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INSTRUCTIONS

FOR

COOLING TOWER REPLACEMENT

AT

GREEN SEA FLOYDS HIGH SCHOOL

GREEN SEA, SOUTH CAROLINA

PREPARED

BY

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GREEN SEA FLOYDS HIGH SCHOOL COOLING TOWER REPLACEMENT
Prepared by
McKnight Smith Ward Griffin Engineers
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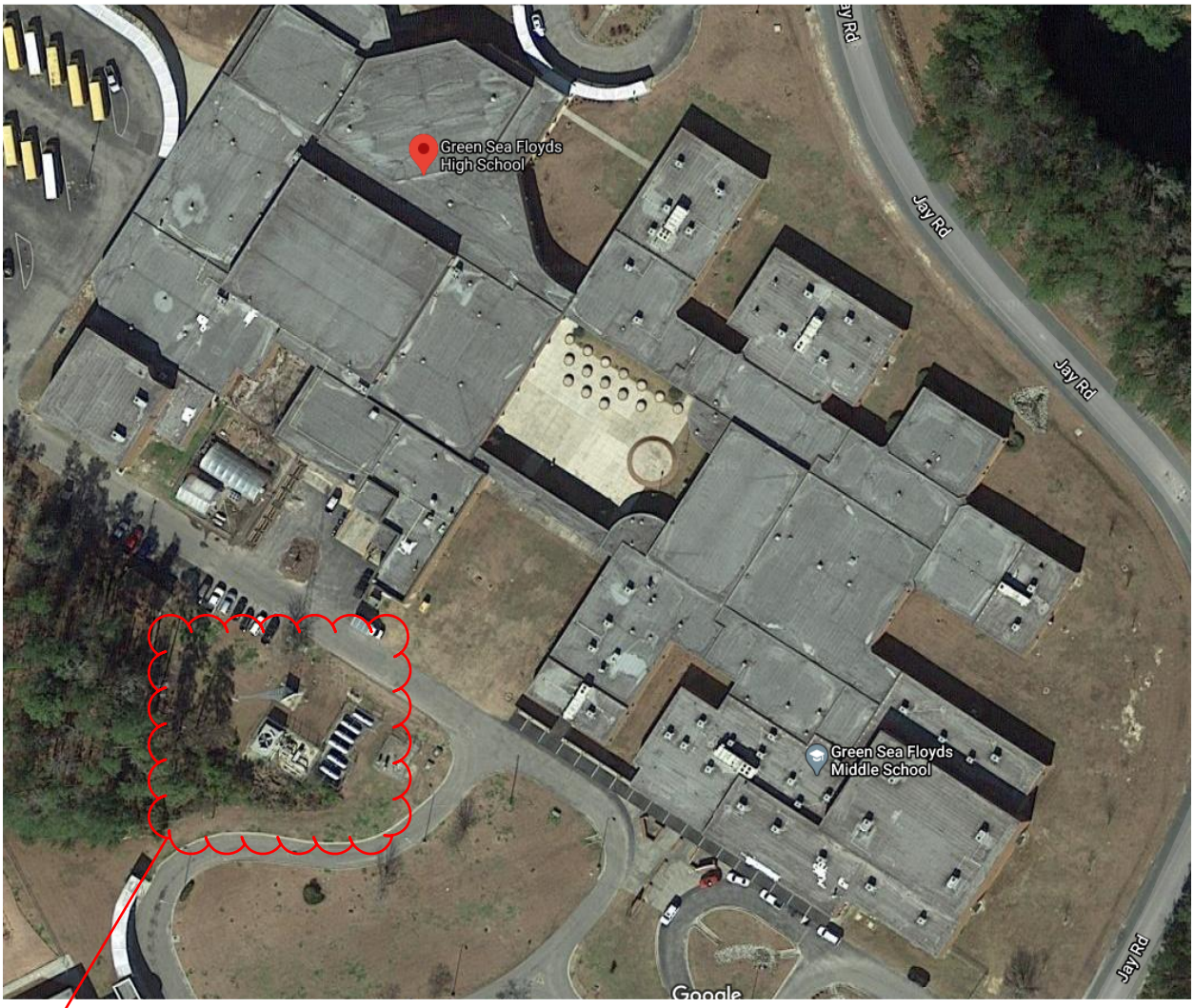
The scope of work consists of the replacement of the existing cooling tower and heat exchanger combination that provided condenser water for a system of water source heat pumps that condition Green Sea Floyds High School located in Green Sea, SC. The tower is to be replaced with a new closed-circuit cooler.



