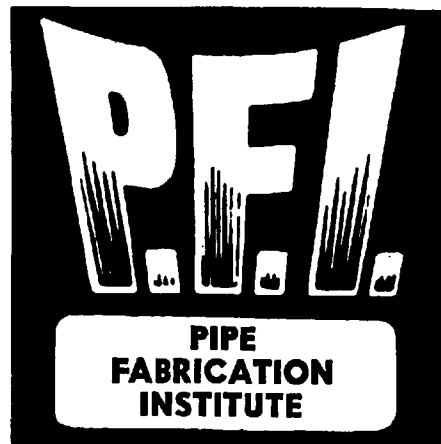


Random Radiography Of Pressure Retaining Girth Butt Welds

Prepared by
Pipe Fabrication Institute Engineering Committee



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RANDOM RADIOGRAPHY OF PRESSURE RETAINING GIRTH BUTT WELDS

METRIC CONVERSIONS

The conversion of quantities between systems of units involves a determination of the number of significant digits to be retained. All conversions depend upon the intended precision of the original quantity and are rounded to the appropriate accuracy.

Pipe sizes together with applicable wall thicknesses are not shown with metric conversions.

The SI (metric) values were included with the customary US Values in this Standard are the rounded equivalents of the US Values and are for reference only.

Metric units were derived utilizing the following conversion factor:

Conversion	Factor
inches to millimeter	25.4

1. Scope

- 1.1 This standard establishes the requirements for random radiographic examination of butt welds in piping sub-assemblies.

2. General Comments

- 2.1 This standard recognizes that random radiographic examination is considered to be a means of verifying a welder/weld operator's performance and is not a substitute for 100% radiographic examination.
- 2.2 When the design integrity of a system requires freedom from specified unacceptable defects determinable only by radiography, 100% radiography of all welds must be employed.
- 2.3 Random radiography performed after a welder/weld operator has completed a weld verifies that the quality of his work does or does not meet the acceptance criteria established for the weld.
- 2.4 Random radiography on shop welds will be performed in the shop prior to shipment.
- 2.5 Welds not radiographed will be judged acceptable, if they pass a hydrostatic test, air test, vacuum test or initial service leak test of the erected system of which they are a part.
- 2.6 The words "random radiography" as used in this standard are defined as meaning 100% radiographic examination of 5% of the total of all pressure retaining girth butt welds. Welds shall be selected to insure that the work of each welder and each process is included. Ongoing in-house quality verification programs may satisfy this requirement.
- 2.7 Random radiography shall be performed at any stage of fabrication convenient to the fabricator.

3. Designation of Welds To Be Radiographed

- 3.1 Designation of welds to be radiographed shall be the responsibility of the fabricator in absence of other contractual agreements.

4. Radiographic Examination Procedure

- 4.1 Radiography shall be performed in accordance with Article 2 of Section V of the ASME Boiler and Pressure Vessel Code except that the requirements of T285 are to be used as a guide and not for the rejection of radiograph film unless the geometrical unsharpness exceeds 0.07 in. Final acceptance of radiograph film shall be based on the ability to see the prescribed penetrameter image and the specified hole or wire.
- 4.2 Personnel performing radiography and radiographic interpretation shall be qualified in accordance with ASNT-SNT-TC-1A.

5. Acceptance Standards

- 5.1 Welds that are shown by radiography to have any of the following type imperfections greater than the limits shown shall be judged unacceptable and shall be repaired:
- 5.1.1 Cracks or lack of fusion.
- 5.1.2 Incomplete penetration (Fig. 1 and 2) the lesser of $1/32"$ (1mm) or shall not exceed $0.2T$ deep, where T is the nominal thickness of the thinner of the two sections being joined. The total length of such imperfections shall not exceed $1\frac{1}{2}"$ (38mm) in any six (6) inches (152mm) of weld.

- 5.1.3 Slag Inclusions or Other Elongated Defects — The developed length of any single slag inclusion or elongated defect shall not exceed $2T$. The total cumulative developed length of slag inclusions and/or other elongated defects shall not exceed $4T$ in any six (6) inch (152mm) length of weld. The width of a slag inclusion shall not exceed the lesser of $\frac{1}{8}$ " (3mm) or $\frac{1}{2}T$.
- 5.1.4 Undercuts in the external surfaces of butt welds which are more than $\frac{1}{32}$ " (1mm) deep or encroach on the minimum required section thickness.
- 5.1.5 Excessive internal concavity—the thickness of the weld shall be at least as thick as the thinner of the base metals. Weld reinforcement up to $\frac{1}{16}$ " (2mm) may be considered as compensation for internal concavity Fig. 4).
- 5.1.6 Burn-through, where excessive penetration has caused the weld puddle to be blown into the pipe, greater than $\frac{1}{2}$ " (13mm) in length.
- 5.1.7 Rounded indications (porosity) shall not exceed the following:
- (A) For T greater than $\frac{1}{4}$ inch (6mm), 1.5 times the limits of (B) below.
 - (B) For T not over $\frac{1}{4}$ inch (6mm), porosity shall not exceed that shown acceptable in BPV, Code Section I, Appendix A-250.

