PART PEB

A02

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PART PEB
REQUIREMENTS FOR ELECTRIC BOILERS

GENERAL

PEB-1 GENERAL

The rules in Part PEB are applicable to electric boilers and parts thereof and shall be used in conjunction with the general requirements in Part PG as well as with the special requirements in the applicable Parts of this Section that apply to the method of fabrication used.

PEB-2 SCOPE

A02 **PEB-2.1** This Part contains special rules for construction of electric boilers, both of the electrode and immersion resistance element type. This Part does not include electric boilers where the heat is applied externally to the boiler pressure vessel by electric resistance heating elements, induction coils, or other electrical means. These types of electric boilers shall be constructed in accordance with other applicable Parts of this Section.

A02 **PEB-2.2** Electric boilers and parts thereof that do not exceed the diameter, volume, or pressure limits of PMB-2 may be constructed using the applicable paragraphs of Part PMB in conjunction with this Part.

PEB-2.3 An electrode type boiler is defined as an electric boiler in which heat is generated by the passage of an electric current using water as the conductor.

PEB-2.4 An immersion resistance element type boiler is defined as an electric boiler in which heat is generated by the passage of an electric current through a resistance heating element immersed in water.

PEB-3 OPTIONAL REQUIREMENTS FOR THE BOILER PRESSURE VESSEL

The boiler pressure vessel may be constructed in compliance with the ASME Pressure Vessel Code Section VIII, Division 1, rules for unfired steam boilers [UW-2(c)] subject to the following conditions:

PEB-3.1 The Manufacturer who certifies and stamps the completed boiler shall specify to the "U" stamp holder all additional requirements of Part PEB, which are not requirements of Section VIII, Division 1, and shall ensure that these requirements are satisfied.

PEB-3.2 These additional requirements are:

PEB-3.2.1 The materials of construction shall comply with the requirements of PEB-5.1 and PEB-5.3.

PEB-3.2.2 Inspection openings shall comply with the requirements of PEB-10.

PEB-3.3 The boiler pressure vessel shall be stamped with the ASME Code "U" symbol and the letters "UB," and be documented with the ASME U-1 or U-1A Data Report. A02

PEB-3.4 The master Data Report P-2A for the Electric Boiler shall indicate "Boiler pressure vessel constructed to Section VIII, Division 1 as permitted by Part PEB."

MATERIALS

PEB-5 GENERAL A02

PEB-5.1 Unless specifically permitted elsewhere in this section, materials used in the construction of pressure parts for electric boilers shall conform to one of the specifications in Section II and shall be limited to those permitted by PG-6, PG-7, PG-8, and PG-9 for which allowable stress values are given in Tables 1A and 1B of Section II, Part D. Miscellaneous pressure parts shall conform to the requirements of PG-11.

PEB-5.2 Seamless or welded shells, plates, or heads of electric boilers shall not be less than $^{3}/_{16}$ in. (4.8 mm) in thickness.

PEB-5.3 Electric boilers of the immersion element type may be fabricated of austenitic stainless steel type 304, 304L, 316, and 316L, of any material specification listed in PG-6 and PG-9, under the following conditions:

(a) The vessel shall not exceed the diameter, volume, or pressure limits of PMB-2 for miniature boilers.

(b) A precautionary statement that the boiler shall be operated using only deionized water, having a maximum conductance of 1 microSiemen per cm (1 μS/cm) [minimum specific resistivity of 1 megohm per cm (1 MΩ/cm)], shall be clearly marked on the boiler in a visible location.

DESIGN

PEB-8 GENERAL

A02 **PEB-8.1** The rules in the following paragraphs apply specifically to the design of electric boilers and parts thereof. They shall be used in conjunction with the general requirements for design in Part PG, any applicable requirements in Part PMB for miniature boilers, and with the specific requirements for design in applicable Parts of this Section that apply to the method of fabrication used.

PEB-8.2 Responsibility of design of electric boilers to be marked with the "E" symbol shall be that of the holder of the "E" stamp.

A02 PEB-9 WELDING

Electric boilers may be constructed by fusion welding in accordance with all the requirements of this Section except that postweld heat treatment, radiography of the welded joints, and the non-destructive examinations described in PG-93.1 are not required when the limitations in PMB-2.1 are not exceeded.

PEB-10 INSPECTION OPENINGS

A02 **PEB-10.1** Electric boilers of a design employing a removable cover, or removable internal electric heating elements that will permit access for inspection, and cleaning and having an internal volume (exclusive of casing and insulation) of not more than 5 cu ft (0.14 m^3) need not be fitted with washout or inspection openings.

