



## AWS D1.1 Interpretation

**Subject:** Ultrasonic Inspection  
**Code Edition:** D1.1-81  
**Code Provision:** Section 6, Part C  
**AWS Log:** D1-SUT

**Inquiry:** (1) One of the questions concerns the evaluation of discontinuities once they have been located by one of the scanning methods specified in Table 6.19.5.2, Page 117 and 118 of the 1980 Edition. The method numbers are derived from the procedure chart, based upon the type of joint and material thickness. The number in the left side of the box refers you to the procedure legend, which specifies the angles that will be used to scan the various weld areas. In the procedure chart, the only way you get to the right side of the box under the asterisk, is when a fusion zone discontinuity is suspected. In the case of a T-joint in 2 in.-thick material, the procedure chart refers you to “F” or “XF” for further evaluation of a suspected fusion zone discontinuity. Paragraph F reads as follows:

*Further evaluate fusion zone indications, with either 70°, 60°, or 45° search unit, whichever sound path is nearest to being perpendicular to the suspected fusion surface.*

*“X” Check From Face “C”*

*In the type joints in question, face “C” always has a continuity plate shop-welded between flanges, thereby nullifying examinations from face “C”.*

**Response:** We interpret this to mean that if the indication being evaluated is suspected of being in the vertical member fusion zone, we would use a 70° search unit to evaluate the severity of the discontinuity regardless of its elevation in the weld throat. Further, if the indication found is suspected to be in the horizontal member fusion zone (i.e., flange bevel), an angle which most nearly intersects the fusion zone perpendicularly would be used for evaluation. For example, if the fusion zone bevel is 30°, you should use a 60° search unit along the entire 30° bevel. If the fusion zone bevel is 45°, you should use a 45° search unit along the entire 45° bevel.

***Question: Are you limited to making evaluation of a discontinuity from face “A” only, or can you evaluate from face “B”?***

(2) In the past, we have evaluated discontinuities from whichever face (A or B), that allowed us to perform the evaluation in Leg 1. We use a search unit whose sound path angle is nearest to being perpendicular to the largest plane of the discontinuity for further evaluation.

***Question: Are you limited to using only the angles specified in the procedure legend for the upper, middle, and bottom portions of the weld, when evaluating a discontinuity?***

(3) Another question which has been raised concerns discontinuity indications which are not in the vertical column fusion zone or in the horizontal member fusion zone bevel. Indications of discontinuities may occur anywhere in the weld area and may be indicative of slag inclusions, cracks, or lack of fusion between individual weld beads or layers. It has been our practice to

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It should be recognized that the fundamental premise of the Code is to provide general stipulations applicable to any situation and to leave sufficient latitude for the exercise of engineering judgment. Another point to be recognized is that the Code represents the collective experience of the committee; and, while some provisions may seem overly conservative, they have been based on sound engineering practice.



evaluate these indications with a 70°, 60°, or 45° search unit to determine at what angle the largest reflecting surface of the indications is perpendicular to. Then, an accept or reject evaluation is made using the attenuation formula and the appropriate severity level from Table 8.15.3 for the angle used.

We have been challenged relative to our ultrasonic examinations, as questioned and exemplified above, due to the fact that the Code does not state specifically that examinations may be conducted in these manners. It has been suggested that the intent of the Code was to evaluate only flaws in the fusion zone, as these are only flaws of interest.... We feel it is evident that the Code procedure chart does not cover all situations as evidenced by paragraph 6.13.2 under Part C.

***Question: Do we ignore flaws other than fusion zone flaws, which exceed the critical limits of Table 8.15.3? Also, should we not try to make the evaluation in Leg 1 where possible and should we not also use whatever angle most nearly intersects the largest plane of the flaw perpendicularly?***

**Response:**

- (1) It is correct to interpret that flaws in the vertical member fusion zone be evaluated with a 70° search unit, and that flaws in the horizontal member fusion zone be evaluated with either a 45°, 60°, 70° search unit angle using the search unit that produces a sound beam most nearly normal to the intersecting fusion zone. The evaluation should be made from Face A only. It is the intent of the Code that other faces be used only where the full volume of weld cannot be tested from Face A, except as required by the Procedure Legend on Page 121 and 6.19.5.
- (2) For discontinuities in the weld, only the angles listed in Table 6.19.5.2 are to be used. It is the intent of the Code that all T-joints be tested from one face only; Legs II and III are to be used when necessary to achieve full coverage (see Table 6.19.5.2, Notes 3, 4, and 5). It is not the intent of the Code that such discontinuities be calculated with search unit angle selected to maximize the amplitude responses.
- (3) It is not the intent of the Code that any flaw be ignored. It is the intent of the Code that flaws in the weld metal and heat-affected zone be evaluated to the weld criteria. As stated in the response above, it is not the intent of the Code that discontinuities be evaluated by selecting an angle based on discontinuity reflected characteristics. While searching at scanning level with angle(s) selected as prescribed in the first column of Table 6.19.5.2, it is the intent of the Code that fusion zone(s) be further evaluated. Either a 70°, 60°, or 45° transducer-whichever sound path is nearest to being normal to the vertical face of the column or the bevel surface of the beam—shall be used for evaluation.

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