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DEPARTMENT OF ENGINEERING RESEARCH

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NONDESTRUCTIVE EXAMINATION
SPECIFICATIONS AND PROCEDURES

ULTRASONIC EXAMINATION
SHEAR WAVE
PULSE-ECHO METHOD

1. SCOPE

1.1 This procedure is applicable to the ultrasonic examination techniques employing the shear wave (angle beam), pulse-echo contact method.

1.2 This procedure shall be employed when examining the butt welded joints of the seamless 304 stainless steel pressure retaining piping at Humboldt Bay Power Plant, Unit 3, nuclear.

1.3 This procedure shall be preceded by the longitudinal wave examination of the volume of base metal through which sound will travel during shear wave examination.

1.4 This procedure covers the examination of nominal pipe sizes of 2" (.218"w.t.), 3" (.300"w.t.), 4" (.337"w.t.), 6" (.562"w.t.), and 8" (.718"w.t.).

2. PERSONNEL

2.1 Personnel performing the calibration and examination shall meet the requirements of Section No. PQC-1.

3. CALIBRATION

3.1 The shear wave examination shall be preceded by the instrument and system requirements specified in Section UCS-1.

4. EQUIPMENT

4.1 The equipment used for the examination shall be the same equipment used during calibration and shall conform to Section UCS-1, par. 2.

5. SURFACE PREPARATION

5.1 The contact surfaces shall be free from weld spatter and any surface roughness that would interfere with free movement of the transducer or impair transmission of ultrasonic vibrations.

5.2 Cleaning materials to be used on austenitic stainless steels shall be certified in compliance with Section No. PE-2, par. 4.2 and 4.2.1.

5.3 Necessary surface grinding; i.e., removal of weld spatter, shall not reduce the original wall thickness.

6. EXAMINATION METHOD

6.1 The examination shall be made from the outside surface of the pipe.

6.2 The examination shall be made from both sides of the weld when accessibility and pipe or fitting geometry permit. The axial scan shall include the pipe metal for a distance of 6t from the scan side of the weld.

6.3 Scanning shall be continuous and in a direction perpendicular to the weld.

6.3.1 Transducer path overlap shall be at least 10% of the transducer width.

6.3.2 Scanning speed shall not exceed 4 inches/sec.

6.3.3 Scanning shall be performed at a minimum gain setting of twice the primary reference level.

6.4 A stainless steel band, marked in 1/4 inch increments shall be placed around the girth of the pipe as a means of indicating the radial location of indications (Figure 1).

6.4.1 The "zero" radial reference point and the radial direction of scan around the girth of the pipe shall be marked on the pipe with a vibrator type marking tool as shown in Figure 1. The depth of markings shall not exceed 1/64 inch.

6.4.2 The direction of scan, unless otherwise specified, shall be clockwise when facing in the normal direction of flow.

6.4.3 The stainless steel band may be secured away from the weld at a point which allows for the band to be used as a stop during transducer longitudinal movement.

6.4.4 The position of an indication in the longitudinal direction shall be measured from the center of the weld. This shall be referred to as the "reference line."

6.5 Evaluation of discontinuities shall be done with the gain control at the primary reference level.

7. RECORDS

7.1 All data shall be recorded in Form UERS-1 and the records shall be maintained in Appendix A.

7.2 All reflectors which produce a response greater than 50% of DAC shall be recorded and the following data shall be included.

7.2.1 The maximum percent of DAC.

7.2.2 The radial location of the indication (in inches) with respect to the weld girth.

7.2.3 The distance from the beam exit point of the transducer to the weld centerline. Note: The front of the transducer wedge may be used as an optional reference point but compensation for the dimensional difference must be made when mapping.

7.2.4 The location of the indication in the volume of the material measured in 1/8's of a vee path.

7.2.5 The circumferential length of the indication as determined by the points which are reduced to 1/2 of the maximum amplitude. Note: An indication has length if it is greater than 9/10's of the transducer width.

7.3 All indications which produce a response greater than 50% of DAC shall be represented on a full-scale cross-sectional drawing of the plate and weld joint, showing the apparent volumetric location of the indication.