The existing tower, heat exchanger, and cooling tower condenser water pump shall be removed and disposed of by the contractor. Prior to removal, Horry County Schools will reclaim any components for use at other schools.

Cooling tower location

Tower and Heat Exchanger to be removed.

Tower and Pump

Makeup water for tower and electrical power source

Condenser Water Piping from Mechanical Room

Scope of Work

Tower shall be a BAC FXV Tower or Equal by Evapco or Marley. Alternate manufacturers will not be considered.

Disconnect existing condenser water piping at grade as noted and install butterfly valves on each pipe for service. Connect all condenser water supply, return, makeup, drain, etc. to new closed circuit cooler tower. Provide heat tape on all above grade piping.

Modify existing concrete pad as required. Provide any additional steel support recommended by tower manufacturer. If new tower requires any modifications of the existing fencing, incorporate modifications into the proposal.

Re-establish interface with building automation system for proper tower operation. Work will be done directly for HCS through CMI. Variable speed drives for the tower till be provided by CMI.

Existing tower chemical treatment system and shall be modified as required to supply protection to the tower basin. Chemical treatment work shall be provided by Nalco Company, LLC.

Reconnect to the existing power. Based on the original plans, the existing tower is 460 volt/ 3 phase. Tower has two fan motors, one 20 HP and one 10 HP. The existing basin heater is 15 KW (460/3). The pump is 40HP, 460V/p phase. Modify the power as required (including new breakers, starters, etc.) for operation of the new system.

Disconnect piping to existing underground storage tank and cap. Piping shall flow from building through closed circuit cooler and tank will be removed from service. Tank to remain.

Test and balance to confirm water flows through the cooler water coil will be performed by the owner.

Furnish a one-year parts and labor warranty on the installation of the closed-circuit cooler.

Closed Circuit Cooler

The new tower shall be a BAC Model FXV-1212B-24T-O Closed Circuit Cooling Tower. The tower shall have a certified capacity of 1100.00 USGPM of Water from 102.00°F to 92.00°F at 80.00°F entering wet bulb and 8.41 PSIG fluid pressure drop.

Unit shall be provided with Two (2) 15 HP fan motor(s), Totally Enclosed, Air Over (TEAO), 1 Speed/1 Winding - Premium Efficiency (Inverter Duty), suitable for 460-volt, 3 phase, 60 hertz electrical service and Space Heater with Shaft Grounding Ring(s). Drives shall be based on 0 inches ESP.

Spray pump shall be (1) 7.5 HP pump motor: 1 Speed/1 Winding - Energy Efficient, suitable for 460-volt, 3 phase, 60 hertz.

The thermal performance of the tower shall be certified through performance tests conducted by the Cooling Technology Institute in accordance with their standard STD-201 RS.

All panels and structural components shall be constructed from Type 304 stainless steel. All factory seams in the cold-water basin shall be welded to ensure watertight construction and welded seams shall be warranted against leaks for a period of five (5) years. Access door(s) provide for interior inspection, cleaning, and adjustments shall be constructed of Type 304 stainless steel.

The air inlet louvers shall be constructed of PVC honeycomb shape louver and shall also act as an air inlet screen and block sunlight to the basin and the front of the fill.

The unit shall be provided with a manufacturer standard fan. The fan drive system shall consist of cast aluminum sheaves located on minimum shaft centerline distances. A premium efficient fan motor shall be provided. Motor and fan drive shall have a 5-year warranty. Provide a heavy gauge, G-235 (Z700 metric) hot-dip galvanized steel wire fan guard over each fan cylinder.

The Fill and integral drift eliminators shall be formed from self-extinguishing (per ASTM D-568) polyvinyl chloride (PVC), having a flame spread rating of 5 per ASTM Standard E84-77a, and shall be impervious to rot, decay, and fungus or biological attack. The fill shall be elevated above the cold-water basin floor to facilitate cleaning. The fill shall be suitable for a maximum entering water temperature of 130°F. The eliminators shall be designed to strip entrained moisture from the leaving airstream with a minimum of air resistance.

The coil shall be suitable for cooling fluids compatible with Type 304 stainless steel or partially open systems. The coil(s) shall be constructed from Type 304 stainless steel and bent in a serpentine shape, encased in steel framework. Coil shall be designed for free liquid drainage. Coil shall have a maximum allowable working pressure of 300 psig and shall be tested at 375 psig air pressure under water. The system shall have a vent placed at the highest point in the installation to facilitate filling and drainage. Vent shall be provided and installed by the contractor.

