morrissey engineering inc

mechanical | electrical | lighting | technology | commissioning

addendum

addendum no.	02
date:	03/27/2026
bid date:	03/31/2026
project name:	Norfolk Public School – Middle School Fluid Cooler Replacement
project no:	26003

This addendum is hereby made a part of the contract documents to the same extent as if it were originally included therein. Contract documents shall be considered modified or revised as hereinafter described.

general items

1. A copy of the pre-bid attendance form has been attached.

mechanical items

1. Sheet M0.0 – MECHANICAL SYMBOLS, NOTES, DETAILS, & SCHEDULES
    a. Revised Fluid Cooler Schedule.
    b. Add existing heat pump loop fluid protection level provided by Dave West with Rassmussen.
    c. Add Bid Alternate to provide temporary dehumidification to the gymnasium area.

2. Specification Section 236514 – CLOSED CIRCUIT, FORCED-DRAFT, COUNTERFLOW COOLING TOWERS
    a. See attached revised section.

electrical items

1. Sheet E0.0 – ELECTRICAL COVER SHEET, RISER DIAGRAM, AND SCHEDULES
    a. Add note 2 to Mechanical Connection Schedule to clarify requirement for routing spray pump circuit via starter. See attached revised drawings.

2. Sheet E2.1 – PARTIAL FLOOR PLANS – POWER
    a. Add HP rating at spray pump connection for clarification. See attached revised drawings.
    b. Add motor starter for spray pump in main electrical room. See attached revised drawings.

3. Add electrical specifications section “262913 - motor controllers” to project. See attached specification section.

end of addendum

4940 North 118th Street
Omaha, NE 68164
P: 402.491.4144
www.morrisseyengineering.com

Norfolk Public Schools

Mandatory Pre-Proposal Meeting conducted on: 3/24/26

Please complete the following information – Print Your Information – *Ensure it is Readable*

Company Name	Your Name	Title of Your Position	Email Address
MTC Mech.	Joe Maio	P.M.	Joe@MTC-Mechanical.com
Helm	Jim Leagve	P.M	jleagve@helmgroup.com
Model Electric	Curt Morris	Electrical	Cmorris@modelelectric.com
Volkman Inc.	Justin Lilly	Mechanical	justin@volkmaninc.com
" "	AARON VOLKMAN	"	aaron@volkmaninc.com
Merit Mechanical	Led Henery	Mechanical	led@meritmech.net
Midwestern Mech	Scott Ricke	PM	sricke@mwmech.com
Ahs Electric	Jesse Schmit	PM	jesse schmit @ ahs-electric.com
Johnsons Pl & Ht Inc	Matt Johnson	Mech	matt@johnsonsplumbingheating.com
Ned Porn Construction	Greg Porn	Concrete	npcinorfolk@gmail.com

Norfolk Public Schools

Mandatory Pre-Proposal Meeting conducted on: 3/24/26

Please complete the following information – Print Your Information – *Ensure it is Readable*

Company Name	Your Name	Title of Your Position	Email Address
RASMUSSEN	MATT BJORDAL	SENIOR PROJECT MGR.	matt.bjordal@rasmech.com

FLUID COOLER SCHEDULE

REMARKS:
1. ~~FORCED DRAFT, COUNTERFLOW, BELT DRIVEN CENTRIFUGAL FAN, CLOSED CIRCUIT COOLING TOWER.~~
2. PROVIDE WITH INVERTER DUTY MOTOR FOR VARIABLE FREQUENCY DRIVE OPERATION, STAINLESS STEEL (304) WATER BASIN, VIBRATION CUTOUT AND KILL SWITCH, ELECTRONIC WATER CONTROL FOR BASIN WATER LEVEL CONTROL, DUAL 6" INLET/OUTLET CONNECTIONS, PVC NON-CORROSIVE SPRAY SYSTEM, 3" OVERFLOW CONNECTION, 2" DRAIN CONNECTION, 1" MAKEUP CONNECTION, GALVANIZED STEEL COIL, 10 kW ELECTRIC BASIN HEATER (RATED FOR 0°F OPERATION) INCLUDING TRANSFORMER AND DISCONNECT, AND STRAIGHT DISCHARGE HOOD WITH POSITIVE CLOSURE DAMPERS.
3. ~~FAN MOTOR TO BE OPERATED BY VFD CONTROLLED THROUGH THE BAS.~~
4. SPRAY PUMP TO BE ENABLED THROUGH THE BAS.
5. ELECTRIC BASIN HEATER TO BE CONTROLLED THROUGH THE BAS.
6. TOWER SHALL BE CAPABLE OF 650 GPM WITH EWT: 102°F; LWT: 93.13°F AT 40°F AMBIENT TEMPERATURE WITHOUT SPRAY WATER OPERATION. (2,768,000 BTH/h OF HEAT REJECTION)
7. DIMENSIONS EXCLUDE SPRAY PUMP AND PIPING ACCESSORIES.
8. ELECTRICAL DISCONNECT AND MOTOR STARTER BY ELECTRICAL CONTRACTOR. SEE ELECTRICAL DRAWINGS. TOTAL OF (3) CONNECTIONS: ONE FOR THE FAN; ONE FOR THE BASIN HEATER; ONE FOR THE SPRAY PUMP.

GENERAL				PHYSICAL SIZE		FAN MOTOR					SPRAY PUMP					COOLING		LOOP WATER						ELECTRIC BASIN HEATER		
PLAN TAG	MANUFACTURER	MODEL	CONFIGURATION	DIMENSIONS (D x W x H)	WEIGHT (lbs.)	DESIGN AIRFLOW (CFM)	HP	VOLTAGE / PHASE	TYPE	CONTROL DEVICE	HP	VOLTAGE / PHASE	FLOW (GPM)	FLUID	REFILL RATE (GPM)	CAPACITY (BTU/h)	AMBIENT WET BULB TEMP (°F)	FLOW (GPM)	FLUID	PRESSURE DROP (PSI)	TEMPERATURE EWT / LWT (°F)	CONN. SIZE INLET	CONN. SIZE OUTLET	CAPACITY (kW)	VOLTAGE / PHASE	REMARKS
FC-1	B.A.C.	VF1-1012N-7D2AS-Q1	(1)	12' - 0" x 9' - 10" x 19' - 5"	26500	77,610	50	480 V / 3	INVERTER DUTY	VFD-FC1	3	480 V / 3	350	100% WATER	7.5	3,742,500	78	650	30% GLYCOL	6.71	102 / 90	6"	6"	10	480 V / 3	(2 - 8)

HYDRONIC PUMP SCHEDULE

REMARKS:
1. BASE MOUNTED, FLEXIBLE COUPLED, END SUCTION CENTRIFUGAL PUMP.
2. SEE MECHANICAL RISER DIAGRAM FOR PIPING SPECIALTIES.
3. PUMP MOTOR SHALL BE COMPATIBLE WITH A VARIABLE FREQUENCY DRIVE (SEE VFD SCHEDULE). PUMP TO BE CONTROLLED BY B.A.S.
4. EACH PUMP IS SIZED FOR 100% OF TOTAL BUILDING LOAD.
5. 3-PHASE, VFD-DRIVEN, MOTORS SHALL BE NEMA MG1 PART 31.4.4.2 (1,600 V), AND SHALL HAVE HELWIG (NO EQUALS) SHAFT-GROUNDING.

GENERAL						PUMP - FLOW						PUMP - SIZE			MOTOR					
PLAN TAG	MANUFACTURER	MODEL	SERVES	TYPE	WEIGHT (lbs.)	FLUID	GPM	HEAD (Feet H²O) TOTAL	HEAD (Feet H²O) SHUTOFF	HEAD (Feet H²O) NPSH	MIN. EFF.	CONNECTIONS SUCT.	CONNECTIONS DISCH.	IMPELLER DIAMETER	BHP / HP	RPM	VOLTAGE / PHASE	TYPE	CONTROL DEVICE	REMARKS
P-1	BELL & GOSSETT	BG-E1510-4GC-SS-324T-L	HEAT PUMP LOOP	(1)	520	30% GLYCOL	650	110	127	9.02	78.6%	5"	4"	12 1/4"	23.4 / 30	1800	480 V / 3	O.D.P.	VFD-P1	(2) (3) (4) (5)
P-2	BELL & GOSSETT	BG-E1510-4GC-SS-324T-L	HEAT PUMP LOOP	(1)	520	30% GLYCOL	650	110	127	9.02	78.6%	5"	4"	12 1/4"	23.4 / 30	1800	480 V / 3	O.D.P.	VFD-P2	(2) (3) (4) (5)

VARIABLE FREQUENCY DRIVE SCHEDULE

REMARKS:
1. VARIABLE FREQUENCY DRIVES SHALL BE SUITABLE FOR HVAC APPLICATIONS. DRIVE SHALL HAVE STANDARD ACH580 FEATURES PLUS FOLLOWING FEATURES: INTEGRAL AND LOCKABLE DISCONNECT, EMI, RFI FILTERS, INPUT AC LINE REACTORS AND AUTOMATIC RESET UPON LOSS OF POWER. DRIVES SHALL NOT HAVE BY-PASS. SEE MECHANICAL SPECIFICATIONS.
2. VARIABLE FREQUENCY DRIVES SHALL BE FURNISHED AND INSTALLED BY MECHANICAL CONTRACTOR. POWERED BY ELECTRICAL CONTRACTOR.

PLAN TAG	MANUFACTURER	MODEL	SERVES	DIMENSIONS (D x W x H)	MOTOR HP	MOTOR TYPE	VOLTAGE / PHASE	REMARKS
VFD-FC1	ASEA BROWN	ACH580	FC-1	11" x 8" x 35"	50	TEFC	480 V / 3	(1) (2)
VFD-P1	ASEA BROWN	ACH580	P-1	10" x 8" x 29"	30	ODP	480 V / 3	(1) (2)
VFD-P2	ASEA BROWN	ACH580	P-2	10" x 8" x 29"	30	ODP	480 V / 3	(1) (2)

PIPING SPECIALTY SCHEDULE

REMARKS:
1. HIGH VELOCITY, COALESCING TYPE AIR AND DIRT ELIMINATOR.
2. 6" INLET / OUTLET, ASME RATED (SECTION VII, DIV. 1), AND RATED FOR 150 PSIG WORKING PRESSURE. PROVIDE WITH REMOVABLE HEAD, AIR VENT, AND BOTTOM DRAIN VALVE. SEPARATOR SHALL HAVE AIR ELIMINATION EFFICIENCY OF 100% FREE AIR, 100% ENTRAINED AIR, AND 99.6% DISSOLVED AIR AT INSTALLED LOCATION. DIRT SEPARATION SHALL HAVE MINIMUM EFFICIENCY OF 80* OF ALL PARTICLES 30 MICRON AND LARGER WITHIN 100 PASSES.

PLAN TAG	MANUFACTURER	MODEL	SERVES	CONFIG.	REMARKS
AS-1	SPIROTHERM	VHN 600 FA	HEAT PUMP LOOP	(1)	(2)

PIPING INSULATION SCHEDULE (1) (2) (3)

SERVICE	PIPING SIZES	INSULATION TYPE	INSULATION THICKNESS	VAPOR RETARDER	REMARKS
HEAT PUMP LOOP (HPLS & HPLR) INSIDE BUILDING	ALL	MINERAL FIBER	2"	YES	-
HEAT PUMP LOOP (HPLS & HPLR) OUTSIDE BUILDING	ALL	NONE	-	-	-
INDUSTRIAL COLD WATER (ICW) INSIDE BUILDING	ALL	MINERAL FIBER	1/2"	YES	-
INDUSTRIAL COLD WATER (ICW) OUTSIDE BUILDING	ALL	MINERAL FIBER	1"	YES	(4) (5)
FLUID COOLER DRAINS	ALL	MINERAL FIBER	2	YES	(4) (5)

REMARKS:
1. SEE PIPING INSULATION DETAIL 1/M0.0.
2. INSULATION TYPE AND THICKNESS SHALL MEET ALL REQUIREMENTS OF 2018 IECC.
3. SEE SPECIFICATION SECTIONS 22 07 20 & 23 07 20 FOR ADDITIONAL INFORMATION.
4. PROVIDE EXTERIOR RATED ALUMINUM INSULATION JACKET.
5. PROVIDE PIPE HEAT TRACING. COORDINATE WITH ELECTRICAL CONTRACTOR.

