PROPOSED QUESTIONS AND REPLIES

**Question 1:** Is it the intent of the Code that the requirements of WB-4243(a) apply to Category C full penetration butt welds of forged flanges with hubs to shells?

**Proposed Reply 1:** Yes.

**Question 2:** Is it the intent of the Code that the requirements of WB-4243(c) regarding the inside corner radius "r" of a flat head to hub transition apply to the transition radius of forged flanges to hubs when designed for full penetration butt welding to shells?

**Proposed Reply 2:** No, they apply to flat heads only.

PROPOSED CODE REVISIONS:

See following pages for proposed Code revisions. There are no technical changes, just revisions to separate requirements for forged flanges with hubs from those requirements associated with flat heads with hubs.
the suitability for cyclic operation shall be analyzed by the method of WB-3222.9 using a fatigue strength reduction factor of not less than 2.

**WB-3252.3 Joints of Category C.** All welded joints of Category C, as defined in WB-3251, shall meet the fabrication requirements of WB-4243 and shall be capable of being examined in accordance with WB-5230. Minimum dimensions of the welds and throat thickness shall be as shown in Figure WB-4243-1 or Figure WB-4243-2 where:

(a) for forged flat heads and forged flanges with the weld preparation bevel angle not greater than 45 deg measured from the face:

\[
t, t_n = \text{nominal thicknesses of welded parts}
\]

\[
t_c = 0.7t_n \text{ or } \frac{1}{4} \text{ in. (6 mm)}, \text{ whichever is less}
\]

\[
t_w = \frac{t_n}{2} \text{ or } t/4, \text{ whichever is less}
\]

(b) for all other material forms and for forged flat heads, and forged flanges with the weld preparation bevel angle greater than 45 deg measured from the face:

\[
t, t_n = \text{nominal thicknesses of welded parts}
\]

\[
t_c = 0.7t_n \text{ or } \frac{1}{4} \text{ in. (6 mm)}, \text{ whichever is less}
\]

\[
t_w = \frac{t_n}{2} \text{ or } t/2, \text{ whichever is less}
\]

(c) Hubs for butt welding to the adjacent shell, head, or other containment part, as in Figure WB-4243-2, shall not be machined from rolled plate. The component having the hub shall be forged in such a manner as to provide in the hub the full minimum tensile strength and elongation specified for the material, in a direction parallel to the axis of the vessel. Proof of this shall be furnished by a tension test specimen (subsize if necessary) taken in this direction and as close to the hub as is practical. In Figure WB-4243-2, the minimum dimensions are as follows:

1. sketch (a), \( r \) not less than 1.5\( t_n \)
2. sketch (b), \( r \) not less than 1.5\( t_n \), and \( e \) not less than \( t_n \)
3. sketch (c), \( r \) not less than 1.5\( t_n \)
4. sketch (d), \( t_f \) not less than 2\( t_n \) and \( r \) not less than 3\( t_f \)
5. sketch (e), \( t_f \) not less than 2\( t_n \), \( r \) not less than 3\( t_f \), and \( e \) not less than \( t_f \)

**WB-3252.4 Joints of Category D.** All welded joints of Category D, as defined in WB-3251, shall be in accordance with the requirements of one of (a) through (f) below.

(a) **Full Penetration Welds.** Full penetration welds, as shown in Figures WB-4244(a)-1, WB-4244(b)-1, and WB-4244(c)-1 may be used [except as otherwise provided in (b)] for the purposes of achieving continuity of metal and facilitating the required radiographic examination. When all or part of the required reinforcement is attributable to the connecting item, the connecting items shall be attached by full penetration welds through either the containment shell or head, the thickness of the connecting item, or both.
WB-3255  Welding Grooves

The dimensions and shape of the edges to be joined shall be such as to permit complete fusion and complete joint penetration, except as otherwise permitted in WB-3252.4.

WB-3256  Thermal Treatment

All containments and containment parts shall be given the appropriate postweld heat treatment prescribed in WB-4620.

