1. GENERAL
   1. SCOPE
      1. The work to be performed includes all new equipment, labor and materials required to furnish and install Fulton FB-E Electric Steam Boilers as described in this product guide specification.
   2. REFERENCES
      1. ASME
      2. CSD1, Controls and Safety Devices
      3. CSA/CUL
      4. NEC, National Electric Code
      5. UL-834
   3. SUBMITTALS
      1. 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.
      2. Shop Drawings: Submit manufacturer’s end assembly drawings indicating dimensions, connection locations, and clearance requirements.
      3. 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.
   4. QUALITY ASSURANCE
      1. Manufacturer’s Qualifications: The boiler must be manufactured in the USA and be able to participate in projects that require a level of USA content of boiler materials.
      2. The boiler package shall be certified to UL 834 (CAS/CUL approval for Canada).
      3. The boiler will be rated for a maximum allowable working pressure of 100 PSIG for ASME Section I. Refer to job schedule for additional clarification.
      4. The entire boiler system and its installation shall conform to the manufacturer’s instructions, applicable codes and associated National Board requirements.
      5. 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. Additional equipment features, details, accessories, etc. which are not specifically identified but which are a part of the manufacturer’s standard commercial product, shall be included in the equipment being furnished.
      6. The equipment shall be of the type, design, and size that the manufacturer currently offers for sale and appears in the manufacturer’s current catalog or website.
      7. The equipment shall fit within the allocated space, leaving ample allowance for maintenance and inspection.
      8. The equipment shall be new and fabricated from new materials. The equipment shall be free from defects in materials and workmanship.
      9. All units of the same classification shall be identical to the extent necessary to ensure interchangeability of parts, assemblies, accessories, and spare parts wherever possible.
      10. In order to provide unit responsibility for the specified capacities, efficiencies, and performance, the boiler manufacturer shall certify in writing that the equipment being submitted shall perform as specified.
      11. Boilers shall be fully tested prior to shipment. Proper operation of the boiler and all controls will be assured by testing the control circuit and safety devices at the factory. Tests will include adjusting all operating and safety controls to the correct settings.
      12. Pressure Vessel 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 pressure vessel as evidence of ASME code compliance. In addition to the ASME symbol, the boiler shall bear a National Board Registration Number.
   5. WARRANTY
      1. Boiler
         1. Five (5) Year (60 Months) Material and Workmanship Warranty:
            1. The pressure vessel is covered against defective material or workmanship for a period of five (5) years from the date of shipment from the factory. Fulton will repair or replace F.O.B. factory any part of the equipment, as defined above, provided this equipment has been installed, operated and maintained by the buyer in accordance with approved practices and recommendations made by Fulton. The commissioning agency must also successfully complete and return the equipment Installation and Operation Checklists to Fulton's Quality Assurance department. This warranty covers any failure caused by defective material or workmanship; however, waterside corrosion or scaling is not covered. Therefore, it is imperative that the boiler water management and chemistry be maintained as outlined in the Installation and Operation Manual.
         2. Parts Warranty:
            1. Fulton will repair or replace F.O.B. factory any part of the equipment of our manufacture that is found to be defective in workmanship or material within one (1) year of shipment from the factory provided this equipment has been installed, operated and maintained by the buyer in accordance with approved practices and recommendations made by both Fulton and the component manufacturers and the commissioning agency has successfully completed and returned the equipment Installation and Operation Checklists to Fulton's Quality Assurance department.
         3. General:
            1. Fulton shall be notified in writing as soon as any defect becomes apparent. This warranty does not include freight, handling or labor charges of any kind. These warranties are contingent upon the proper sizing, installation, operation and maintenance of the boiler and peripheral components and equipment. Warranties valid only if installed, operated, and maintained as outlined in the Fulton Installation and Operation Manual. No Sales Manager or other representative of Fulton other than the Quality Manager or an officer of the company has warranty authority. Fulton will not pay any charges unless they were pre-approved, in writing, by the Fulton Quality Manager. This warranty is exclusive and in lieu of all other warranties, expressed or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Fulton shall in no event be liable for any consequential or incidental damages arising in any way, including but not limited to any loss of profits or business, even if the Fulton Companies has been advised of the possibility of such damages. Fulton's liability shall never exceed the amount paid for the original equipment found to be defective. To activate the warranty for this product, the appropriate commissioning sheets must be completed and returned to the Fulton Quality Assurance department for review and approval.