COMcheck Software Version 4.1.5.5

Mechanical Compliance Certificate

Project Information

Energy Code:	2018 IECC
Project Title:	Norfolk Middle School Fluid Cooler Replacement
Location:	Norfolk, Nebraska
Climate Zone:	5a
Project Type:	Alteration

Construction Site:	Owner/Agent:	Designer/Contractor:
1221 N. First Street Norfolk, NE 68702	Norfolk Public Schools 512 West Phillip Avenue PO Box 139 Norfolk, NE 68701	Morrissey Engineering Inc 4940 N 118th St Omaha, NE 68164

Mechanical Systems List

Quantity System Type & Description

1 FC-1 (Single Zone):
Cooling: 1 each - Hydronic Coil, Capacity = 3742 kBtu/h, Air Economizer
No minimum efficiency requirement applies
Fan System: FC-1 FAN -- Compliance (Motor nameplate HP method) : Passes

Centrifugal Closed-Circuit Cooling Tower:
Proposed Efficiency = 15.06 gpm/hp,
Required Efficiency = 7.0 gpm/hp

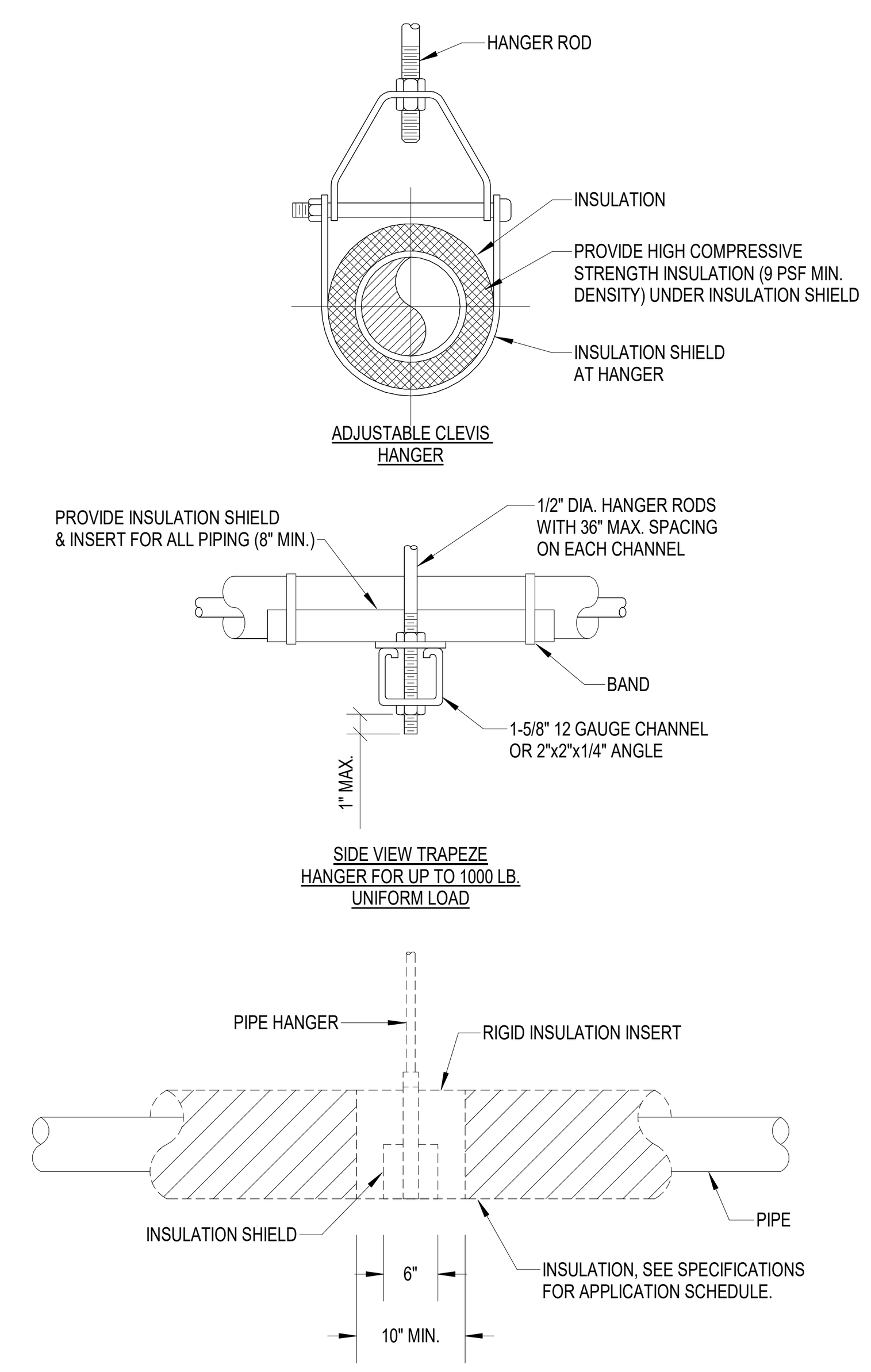
Fans:
FC1 FAN Supply, Constant Volume, 77610 CFM, 50.0 motor nameplate hp, 0.0 fan efficiency grade

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical alteration project represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2018 IECC requirements in COM*check* Version 4.1.5.5 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Matt Kasprzak, PE - Mech Eng. [signature] 02/17/2026
Name - Title Signature Date

Project Title: Norfolk Middle School Fluid Cooler Replacement Report date: 02/17/26
Data filename: K:\2026\26003 - Norfolk Middle School Fluid Cooler Replacement\Calculations\Mechanical\2600 ComCheck.cck Page 1 of 10



1 / M0.0 PIPE HANGER & INSULATION DETAILS
NTS

MECHANICAL SYMBOLS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	TYPICAL PIPING		
	PIPE TEE / PIPE ELBOW		UNION
	ELBOW DN / ELBOW UP		STRAINER
	ISOLATION VALVE (BALL OR BUTTERFLY)		CHECK VALVE (ARROW INDICATES FLOW)
	BALANCING VALVE		AUTOMATIC CONTROL VALVE TWO-WAY/THREE-WAY
	GATE VALVE		PRESSURE REGULATING VALVE (PRV)
	AIR VENT		PRESSURE GAUGE
P.T.T	PRESSURE/TEMPERATURE TEST PORT		THERMOMETER

ENERGY CODE COMPLIANCE

CODE	2018 IECC	
ComCHECK	YES	(1)
COMMISSIONING	YES	(2)(3)(4)
TAB REPORT	YES	(3) (4)

REMARKS:

1. ComCHECK COMPLIANCE REPORT CAN BE FOUND ON THIS SHEET.
2. COMMISSIONING IS REQUIRED.
3. REQUIRED DOCUMENTS (REFER TO CODE) SHALL BE PROVIDED TO THE BUILDING OWNER OR OWNER REPRESENTATIVE WITHIN 90 DAYS OF THE DATE OF RECEIPT OF THE CERTIFICATE OF OCCUPANCY.
4. SEE RESPECTIVE SPECIFICATION SECTIONS FOR ADDITIONAL INFORMATION.

PIPING ABBREVIATIONS

DESCRIPTION	ABBV.
Heat Pump Loop Return	HPLR
Heat Pump Loop Supply	HPLS
Industrial Cold Water	ICW
Sanitary	W

TEMPERATURE CONTROL GENERAL NOTES

EXISTING TEMPERATURE CONTROL SYSTEM WAS INSTALLED MY RASMUSSEN MECHANICAL SERVICE (GIBBON, NE). ALL TEMPERATURE CONTROL WORK SHALL BE INCLUDED IN THE MECHANICAL CONTRACTOR'S SCOPE OF WORK AND COST, AND PERFORMED BY RASMUSSEN MECHANICAL SERVICE. CONTACT DAVE WEST WITH RASMUSSEN MECHANICAL SERVICES - 712-266-6691.

1. TEMPERATURE CONTROL CONTRACTOR SHALL PROVIDE ALL PATHWAYS AND CONTROL WIRING FOR A COMPLETE CONTROL SYSTEM.
2. CONTROLS CONTRACTOR SHALL PROVIDE ALL THERMOSTATS, SENSORS, ACTUATORS, ETC. AS REQUIRED FOR THE FLUID COOLER REPLACEMENT. THE FLUID COOLER REPLACEMENT SHALL BE BACnet IP COMPATIABLE.
3. EXISTING BUILDING MANAGEMENT SYSTEM CONSISTS OF HONEYWELL BACnet CONTROLLERS AND LON CONTROLLERS. EXISTING JACE CONTROLLER SERVING RENOVATION AREA SHALL BE REPLACED/UPDATED TO LATEST BACnet PROTOCOL BY THE CONTROLS CONTRACTOR.

GENERAL DEMOLITION NOTES

1. ALL MECHANICAL ITEMS SHOWN ARE EXISTING. NOT ALL EXISTING MECHANICAL ITEMS ARE SHOWN. ITEMS MARKED (E) SHALL REMAIN AS IS UNLESS OTHERWISE NOTED. REMOVE ITEMS SHOWN DASHED AND/OR MARKED (D). RELOCATE ITEMS MARKED (R).
2. EXISTING DRAWINGS ARE BASED ON EXISTING CONSTRUCTION DOCUMENTS AND APPROXIMATIONS FROM FIELD OBSERVATIONS. DRAWINGS ARE SCHEMATIC IN NATURE. FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO DEMOLITION AND INSTALLATION OF NEW WORK. CONTACT ARCHITECT/ENGINEER IF EXISTING CONDITIONS SIGNIFICANTLY VARY FROM THOSE SHOWN.
3. HOLES CUT IN WALLS, FLOORS, AND CEILINGS TO PERMIT THE REMOVAL OF EQUIPMENT, PIPING, ETC. SHALL BE CAREFULLY MADE AND RESTRICTED TO THE SMALLEST PRACTICAL SIZE. PATCH ALL HOLES NOT REQUIRED FOR NEW WORK TO MATCH EXISTING.
4. THE OWNER RESERVES THE FIRST RIGHT OF SALVAGE OF ANY ITEMS REMOVED. CONTRACTOR SHALL REMOVE ALL UNWANTED MATERIALS FROM THE SITE. OWNER'S DUMPSTER OR OTHER TRASH RECEPTACLES ARE NOT TO BE UTILIZED.
5. COORDINATE PHASING OF DEMOLITION AND REMOVAL WITH GENERAL CONTRACTOR. PLAN ALL WORK TO MINIMIZE SHUT DOWNS. WHERE APPLICABLE, COORDINATE EXTENT OF DEMOLITION WORK WITH NEW WORK.

BID ALT #1: PROVIDE TEMPORARY / PORTABLE COOLING / DEHUMIDIFICATION FOR THE GYMNASIUM. OPENINGS INTO THE SHAPE SHALL BE SEALED WITH A VAPOR BARRIER / POLY TO MINIMIZE HUMIDITY / MOISTURE INTO THE SPACE.

INTENT IS TO MAINTAIN A MAXIMIUM OF 80°F DB / 65°F WB. APPROXIMATELY 15 TONS IS REQUIRED. COORDINATE ACCESS TO THE GYMNASIUM AND COOLING UNIT PLACEMENT WITH THE DISTRICT REPRESENTATIVE.

CURRENT HEAT PUMP LOOP CONTENT: DAVE WEST WITH RASSMUSSEN MECHANICAL TESTED THE FLUID THE WEEK OF MARCH 23RD, 2026. TEST RESULTS INDICATED PROTECTION ABOVE 10°F.