WB-3260  SPECIAL CONTAINMENT REQUIREMENTS

WB-3261  Category A or Category B Joints Between Sections of Unequal Thickness

In general, a tapered transition section as shown in Figure WB-3261-1, which is a type of gross structural discontinuity (WB-3213.2), shall be provided at joints of Categories A and B between sections that differ in thickness by more than one-fourth the thickness of the thinner section. The transition section may be formed by any process that will provide a uniform taper. An ellipsoidal or hemispherical head that has a greater thickness than a cylinder of the same inside diameter may be machined to the outside diameter of the cylinder, provided the remaining thickness is at least as great as that required for a shell of the same diameter. A uniform taper is not required for flanged hubs. The adequacy of the transition shall be evaluated by stress analysis. Stress intensity limitations are given in WB-3220. The requirements of this paragraph do not apply to flange hubs.

WB-3700  STRAIN-BASED ACCEPTANCE CRITERIA

The strain-based acceptance criteria are applicable only to the metallic containments of transportation packagings subject to energy-limited dynamic events. It is not the intent of this subarticle to permit significant regions or major portions of the containment to experience strains at or near the limits of these strain-based acceptance criteria without consideration of the overall component deformation. These strain-based acceptance criteria are established to address the regions of the containment that experience high strains due to the effects of direct impacts. Deformation limits, if any, provided in the Design Specification shall be satisfied. Section III Appendices, Nonmandatory Appendix FF provides the strain-based acceptance criteria.
WB-4240 REQUIREMENTS FOR WELD JOINTS IN CONTAINMENTS

WB-4241 Category A Weld Joints in Containments

Category A weld joints containments shall be full penetration butt joints. Joints that have been welded from one side with backing that has been removed and those welded from one side without backing are acceptable as full penetration welds provided the weld root side of the joints meets the requirements of WB-4424.

WB-4242 Category B Weld Joints in Containments

Category B weld joints in containments shall be full penetration butt joints. When used, backing strips shall be continuous in cross section. Joints prepared with opposing lips to form an integral backing strip and joints with backing strips which are not later removed are acceptable provided the requirements of WB-3252.2 are met.

WB-4243 Category C Weld Joints in Containments

Category C weld joints shall be described in subparas. (a) through (c) below.

(a) Full Penetration Butt Joints. Category C welds shall be full penetration joints. Joints that have been welded from one side with backing where backing has been subsequently removed and those welded from one side without backing are acceptable as full penetration welds provided the weld root side of the joints meets the requirements of WB-4424. Butt-welded joints are shown in Figure WB-4243-1.

(b) Full Penetration Corner Joints. Full penetration corner joints shall be groove welds extending completely through at least one of the parts being joined and shall be fully fused to each part. Typical details for type No. 1 and No. 2 full penetration corner joints are shown in Figure WB-4243-1.

(c) Flat Heads With Hubs

Hubs for butt welding to the adjacent shell, head, or other containment parts, as shown in Figure WB-4243-2, for flat heads, shall not be machined from flat plate. The hubs shall be forged in such a manner as to provide in the hub the full minimum tensile strength and elongation specified for the material in the direction parallel to the axis of the containment vessel. Proof of this shall be furnished by a tension test specimen (subsize, if necessary) taken in this direction and as close to the hubs as is practical. One test specimen may represent a group of forgings, provided they are of the same nominal dimensions, from the same heat material and the same heat treatment lot, and forged in the same manner. The minimum height of the hub shall be the lesser of 1\(\frac{1}{2}\) times...
the thickness of the containment part to which it is welded or $\frac{3}{4}$ in. (19 mm), but need not be greater than 2 in. (50 mm).

(2) Hubbed flanges shall not be machined from flat plate.

**WB-4244** Category D Weld Joints in Containments

Category D weld joints in containments and similar weld joints in other components shall be full or partial penetration weld joints using one of the details of (a) through (d) below.

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**Figure WB-4243-2**

Typical Flat Heads With Hubs

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**GENERAL NOTE:** For definitions of nomenclature, see WB-3252.3(c).