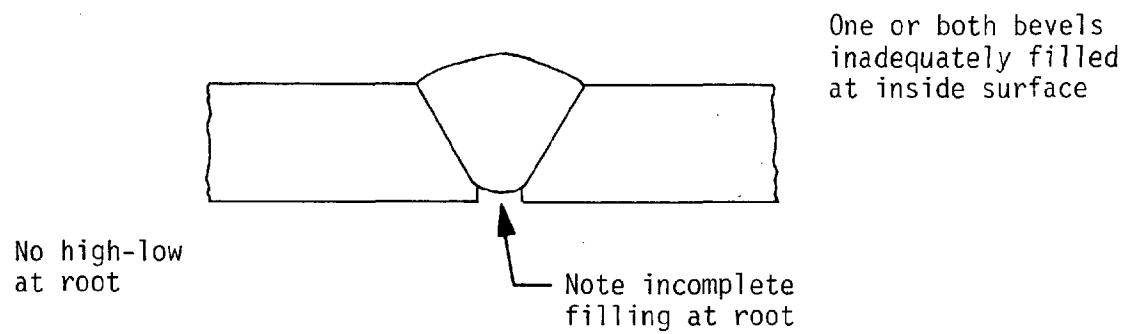


FIGURE 1

INADEQUATE PENETRATION OF WELD GROOVE

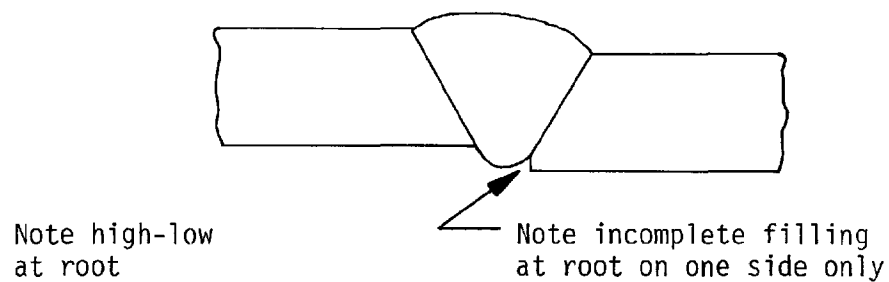


FIGURE 2

INADEQUATE PENETRATION DUE TO
HIGH-LOW CONDITION

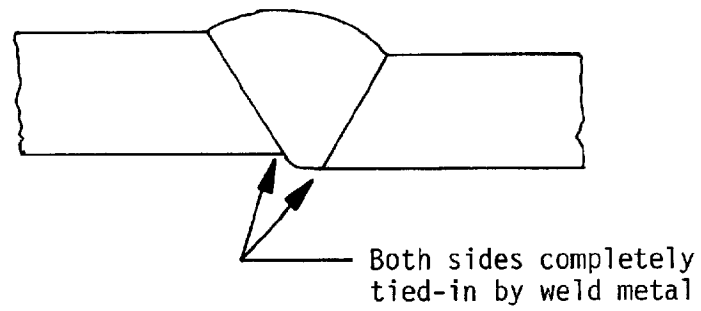


FIGURE 3
HIGH-LOW CONDITION
(Acceptable)

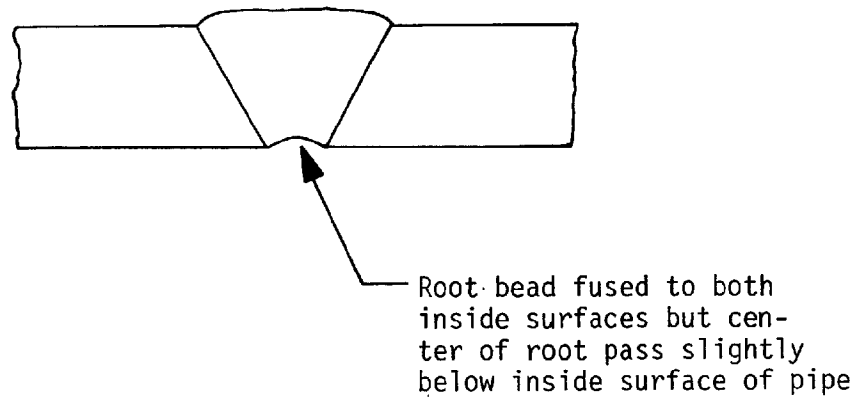


FIGURE 4
INTERNAL CONCAVITY

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PFI Standards and Technical Bulletins are published to serve proven needs of the pipe fabricating industry at the design level and in actual shop operations. Hence, such needs are continually considered and reviewed by the Engineering Committee of the Pipe Fabrication Institute to provide recommended procedures which have been demonstrated by collective experiences to fulfill requirements in a manner for Code compliance. However, as the PFI Standards are for minimum requirements the designer or fabricator always has the option of specifying supplementary conditions in the form of requirements beyond the scope of the PFI publications.