FINAL SOLUTION SHALL PROVIDE BURST PROTECTION DOWN TO -20°F. (TYPICALLY 30% PROPYLENE GLYCOL SOLUTION.)

2

MECHANICAL GENERAL NOTES

1. DO NOT ROUTE PIPING ABOVE ELECTRICAL PANELS. MAINTAIN ALL CODE REQUIRED CLEARANCES.
2. MAINTAIN MINIMUM 10'-0" CLEARANCE TO WASTE VENTS FROM ALL FRESH AIR INTAKES.
3. MAINTAIN MANUFACTURER'S REQUIRED CLEARANCE AROUND ALL MECHANICAL EQUIPMENT TO ALLOW PROPER OPERATION AND FOR EASY MAINTENANCE AND FILTER ACCESS.
4. COORDINATE EXACT LOCATION OF ALL FLOOR, WALL, AND ROOF PENETRATIONS AND WORK TO BE PERFORMED ABOVE THE FLOORS AND ROOF WITH GENERAL CONTRACTOR. SEAL ALL PENETRATIONS OF EXTERIOR ENVELOPE WEATHER TIGHT.
5. UNLESS OTHERWISE NOTED, ROUTE PIPING AS HIGH AS POSSIBLE. UTILIZE JOIST SPACE AND OPEN WEBBING OF JOISTS TO AVOID CONFLICTS. COORDINATE EXACT ROUTING WITH STRUCTURE, LIGHTS, DUCTWORK, AND ALL OTHER TRADES. PROVIDE NECESSARY OFFSETS, TRANSITIONS, AND EXTENSIONS AS REQUIRED TO COMPLETE INSTALLATION AT NO ADDITIONAL COST TO OWNER.
6. PLANS ARE SCHEMATIC IN NATURE. PIPE ROUTING IS SHOWN FOR CLARITY AND FOR GENERAL ROUTING INFORMATION. COORDINATE EXACT ROUTING WITH ALL OTHER TRADES. PROVIDE ALL ADDITIONAL OFFSETS AS REQUIRED TO COMPLETE INSTALLATION.
7. INSTALL ALL VALVES ABOVE ACCESSIBLE CEILINGS OR IN ACCESSIBLE LOCATIONS. PROVIDE ACCESS PANELS WHERE REQUIRED.
8. CONNECT NEW PIPING TO EXISTING PIPING AT LOCATION INDICATED. FIELD VERIFY EXACT SIZE, LOCATION AND ELEVATION OF EXISTING PIPING PRIOR TO CONNECTION. TRANSITION, EXTEND AND OFFSET NEW PIPING AS REQUIRED TO MAKE CONNECTION AND AVOID CONFLICTS.
9. DO NOT ROUTE WATER PIPING IN EXTERIOR WALLS UNLESS OTHERWISE NOTED. PIPING ROUTED IN EXTERIOR WALLS SHALL BE LOCATED ON THE INTERIOR SIDE OF INSULATION.
10. FIRE CAULK ALL PIPE PENETRATIONS THROUGH FIRE RATED WALLS AND ASSEMBLIES. CAULK AROUND ALL PIPE PENETRATIONS THOUGH FULL HEIGHT SOUND WALLS. REFER TO ARCHITECTURAL DRAWINGS FOR WALL CONSTRUCTION. ALL PENETRATIONS OF FIRE-RESISTANT CONSTRUCTION SHALL BE SEALED WITH A LISTED FIRESTOPPING ASSEMBLY BY THE CONTRACTOR RESPONSIBLE FOR THE PENETRATION.
11. ALL PLUMBING SHALL BE IN ACCORDANCE WITH THE LOCAL PLUMBING CODE. NOT ALL CLEANOUTS SHOWN. PROVIDE CLEANOUTS AS REQUIRED PER AUTHORITY HAVING JURISDICTION. COORDINATE CLEANOUT LOCATIONS WITH GENERAL CONTRACTOR.

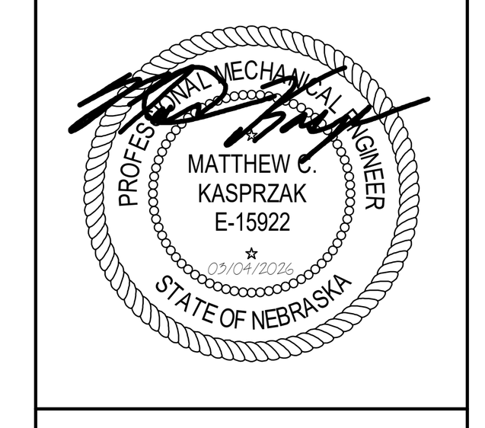
note:
do not scale drawings. verify all dimensions and clearances from architectural, structural, shop and other appropriate drawings or at site. lay out and coordinate all work prior to installation to provide clearances required for operation, maintenance, and codes and verify non-interference with other work. do not fabricate prior to verification of clearance for all trades.

morrissey engineering inc
mechanical | electrical | lighting | technology | sustainability
4940 North 118th Street
Omaha, NE 68164
P: 402.491.4144
Nebraska COA Number: CA-0835
www.morrisseyengineering.com

MARK	REVISION	DATE
2	ADDENDUM 002	03/27/2026

MECHANICAL SYMBOLS, NOTES, DETAILS, & SCHEDULES

NORFOLK MIDDLE SCHOOL FLUID COOLER REPLACEMENT
1221 N. FIRST STREET NORFOLK, NE 68702



date:	03/04/2026
project number:	26003
designed by:	MCK
drawn by:	KWM
sheet number:	M0.0

SECTION 236514 –CLOSED CIRCUIT, FORCED-DRAFT, COUNTERFLOW COOLING TOWERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Owner has contracted directly with the Commissioning Authority (CxA) for this project. All Contractors shall cooperate with the CxA to complete all required commissioning. Specification Section 019113 defines the Contractor's responsibilities with respect to the process. The Contractor shall review this section and shall include in their bids the work associated with the commissioning effort described.

1.2 SUMMARY

A. Section includes factory-assembled, open-circuit, forced-draft, counterflow cooling towers.

1.3 SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, pressure drop, fan performance data, rating at selected points indicated, and furnished specialties and accessories.
2. Maximum flow rate.
3. Minimum flow rate.
4. Pressure required at cooling tower supply piping connections.
5. Drift loss as percent of design flow rate.
6. Sound:

    a. Sound pressure levels for operation with fan off, fan at minimum speed, and design speed. If sound requirements are indicated at a specific distance, submit performance using same distance for comparative analysis.
    b. Sound power levels in eight octave bands for operation with fans off, fans at minimum speed, and design speed.

7. Fan airflow at design conditions, brake horsepower, and drive losses (indicated in horsepower and percent of brake horsepower).
8. Fan motor electrical characteristics including, but not limited to, speed, voltage, phase, hertz, amperage, efficiency, and power factor at 100, 75, 50, and 25 percent of nameplate horsepower.
9. Pump motor electrical characteristics including, but not limited to, speed, voltage, phase hertz, amperage, efficiency, and power factor at 100, 75, 50, and 25 percent of nameplate horsepower.
10. Electrical power requirements for each cooling tower component requiring power.

B. Shop Drawings:

1. Manufacturer's drawings of assembled cooling towers, control panels, sections, and elevations.
2. Assembled unit dimensions.
3. Diagram showing each separate piece requiring field assembly.
4. Shipped sub-assembly dimensions and weights for field assembly.
5. Assembled unit weight without water.
6. Operating weight and load distribution.
7. Unit vibration isolation.
8. Required clearances for maintenance and operation.
9. Sizes and dimensioned locations of piping and wiring connections.
10. Diagrams for power, signal, and control wiring.

C. Coordination Drawings:

1. Drawings on which the following items are shown and coordinated with each other, using input from installers of the items involved:

    a. Structural supports.
    b. Piping roughing-in requirements.
    c. Conduit and wiring roughing-in requirements for controls and electrical power, including spaces reserved for controls and electrical equipment.
    d. Access requirements, including working clearances for controls and electrical equipment, and service clearances. Mark and label clearances on drawings.

2. Drawings showing plans, sections, and elevation views, drawn to scale of at least ¼" = 1'-0".
3. Each view to show screened background with the following:

    a. Structural grids.
    b. Adjacent walls, floors, and roofs.
    c. Equipment and products of other trades that are located in vicinity of cooling towers and are part of final installation, such as, controls, power, lighting, fire-suppression systems, and plumbing systems.

D. Product Certificates: For certification required in "Quality Assurance" Article.

E. Field Test Reports: Include startup service reports.

F. Source quality-control reports.

G. Field quality-control reports.

H. Sample Warranty: For special warranty.

I. Operation and Maintenance Data: For each cooling tower to include in emergency, operation, and maintenance manuals.

J. Tool Kit:

1. A tool kit specially designed by cooling tower manufacturer for use in servicing cooling tower furnished.
2. Special tools required to service components not readily available to Owner service personnel in performing routine maintenance.
3. Lockable case with hinged cover, marked with large and permanent text to indicate the special purpose of tool kit, such as "Cooling Tower Tool Kit." Text size shall be at least 1 inch high.
4. A list of each tool furnished. Permanently attach the list to underside of case cover. Text size shall be at least 1/2 inch high.

K. Touchup Coating: 32-oz. container of paint coating used. Label outside of container with detailed description of coating to allow for procurement of a matching coating in the future.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Certified by CTI.

B. CTI Certification: Cooling tower thermal performance according to CTI STD 201RS.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Coordinate requirements for multi-piece assembly for shipment. Limit the number of separate pieces for field installation to as few as possible.

B. If factory assembly of multiple pieces is required for testing or other reasons, disassemble cooling tower into major assemblies as required by installation before packaging for shipment.

1. Clearly label each separate package with a unique designation and include assembly instructions for complete cooling tower.

C. Install seals on gear-drive assemblies to eliminate oil leakage during shipment if shipped with oil.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace the following components of cooling towers that fail in materials or workmanship within specified warranty period:

1. One-year warranty after start-up, or eighteen months from date of shipment, whichever occurs first. Warranty to include coverage for defects in material and workmanship.

B. Fans, fan shafts, bearings, sheaves, gearboxes, drive shafts, couplings, and mechanical equipment support must be warranted against defects in materials and workmanship for a period of five (5) years.

C. For direct drive fan system: Fans, fan shafts, bearings, sheaves, gearboxes, drive shafts, couplings, and mechanical equipment support must be warranted against defects in materials and workmanship for a period of seven (7) years from date of shipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Baltimore Air Coil (BAC)

B. Marley, SPX

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Cooling tower and support structure shall withstand the effects of loads and stresses within limits and under conditions indicated according to governing codes.

B. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Vibration:

1. Rotating assemblies shall be dynamically balanced to achieve a balance level of "good" while complying with industry-standard requirements for cooling towers.
2. Critical speed shall be at least 115 percent of design speed.

2.3 DESIGN ARRANGEMENT

A. Counterflow design with airflow from two sides and forced-draft, centrifigal fan and pressurized spray distribution basin.

2.4 CASING AND FRAME

A. Casing Material: Polymer-coated galvanized steel or Stainless steel, Grade 304.

B. Frame Material: Polymer-coated galvanized steel or stainless steel, Grade 304.

C. Hardware: Galvanized or stainless steel.

D. Joints and Seams: Sealed watertight.

E. Welded Connections: Sealed watertight by continuous welds.

2.5 COLLECTION BASIN

A. Factory-Assembled Collection Basin:

1. Material: Stainless steel, Grade 304.
2. Hardware: Stainless steel.

3. Joints and Seams: Sealed watertight.
4. Removable stainless-steel strainer with openings smaller than nozzle orifices.
5. Overflow and drain connections.
6. Makeup-water connection.
7. Outlet Connection: Configured to mate to ASME B16.5, Class 150 flange.