The structure shall be designed and analyzed in accordance with the wind and seismic load requirements of the 2006 IBC, 2009 IBC, 2012 IBC, 2015 IBC, ASCE/SEI 7-05, and ASCE/SEI 7-10.

Each cold-water basin shall have an integral pump with large area, lift out, steel strainer screens including perforated openings sized smaller than the water distribution nozzle orifices. Strainers shall include anti-vortexing baffles to prevent air entrainment. A close-coupled, bronze-fitted pump with a mechanical seal shall be mounted on the basin. The pump motors shall be premium efficiency, totally enclosed, fan cooled (TEFC). A water bleed line with a metering valve to control the bleed rate shall be installed between the pump discharge and the overflow connection.

Provide spray header with schedule 40 PVC branches. Removable branches and 360° spray pattern plastic spray nozzles shall be held in place with snap-in rubber grommets.

The unit shall be supplied with a make-up valve with unsinkable polystyrene filled plastic float arranged for easy adjustment. The make-up valve shall be corrosion resistant and shall be suitable for water supply pressures between 15 psig and 50 psig.

A minimum number of high-watt-density electric immersion copper heater elements, sized to maintain +40°F basin water at 0°F ambient with a 10-mph wind speed, shall be provided. Heaters shall be wiring in the field by the contractor.

An electric immersion heater control package which includes a control panel in a NEMA 4 enclosure shall be provided. Control package shall include contactor(s), disconnect, thermostat, 24V transformer, and Type 316 stainless steel probe for water level and water temperature sensing. Panel ships loose for field mounting and wiring by the Contractor.

Fan system shall be provided with an appropriate number of vibration cutout switches to limit collateral damage to the unit in the event of a catastrophic fan failure. The vibration switch(es) shall be mechanically tripped with a frequency range of 0 to 3,600 RPM and trip point of 0.2 to 2.0 g's. No input power shall be required. Switch rating shall be 10 amperes at a maximum 480 VAC, and 1/4 ampere at 250 Vdc.

Provide one davit arm per motor and access panel for removing the motor. The davit shall be installed on the coil/fan section before rigging.

A straight sided coil air intake hood(s) shall be provided for mounting on top of the coil and spray distribution system to reduce heat loss during idle operation at cold ambient temperatures. The hood(s) shall be constructed of Type 304 Stainless Steel. The hood(s) shall include Stainless Steel positive closure dampers (PCD's) with stainless steel linkages, damper actuator(s), actuator end switch(es), and access doors. The hood(s) ships loose and shall be field installation by the contractor.

The unit shall be configured with a platform (with FRP grating) with Type 304 stainless steel supports, ladder with safety cage and safety railing on the louver face. The safety rails shall be constructed of 1 1/4" galvanized steel pipe. A spring-loaded safety gate shall be provided. These components ship loose and are to be assembled and shall be field installed by the Contractor.

The unit shall have access doors on both ends and an internal walkway. An internal aluminum ladder and service platform with Type 304 stainless steel supports shall be supplied to facilitate access to the mechanical equipment. Provide a spring-loaded self-closing safety gate.

Piping

Condenser water pipe shall be standard schedule 40 steel pipe as manufactured by Wheatland Tube or equivalent, ASTM A53, Type E, Grade B. Pipe shall be domestically produced.

Make-up water piping above grade, shall be Type "L" hard copper tubing with wrought copper sweated fittings. Copper pipe to conform to ASTM Specifications B-88 and fittings to conform to ASA Specifications B-16-22 Joints in copper piping to be reamed, cleaned, fluxed, and soldered with 95% tin, 5% antimony solder. Joints between dissimilar metals to be made with red brass fittings.

Drain lines shall be Schedule 40 PVC drainpipe conforming to ASTM D 1785. Drains shall be connected to existing drain line. PVC pipe shall be painted with UV resistant paint.

Provide all piping and connections to all items of equipment as required to fully complete the system indicated, including drains and other connections. All piping shall be reamed or filed and cleaned to remove burrs and other obstructions.

The Contractor shall be responsible for installing all piping work in a neat workmanlike manner. This shall be interpreted to mean that all piping shall be neatly aligned, installed, and supported in equally spaced parallel runs using trapeze hangers where applicable, install square, true and plumb with walls, equipment or other related surfaces using standard fittings. Any pipe work installed in a disorderly or unworkmanlike manner as adjudged by the Architect shall be corrected by the Contractor at the Contractor's expense.