PEB-10.2 Electric boilers of more than 5 cu ft (0.14 m^3) not provided with a manhole, shall have an inspection opening or handhole located in the lower portion of the shell or head. The inspection opening shall not be smaller than NPS 3 (DN 80). In addition, electric boilers of the resistance heating element type designed for steam service shall have an inspection opening or handhole at or near the normal waterline.

PEB-11 FEEDWATER SUPPLY A02

PEB-11.1 The feedwater source to electric boilers shall be capable of meeting the applicable requirements of PG-61. Feedwater connections to an electric boiler shall not be smaller than NPS $\frac{1}{2}$ (DN 15), except as permitted by PMB-11.

PEB-11.2 Electric boilers that do not exceed the diameter, volume, or pressure limits of PMB-2, may have the feedwater delivered through the blowoff opening if desired.

PEB-12 BLOWOFF

PEB-12.1 The blowoff piping for each electric boiler pressure vessel having a normal water content not exceeding 100 gal (380 l) is required to extend through only one valve.

PEB-12.2 The minimum size of blowoff pipes and A02 fittings shall be NPS 1 (DN 25), except that for boilers of 200 kW input or less the minimum size of pipe and fittings may be NPS $\frac{3}{4}$ (DN 20). Electric boilers that do not exceed the diameter, volume, or pressure limits of PMB-2 may have blowoff connections in accordance with PMB-12.

PEB-13 WATER LEVEL INDICATORS A02

PEB-13.1 Electric boilers of the electrode type shall have at least one gage glass. The gage glass shall be located as to indicate the water levels both at startup and under maximum steam load conditions as established by the Manufacturer.

PEB-13.2 Electric boilers of the resistance element type shall have at least one gage glass. The lowest visible water level in the gage glass shall be at least 1 in. (25 mm) above the lowest permissible water level as determined by the Manufacturer. Each electric boiler of this type shall also be equipped with an automatic low-water cutoff on each boiler pressure vessel so located as to automatically cut off the power supply to the heating elements before the surface of the water falls below the visible level in the gage glass.

PEB-13.3 Tubular gage glasses on electric boilers shall be equipped with protective rods or shields.

A02 **PEB-14 PRESSURE GAGES**

Pressure gages shall meet the requirements of PG-60.6.

PEB-15 SAFETY VALVES

A02 **PEB-15.1** Each electric boiler shall have at least one safety valve or safety relief valve. Electric boilers with a power input more than 1,100 kW shall have two or more safety valves or safety relief valves.

PEB-15.2 The minimum safety valve or safety relief valve relieving capacity for electric boilers shall be $3\frac{1}{2}$ lb/hr/kW (1.6 kg/hr/kW) input.

A02 **PEB-16 AUTOMATIC DEVICES**

Electric boilers shall be provided with pressure and/or temperature controls and an automatic low-water fuel cutoff. No low-water cutoff is required for electrode type boilers.

PEB-17 HYDROSTATIC TEST

PEB-17.1 Each electric boiler pressure vessel shall be hydrostatically tested at completion of fabrication in accordance with PG-99 or PMB-21, as applicable.

A02 **PEB-17.2** In addition to the above, after assembly of the boiler pressure vessel and the mechanically assembled boiler external piping and trim, the completed electric boiler shall be given a final hydrostatic test at a pressure not less than $1\frac{1}{2}$ times the MAWP of the pressure vessel. Miniature electric boilers that are trimmed to operate at less than the MAWP of the pressure vessel shall be given a hydrostatic test at a pressure not less than $1\frac{1}{2}$ times the safety valve setting.

PEB-17.3 When the electric boiler is to be marked with the "E" symbol, the symbol shall be applied after completion of the hydrostatic test of PEB-17.2.

A02 **PEB-18 INSPECTION AND STAMPING OF BOILERS**

A03 **PEB-18.1** Inspection of electric boilers shall be as required by PG-90.1 and PG-90.3. Witness by the Authorized Inspector of the hydrotest required in PEB-17.2 for the completed boiler may be omitted for electric boilers that meet all the following limitations:

(a) 800 kW maximum per vessel

(b) 600 V maximum

(c) mechanically assembled boiler external piping (BEP) only

When the Authorized Inspector does not perform a final inspection of the completed boiler, the Manufacturer or Assembler shall make an equivalent examination. The equivalent examination shall be in accordance with a quality control procedure meeting the requirements of PEB-18.2 and PEB-18.5.

