for bend tests, as shown in Figure 17-12, immediately before and after the welding of the proof test vessel. The bend specimens shall be tested in accordance with Section IX, Figures QW-466.1 through QW-466.6, except that after bending, the convex surface of the specimen, in the weld and the heat-affected base metal, shall show not more than two cracks or other open defects, neither of which shall measure more than \(\frac{1}{16}\) in. (1.5 mm) in length in any direction.

(b) Machine Settings and Controls

(1) For vessels constructed under the provisions of this Appendix, all applicable parameters used in the making of the proof test vessel and workmanship samples shall be recorded. Parameters to be recorded are as follows:

- (a) all Essential, Nonessential, and Supplementary Essential (if required) Variables listed in Section IX for procedure qualifications of the applicable process;
- (b) all preheat, postweld heat treatments, and examination procedures;
- (c) applicable material specification, including type, grade, and thickness of the material welded;
- (d) parameters recorded above shall be included in a written Welding Procedure Specification and will serve as procedure and performance qualifications for future production.

(2) Except for minor variations permitted by the welding variables in Section IX, the settings recorded per (1) above shall be used in the fabrication of all vessels in a given production run. See 17-8(a)(1).

(3) If equipment other than that used for the initial proof test vessel and the workmanship samples is to be used in production, each additional machine and welding procedure shall be qualified in full accordance with (1) above. The performance of the additional proof test vessels shall substantiate the allowable working pressure previously established for the specific pressure vessel design. In assemblies welded per 17-1(b)(3), any major component change or replacement of welding equipment previously qualified shall require requalification. (Routine maintenance and replacement of expendable items, such as contact tubes and shielding nozzles, are excluded.)

(c) Miscellaneous Welding Requirements

(1) Lap joints may only be resistance spot or seam welded per 17-1(b)(1) or 17-1(b)(2); or machine, automatic, or semiautomatic gas tungsten-arc welded per 17-1(b)(4) or 17-1(b)(5); or machine or automatic plasma-arc welded per 17-1(b)(6); or machine or automatic submerged-arc welded per 17-1(b)(7); or machine or automatic laser beam welded per 17-1(b)(8) or 17-1(c).

(2) For assemblies welded per 17-1(b)(3), the gas metal arc-spot welding equipment used in the qualification tests and in production shall be semiautomatic (with a timed arc) or fully automatic. Manual arc-spot welding where the welder has manual control of arc time is not permitted under the rules of this Appendix, nor are edge or fillet type arc-spot welds. All gas metal arc-spot welding shall be done in the downhand position, with the work, at the location of the spot weld, in a substantially horizontal plane. The required size and spacing of the gas metal arc-spot welds shall be demonstrated by calculation and by the pressure proof test [see 17-5(a)].

(3) For assemblies constructed under the provisions of 17-1(a)(2), and having sheets formed within dies where the dies control the shape of the pillow (Figure 17-15) and restrain the welds so that the bending in the sheet is outside of the heat-affected zone, the welding may be done before or after forming; and the requirements and limitations of 17-6(b) do not apply.

(d) Welding other than that permitted by this Appendix, used for the attachment of nozzles, tubes and fittings, for the closing of peripheral seams, for the making of plug and slot welds, or for the fillet welding of holes and slots, shall be conducted in accordance with the requirements of this Division.

### 17-8 QUALITY CONTROL

(a) Definitions

(1) production run — a group of vessels or assemblies all produced during the same 24 hr day using the same welding processes, materials, and material thicknesses.

(2) peel test — a destructive test performed in a tension test machine employing specimens shown in Figures 17-7, 17-8, 17-9, 17-10, and 17-11.

(b) Test Requirements. At the beginning of each production run, at least one test shall be made as follows:

(1) For assemblies constructed under 17-1(b)(1), 17-1(b)(2), 17-1(b)(4), 17-1(b)(5), 17-1(b)(6), 17-1(b)(7), 17-1(b)(8), or 17-1(c), a peel test, a tension test, or a macroetch examination shall be performed. The acceptance criteria for the peel and tension tests shall be that the parent metal adjacent to the weld must fail before the weld itself fails. The macroetch examination shall be performed on one test specimen by cross sectioning and examining the weld in accordance with 17-7(a)(2)(b).

(2) For assemblies constructed under 17-1(b)(3), a macroetch examination shall be performed in accordance with 17-7(a)(2)(b) except that only one weld need be cross sectioned and examined.

### 17-9 RECORDS

As specified in 17-7(b), records shall be maintained for all data obtained during the fabrication of the proof test vessels and the workmanship samples. Such records shall