2.6 COLLECTION BASIN MAKEUP-WATER ASSEMBLY

A. Electric water level control with NEMA 4 enclosure, solid state controls, LED status light, and stainless steel water level sensing electrodes. Number and position of probes provided to sense the following: high water level, low water level, high water alarm level, low water alarm level, heater safety cutout, and automatic solenoid valve. Include all necessary mounting hardware.

2.7 COLLECTION BASIN HEATER

A. Electric Heater:

1. Stainless-Steel Electric Immersion Heaters: Installed in a threaded coupling on the side of the collection basin.
2. Heater Control Panel: Mounted on the side of each cooling tower cell.
3. Enclosure: NEMA 250, Type 4.
4. Magnetic contactors controlled by a temperature sensor/controller to maintain collection basin water-temperature set point. Water-level probe shall monitor cooling tower water level and de-energize the heater when the water reaches low-level set point.
5. Control-circuit transformer with primary and secondary side fuses.
6. Terminal blocks with numbered and color-coded wiring to match wiring diagram.
7. Single-point, field-power connection to a non-fused disconnect switch (provided by electrical) and heater branch circuiting complying with NFPA 70.
8. Factory Wiring Method: Metal raceway for factory-installed wiring outside of enclosures, except connections to each electric basin heater shall be liquidtight conduit.

    a. Raceway shall be corrosion-resistant stainless steel.

2.8 PRESSURIZD WATER DISTRIBUTION SYSTEM

A. Water will be distributed evenly over the coil at a flow rate sufficient to ensure complete wetting of the coil at all times. Large diameter, non-clog, 360° plastic distribution nozzles will utilize a two-stage diffusion pattern to provide overlapping, umbrella spray patterns that create multiple intersection points with adjacent nozzles. The branches and spray nozzles will be held in place by snap-in rubber grommets, allowing quick removal of individual nozzles or complete branches for cleaning or flushing. Distribution system must be able to be inspected while the unit is in operation.

B. Spray Water Pump(s): The closed circuit cooling tower will include an appropriate number of close coupled, bronze-fitted centrifugal pump and motor assemblies equipped with mechanical seal, and piped from the suction connection to the water distribution system. The pump motor(s) will be the totally enclosed fan cooled (TEFC) type, premium efficiency. The system will

include a metering valve and bleed line to control the bleed rate from the pump discharge to the overflow connection.

C. Pump Motor:

1. Comply with NEMA MG 1 unless otherwise indicated.
2. Description: NEMA MG 1, Design B, as required to comply with capacity and torque characteristics; medium induction motor.
3. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
4. Motor Enclosure: Totally enclosed.
5. Rotor: Random-wound, squirrel cage.
6. Energy Efficiency: Comply with ASHRAE/IES 90.1.
7. Service Factor: 1.15.
8. Temperature Rise: Match insulation rating.
9. Insulation: Class F.

D. Piping: Interconnecting collection basin to pump and pressurization distribution system.

1. Design delegated to manufacturer.
2. External to and supported from cooling tower casing and frame.
3. Material: PVC.
4. Install flanges at connections to collection basin and pressurized distribution system.
5. Drain connection with isolation valve at piping low point if piping does not drain directly into collection basin.

2.9 HEAT TRANSFER COIL

A. Galvanized Steel: The coil will be constructed of continuous serpentine all prime surface steel, be pneumatically tested at 375 psig, and be hot-dip galvanized after fabrication. The coil will be designed for free drainage of fluid and will be ASME B31.5 compliant. Maximum allowable working pressure will be 300 psig.

2.10 FILL

A. Materials: PVC, with maximum flame-spread index of 5 according to ASTM E84.

B. Minimum Thickness: 20 mils, before forming.

C. Fabrication: Fill-type sheets, fabricated, formed, and bonded together after forming into removable assemblies that are factory installed by manufacturer.

D. Fill Material Operating Temperature: Suitable for entering-water temperatures up through 120 deg F.

E. Hardware: Galvanized or stainless steel.

2.11 DRIFT ELIMINATORS

A. Material: PVC; with maximum flame-spread index of 5 according to ASTM E84.

B. UV Treatment: Inhibitors to protect against damage caused by UV radiation.

C. Configuration: Multipass, designed and tested to reduce water carryover to 0.005 percent of design flow rate indicated.

D. Location: Integral to fill.

E. Hardware: Galvanized or stainless steel.

2.12 AIR INLET

A. Air-Intake Louvers:

1. Material: FRP.
2. UV Treatment: Inhibitors to protect against damage caused by UV radiation.
3. Louver Blades: Arranged to uniformly direct air into cooling tower, to minimize air resistance, and to prevent water from splashing out of tower during all modes of operation including operation with fans off.
4. Location: Separate from fill.

B. Hardware: Galvanized or stainless steel.

2.13 FAN AND DRIVE ASSEMBLY

A. Belt-driven Centrifugal Fan: Balanced at the factory after assembly.

1. Blade Material: Aluminum or galvanized steel.
2. Hub Material: Aluminum or galvanized steel.
3. Fan Shaft: Solid steel.
4. Fan Shaft Bearings: Self-aligning ball or roller bearings with moisture-proof seals and premium, moisture-resistant grease suitable for temperatures between minus 20 and plus 300 deg F. Bearings designed for an L-10 life of 40,000 hours.
5. Bearings Grease Fittings: Extended lubrication lines to an easily accessible location.

B. Fan Motor:

1. Comply with NEMA MG 1 unless otherwise indicated.
2. Description: NEMA MG 1, Design B, as required to comply with capacity and torque characteristics; medium induction motor.
3. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
4. Motor Enclosure: Totally enclosed fan cooled (TEFC).
5. Rotor: Random-wound, squirrel cage.
6. Energy Efficiency: Comply with ASHRAE/IES 90.1.
7. Service Factor: 1.15.

8. Temperature Rise: Match insulation rating.
9. Insulation: Class F.
10. Variable-Speed Motors: Inverter-duty rated per NEMA MG 1, Section IV, "Performance Standard Applying to All Machines," Part 31, "Definite-Purpose, Inverter-Fed, Polyphase Motors."
11. Motor Location: Mounted outside of cooling tower casing and cooling tower discharge airstream.
12. Motor Shaft Grounding: Motors shall be controlled through variable-frequency controllers with shaft grounding system to protect motor bearings from induced voltage. Drag on motor shaft due to shaft ground system shall be less than 0.5 percent of motor nameplate horsepower.

C. Hardware: Galvanized or stainless steel.

2.14 CONTROLS

A. Vibration Switch: For each fan drive.

1. Enclosure: NEMA 250, Type 4.
2. Vibration Detection: Sensor with a field-adjustable, acceleration-sensitivity set point in a range of 0.2 to 2.0 g and frequency range of 2 to 1000 cycles per minute. Cooling tower manufacturer shall recommend switch set point for proper operation and protection.
3. Switch shall have manual-reset button hardwired connection to fan motor electrical circuit.
4. Switch shall have field connection to a control system hardwired connection to fan motor electrical circuit.
5. Switch shall, on sensing excessive vibration, signal an alarm for connection to control system and shut down the fan.

B. Control Package:

1. Comply with requirements on plans and in Section 230993.
2. Factory installed and wired, and functionally tested at factory before shipment.
3. NEMA 250, Type 4 enclosure with removable internally mount backplate.
4. Control-circuit transformer with primary and secondary side fuses.
5. Terminal blocks with numbered and color-coded wiring to match wiring diagram. Spare wiring terminal block for connection to external controls or equipment.
6. Electric basin heaters with temperature control and low-water-level safety switch for each cell, complying with requirements in "Collection Basin Heater" Article.
7. Vibration switch for each fan, complying with requirements in "Vibration Switch" Paragraph.
8. Single-point, field-power connection to a non-fused disconnect switch.

    a. Branch power circuit to each motor and electric basin heater and to controls with a disconnect switch or circuit breaker.
    b. NEMA-rated motor controller, hand-off-auto switch, and overcurrent protection for each motor. Include variable-frequency controller with manual bypass and line reactors for each variable-speed motor indicated.

9. Factory-installed wiring outside of enclosures shall be in metal raceway, except make connections to each motor and electric basin heater with liquidtight conduit.
10. Visual indication of status and alarm with momentary test push button for each motor.
11. Visual indication of elapsed run time, graduated in hours for each motor.
12. Cooling tower shall have hardware to enable control system to remotely monitor and display the following:

    a. Operational status of each motor.
    b. Cooling tower leaving-fluid temperature.
    c. Fan vibration alarm.
    d. Oil-level alarm.
    e. Collection basin high- and low-water-level alarms.

2.15 SERVICE ACCESS

A. Doors:

1. Large enough for personnel to access cooling tower internal components from both cooling tower end walls.
2. Doors shall be hinged with handles operable from both sides of the door.
3. Door materials shall match casing.
4. Hinges and handles shall be stainless steel.

B. Fan Deck Floor between Cooling Tower Cells:

1. Factory furnish reinforced fan deck floor panels between cooling tower cells for field installation.
2. Floor materials shall match adjacent cooling tower cell fan deck.
3. Fan deck floor shall fasten to and be supported by framing that is attached to cooling tower cells.
4. Frame shall be constructed of same materials as cooling tower frame.

C. Internal Platforms: Aluminum, galvanized-steel or stainless-steel bar grating.

1. Spanning the collection basin from one end of cooling tower to the other and positioned to form a path between the access doors. Platform shall be elevated so that all parts are above the high water level of the collection basin.
2. Elevated internal platforms with handrails accessible from fixed vertical ladders to access the fan drive assembly when out of reach from collection basin platform.

D. Hardware: Galvanized steel when connecting galvanized-steel components; stainless steel when connecting other materials.

E. Hardware: 304 or 316 series stainless steel.

F. Nameplate:

1. Stamped or engraved aluminum or stainless-steel nameplate with rated load capacity on each davit arm and pedestal.
2. Letter size legible from a distance of 60 inches and not less than 1/2 inch.

3. Fasten nameplate at multiple points with stainless-steel rivets or screws.

2.16 SOURCE QUALITY CONTROL

A. Performance Test: Factory test and certify cooling tower performance according to CTI STD 201RS, "Standard for the Certification of Water-Cooling Tower Thermal Performance."

B. Factory Functional Tests:

1. Test collection and distribution basins after assembly, and prove free of leaks.
2. Test factory-installed electric/electronic water-level controls for proper operation.
3. Test factory-installed electric basin heaters for proper operation.
4. Test factory-installed fan and drive assemblies for proper operation.
5. Test factory-installed control package for proper operation.
6. Test access doors to ensure smooth operation and proper fit.
7. Submit report documenting tests performed and results within one week of test date.

C. Heat-Exchanger Factory Pressure and Leak Tests:

1. Pneumatically test heat-exchanger assembly while submerged underwater and prove to be free of leaks.
2. Test pressure equal to 1.5 times rated pressured, but not less than 375 psig.
3. Submit report documenting test and results.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine cooling towers before installation. Reject cooling towers that are damaged.

B. Before cooling tower installation, examine roughing-in for tower support, anchor-bolt sizes and locations, piping, controls, and electrical connections to verify actual locations, sizes, and other conditions affecting cooling tower performance, maintenance, and operation.

1. Cooling tower locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping, controls, and electrical connections.
2. Verify sizes, locations, and anchoring attachments of structural-steel support structures.
3. Verify sizes and locations of equipment supports with actual equipment.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install cooling towers on support structure.

B. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Maintain manufacturer's recommended clearances for service and maintenance.

D. Maintain clearances required by governing code.

E. Loose Components: Install components, devices and accessories furnished by manufacturer, with cooling tower, that are not factory mounted.

1. Loose components shall be installed by manufacturer's factory-trained service personnel.

3.3 PIPING CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to cooling towers, allow space for service and maintenance.

C. Install flexible pipe connectors at pipe connections of cooling towers mounted on vibration isolators.

D. Install drain piping with valve at cooling tower drain connections and at low points in piping.

E. Connect cooling tower overflows and drains, and piping drains, to sanitary sewage system.

F. Makeup-Water Piping:

1. Comply with applicable requirements in Section 221116 "Domestic Water Piping."
2. Connect to makeup-water connections with shutoff valve, plugged tee with pressure gage, flow meter, and drain connection with valve and union.