PEB-18.1.1 Electric boilers exceeding the size limitations specified in PEB-18.1, and having only mechanically assembled external piping (BEP) and trim, shall have a final inspection by the Authorized Inspector, who shall also witness the hydrostatic test called for in PEB-17.2.

PEB-18.1.2 For electric boilers having welded or brazed boiler external piping (BEP) or trim, the inspection requirements of PG-90.1 and the hydrostatic test requirements of PG-99 apply.

PEB-18.2 Each electric boiler Manufacturer shall comply with the applicable requirements of PG-104 and PG-105.

PEB-18.2.1 An electric boiler Manufacturer or Assembler applying for or renewing the "E" stamp shall have its facilities and organizations subject to a joint review by its Authorized Inspection Agency and the legal jurisdiction involved (see last paragraph of PG-105.4).

PEB-18.2.2 A Manufacturer or Assembler holding an "E" stamp and assembling units where the final shop inspection is not mandatory (see PEB-18.1), shall be subject to periodic review by its Authorized Inspection Agency. The review shall be conducted on a quarterly basis or more frequently if deemed necessary by the Authorized Inspection Agency. The frequency of this review may be reduced subject to written agreement between the Manufacturer or Assembler and its inspection agency and the written approval of the appropriate legal jurisdiction. However, in no case shall the review be less than once every 6 months.

PEB-18.3 The stamping of electric boilers shall conform to the requirements of PG-106. Completed electric boilers shall be marked with the "S" or "M" symbol by the Manufacturer of the boiler pressure vessel except when the boiler pressure vessel is constructed under the provisions of PEB-3 (see PEB-18.4).

When the trim, fixtures and fittings (such as valves), threaded boiler external piping, and appurtenances are connected to an electric boiler by a Manufacturer or Assembler not authorized to apply the "S" or "M" stamp, the boiler assembler shall apply an "E" stamp to the completed assembly. "E" stamp holders are limited to the use of assembly methods that do not require welding or brazing.

PEB-18.3.1 The stamping of the boiler pressure vessel shall be located as called for in PG-111.8 and need not indicate the kW input or the maximum designed steaming capacity.

PEB-18.3.2 The stamping of the complete electric boiler shall be on a separate metallic plate and shall be in accordance with PG-106.4. This plate shall be located on the assembly so that it is readily visible from the operating floor.

PEB-18.3.3 The stamping required by PEB-18.3.2 need not be done in the presence of the Authorized Inspector for electric boilers that do not receive final inspection by the Authorized Inspector (see PEB-18.1).

PEB-18.4 For boiler pressure vessels constructed under the provisions of PEB-3, the inspection and stamping requirements of Section VIII, Division 1, UG-116(c) for special service pressure vessels (UB), shall be followed.

A03 **PEB-18.5** Those Manufacturers and Assemblers providing an equivalent examination of completed electric boilers when final inspection is not witnessed by the Authorized Inspector (see PEB-18.1), shall provide oversight by a Certified Individual (CI).

PEB-18.5.1 A Certified Individual (CI) shall be an employee of the Manufacturer or Assembler and shall be qualified and certified by the Manufacturer or Assembler. Qualifications shall include as a minimum:

(a) knowledge of the requirements of this Section for the application of Code symbols

(b) knowledge of the Manufacturer's quality program

(c) training commensurate with the scope, complexity, or special nature of the activities to which oversight is to be provided.

The Manufacturer or Assembler shall maintain a record containing objective evidence of the Certified Individual's qualifications, training, and certification.

PEB-18.5.2 The duties of a Certified Individual (CI) shall be to assure that each use of the Code symbol as permitted in PEB-18.3.3 is in accordance with the requirements of this Section and is documented on the Certificate of Conformance on Form P-2A, Manufacturer's Data Report for All Types of Electric Boilers. The CI shall also

(a) verify that each electric boiler, to which a Code symbol is applied, meets all applicable requirements of this Section

(b) sign the Certificate of Conformance, Form P-2A, prior to release of control of the boiler

PEB-19 MANUFACTURERS' DATA REPORT FOR ELECTRIC BOILERS

PEB-19.1 This form consists of two parts. Part I is A02 to be completed by the Manufacturer of the boiler pressure vessel who is the holder of the "S" or "M" stamp and his inspection agency. Part II is to be completed by the Manufacturer or Assembler responsible for the completed electric boiler who shall be authorized to use any of the "S," "M," or "E" stamps.

PEB-19.2 When the boiler pressure vessel is constructed by a "U" stamp holder and certified on a U-1 or U-1A Data Report, Part 1 shall be completed by the "S," "M," or "E" stamp holder to the extent indicated in Guide A-351.1.