      2. Premier Steam Engineered System
         1. Ten (10) year (120 months) Material and Workmanship Warranty:
            1. The pressure vessel is covered against defective material or workmanship for a period of ten (10) years from the date of shipment from the factory. Fulton will repair or replace F.O.B. factory any part of the equipment, as defined above, provided this equipment has been installed, operated and maintained by the buyer in accordance with approved practices and recommendations made by Fulton. The commissioning agency must also successfully complete and return the equipment Installation and Operation Checklists to Fulton's Quality Assurance department. This warranty covers any failure caused defective material or workmanship; however, waterside corrosion or scaling is not covered. Therefore, it is imperative that the boiler water management and chemistry be maintained as outlined in the Installation and Operation Manual. There is a $1,000 labor allowance for any failed pressure vessel that is covered under the above warranty.
         2. Parts Warranty:
            1. Fulton will repair or replace F.O.B. factory any part of the equipment of our manufacture that is found to be defective in workmanship or material within one (1) year of shipment from the factory provided this equipment has been installed, operated and maintained by the buyer in accordance with approved practices and recommendations made by both Fulton and the component manufacturers and the commissioning agency has successfully completed and returned the equipment Installation and Operation Checklists to Fulton's Quality Assurance department.
         3. General:
            1. The extended warranty is valid only for boilers that are purchased as part of a Premier Steam Engineered System. Generally, this system MUST include ALL of the following equipment in order for the warranty to apply. Any deviation or additional equipment specified by Fulton Engineering must be used and maintained per the Installation and Operation Manual as well: Fulton Boiler with model number as listed above; Feedwater or DA system with preheat kit; Fulton blowdown tank; Water softener; Chemical feed system; Automatic surface or Timer Based bottom blowdown, which must operate to maintain a TDS level as specified in the Installation and Operation Manual. Fulton shall be notified in writing as soon as any defect becomes apparent. This warranty does not include freight, handling or labor charges of any kind except as noted above. These warranties are contingent upon the proper sizing, installation, operation and maintenance of the boiler and peripheral components and equipment. Warranties valid only if installed, operated, and maintained as outlined in the Fulton Installation and Operation Manual. No Sales Manager or other representative of Fulton other than the Quality Manager or an officer of the company has warranty authority. Fulton will not pay any charges unless they were pre-approved, in writing, by the Fulton Quality Manager. This warranty is exclusive and in lieu of all other warranties, expressed or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Fulton shall in no event be liable for any consequential or incidental damages arising in any way, including but not limited to any loss of profits or business, even if the Fulton Companies has been advised of the possibility of such damages. Fulton’s liability shall never exceed the amount paid for the original equipment found to be defective. This warranty applies only in the U.S.A. and Canada. To activate the warranty for this product, the appropriate commissioning sheets must be completed and returned to the Fulton Quality Assurance department for review and approval.
2. PRODUCTS
   1. ACCEPTABLE MANUFACTURERS
      1. This specification is based on the FB-E Series boilers as manufactured by Fulton Steam Solutions, Inc. Equivalent units and manufacturers must meet all performance criteria, and will be considered upon prior approval.
