Section 1 - GENERAL

1.2 SCOPE

A. The work to be performed includes all new equipment, labor, and materials required to furnish and install Chromalox CHSI Electric Steam Boilers as described in this product guide specification.

1.3 REFERENCES

A. ASME

B. CSD1, Controls and Safety Devices

C. NEC, National Electric Code

D. UL-834

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model, weights (shipping, installed, and operating), installation and start-up instructions, and furnished accessory information.

B. Shop Drawings: Submit manufacturer's end assembly drawings indicating dimensions, connection locations, and clearance requirements.

C. Wiring Diagrams: Submit applicable manufacturer's electrical requirements for the boiler including ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory installed and portions to be field installed.

1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in the manufacture of steam boilers and pressure vessels, whose products have been in satisfactory use in service for not less than seventy (70) years.

B. The boiler package shall be certified to cULus 834.

C. The boiler will be rated for a maximum allowable working pressure of 150 PSIG for ASME Section I or 15 PSIG for ASME Section IV. Refer to job schedule for additional clarification.

D. The entire boiler system and its installation shall conform to the manufacturer's instructions, applicable codes and associated National Board requirements.

E. The equipment shall be in strict compliance with the requirements of this specification and shall be the manufacturer's standard commercial product unless specified otherwise.

F. The equipment shall fit within the allocated space, leaving ample allowance for maintenance and inspection.

G. Boilers shall be tested prior to shipment. Proper operation of the boiler control circuit and safety devices will be performed at the factory.

H. Boiler inspection shall include a hydrostatic test in the presence of an inspector having a National Board Commission. The inspector shall certify a Data Report which shall be delivered with the boiler as evidence of ASME code compliance. In addition to the ASME symbol, the boiler shall bear a National Board Registration Number.

1.6 WARRANTY

A. Boiler is covered against defective material or workmanship for a period of one (1) year from the date of shipment from the factory.

B. Parts are covered against defective material or workmanship for a period of one (1) year from the date of shipment from the factory.

Part 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers

1. Chromalox CHSI (basis of design)
2. Chromalox CES
3. Bryan BE

B. Basis of Design: Chromalox CHSI series:

C. Boiler capacities per schedule:

1. CHSI-___. __ lb/hr F&A212ºF, _____ BTU/hr)

D. Steam Output rating at 212 ºF feedwater temperature, 0 psig (Sea Level to 2000 ft)

2.2 BOILER CONSTRUCTION

A. The boiler shall be completely factory assembled as a self-contained unit. Each boiler shall be neatly finished, thoroughly tested, and properly packaged for shipping.

B. The pressure vessel design and construction shall be in accordance with Section I or Sec IV of the ASME Code for steam boilers.

C. The boiler shall comply with CSD-1 code requirements and carry a cULus listing.

D. The pressure vessel shell is of the vertical type with horizontally oriented flanged element insertion openings.

E. Boiler shall be insulated with 2” high density high temperature insulation.

F. Surface losses from the boiler will not exceed 0.5% of boiler rating.

G. The boiler jacket shall be a minimum of 18 gauge carbon steel and shall have a primer and an enamel finish paint.

H. BOILER DESIGN

I. The boiler shall be of a vertical design with adequate openings for access to the water side of the boiler.

J. The boiler shall be supplied with resistance type heating elements with incoloy sheathing to ensure longer life.

K. Heating elements shall be mounted on circular flanges to permit convenient inspection of element and pressure vessel.

L. The operating water volume of the boiler shall not be less than ___ Gallons:

2.3 CONTROLS

A. Electrical Power

1. Electrical power supply shall be [480][600] volts, [60] cycle three phase.
2. Main lugs for supply circuits.
3. Distributions blocks with pressure connectors.
4. Power distribution blocks, fuses, contactors shall be such that a 100k SCCR rating shall be possible when appropriate disconnects and fusing are used upstream of the boiler.
5. Magnetic contactors rated at 500,000 cycles, 50A resistive up to 600V.
6. Housed in UL Type 1A rated enclosure with louvers.
7. Wiring shall be numbered and color coded to match a wiring diagram.
   a. Install factory wiring outside of an enclosure in a metal raceway or conduit.
   b. Minimum heating element wire size shall be #8 AWG.
   c. Minimum control circuit wire size shall be #16 AWG.
8. Field power interface shall be [non-fused] [fused] disconnect switch.
   a. Disconnect shall be mounted with the boiler.
   b. Disconnect shall be shipped loose for installation by others.
   c. Disconnect shall be provided by others.
9. Optional: Ground fault current interrupting (GFCI) circuit breaker.