G. Supply and Return Piping:

1. Comply with applicable requirements in Section 232113 "Hydronic Piping."
2. Connect to entering cooling tower connections with shutoff valve, strainer, balancing valve, thermometer, plugged tee with pressure gage, flow meter, and drain connection with valve.
3. Connect to leaving cooling tower connection with shutoff valve thermometer, plugged tee with full port ball valve for portable field instruments, and drain connection with valve.
4. Make connections to cooling tower with a flange.

3.4 ELECTRICAL POWER CONNECTIONS

A. Connect field electrical power source to each separate electrical device requiring field electrical power. Coordinate termination point and connection type with Installer.

B. Comply with requirements in Division 26.

C. Install nameplate for each electrical connection indicating electrical equipment designation and circuit number feeding connection. Nameplate shall be laminated phenolic layers of black with engraved white letters at least 1/2 inch high. Locate nameplate where easily visible.

3.5 CONTROLS CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring between cooling towers and other equipment to interlock operation as required to achieve a complete and functioning system.

C. Connect control wiring between cooling tower control interface and DDC system for remote monitoring and control of cooling towers. Comply with requirements in Section 230900 and 230933.

D. Install label at each termination indicating control equipment designation serving cooling tower and the I/O point designation for each control connection. Comply with requirements in Division 26 for labeling and identification products and installations.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Tests and Inspections: Comply with ASME PTC 23 or CTI ATC 105.

C. Cooling towers will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Inspect field-assembled components, equipment installation, and piping; controls; and electrical connections for proper assemblies, installations, and connections.

C. Obtain performance data from manufacturer.

1. Complete installation and startup checks according to manufacturer's written instructions and perform the following:

    a. Clean entire unit including basins.
    b. Verify that accessories are properly installed.
    c. Verify clearances for airflow and for cooling tower servicing.
    d. Check for vibration isolation and structural support.
    e. Lubricate bearings.
    f. Verify fan rotation for correct direction and for vibration or binding and correct problems.
    g. Verify proper oil level in gear-drive housing. Fill with oil to proper level.
    h. Operate variable-speed fans through entire operating range and check for harmonic vibration imbalance. Set motor controller to skip speeds resulting in abnormal vibration.
    i. Check vibration switch setting. Verify operation.

j. Verify water level in tower basin. Fill to proper startup level. Check makeup-water-level control and valve.
k. Verify operation of basin heater and control.
l. Verify that cooling tower air discharge is not recirculating air into tower or HVAC air intakes. Recommend corrective action.
m. Replace defective and malfunctioning units.

D. Start cooling tower and associated water pumps. Follow manufacturer's written starting procedures.

E. Prepare a written startup report that records the results of tests and inspections.

3.8 ADJUSTING

A. Set and balance water flow to each tower inlet.

B. Adjust water-level control for proper operating level.

C. Adjust basin heater control for proper operating set point.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain cooling towers.

1. Video record the training sessions.
2. Instructor shall be factory trained and certified.
3. Perform not less than 4 hours of training.
4. Train personnel in operation and maintenance and to obtain maximum efficiency in plant operation.
5. Perform instructional videos showing general operation and maintenance that are coordinated with operation and maintenance manuals.
6. Obtain Owner sign-off that training is complete.
7. Owner training shall be held at Project site.

END OF SECTION 236514

GENERAL ELECTRICAL DEMOLITION NOTES

1. THE OWNER SHALL HAVE FIRST SALVAGE RIGHTS TO ALL FIXTURES, DEVICES AND EQUIPMENT REMOVED.
2. WHERE EXISTING CIRCUITS ARE NOT REUSED, REMOVE CONDUCTORS AND ASSOCIATED ACCESSIBLE RACEWAYS BACK TO THE SOURCE. ABANDON CONCEALED CONDUITS IN WALLS WHICH ARE NOT REMOVED.
3. DEMOLITION DRAWINGS INDICATE FIXTURES, DEVICES AND MAJOR PIECES OF EQUIPMENT WHICH ARE TO BE REMOVED OR RECONNECTED. REMOVE INDICATED ITEMS AND ASSOCIATED ITEMS NOT INDICATED BUT WHICH MUST BE REMOVED TO ACCOMMODATE REMODELING. SEE PROJECT MANUAL "WORK IN EXISTING BUILDINGS" FOR ADDITIONAL INFORMATION.
4. SEE MECHANICAL DRAWINGS FOR ADDITIONAL ELECTRICAL DEMOLITION ITEMS. DISCONNECT AND REMOVE ELECTRICAL DEVICES, EQUIPMENT AND ASSOCIATED WIRING AS REQUIRED TO ACCOMMODATE NEW WORK.
5. POWER TO EXISTING AREAS NOT BEING REMODELED SHALL BE MAINTAINED AT ALL TIMES EXCEPT FOR SHORT TERM OUTAGES NECESSARY FOR RECONNECTION OF EXISTING CIRCUITS. COORDINATE AND SCHEDULE OUTAGES WITH THE OWNER.
6. COORDINATE DEMOLITION WITH THE WORK OF OTHER TRADES. PROVIDE TEMPORARY POWER AS REQUIRED TO ALLOW THE WORK OF OTHER TRADES TO PROCEED OR AS REQUIRED TO ALLOW THE OWNER TO OCCUPY THE SPACE.
7. SUBSCRIPT 'E' INDICATES AN EXISTING FIXTURE OR DEVICE TO REMAIN. MAINTAIN EXISTING CIRCUITING CONTINUITY UNLESS NOTED OTHERWISE.
8. SUBSCRIPT 'R' INDICATES AN EXISTING FIXTURE OR DEVICE SCHEDULED FOR RELOCATION. REMOVE EXISTING FIXTURE OR DEVICE AND SALVAGE FOR REUSE. SEE NEW WORK PLANS FOR NEW LOCATION AND RECONNECT AS REQUIRED.
9. UPDATE ALL PANELBOARD DIRECTORIES IMPACTED BY ELECTRICAL WORK.
10. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR PATCHING, PAINTING, REPAIRING, AND REPLACEMENT OF ALL EXISTING WALLS, CEILING, FLOORS, OR OTHER BUILDING ELEMENTS WHICH ARE DISTURBED AS PART OF THE DEMOLITION OR INSTALLATION OF NEW ELECTRICAL WORK.

GENERAL SITE NOTES

1. UTILITY LOCATIONS INDICATED ON DRAWINGS ARE APPROXIMATE AND THE MOST ACCURATE INFORMATION AVAILABLE AT THE TIME OF DESIGN. REFER TO CIVIL AND ARCHITECTURAL DRAWINGS FOR MORE INFORMATION. PRIOR TO EQUIPMENT AND CONDUIT INSTALLATION, THE CONTRACTOR SHALL COORDINATE EXACT INSTALLATION DETAILS AND MODIFY WORK PLAN ACCORDINGLY TO MEET UTILITY REQUIREMENTS. CORRESPOND WITH UTILITY COMPANY PRIOR TO ANY SITE DEVELOPMENT THAT MAY IMPACT THE INSTALLATION SUCH AS IRRIGATION INSTALLATION, CONCRETE OR ASPHALT INSTALLATION, LANDSCAPING, ETC.
2. MINIMUM SIZE FOR ALL UNDERGROUND CONDUITS SHALL BE 1" UNLESS OTHERWISE NOTED. MINIMUM WIRE SIZE SHALL BE #10 UNLESS OTHERWISE NOTED.
3. ROUTE CONDUITS UNDER HARD SURFACES AS MUCH AS POSSIBLE TO AVOID CONFLICTS WITH LANDSCAPING AND LAWN IRRIGATION.
4. PROVIDE A GREEN INSULATED GROUND WIRE IN ALL RECEPTACLE, LIGHTING, AND EQUIPMENT BRANCH CIRCUITS.
5. PROVIDE A DEDICATED NEUTRAL CONDUCTOR FOR EACH BRANCH CIRCUIT.
6. PROVIDE A PULL STRING IN ALL EMPTY CONDUITS. CAP EMPTY UNDERGROUND CONDUITS WITH WATER TIGHT FITTINGS, STAKE LOCATIONS, AND MARK LOCATIONS ON AS-BUILD RECORD DRAWINGS FOR OWNER
7. CALL FOR UTILITY LOCATIONS PRIOR TO DIGGING.
8. PROVIDE ALL REQUIRED EXCAVATION, TRENCHING, BORING, SHORING, BACKFILL, AND SURFACE REPAIR REQUIRED FOR INSTALLATION OF NEW UTILITIES.
9. LOCATION OF CONTROL DEVICES ON PLAN IS DIAGRAMMATIC FOR CLARITY. LOCATE DEVICES IN ELECTRICAL ROOM SERVING CIRCUIT.

GENERAL POWER NOTES

1. MINIMUM BRANCH CIRCUIT CONDUIT SHALL BE 3/4". MINIMUM DATA/COMMUNICATIONS CONDUIT SHALL BE 1." SEE DRAWINGS FOR AREAS WHERE LARGER CONDUITS ARE REQUIRED.
2. PROVIDE A DEDICATED NEUTRAL CONDUCTOR FOR EACH BRANCH CIRCUIT.
3. PROVIDE A GREEN INSULATED GROUND WIRE IN ALL RECEPTACLE AND EQUIPMENT BRANCH CIRCUITS.
4. SEE DEVICE ALIGNMENT DETAIL FOR INSTALLATION LOCATION OF DEVICES ADJACENT TO DOORS AND MOUNTING HEIGHT REQUIREMENTS.
5. PROVIDE TAMPER RESISTANT RECEPTACLES PER NEC 406.12. TAMPER RESISTANT RECEPTACLES ARE NOT INDICATED ON THE DRAWINGS.
6. INSTALL CONVENIENCE RECEPTACLES AT EQUIPMENT REQUIRING SERVICING PER 2017 NEC 210.63.
7. IN EXPOSED STRUCTURE AREAS (NO CEILINGS), ROUTE CONDUIT TIGHT TO DECK. CONDUIT SHALL BE ROUTED PARALLEL OR PERPENDICULAR TO STRUCTURE IN A NEAT AND WORKMANLIKE MANNER AND GROUPED WHERE POSSIBLE. PAINT EXPOSED CONDUIT AND BOXES TO MATCH STRUCTURE IN FINISHED AREAS WITHOUT CEILINGS. EXPOSED WIRING OF ANY TYPE WILL NOT BE ALLOWED.
8. ALL CABLING AND RACEWAY INSTALLED IN EXPOSED OR CONCEALED LOCATIONS NEAR METAL CORRUGATED ROOF DECKING SHALL BE INSTALLED WITH THE REQUIRED CLEARANCE PER NEC SECTION 300.4(E).
9. CONTRACTOR SHALL COORDINATE LOCATION OF LUMINAIRES, SPEAKERS, FIRE ALARM, ETC. WITH FIRE RATED WALLS AND CEILINGS AND PROVIDE ENCLOSURES AS REQUIRED TO MAINTAIN THE FIRE RATING INTEGRITY. COORDINATE EXACT LOCATIONS OF FIRE RATED WALLS AND CEILINGS WITH ARCHITECTURAL DRAWINGS. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
10. REFER TO ACCESS CONTROL DETAIL FOR DOOR HARDWARE ROUGH-IN REQUIREMENTS. COORDINATE WITH ARCHITECTURAL DOOR HARDWARE SCHEDULE AND EQUIPMENT SUPPLIER PRIOR TO INSTALLATION.
11. COORDINATE ALL FLOOR BOX LOCATIONS WITH ARCHITECT AND FURNITURE EQUIPMENT SUPPLIER PRIOR TO INSTALLATION.
12. COORDINATE MOUNTING HEIGHT AND EXACT LOCATION OF DEVICES FOR ALL TVs WITH ARCHITECT PRIOR TO ROUGH-IN.
13. ELECTRICAL CONTRACTOR SHALL PROVIDE ROUGH IN FOR ALL THERMOSTATS AND/OR SENSORS. ROUGH-IN TO INCLUDE 4" SQUARE BOX WITH SINGLE GANG MUD RING AND 1/2" CONDUIT TO ABOVE NEAREST ACCESSIBLE CEILING. LOCATE BOX AT 44" AFF ALIGNED VERTICALLY AND HORIZONTALLY WITH ADJACENT ELECTRICAL DEVICES. REFER TO MECHANICAL DRAWINGS FOR THERMOSTAT AND/OR SENSOR LOCATIONS.

