Proposed Code Clarification

**PG-16.3 Minimum Thicknesses.** The minimum thickness of any boiler plate under pressure shall be $\frac{1}{4}$ in. (6 mm) except for electric boilers constructed under the rules of Part PEB. The minimum thickness of plates to which stays may be applied in other than cylindrical outer shell plates shall be $\frac{5}{16}$ in. (8 mm). When pipe larger than NPS 5 (DN 125) is used in lieu of plate for the shell of cylindrical components under pressure, its minimum wall shall not be less than the smaller of $\frac{1}{4}$ in. (6 mm) or the minimum wall thickness of Standard wall pipe listed in ASME B36.10M, Table 1.

The minimum thickness requirements stipulated above are exclusive of any allowances for corrosion, erosion and forming.
Proposed Interpretation

Standard Designation: BPV Section I
Para./Fig./Table No: PG-16.3
Subject Description: Minimum Thickness of Boiler Plate

Record No.: 20-1114
Subject: Section I, PG-16.3 Minimum Thickness of Boiler Plate

Question: Is it the intent of PG-16.3 that corrosion allowance, if applicable, be added to the minimum thickness of any boiler plate under pressure?

Reply: Yes.

Explanation: FOR INFORMATION ONLY
The Subgroup on Design, BPV-I could not find any existing Interpretations or references regarding the intent on the inclusion or exclusion of corrosion allowance as it relates to the minimum thicknesses stipulated in PG-16.3. The minimum thickness of ¼” was in the 1914 Code. At that time there was no discussion of a corrosion allowance. Per discussions at May 2020 SGD meeting it was mentioned that word “minimum” meant exclusive of any corrosion allowances. So an intent interpretation is provide with clarifications to PG-16.3.

PG-16.7 provides rules regarding corrosion allowance as it relates to the dimensional symbols used in design formulas only, and those rules do not apply to PG-16.3.

It should be noted that 2019 Section VIII, Division 1, UG-16(b)(3) states “the minimum thickness of shells and heads of unfired steam boilers shall be 1/4 in. (6 mm) exclusive of any corrosion allowance.”
Original Inquiry(ies):

The minimum thickness of any boiler plate under pressure shall be 1/4 in. (6 mm) except for electric boilers constructed under the rules of Part PEB. Is this minimum thickness be exclusive of any corrosion allowance?

Proposed Reply(ies):

No

References

2019 Section I, PG-16.3 and PG-16.7

PG-16.3 Minimum Thicknesses. The minimum thickness of any boiler plate under pressure shall be 1/4 in. (6 mm) except for electric boilers constructed under the rules of Part PEB. The minimum thickness of plates to which stays may be applied in other than cylindrical outer shell plates shall be 5/16 in. (8 mm). When pipe larger than NPS 5 (DN 125) is used in lieu of plate for the shell of cylindrical components under pressure, its minimum wall shall not be less than the smaller of 1/4 in. (6 mm) or the minimum wall thickness of Standard wall pipe listed in ASME B36.10M, Table 1.

PG-16.7 The dimensional symbols used in the design formulas throughout this Code do not include any allowance for corrosion, erosion, and forming, except where noted. Additional thickness should be provided where these allowances are applicable.
2019 Section VIII, Division 1, UG-16

UG-16 GENERAL

(a) The design of pressure vessels and vessel parts shall conform to the general design requirements in the following paragraphs and in addition to the specific requirements for Design given in the applicable Parts of Subsections B and C. As an alternative, the design rules of Mandatory Appendix 46 may be used.

(b) Minimum Thickness of Pressure-Retaining Components. Except for the special provisions listed below, the minimum thickness permitted for shells and heads, after forming and regardless of product form and material, shall be 1/16 in. (1.5 mm) exclusive of any corrosion allowance. Exceptions are:

(1) the minimum thickness does not apply to heat transfer plates of plate type heat exchangers;

(2) this minimum thickness does not apply to the inner pipe of double pipe heat exchangers nor to pipes and tubes that are enclosed and protected from mechanical damage by a shell, casing, or ducting, where such pipes or tubes are NPS 6 (DN 150) and less. This exemption applies whether or not the outer pipe, shell, or protective element is constructed to Code rules. When the outer protective element is not provided by the Manufacturer as part of the vessel, the Manufacturer shall note this on the Manufacturer’s Data Report, and the owner or his designated agent shall be responsible to assure that the required enclosures are installed prior to operation. Where pipes and tubes are fully enclosed, consideration shall be given to avoiding buildup of pressure within the protective chamber due to a tube/pipe leak. All other pressure parts of these heat exchangers that are constructed to Code rules must meet the 1/16 in. (1.5 mm) minimum thickness requirements.

(3) the minimum thickness of shells and heads of unfired steam boilers shall be 1/4 in. (6 mm) exclusive of any corrosion allowance;

(4) the minimum thickness of shells and heads used in compressed air service, steam service, and water service, made from materials listed in Table UCS-23, shall be 3/32 in. (2.5 mm) exclusive of any corrosion allowance.

(5) this minimum thickness does not apply to the tubes in air cooled and cooling tower heat exchangers if all the following provisions are met:

(-a) the tubes shall not be used for lethal UW-2(a) service applications;
(-b) the tubes shall be protected by fins or other mechanical means;
(-c) the tube outside diameter shall be a minimum of 3/8 in. (10 mm) and a maximum of 1 1/2 in. (38 mm);
(-d) the minimum thickness used shall not be less than that calculated by the formulas given in UG-27 or 1-1 and in no case less than 0.022 in. (0.5 mm).

(c) Plate Undertolerance

(1) Plate material shall not be ordered with a nominal thickness thinner than the design thickness.

(2) Plate material with an actual thickness less than the design thickness shall not be used unless the difference in thicknesses is less than the smaller of 0.01 in. (0.3 mm) or 6% of the design thickness [see UG-90(b)(6)].

(3) If plate material is ordered to a specification that allows an undertolerance greater than the smaller of 0.01 in. (0.3 mm) or 6% of the nominal thickness, the thickness of the plate ordered shall be increased, if required, so that the plate material will meet the requirement of (2) when used.

(d) Pipe Undertolerance. If pipe or tube is ordered by its nominal wall thickness, the manufacturing undertolerance on wall thickness shall be taken into account except for nozzle wall reinforcement area requirements in accordance with UG-37 and UG-40. The manufacturing undertolerances are given in the several pipe and tube specifications listed in the applicable Tables in Subsection C.

(e) Corrosion Allowance in Design Formulas. The dimensional symbols used in all design formulas throughout this Division represent dimensions in the corroded condition.

(f) Examples showing the application of the design rules of this Division are contained in ASME PTB-4, ASME Section VIII, Division 1, Example Problem Manual.