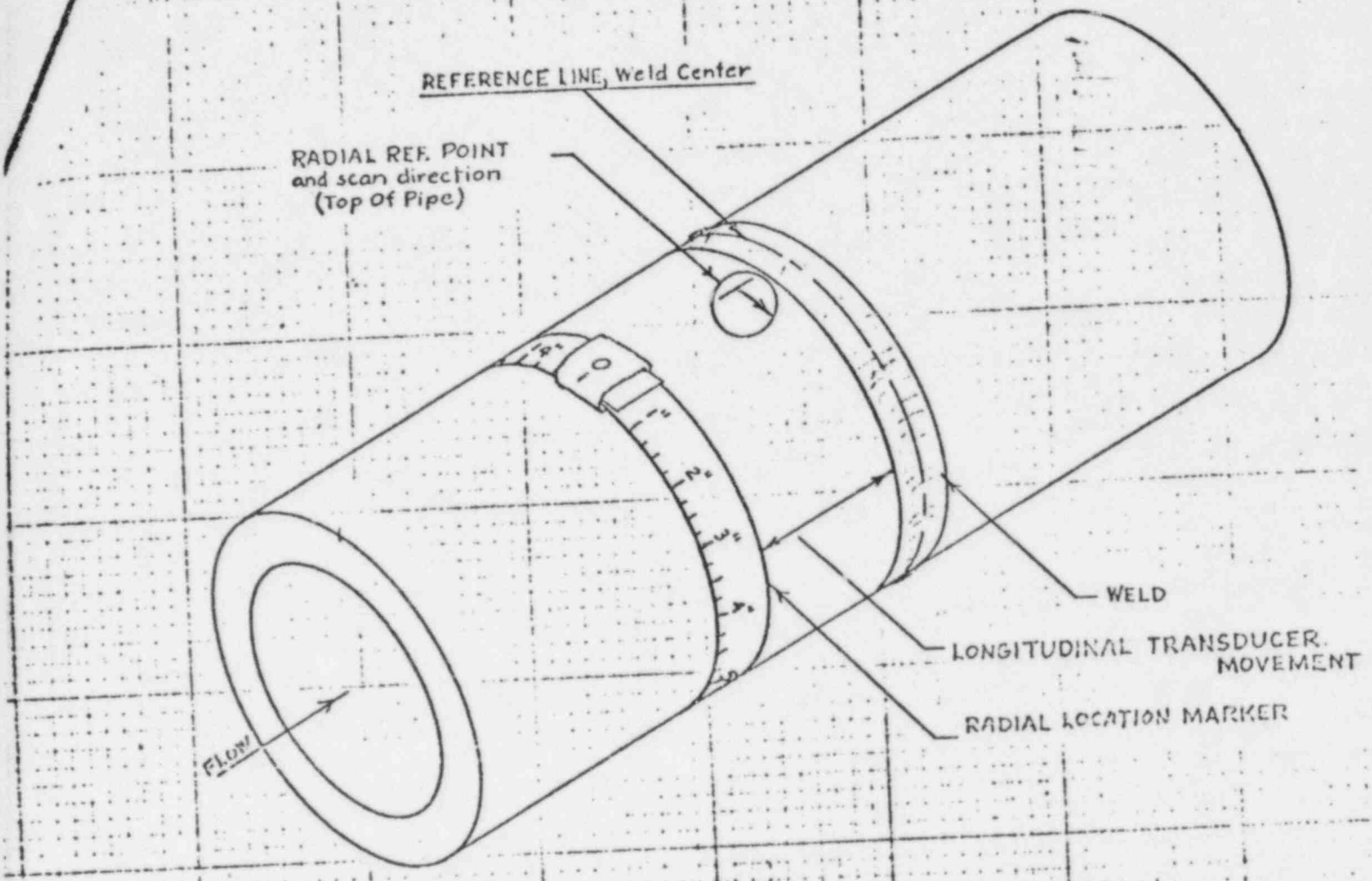
REFERENCE LINE, Weld Center
RADIAL REF. POINT
and scan direction
(Top Of Pipe)
WELD
LONGITUDINAL TRANSDUCER
MOVEMENT
RADIAL LOCATION MARKER
FLOW

FIG. 1