      2. Basis of Design: Fulton Steam Solutions, Inc. Models:
         1. FB-E-012 – 42 lb/hr (40,840 BTU/hr)
         2. FB-E-018 – 63 lb/hr (61,259 BTU/hr)
         3. FB-E-024 – 84 lb/hr (82,014 BTU/hr)
         4. FB-E-030 – 106 lb/hr (102,434 BTU/hr)
         5. FB-E-036 – 127 lb/hr (122,853 BTU/hr)
         6. FB-E-048 – 169 lb/hr (163,693 BTU/hr)
         7. FB-E-060 – 211 lb/hr (204,867 BTU/hr)
         8. FB-E-072 – 253 lb/hr (245,707 BTU/hr)
         9. FB-E-084 – 295 lb/hr (286,546 BTU/hr)
         10. FB-E-108 – 380 lb/hr (368,560 BTU/hr)
         11. FB-E-144 – 506 lb/hr (491,413 BTU/hr)
         12. FB-E-157 – 554 lb/hr (537,609 BTU/hr)
         13. FB-E-180 – 633 lb/hr (614,266 BTU/hr)

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

* + 1. The boiler manufacturer shall have the capability to construct an engineered system, skid mounted, including but not limited to mounting any number of boilers in a common system with common piping headers and single source customer connections for single source steam supply, feedwater, drain, electrical power, fuel supply (if applicable), condensate return, and vents. Electrical panel boxes for the system must be available along with all wiring requirements. Other available components shall include feed-water tanks and pumps, chemical feed systems, water softeners, carbon filters, and various relevant valves and other accessories. The system manufacturer shall have the engineering capabilities for all aspects of the mechanical and electrical design aspects of the skid mounted system.
  1. BOILER CONSTRUCTION
     1. 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.
     2. The pressure vessel design and construction shall be in accordance with Section I of the ASME Code for steam boilers. The boiler shall comply with CSD-1 code requirements and carry a UL listing (CAS/CUL approval for Canada).
     3. The pressure vessel shells shall be constructed of SA-285 or SA-516 plates or SA-106 or SA-53 pipes. The shells shall have a minimum thickness of 0.25 inches. The heads shall be constructed of SA-285 or SA-516 plates.
     4. Boiler pressure vessel can optionally be provided with austenitic Stainless Steel material if the boilers are built to ASME Section I. The boilers shall be operating using only deionized/reverse osmosis water, having a maximum conductance of 1 microSiemen per cm ((1 μ S/cm) [mini-mum specific resistivity of 1 megohm per cm (1 M Ω /cm)].
     5. Boiler shall be covered with a blanket type, high temperature insulation.
     6. The jacket shall be stainless steel.
  2. BOILER DESIGN
     1. Boiler shall be supplied with incoloy elements to ensure longer life.
     2. The heating elements shall have a watt density not to exceed 123 Watts per square inch.
     3. The water volume of the boiler shall not be less than:  
        1. FB-E-012 – 4 Gallons (15 liters)
        2. FB-E-018 – 4 Gallons (15 liters)
        3. FB-E-024 – 9 Gallons (34 liters)
        4. FB-E-030 – 9 Gallons (34 liters)
        5. FB-E-036 – 9 Gallons (34 liters)
        6. FB-E-048 – 9 Gallons (34 liters)
        7. FB-E-060 – 9 Gallons (34 liters)
        8. FB-E-072 – 9 Gallons (34 liters)
        9. FB-E-084 – 18 Gallons (68 liters)
        10. FB-E-108 – 18 Gallons (68 liters)
        11. FB-E-144 – 23 Gallons (87 liters)
        12. FB-E-157 – 23 Gallons (87 liters)
        13. FB-E-180 – 23 Gallons (87 liters)
     4. The dimensions of the boiler shall not be less than (Boiler Width Overall x Boiler Height):  
        1. FB-E-012 – 21 in x 37 in (534 mm x 940 mm)
        2. FB-E-018 – 21 in x 37 in (534 mm x 940 mm)
        3. FB-E-024 – 26 in x 46 in (661 mm x 1,169 mm)
        4. FB-E-030 – 26 in x 46 in (661 mm x 1,169 mm)
        5. FB-E-036 – 26 in x 46 in (661 mm x 1,169 mm)
        6. FB-E-048 – 26 in x 46 in (661 mm x 1,169 mm)
        7. FB-E-060 – 26 in x 46 in (661 mm x 1,169 mm)
        8. FB-E-072 – 26 in x 46 in (661 mm x 1,169 mm)