GENERAL LIGHTING NOTES

1. MINIMUM BRANCH CIRCUIT CONDUIT SHALL BE 3/4". MINIMUM DATA/COMMUNICATIONS CONDUIT SHALL BE 1". SEE DRAWINGS FOR AREAS WHERE LARGER CONDUITS ARE REQUIRED
2. PROVIDE A DEDICATED NEUTRAL CONDUCTOR FOR EACH BRANCH CIRCUIT.
3. PROVIDE A GREEN INSULATED GROUND WIRE IN ALL LIGHTING BRANCH CIRCUITS.
4. CONNECT ALL EXIT SIGNS AND EMERGENCY LIGHTING UNITS TO GENERAL LIGHTING CIRCUIT SERVING AREA AHEAD OF ALL SWITCHING AND DIMMING CONTROL.
5. PROVIDE SENSING CONNECTIONS AS REQUIRED FOR OPERATION OF ALL EMERGENCY LIGHTING DEVICES. FOR LUMINAIRES WITH INTEGRAL BATTERIES, CONNECT BATTERY LEADS TO ROOM LIGHTING CIRCUIT AHEAD OF ALL SWITCHING AND DIMMING CONTROL.
6. SEE DEVICE ALIGNMENT DETAIL FOR INSTALLATION LOCATION OF DEVICES ADJACENT TO DOORS AND MOUNTING HEIGHT REQUIREMENTS.
7. CONTRACTOR SHALL COORDINATE LOCATION OF LUMINAIRES, SPEAKERS, FIRE ALARM, ETC. WITH FIRE RATED WALLS AND CEILINGS AND PROVIDE ENCLOSURES AS REQUIRED TO MAINTAIN THE FIRE RATING INTEGRITY. COORDINATE EXACT LOCATIONS OF FIRE RATED WALLS AND CEILINGS WITH ARCHITECTURAL DRAWINGS. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
8. IN EXPOSED STRUCTURE AREAS (NO CEILINGS), ROUTE CONDUIT TIGHT TO DECK. CONDUIT SHALL BE ROUTED PARALLEL OR PERPENDICULAR TO STRUCTURE IN A NEAT AND WORKMANLIKE MANNER AND GROUPED WHERE POSSIBLE. PAINT EXPOSED CONDUIT AND BOXES TO MATCH STRUCTURE IN FINISHED AREAS WITHOUT CEILINGS. EXPOSED WIRING OF ANY TYPE WILL NOT BE ALLOWED.
9. ALL CABLING AND RACEWAY INSTALLED IN EXPOSED OR CONCEALED LOCATIONS NEAR METAL CORRUGATED ROOF DECKING SHALL BE INSTALLED WITH THE REQUIRED CLEARANCE PER NEC SECTION 300.4(E).
10. MINIMUM WIRE SIZE FOR EMERGENCY LIGHTING CIRCUITS SHALL BE #10 UNLESS OTHERWISE NOTED ROUTED IN SEPARATE CONDUIT.

ELECTRICAL SYMBOLS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	LIGHTING		
	LUMINAIRE	S	SINGLE POLE SWITCH
	LUMINAIRE	S_3	3 - WAY SWITCH
	LUMINAIRE CONNECTED TO EMERGENCY CIRCUIT OR BATTERY	S_4	4 - WAY SWITCH
	STRIP LUMINAIRE		WALL BOX DIMMER SWITCH
	WALL MOUNTED LUMINAIRE		CEILING MOUNTED MOTION SENSOR/SWITCH
	WALL MOUNTED LUMINAIRE		WALL MOUNTED MOTION SENSOR/SWITCH
	TRACK LUMINAIRE	D	WALL MOUNTED MOTION SENSOR/SWITCH WITH 0-10V DIMMING
	EMERGENCY BATTERY PACK		LOW VOLTAGE LIGHTING CONTROL SWITCH
	CEILING MOUNTED EXIT LIGHT WITH DIRECTIONAL ARROW	P	WALL MOUNTED PHOTOCELL
	WALL OR END MOUNTED EXIT LIGHT WITH DIRECTIONAL ARROW	P	CEILING MOUNTED PHOTOCELL
	POLE MOUNTED LUMINAIRE	PP	POWER PACK
	BOLLARD LUMINAIRE		
	(NUMBER OR LETTER DENOTES TYPE, SEE CORRESPONDING MARK IN LUMINAIRE SCHEDULE)		
	FIRE ALARM		
	FIRE ALARM SMOKE DETECTOR	F	FIRE ALARM HORN & STROBE COMBINATION
	FIRE ALARM HEAT DETECTOR	F	FIRE ALARM MINI-HORN & STROBE COMBINATION
	DUCT MOUNTED SMOKE DETECTOR	F	CEILING FIRE ALARM STROBE
F	FIRE ALARM MANUAL PULL STATION	F	WALL FIRE ALARM STROBE
F	FIRE SPRINKLER VALVE TAMPER SWITCH	F	CEILING FIRE ALARM HORN & STROBE COMBINATION
F	FIRE SPRINKLER FLOW SWITCH	F	CEILING FIRE ALARM SPEAKER & STROBE COMBINATION
FACP	FIRE ALARM CONTROL PANEL	F	WALL FIRE ALARM SPEAKER & STROBE COMBINATION
FAA	FIRE ALARM ANNUNCIATOR PANEL	S F	CEILING FIRE ALARM SPEAKER
	FIRE ALARM MAGNETIC DOOR HOLDER	S F	WALL FIRE ALARM SPEAKER
	POWER		
	DUPLEX RECEPTACLE		CEILING MOUNTED DOUBLE DUPLEX RECEPTACLE
G	"G" DENOTES GFCI TYPE		FLOOR BOX - COMBINATION POWER & DATA
▷	"▷" DENOTES ISOLATED GROUND TYPE		POKE-THRU - COMBINATION POWER & DATA
H	"H" DENOTES HOSPITAL GRADE TYPE		FLOOR MOUNTED DUPLEX RECEPTACLE
TR	"TR" DENOTES TAMPER RESISTANT TYPE	M #	MOTOR ("#" DENOTES HORSEPOWER RATING)
U	"U" DENOTES UNIVERSAL SERIAL BUS (USB) TYPE		DISCONNECT SWITCH
	DOUBLE SHADING DENOTES RED DEVICE	S_{TE}	THERMAL ELEMENT SWITCH
	SINGLE SHADING DENOTES SPLIT WIRED DEVICE		SWITCH & FUSE
	HORIZONTAL MOUNTED DUPLEX RECEPTACLE		SWITCH & FUSTAT
	CEILING MOUNTED DUPLEX RECEPTACLE		MAGNETIC MOTOR STARTER
	DOUBLE DUPLEX RECEPTACLE		COMBINATION MAGNETIC STARTER/DISCONNECT
	SINGLE RECEPTACLE		MOTOR CONTROL PUSHBUTTON STATION
	DRYER RECEPTACLE NEMA 14-30 (125/250V 30A)	R	RELAY
	RANGE RECEPTACLE NEMA 14-50 (125/250V 50A)		MULTI-OUTLET ASSEMBLY - LENGTH AS INDICATED
W	"W" DENOTES WELDER RECEPTACLE NEMA 6-50 (250V 50A)		
	SPECIAL PURPOSE RECEPTACLE (NEMA CONFIG. AS NOTED)		
	COMMUNICATION		
	WALL PHONE OUTLET	S	INTERCOM CEILING SPEAKER
	WALL COMMUNICATIONS DATA OUTLET	S	INTERCOM WALL SPEAKER
	CEILING COMMUNICATIONS DATA OUTLET	S	SOUND REINFORCEMENT WALL SPEAKER
WAP	CEILING WIRELESS ACCESS POINT OUTLET	S	SOUND REINFORCEMENT CEILING SPEAKER
TV	TELEVISION/VIDEO OUTLET	M	WALL MICROPHONE OUTLET
	WALL CLOCK	M	CEILING MICROPHONE OUTLET
V	VOLUME CONTROL	C	CALL-IN DEVICE
	BASKET CABLE TRAY		LADDER CABLE TRAY
AVR	AV RACK OUTLET		
	SECURITY		
	CEILING MOUNTED SECURITY MOTION DETECTOR	#	VIDEO SURVEILLANCE CAMERA (# INDICATES TYPE)
	WALL MOUNTED SECURITY MOTION DETECTOR	CR	SECURITY CARD READER
RTE	WALL MOUNTED REQUEST TO EXIT MOTION SENSOR	ES	ELECTRIC STRIKE
	DOOR POSITION SWITCH	EL	ELECTRONIC LATCH RETRACTION
	MAGNETIC LOCK	KP	INTRUSION KEYPAD
IC	INTERCOM STATION	WG	WANDER GUARD
	GENERAL		
	LIGHTING PANEL	J	WALL MOUNTED JUNCTION BOX
	DISTRIBUTION PANEL SWITCHBOARD OR MOTOR CONTROL CENTER	J	JUNCTION BOX
	CABINET, ENCLOSURE, OR CONTROL PANEL, TYPE INDICATED ON PLANS		CONDUIT SEAL
	BRANCH CIRCUIT - EXPOSED		CIRCUIT DOWN
	BRANCH CIRCUIT CONCEALED IN CEILING OR WALL		CIRCUIT UP
	BRANCH CIRCUIT CONCEALED IN FLOOR		CONDUIT STUB-OUT
	BRANCH CIRCUIT - CLASS TWO WIRING		CIRCUIT BREAK
	HOMERUN TO PANEL (QUANTITY OF ARROWS INDICATES QUANTITY OF CIRCUITS)		BELL
	SPECIAL PURPOSE HOMERUN AS INDICATED		PUSH BUTTON
	CONDUIT / CONDUIT SLEEVE (SIZE INDICATED ON PLANS)	B	BUZZER
WP	SUBSCRIPT "WP" APPLIED TO ANY SYMBOL INDICATES WEATHERPROOF NEMA TYPE 3R OR EQUIVALENT	T	THERMOSTAT
3R OR RT	SUBSCRIPT "3R" OR "RT" APPLIED TO ANY SYMBOL INDICATES WEATHERPROOF NEMA TYPE 3R OR EQUIVALENT	E	SUBSCRIPT "E" ADDED TO ANY SYMBOL INDICATES EXISTING
		R	SUBSCRIPT "R" ADDED TO ANY SYMBOL INDICATES RELOCATED
PD	SUBSCRIPT "PD" ADDED TO ANY FLOOR OUTLET INDICATES PEDESTAL MOUNTED	(TYP)	WHERE (TYP) IS USED ON PLANS INDICATES A TYPICAL NOTE OR CONDITION
		DL	SUBSCRIPT "DL" ADDED TO ANY SYMBOL INDICATES DAMP LOCATION
EP	SUBSCRIPT "EP" APPLIED TO ANY SYMBOL INDICATES EXPLOSION PROOF CLASS, GROUP & DIVISION AS NOTED	K	SUBSCRIPT "K" ADDED TO ANY SYMBOL INDICATES KEY OPERATED
		P	SUBSCRIPT "P" ADDED TO ANY SYMBOL INDICATES PILOT LIGHT

LUMINAIRE SCHEDULE.

