ABM NDT

Procedure For The Ultrasonic Testing

Of Full Penetration Butt Welds In

Mild Steel And Low Alloy Steel Pipe

To ASME BPVC V:2019

SAMPLE ONLY - NOT FOR PRODUCTION USE FULL PROCEDURE AVAILABLE TO PURCHASE FROM www.n-d-t.com

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1. Scope

This procedure describes the method of ultrasonic examination of full penetration butt welded joints in mild steel and low alloy steel pipe sections and must be adhered to as applicable to ensure customer requirements are met and that compliance with orders received is achieved.

This procedure only covers the pulse echo contact method of ultrasonic examination of fusion welded pipe joints in mild/low alloy ferrous steel having wall thickness up to, and including 75mm and at temperatures between 0° to 60° C.

Weld undergoing ultrasonic inspection shall be subject to 100% volumetric examination of the weld body and heat affected zone.

This procedure shall only be used on newly manufactured items and is not to be used for in-service inspection.

2. References

This procedure makes reference to the following documents:-

ASME BPVC Section V: 2019 Non-destructive Examination

ASME B31.3-2018 Process piping.

BS EN ISO 9712:2012 Non-destructive Testing. Qualification and certification of NDT personnel.

BS EN ISO 7963:2010 Non-destructive testing. Specification for calibration block No. 2

BS EN 12668-1:2010 Non-destructive testing. Characterisation and verification of ultrasonic examination equipment. Pt. 1 Instruments

BS EN 12668-2:2010 Non-destructive testing. Characterisation and verification of ultrasonic examination equipment. Pt 2. Probes

BS EN 12668-3:2013 Non-destructive testing. Characterisation and verification of ultrasonic examination equipment. Combined equipment.

3. Definitions & Abbreviations

The following definitions and abbreviations are used in this procedure.

BWE	Back wall echo
DAC	Distance amplitude correction
dB	Decibel
FSH	Full screen height
NDT	Non-destructive testing
PCN	Personnel Certification In NDT
UT	Ultrasonic Testing

4. Personnel Qualifications

All personnel operating to this procedure shall hold a minimum of Level 2 certification in accordance with ISO 9712, in the ultrasonic testing of welds. e.g. PCN Level 2.

Note: It is critical that UT operator certification must cover the configuration of weld that is to be tested i.e. 3.2 for pipe welds.

All personnel shall also hold a valid eyesight certificate (meeting the requirements of ISO 9712 Section 7.4) obtained within the last 12 months.

5. Surface Finish

Surfaces from which scanning is carried out shall be such that satisfactory acoustic coupling can be maintained at all times.

Surfaces shall be free from scale, foreign material, rust, oil/grease, gouge marks, burning slag residue or any other material that could affect the sensitivity of the test.

The scanning surface shall be given as either 1.25 x the maximum beam path or three times the weld thickness, whichever is greatest.

6. Equipment

The following equipment shall be used when working to this procedure.

- A-scan ultrasonic flaw detector.
- No.2 Calibration block.
- 0^0 Twin crystal, 45^0, 60^0, 70^0 twin and single crystal 10mm Ø, 4-5MHz probes.
- Commercial couplant.
- DAC calibration block with 8-11% Notches in compliance with ASME BPVC V T434.3

All flaw detectors and probes used shall comply with EN 12668. All flaw detectors shall have a valid external calibration certificate issued within the last twelve months.

7. Equipment and Performance Checks

All functional and calibration checks of equipment shall be performed in accordance with BS EN 12668-3

Daily checks to include:-

- Probe index point
- Probe beam angle
- Physical state and external aspects.

Weekly checks to include:-

- Timebase linearity
- Amplification linearity
- Probe signal to noise ratio
- Pulse duration

Also the following checks shall be made every 3 months for analog flaw detectors or every 12 months for digital flaw detectors.

- ASME BPVC V: Mandatory appendix I - Screen Height Linearity.
- ASME BPVC V: Mandatory appendix II - Amplitude Control Linearity

All equipment checks shall be recorded by the operator and shall be made available upon future request.

8. Couplant

Commercial couplant shall be used. Eg. UCA-7 or Sonagel. The choice of couplant used shall not be harmful to the material being tested.

9. Calibration & Sensitivity

When calibrating and setting sensitivity all calibration blocks and reference test pieces shall be no more than +/- 15^{o}C from the temperature of the item under test.

All probes shall be calibrated for range using the no.2 block.

Sensitivity for compression wave probes shall be BWE to FSH from a defect free area of parent material plus an additional 6dB.

Angle beam calibration using notches.

The angle beam shall be directed toward the notch that yields the maximum response. The gain control shall be set so that this response is 80% ± 5% of full screen height. This shall be the primary reference level.

The search unit shall then be manipulated, without changing instrument settings, to obtain the maximum responses from the calibration reflectors at the distance increments necessary to generate a three-point distance–amplitude correction (DAC) curve. Separate calibrations shall be established for both the axial and circumferential notches.

These calibrations shall establish both the distance range calibration and the distance–amplitude correction.

9.1 Calibration Checks

When any part of the examination system is changed, a calibration check shall be made on the basic calibration block to verify that distance range points and sensitivity setting(s) satisfy the requirements of 9.2 and 9.3

A calibration check on at least one of the reflectors in the basic calibration block shall be performed at the completion of each examination or series of similar examinations, and when examination personnel are changed.

The distance range and sensitivity values recorded shall satisfy the requirements of 9.2 and 9.3.

NOTE: Interim calibration checks between the required initial calibration and the final calibration check may be performed.

9.2 Distance Range Points.

If any distance range point has moved on the sweep line by more than 10% of the distance reading or 5% of full sweep, whichever is greater, correct the distance range calibration and note the correction in the examination record. All recorded indications since the last valid calibration or calibration check shall be reexamined and their values shall be changed on the data sheets or re-recorded.

9.3 Sensitivity Settings.

If any sensitivity setting has changed by more than 20% or 2 dB of its amplitude, correct the sensitivity calibration and note the correction in the examination record. If the sensitivity setting