Table 323.2.2 Requirements for Low Temperature Toughness Tests for Metals (Cont'd)

NOTES: (Cont'd)

(4) Impact tests are not required when the maximum obtainable Charpy specimen has a width along the notch of less than 2.5 mm (0.098 in.). Under these conditions, and where the stress ratio defined in para. 323.2.2(b) is greater than 0.3, the design minimum temperature shall not be colder than the lower of −48°C (−55°F) or the minimum temperature for the material in Table A-1 or Table A-1M. See also para. 323.2.2(g).

(5) Impact tests are not required when the maximum obtainable Charpy specimen has a width along the notch of less than 2.5 mm (0.098 in.).

(6) For austenitic stainless steels, impact testing is not required if the design minimum temperature is warmer than or equal to −104°C (−155°F), and the stress ratio as defined in para. 323.2.2(b) is 0.3 or less. See also para. 323.2.2(g).

(7) Tests may include tensile elongation, sharp-notch tensile strength (to be compared with unnotched tensile strength), or other tests, conducted at or colder than design minimum temperature. See also para. 323.3.4.

Table A-1, or Table A-1M, except as provided in Table 323.2.2, Box A-4(a) for austenitic stainless steel base material. In some cases, welds will require either impact testing or testing as described in Table 323.2.2, Box B-6 even when the base metal is not required to be tested. See (f) for steels or Table 323.2.2, Box A-6 (b) for other materials.

(e) For carbon steels with a letter designation in the Min. Temp. column of Table A-1 or Table A-1M, the minimum temperature is defined by the applicable curve and Notes in Figure 323.2.2A. If a design minimum temperature–thickness combination is on or above the curve, impact testing exemption requirements described in (d) apply.

(f) For steel materials, impact testing of welds, including those made in manufacturing (e.g., for seam welded pipe and welded tees), is required if either base material is required to be impact tested or if the design minimum temperature is colder than ~~−18°C (0°F)~~ −29°C (-20°F), except for manufacturing welds in austenitic stainless steel base materials having a carbon content not exceeding 0.10% and supplied in the solution heat treated condition or as provided in Table 323.2.2, Boxes A-3(b) and A-4(b). For impact testing of production welds, see Table 323.2.2, Note (2).

(g) For steels, impact testing is not required for material (including welds) if the stress ratio as defined in (b) is 0.3 or less, the design minimum temperature is warmer than or equal to −104°C (−155°F), and when (c) applies.

(h) For carbon, low alloy, and intermediate alloy steel materials (including welds) that have not been qualified by impact testing, the minimum temperature from Table A-1, Table A-1M, or Figure 323.2.2A may be reduced to a temperature no colder than −48°C (−55°F) by the temperature reduction provided in Figure 323.2.2B when (c) applies. For carbon, low alloy, and intermediate alloy steel welds that require impact testing in accordance with Table 323.2.2, Box A-3(b), the temperature reduction from Figure 323.2.2B shall be applied to −29°C (−20°F).

(i) For carbon, low alloy, and intermediate alloy steel materials (including welds) that have been qualified by impact testing, the permitted design minimum temperature may be reduced to a temperature no colder than −104°C (−155°F) by the temperature reduction from Figure 323.2.2B when (c) applies.

(j) Impact testing is not required for the following combinations of weld metals and design minimum temperatures:

(1) for austenitic stainless steel base materials having a carbon content not exceeding 0.10%, welded without filler metal, at design minimum temperatures of −104°C (−155°F) and warmer

(2) for austenitic weld metal

(-a) having a carbon content not exceeding 0.10%, and produced with filler metals conforming to AWS A5.4, A5.9, A5.11, A5.14, or A5.22[1] at design minimum temperatures of −104°C (−155°F) and warmer, or

(-b) having a carbon content exceeding 0.10%, and produced with filler metals conforming to AWS A5.4, A5.9, A5.11, A5.14, or A5.22[1] at design minimum temperatures of −48°C (−55°F) and warmer

323.2.3 Temperature Limits, Unlisted Materials. An unlisted material, acceptable under para. 323.1.2, shall be qualified for service at all temperatures within a stated range, from design minimum temperature to design maximum temperature, in accordance with para. 323.2.4.

323.2.4 Verification of Serviceability

(a) When an unlisted material is to be used, or when a listed material is to be used above the highest temperature for which stress values appear in Appendix A, the designer is responsible for demonstrating the validity of the allowable stresses and other limits used in design and of the approach taken in using the material, including the

[1] Titles of referenced AWS standards are as follows:

AWS A5.4/A5.4M, Specification for Stainless Steel Electrodes for Shielded Metal Arc Welding

AWS A5.9/A5.9M, Welding Consumables—Wire Electrodes, Strip Electrodes, Wires, and Rods for Arc Welding of Stainless and Heat Resisting Steels—Classification

A5.11/A5.11M, Specification for Nickel and Nickel-Alloy Welding Electrodes for Shielded Metal Arc Welding

A5.14/A5.14M, Specification for Nickel and Nickel-Alloy Bare Welding Electrodes and Rods

A5.22/A5.22M, Specification for Stainless Steel Flux Cored and Metal Cored Welding Electrodes and Rods