B. PLC Touchscreen Hardware:

   a. Boiler shall include a 5.7" Color touchscreen with NEMA4X/IP66/IP65 rating
   b. Control shall be password protected
   c. Control shall annunciate alarms
   d. Control shall utilize automatic PID
   e. Controller shall contain a dedicated BMS Modbus RTU port.
      I. Option: BACnet, LONworks, and other integration options shall be available with use of a protonode.
   f. As standard the controller shall incorporate the following I/O

I. 4-20mA remote setpoint
II. Boiler steam pressure
III. Dedicated outputs for element staging

g. Individual input monitoring for safety devices with alarm annunciation (Low Water, high pressure
h. The PLC shall incorporate the following:
   I. Cold Start based on Water Temperature
   II. Setback schedule
   III. SCR control
   IV. PID based Control Variable / Firing Rate Control
   V. Track hours/cycles separately per stage/element
   VI. Element totalization of running element stages
   VII. kWh totalization of running element stages

2.4 BOILER FITTINGS & TRIM

A. The boiler shall be supplied with an ASME Section I or Section IV safety relief valve. The safety relief valve size shall be in accordance with ASME code requirements and set at ___ psig for Section I Pressure Vessels, or 15 psig for Section IV vessels.

B. Boilers shall have an external sight glass. A gauge glass and drain valve will be supplied. The gauge glass shall be protected by four brass rods.

C. Operating Pressure Controller for automatic start and stop of boiler operation.

D. High Limit Pressure Controller with manual reset.

E. Primary Low Water: A probe type low water cut-off to cause a shut-down of unit should the water level drop to an unsafe level.
   a. Optional: A float type low water cut-off to cause a shut-down of unit should the water level drop to an unsafe level

F. An auxiliary low water cutoff probe shall also be mounted in the boiler shell.
   a. Optional: A float type low water cut-off to cause a shut-down of unit should the water level drop to an unsafe level

G. A 4-1/2” diameter steam pressure gauge shall be included with the boiler, mounted, and shall be complete with test connection.

H. Feedwater stop and check valve shall be supplied at factory in line to an internally baffled feed connection in boiler shell to prevent thermal shock.

   1. Select: Feed water control will be on on/off

   2. Select: A fully modulating feedwater system shall be provided via the use of a modulating float control and a motorized feedwater valve with three valve bypass

   3. Select: A fully modulating feedwater system shall be provided via the use of a proportional differential pressure based level control and a motorized feedwater valve with three valve bypass

I. Additional standard trim shall include Y-type blow down valve and water column blow down valve.

J. A surface blowdown connection shall be provided and provided with a manual valve.

   1. Optional A conductivity based surface blowdown system shall be provided.

K. The boiler shall come set up for transporting by forklift or crane.

L. Instructions for installation, operation and maintenance of the boiler shall be contained in a manual provided with each boiler.

M. A wiring diagram corresponding to the boiler configuration shall be included with each boiler.

Part 3 – EXECUTION

3.1 INSTALLATION

A. Equipment and materials shall be installed in an approved manner and in accordance with the boiler manufacturers' installation requirements.

B. The installer shall construct a flat, level foundation designed to support the entire load. Calculations shall be based upon the maximum or filled weight of the system. The boiler should be located in dry surroundings on a level base, making sure that there is sufficient room around the boiler to enable the operator and/or the maintenance engineer to gain access to all parts of the boiler. Check location for ease of water supply and electrical connections. Place the boiler on a noncombustible floor with clearances to unprotected combustible materials, including plaster or combustible supports.

C. Assemble unit sections and parts shipped loose or unassembled for shipment purposes. Follow manufacturer's installation recommendations and instructions.

D. Install electrical control items furnished by manufacturer per wiring diagram provided by manufacturer.

E. Complete feedwater, steam, blowdown, fuel (as applicable), safety valve discharge, and vent piping installation as required by manufacturer for operation of system.

3.2 FIELD QUALITY CONTROL

A. After boiler installation is completed, the manufacturer shall provide the services of a field representative for starting the unit and training the operator for a fee.

B. Arrange with National Board of Boiler and Pressure Vessel Inspectors for inspection of boilers and piping. Obtain certification for completed boiler units, deliver to Owner, and obtain receipt.

END OF SECTION