -
NEW WORK**

Scale
1/4"=1'-0"

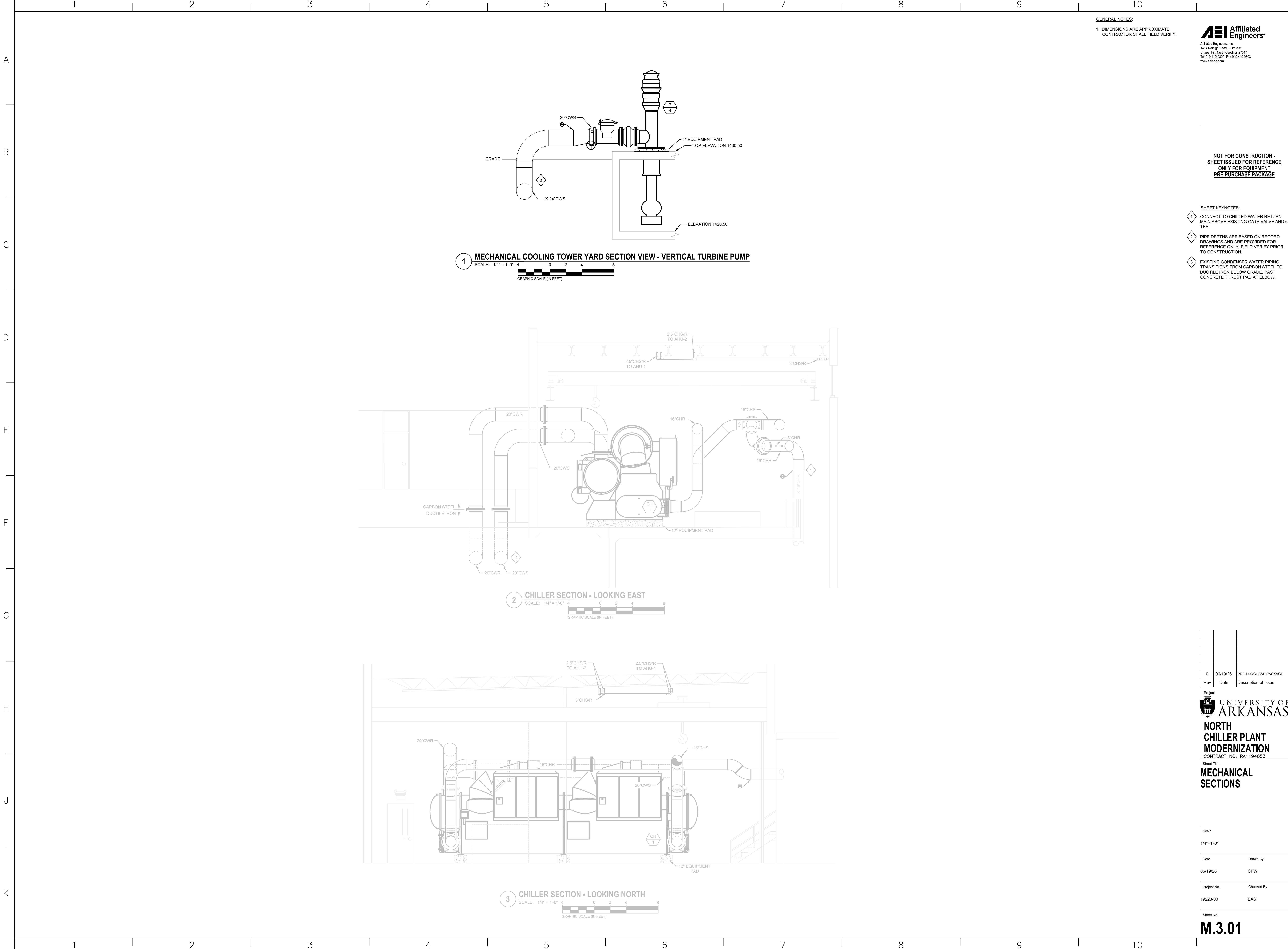
Date
06/19/26

Drawn By
CFW

Project No.
19223-00

Checked By
EAS

Sheet No.
M.2.11



GENERAL NOTES:
1. DIMENSIONS ARE APPROXIMATE.
CONTRACTOR SHALL FIELD VERIFY.