        9. FB-E-084 – 29 in x 61 in (737 mm x 1,550 mm)
        10. FB-E-108 – 29 in x 61 in (737 mm x 1,550 mm)
        11. FB-E-144 – 31 in x 60 in (788 mm x 1,524 mm)
        12. FB-E-157 – 31 in x 60 in (788 mm x 1,524 mm)
        13. FB-E-180 – 31 in x 60 in (788 mm x 1,524 mm)
     5. The dry weight of the boiler shall not be less than:  
        1. FB-E-012 – 151 lb (68 kg)
        2. FB-E-018 – 151 lb (68 kg)
        3. FB-E-024 – 262 lb (119 kg)
        4. FB-E-030 – 262 lb (119 kg)
        5. FB-E-036 – 262 lb (119 kg)
        6. FB-E-048 – 356 lb (161 kg)
        7. FB-E-060 – 356 lb (161 kg)
        8. FB-E-072 – 356 lb (161 kg)
        9. FB-E-084 – 423 lb (192 kg)
        10. FB-E-108 – 423 lb (192 kg)
        11. FB-E-144 – 645 lb (293 kg)
        12. FB-E-157 – 645 lb (293 kg)
        13. FB-E-180 – 645 lb (293 kg)
  3. CONTROLS
     1. Boiler safety controls shall include:
        1. Operating Pressure Controller for automatic start and stop of boiler operation.
        2. High Limit Pressure Controller with manual reset.
        3. A float type water bottle for feedwater pump and water level control. Probe type auxiliary low water cut-off to cause a shut-down of unit should the water level drop to an unsafe level.
        4. Optional Element Step Sequencer Controller: Modulation of boiler capacity
     2. All controls to be panel mounted in a NEMA 1 enclosure and so located on the boiler as to provide ease of servicing the boiler without disturbing the controls. Panel shall be located to prevent possible damage by water or heat. Controls connected to water or steam shall be installed outside the main boiler control panel. All controls shall be mounted and wired according to Underwriters’ Laboratories requirements.
  4. BOILER FITTINGS & TRIM
     1. The boiler shall be supplied with an ASME Section I safety relief valve. The safety relief valve size shall be in accordance with ASME code requirements and set at 100 psig for Section I Pressure Vessels.
     2. Boilers shall have an external sight glass, with a McDonnell Miller Float Type Water Bottle and a probe for auxiliary low water cut off in the vessel. A gauge glass will be supplied. The gauge glass shall be protected by two brass rods as an additional safety factor.
     3. A steam pressure gauge shall be included with the boiler, mounted, and shall be complete with a ball valve.
     4. Feedwater solenoid valve shall be supplied.
     5. Additional standard trim shall include Y-type strainer, blow down valve and water column blow down valve.
     6. The boiler shall come set up for transporting by fork lift.
     7. Instructions for installation, operation and maintenance of the boiler shall be contained in a manual provided with each boiler.
     8. A wiring diagram corresponding to the boiler configuration shall be included with each boiler.

1. EXECUTION
2. 1. INSTALLATION
      1. Equipment and materials shall be installed in an approved manner and in accordance with the boiler manufacturers’ installation requirements.
      2. 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 non combustible floor with clearances to unprotected combustible materials, including plaster or combustible supports.
      3. Assemble unit sections and parts shipped loose or unassembled for shipment purposes. Follow manufacturer's installation recommendations and instructions.
      4. Install electrical control items furnished by manufacturer per wiring diagram provided by manufacturer.
      5. Complete feedwater, steam, blowdown, fuel (as applicable), safety valve discharge, and vent piping (as applicable) installation as required by manufacturer for operation of system.
   2. FIELD QUALITY CONTROL
      1. After boiler installation is completed, the manufacturer shall provide the services of a field representative for starting the unit and training the operator.
      2. 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