MARK	DESCRIPTION	MANUFACTURER	CATALOG NUMBER	LIGHT SOURCE SPEC.	LIGHT SOURCE CCT	LIGHT SOURCE TYPE	ELECTRICAL LOAD	ELECTRICAL VOLTS	FINISH	MOUNTING	ACCEPTABLE MANUFACTURERS	REMARKS
L1	4' LED STRIPLIGHT, CHAIN-HUNG	LITHONIA	ZL1D L48 5000LM FST 277 40K 80CRI WH HC36 M12	5,000 LM	4000 K	LED	41 W	277 V	WHITE	SUSPENDED	NOTE 1	

GENERAL REQUIREMENTS:

A. CONTRACTOR SHALL VERIFY CATALOG NUMBERS AND INSTALLATION REQUIREMENTS PRIOR TO ORDERING. NOTIFY ENGINEER OF ANY CONFLICTS WITH PROPOSED INSTALLATION.

B. CONTRACTOR SHALL COORDINATE CEILING TRIM OPTIONS FOR LUMINAIRES INSTALLED IN GRID-TYPE SUSPENDED CEILINGS. SEE ARCHITECTURAL DRAWINGS AND SPECIFICATIONS.

C. UNLESS NOTED OTHERWISE REFER TO PLANS FOR SUSPENSION LENGTHS REQUIRED FOR ALL SUSPENDED LUMINAIRES.

D. PROVIDE EQUAL SECTION LENGTHS FOR LUMINAIRES COMPRISED OF MULTIPLE SECTIONS. SUBMIT SHOP DRAWINGS OF PROPOSED CONFIGURATIONS FOR REVIEW.

LUMINAIRE SCHEDULE NOTES:

1. LUMINAIRE SHALL BE CONSIDERED EQUAL AS MANUFACTURED BY: ACUITY BRANDS, COOPER, CURRENT, SIGNIFY, CREE LIGHTING.

MECHANICAL CONNECTION SCHEDULE

PLAN TAG	VOLTAGE	PHASE	DISCONNECT	CIRCUIT	WIRE AND CONDUIT	REMARKS
FC-1 BASIN HEATER	480 V	3	30/3 / N.F. / NEMA 3R	L8-8,10,12	3#12#12N,#12G.-3/4"C.	
FC-1 SPRAY PUMP	480 V	3	30/3 / N.F. / NEMA 3R	L8-7,9,11	3#12#12N,#12G.-3/4"C.	NOTE 2
FC-1	480 V	3	100/3 / N.F. / NEMA 3R	MSB-1	3#3,#3N,#6G.,1-1/2"C.	NOTE 1
P-1	480 V	3	60/3 / N.F	L8-1,3,5	3#6,#6N,#6G.,1-1/4"C	NOTE 1
P-2	480 V	3	60/3 / N.F	L8-2,4,6	3#6,#6N,#6G.,1-1/4"C	NOTE 1

MECHANICAL CONNECTION SCHEDULE NOTES:
1. ROUTE CIRCUIT FOR PUMP VIA ASSOCIATED VFD. SEE PLANS FOR LOCATION.
2. ROUTE CIRCUIT FOR PUMP VIA ASSOCIATED STARTER NEW ELECTRICAL PANEL THAT SERVES PUMP. SEE PLANS FOR LOCATION.

2

KEYNOTES

E201 PROVIDE A NEW 400/3 CIRCUIT BREAKER IN SPACE IN EXISTING GE SPECTRA SERIES SWITCHBOARD. PROVIDE NEW COVERS AND MODIFICATIONS TO SWITCHBOARD AS NECESSARY TO ACCOMMODATE NEW CIRCUIT BREAKER.

E204 PROVIDE A NEW 175/3 CIRCUIT BREAKER IN SPACE IN EXISTING GE SPECTRA SERIES SWITCHBOARD. PROVIDE NEW COVERS AND MODIFICATIONS TO SWITCHBOARD AS NECESSARY TO ACCOMMODATE NEW CIRCUIT BREAKER.

COPPER FEEDER SCHEDULE

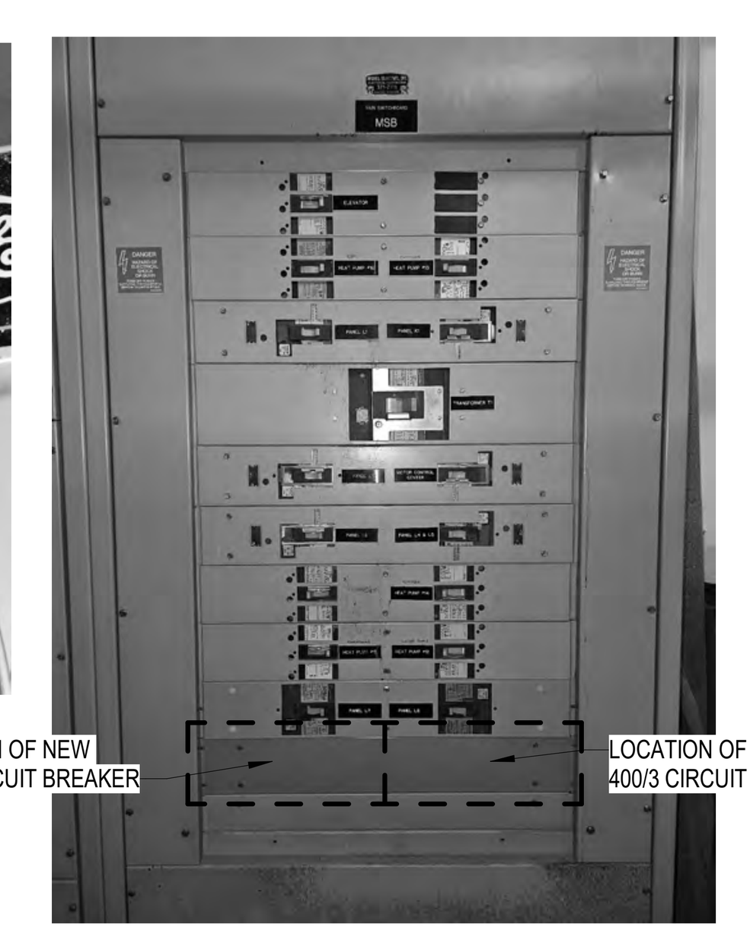
FEEDER	WIRE AND CONDUIT
400-4	4-600 KCMIL, #3 G - 4"C.

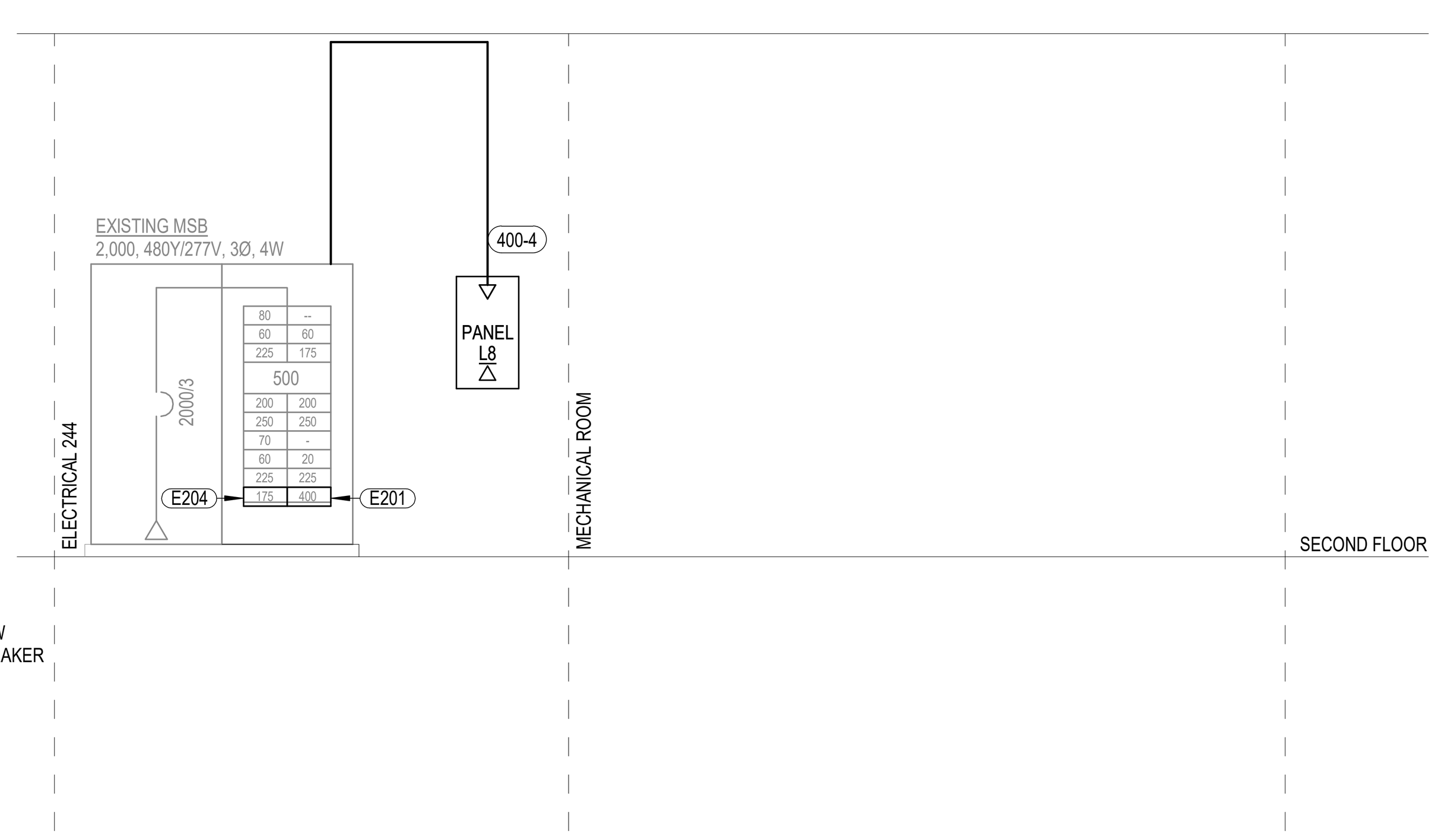
LIGHTING PANEL SCHEDULE

Panel: L8 **Voltage:** 480/277
Rating: 400 A **Phase:** 3
Mounting: SURFACE **Wire:** 4
Type: MLO W/FEED THRU LUGS AND GND. BAR **A.I.C. Rating:** 25000
Integral SPD: NO

Circuit Description	OPT	R	P	CKT	A	B	C	CKT	P	R	OPT	Circuit Description
P-1		100	3	1	...			2	3	100		P-2
				3		...		4				
				5			...	6				
FC-1 SPRAY PUMP		15	3	7	...			8	3	20		FC-1 BASIN HEATER
				9		...		10				
				11			...	12				
SPARE	--	20	1	13	...			14	1	20	--	SPARE
SPARE	--	20	1	15		...		16	1	20	--	SPARE
SPARE	--	20	1	17			...	18	1	20	--	SPARE
SPARE	--	20	1	19	...			20	1	20	--	SPARE
SPARE	--	20	1	21		...		22	1	20	--	SPARE
SPARE	--	20	1	23			...	24	1	20	--	SPARE
SPARE	--	20	1	25	...			26	1	20	--	SPARE
SPARE	--	20	1	27		...		28	1	20	--	SPARE
SPARE	--	20	1	29			...	30	1	20	--	SPARE
SPARE	--	20	1	31	...			32	1	20	--	SPARE
SPARE	--	20	1	33		...		34	1	20	--	SPARE
SPARE	--	20	1	35			...	36	1	20	--	SPARE
SPACE	--	--	1	37	...			38	1	--	--	SPACE
SPACE	--	--	1	39		...		40	1	--	--	SPACE
SPACE	--	--	1	41			...	42	1	--	--	SPACE

Options:
G – GFCI type circuit breaker. S – Shunt trip type circuit breaker.
L – Locking handle type circuit breaker.
Notes:





