

APPENDIX R

USE OF ALTERNATIVE ULTRASONIC ACCEPTANCE CRITERIA

ultrasonic fracture mechanics based acceptance criterion

R300 GENERAL

(a) This Appendix provides alternative ~~acceptance criteria based on ultrasonic fracture mechanics~~ that may be used for Code piping in lieu of those described in para. 344.6.

(b) The acceptance criteria within this Appendix are applicable to \bar{T}_w having a thickness equal to or greater than 25 mm (1.0 in.). The acceptance criteria stated in para. 344.6.2 shall be used for all thicknesses less than 25 mm (1.0 in.).

R301 SCOPE

(a) The examination shall be conducted using automated or semiautomated techniques utilizing computer-based data acquisition.

(b) The examination shall be performed in accordance with a written procedure approved by UT (ultrasonic testing) Level III personnel [see para. R303(a)] and conforming to the requirements of ASME BPV Code, Section V, Article 4, Mandatory Appendix VIII, and

(1) for phased array — Section V, Article 4, Mandatory Appendix V

(2) for time of flight diffraction (TOFD) — Section V, Article 4, Mandatory Appendix III

(c) Procedure qualification shall meet the requirements of Section V, Article 4, Mandatory Appendix IX.

R302 EQUIPMENT

A mechanical guided scanner capable of maintaining a fixed and consistent search unit position relative to the weld centerline shall be used.

R303 PERSONNEL

(a) Personnel performing nondestructive examination to the requirements of this Appendix shall be qualified and certified in the ultrasonic testing method in accordance with a procedure as described in Section V, Article 1, T-120(e) or (f).

(b) Setup and scanning of welds shall be performed by personnel certified as UT Level II or III (or by Level I personnel under the direct supervision of Level II or Level III personnel).

(c) Interpretation and evaluation of data shall be performed by UT Level II or III personnel.

(d) Personnel demonstration requirements shall be as stated in Section V, Article 4, Mandatory Appendix VIII.

R304 EXAMINATION

(a) The initial straight beam scan for reflectors that could interfere with the angle beam examination shall be performed (1) manually, (2) as part of a previous manufacturing process, or (3) during the weld examination, provided detection of these reflectors is included in the demonstration as required in para. R301(c).

(b) The examination area shall include the volume of the weld, plus the lesser of 25 mm (1.0 in.) or \bar{T}_w of adjacent base metal on each side of the weld. Alternatively, the examination volume may be reduced to include the actual heat affected zone (HAZ) plus 6 mm (0.25 in.) of base material beyond the heat affected zone on each side of the weld, provided the extent of the weld HAZ is measured and documented.

R305 DATA RECORDING AND CAPTURE

Data shall be recorded in the unprocessed form as specified in Section V, Article 4, V-471.6. The data record shall include the complete examination area as specified in para. R304(b).

R306 DATA ANALYSIS

(a) Reflectors exceeding the limits of (1) or (2) below shall be investigated to determine whether the indication originates from a flaw or is a geometric indication as described in (b) below.

(1) For amplitude-based techniques, the location, amplitude, and extent of all reflectors that produce a response greater than 20% of the reference level shall be evaluated.

(2) For non-amplitude-based techniques, the location and extent of all images that have an indicated length greater than 4.0 mm (0.16 in.) shall be investigated.

(b) Ultrasonic indications of geometric and metallurgical origin shall be classified as specified in Section V, Article 4, T-481. Alternatively, other techniques or non-destructive examination methods may be used to classify an indication as geometric (e.g., alternative beam