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ONLY FOR EQUIPMENT
PRE-PURCHASE PACKAGE**

- SHEET KEYNOTES:**
- 1. CONNECT TO CHILLED WATER RETURN MAIN ABOVE EXISTING GATE VALVE AND 6" TEE.
 - 2. PIPE DEPTHS ARE BASED ON RECORD DRAWINGS AND ARE PROVIDED FOR REFERENCE ONLY. FIELD VERIFY PRIOR TO CONSTRUCTION.
 - 3. EXISTING CONDENSER WATER PIPING TRANSITIONS FROM CARBON STEEL TO DUCTILE IRON BELOW GRADE. PAST CONCRETE THRUST PAD AT ELBOW.

0	06/19/26	PRE-PURCHASE PACKAGE
Rev	Date	Description of Issue



**NORTH
CHILLER PLANT
MODERNIZATION**
CONTRACT NO: RA1194053

Sheet Title
**MECHANICAL
SECTIONS**

Scale

1/4"=1'-0"

Date

06/19/26

Drawn By

CFW

Project No.

19223-00

Checked By

EAS

Sheet No.

M.3.01

June 19, 2026

[illegible]

NOTES:

1. NET POSITIVE SUCTION HEAD REQUIRED (NPSHR) BY PUMP SHALL NOT EXCEED VALUE INDICATED.

SHEET KEYNOTES:

MARK WFM 	LOCATION	SYSTEM	SERVICE	TYPE	CAPACITY (GPM)	PIPE SIZE (IN)	MAX. PD (FT)	VOLTAGE	REMARKS
CW-1	NCP GROUND LEVEL	CW	CHILLER CONDENSER WATER SOURCE	ELECTROMAGNETIC	8,200	20	0	24	1
CHW-1	NCP GROUND LEVEL	CHW	CHILLER CHILLED WATER RETURN	ELECTROMAGNETIC	5,000	16	0	24	1
CHW-2	NCP GROUND LEVEL	CHW	MAIN CHILLED WATER SOURCE	ELECTROMAGNETIC	6,000	16	0	24	1
CHW-3	NCP GROUND LEVEL	CHW	CHILLED WATER SOURCE FEEDER LINE	ELECTROMAGNETIC	6,000	16	0	24	1

23 0902

NOTES:

1. CV CALCULATION INCLUDES PIPING GEOMETRY FACTOR FOR INLET AND OUTLET PIPE

NOTES:

1. ESP TO EXCLUDE PD OF UNIT COMPONENTS FURNISHED BY UNIT MANUFACTURER SUCH AS COILS, DAMPERS, FILTERS WHERE REQUIRED
2. COOLING COIL MAX FPI =9, MAX ROWS=8
3. PROVIDE UNIT WITH EC MOTORS. UNIT SHALL BE CAPABLE OF PROVIDING A MINIMUM OF 75% OF THE AIRFLOW WITH ONE FAN DOWN.
4. PROVIDE UNITS WITH OUTDOOR RATED ZIN DOUBLE WALL CABINET WITH THERMAL BREAK, INSULATED ROOF CURB, COOLING COIL, STAINLESS STEEL DRAIN PAN.

NOTES:

1. PROVIDE (MAX) RPM MOTOR AS INDICATED ON THE SCHEDULES.
2. PROVIDE UNIT WITH REMOVABLE WINDBAND, OUTLET SCREEN, INLET GUARD, ALUMINUM PROPELLER AND MOTORIZED ALUMINUM BUTTERFLY DAMPER
3. PROVIDE UNIT WITH 2" INSULATED ROOF CURB, CURB EXTENSION, DISCONNECT SWITCH

 UNIVERSITY OF CAMBRIDGE

NOTES:

1. ARROWS ON PLANS INDICATE THROW. NO ARROWS INDICATE 4-WAY THROW.
2. PROVIDE GRILLES WITH OPPOSED BLADE DAMPERS. DAMPER SHALL MATCH MATERIAL OF ASSOCIATED AIR DEVICE.