1 PARTIAL ELECTRICAL RISER DIAGRAM
NOT TO SCALE

note:
do not scale drawings. verify all dimensions and clearances from architectural, structural, shop and other appropriate drawings or at site. lay out and coordinate all work prior to installation to provide clearances required for operation, maintenance, and codes and verify non-interference with other work. do not fabricate prior to verification of clearance for all trades.

morrissey engineering inc
mechanical | electrical | lighting | technology | sustainability
4940 North 118th Street
Omaha, NE 68164
P: 402.491.4144
Nebraska COA Number: CA-0835
www.morrisseyengineering.com

MARK	REVISION	DATE
2	ADDENDUM 002	03/27/2026

ELECTRICAL COVER SHEET, RISER DIAGRAM, AND SCHEDULES

NORFOLK MIDDLE SCHOOL FLUID COOLER REPLACEMENT
1221 N. FIRST STREET NORFOLK, NE 68702

DOUGLAS C. HOLT JR
E-17645
PROFESSIONAL ENGINEER
STATE OF NEBRASKA

date: 03/04/2026
project number: 26003
designed by: d. holt
drawn by: d. holt
sheet number: E0.0

KEYNOTES

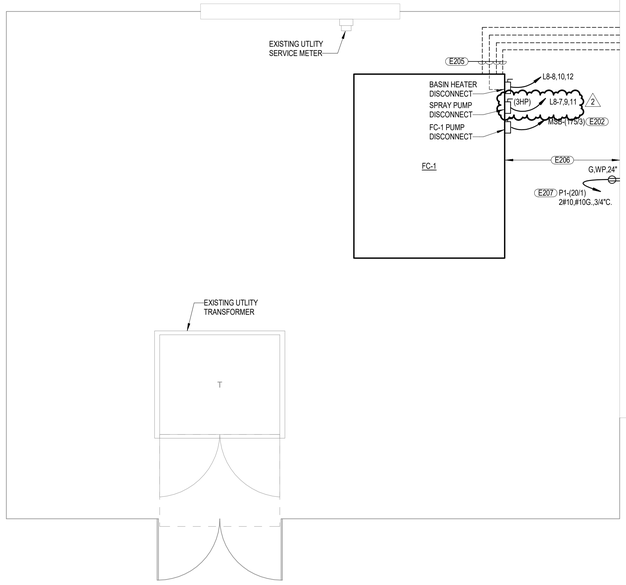
E202 ROUTE CIRCUIT FOR PUMP VIA ASSOCIATED VFD.

E205 PROVIDE HEAT TAPE TO PREVENT FREEZING OF PIPES TO FLUID COOLER 'FC-1'. PROVIDE SELF-REGULATING HEAT TRACE CABLE. DELTA-THERM #C0240-6-CBT. SEE 2/M1.1 AND 1/M1.2 ON THE MECHANICAL DRAWINGS FOR EXACT LOCATION, LENGTH, AND QUANTITY OF PIPES THAT REQUIRE HEAT TRACE. PROVIDE HEAT TRACE FOR ENTIRE EXTERIOR LENGTH OF PIPE FROM THE FLUID COOLER TO THE EXTERIOR FACE OF THE BUILDING. PROVIDE AMBIENT PIPE SENSING ELECTRONIC THERMOSTAT WITH EMBEDDED SENSOR, DELTA-THERM #OTS-P1 FOR EACH PIPE THAT REQUIRES HEAT TRACE. LOCATE SENSOR IN LOCATION ON PIPE THAT WOULD POTENTIALLY THE COLDEST SO THAT SYSTEM CAN PREDICT FREEZING CONDITIONS. LOCATE TEMPERATURE SENSOR AT PIPES PER MANUFACTURER'S RECOMMENDATION. PROVIDE ALL CONNECTORS, TEMPERATURE SENSING COMPONENTS, MOUNTING ACCESSORIES, AND OTHER PARTS AS REQUIRED FOR A COMPLETE HEAT TRACE SYSTEM. LOCATE HEAT TRACE CONTROLLER IN MECHANICAL ROOM ON THE 2ND FLOOR.

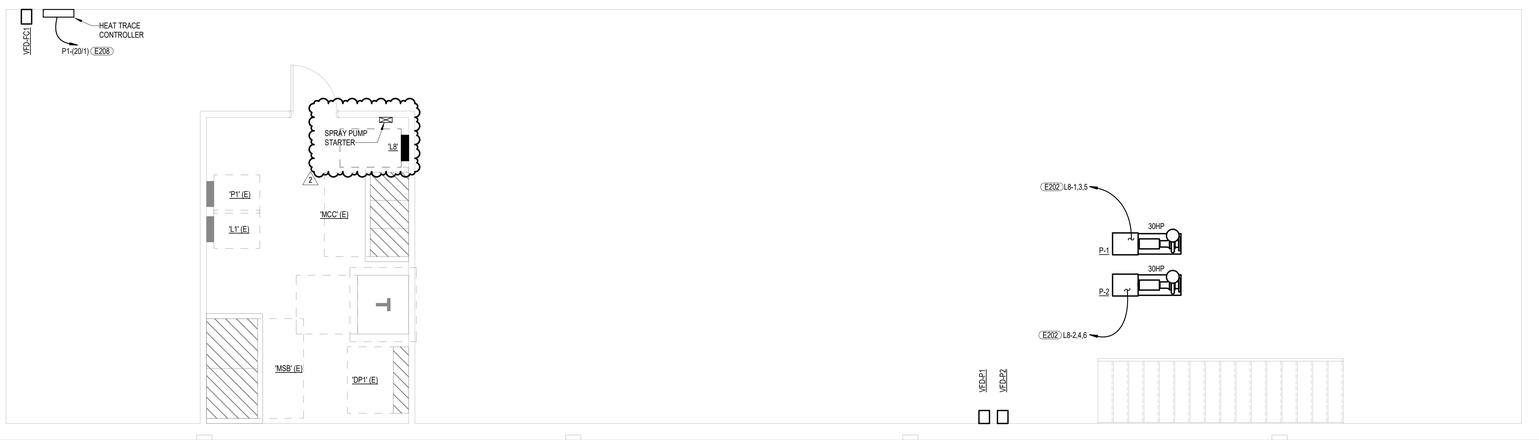
E206 ROUTE CONDUIT FROM FC-1 UNDERGROUND TO WALL. ROUTE CONDUIT UP WALL AND LB INTO MECHANICAL ROOM ON 2ND FLOOR. UTILIZE TWO-HOLE STRAPS FOR CONNECTION OF CONDUIT TO SIDE OF BUILDING AND PAINT CONDUIT AND FASTENERS TO MATCH SIDE OF BUILDING. REUSE EXISTING WALL PENETRATIONS AS MUCH AS POSSIBLE. SEAL ALL PENETRATIONS WEATHER TIGHT WITH SILICONE.

E207 PROVIDE NEW CIRCUIT BREAKER OF SIZE INDICATED IN EXISTING GE PANELBOARD. IF NECESSARY, REMOVE SPARE CIRCUIT BREAKERS TO ACCOMMODATE ADDITION OF NEW CIRCUIT BREAKER. TURN REMOVED CIRCUIT BREAKERS OVER TO OWNER.

E208 PROVIDE NEW CIRCUIT BREAKER OF SIZE INDICATED IN EXISTING GE PANELBOARD. PROVIDE CIRCUIT BREAKER WITH 30mA GFCI PROTECTION. IF NECESSARY, REMOVE SPARE CIRCUIT BREAKERS TO ACCOMMODATE ADDITION OF NEW CIRCUIT BREAKER. TURN REMOVED CIRCUIT BREAKERS OVER TO OWNER.



1 E2.1 PARTIAL FIRST FLOOR PLAN - POWER
1/4" = 1'-0"



2 E2.1 PARTIAL SECOND FLOOR PLAN - POWER
1/4" = 1'-0"

morrissey engineering inc
mechanical | electrical | lighting | technology | sustainability
4940 North 118th Street
Omaha, NE 68164
(402) 493-3344
Nebraska C/A Number CA-0835
www.morrisseyengineering.com

MARK	REVISION	DATE
2	ADDENDUM 002	03/27/2026

PARTIAL FLOOR PLANS - POWER

NORFOLK MIDDLE SCHOOL FLUID COOLER REPLACEMENT
1221 N. FIRST STREET NORFOLK, NE 68702

date: 03/04/2026
project number: 26003
designed by: d. holt
drawn by: d. holt
sheet number: E2.1

SECTION 262913 - MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. The Owner has contracted directly with the Commissioning Authority (CxA) for this project. All Contractors shall cooperate with the CxA to complete all required commissioning. Specification Section 019113 defines the Contractor's responsibilities with respect to the process. The Contractor shall review this section and shall include in their bids the work associated with the commissioning effort described.

1.2 SUMMARY

A. This Section includes ac motor-control devices rated 600 V and less that are supplied as enclosed units.

B. Related Sections include the following:

1. Division 26 Section "Basic Electrical Materials and Methods" for general materials and installation methods.

1.3 SUBMITTALS

A. Product Data: For products specified in this Section. Include dimensions, ratings, and data on features and components.

B. Maintenance Data: For products to include in the maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain similar motor-control devices through one source from a single manufacturer.

B. Comply with NFPA 70.

C. Listing and Labeling: Provide motor controllers specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

1.5 COORDINATION

A. Coordinate features of controllers and accessory devices with pilot devices and control circuits to which they connect.

B. Coordinate features, accessories, and functions of each motor controller with the ratings and characteristics of the supply circuit, the motor, the required control sequence, and the duty cycle of the motor and load.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Spare indicating lights: Furnish 6 of each type required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. GE/ABB.
2. Square D Co.
3. Eaton Corp.; Cutler-Hammer Products.
4. Siemens Energy and Automation, Inc.

2.2 MAGNETIC MOTOR CONTROLLERS

A. Description: Full voltage, nonreversing, across the line, unless otherwise indicated.

B. Control Circuit: 120 V; obtained from integral control power transformer, unless otherwise indicated. Include a control power transformer with adequate capacity to operate connected pilot, indicating and control devices, plus 100 percent spare capacity.

C. Combination Controller: Factory-assembled combination controller and disconnect switch with or without overcurrent protection as indicated.

1. Fused Disconnect.

D. Auxiliary contacts: 2 normally open, 2 normally closed

E. Pilot lights: Red LED run.

F. Hand switches: On-off-auto.

G. Overload Relay: Solid State Overload with Class 10 or 20 motor protection curves.

2.3 FUSES

A. Fuses shall de dual element time delay Bussman Low Peak Class RK-1.

2.4 ENCLOSURES

A. Description: Surface-mounted cabinets as indicated. NEMA 250, Type 1, unless otherwise indicated to meet environmental conditions at installed location.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Select features of each motor controller to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; duty cycle of motor, drive, and load; and configuration of pilot device and control circuit affecting controller functions.

B. Select horsepower rating of controllers to suit motor controlled.

C. Hand-Off-Automatic Selector Switches: In covers of manual and magnetic controllers of motors started and stopped by automatic controls or interlocks with other equipment.

3.2 INSTALLATION

A. Install independently mounted motor-control devices according to manufacturer's written instructions.

B. Location: Locate controllers within sight of motors controlled, unless otherwise indicated.

3.3 IDENTIFICATION

A. Identify motor-control components and control wiring according to Division 26 Section "Basic Electrical Materials and Methods."

3.4 CONTROL WIRING INSTALLATION

A. Bundle, train, and support wiring in enclosures.

3.5 CONNECTIONS

A. Tighten connectors, terminals, bus joints, and mountings. Tighten field-connected connectors and terminals, including screws and bolts, according to manufacturer's published torque-tightening values.

3.6 FIELD QUALITY CONTROL

A. Testing: After installing motor controllers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Sections 7.5, 7.6, and 7.16. Certify compliance with test parameters.
2. Remove and replace malfunctioning units with new units, and retest.

3.7 CLEANING

A. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean devices internally, using methods and materials recommended by manufacturer.

END OF SECTION 262913