Piping and Pipe Work: Grade all piping properly to insure noiseless circulation of water without formation of pockets. Unless otherwise called for in the plans and specifications, horizonal pipe runs shall be graded to permit complete drainage of the system. Install eccentric reducers to change size of mains installed with eccentricity up to keep the top of mains level in the piping.

Welding: All welding of joints in piping connections done in the field shall be in accordance with the requirements of the American Standard Code for Pressure Piping. Welding may be either by Metal Arc-Welding Process of the Oxyacetylene Welding Process and in general conformance with procedures established in the latest edition of Appendix B to Section 6 of the ASA Code for Pressure Piping B31.1.

Welding fittings shall be used with welded piping. These shall be welding pattern in accordance with ASTM Specifications A-234 and ASA Standard B16.9. Such fittings shall be provided at all changes in direction or changes in pipe size except as hereinafter provided.

Fittings: Fittings in welded piping shall be standard weight welding fittings, with radii of 1-1/2" the diameter and equal to Tube Turns, Ladish, Taylor Forge or approved equal. See "welding" section for lateral connections and welding fittings standards.

During erection, care shall be taken to remove all dirt, scale, and other foreign matter from inside the piping before tying in long sections or installing valves.

Copper piping:

Piping shall be installed to be free floating. 125-pound copper sweat pattern unions shall be provided in the piping as indicated on the drawings.

Unions shall be installed at each piece of equipment.

All piping and equipment shall be thoroughly blown-out under pressure and clean of all foreign matter wasting condensate through temporary connections so long as necessary to thoroughly clean before system is placed in operation. Use every precaution to prevent pipe compound, scale, dirt, welding, and other objectionable matter getting into piping system and equipment.
Piping shall be supported on metal frames. Frames shall be primed and painted and shall be suitable for the piping installed.

All insulated piping shall be provided with insulating protection sheet metal saddles. These shall be 20-gauge galvanized iron. Saddles shall be of a length equal to two times the outside diameter of the insulation and

Pressure test all condenser water piping at a pressure of 150 psig for 24 hours.

Insulation

Condenser water supply and return piping, overflow, and drain lines shall be insulated with 2” thick heavy density fiberglass with an all-service jacket.

Insulation and surfaces to be insulated shall be clean and dry when insulation is installed and during the application of any finish.

All fiberglass pipe covering shall be furnished with self-seal lap and 3" wide butt joint strips. The release paper is pulled from adhesive edge, pipe covering closed tightly around pipe and self-seal lap rubbed hard in place with the blunt edge of an insulation knife. This procedure applies to longitudinal as well as circumferential joints. Under no circumstances will staples be allowed. Care shall be taken to keep jacket clean, as it is the finish on all exposed work. All adjoining insulation sections shall be firmly butted together before butt joint strip is applied. All insulation shall be protected with aluminum weather-proof jacketing with lap-seal, and factory attached moisture barrier. The aluminum shall be .016 gauge (3303-H14 alloy) of embossed pattern. It shall be applied with a 2" circumferential and 1-1/2" longitudinal lap and be secured with aluminum bands 3/8" wide 8" o.c. All elbows shall be covered with the same .016 aluminum with factory applied moisture barrier. All fittings, valve bodies, unions, and flanges shall be finished as follows:

Apply molded or segmental insulation to fittings equal in thickness to the insulation on adjoining pipe and wire in place with 2#14 copper wires.

Apply a skim coat of insulating cement to the insulated fitting, if needed, to produce a smooth surface. After cement is dry, apply Owens-Corning Fiberglass Fitting Mastic, Type C, UL labeled.

Wrap the fitting with fiberglass reinforcing cloth overlapping the preceding layer by 1 to 2". Also, overlap mastic and cloth by 2" on adjoining sections of pipe insulation.

Apply a second coat of mastic over cloth, working it well into mesh of cloth and smooth the surface. Mastic to be applied at the rate of 40 square feet per gallon. All flanges and fittings on hot and cold lines in utility tunnels shall be insulated according to above. Omit insulation on flanges and unions over 60 degrees F. If painting is required, no sizing is necessary. To maintain the non-combustibility of the system only Glidden acrylic latex paint (#5370) is to be used.

CLOSED CIRCUIT COOLER DETAIL