

1.0 SCOPE

This procedure is applicable for Straight beam pulse echo ultrasonic examination over a length of 50 mm circumferentially from both ends of bends to detect lamination, inclusions & other laminar type of imperfections.

2.0 APPLICABLE CODE & STANDARDS

- API 5L 45th Edition-2012 "Specification for Line Pipe"
- ISO 15590-1:2009 Petroleum and natural gas industries — "Induction bends, fittings and flanges for pipeline transportation systems — Part 1: Induction bends"
- MSS-SP-75-2008 "Specification for high test, wrought, butt welding fitting"
- ASME B 16.49:2007 "Factory-Made, Wrought Steel, Butt welding Induction Bends for Transportation and Distribution Systems"
- ISO 9712 "Qualification and certification of personnel"

3.0 RESPONSIBILITY

Personnel performing Ultrasonic Examination shall be responsible for interpretation & evaluation of indications during the examination & preparation of Test reports. An ASNT LEVEL III shall be responsible for overall supervision.

4.0 PERSONNEL QUALIFICATION

NDT personnel shall be qualified as per WCL written practice & Vision examination shall be as per applicable SNT-TC-1A.

- 1) NDT L-III shall be responsible for overall supervision.
- 2) NDT L-II personnel shall set up the equipment; perform tests and reports the results.

5.0 STAGE OF EXAMINATION

The End Ultrasonic Examination shall be carried on bend after completion of manual ultrasonic inspection for welding.

6.0 METHOD OF EXAMINATION

Straight beam contact method.

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7.0 TECHNIQUE

Pulse echo technique

8.0 EQUIPMENT USED

- Flaw Detector - Einstein – II, Make – Modsonic /EEC
- Cable - Co-axial cable with Lemo to mini lemo connectors of length 1.5 to 2.5 meter.
- Search Unit – Normal /TR probe, with frequency 4 MHz. of size Ø 24 mm / 10 mm.

9.0 SCANNING SURFACE

9.1 All surfaces of material to be examined shall be clean from scale, dirt, burrs, slag, spatter or other conditions that would interfere with the examination results. The configuration of the weld must be such that interfering signals are not generated by reflections from it.

9.2 Treatment of the inner surface and outer surface weld beads such as trimming (“scarfing”) or rolling is often required to remove protuberances that could result in spurious reflections. The standardization and examination surface temperatures should be within 14°C to avoid large attenuation and velocity differences in the wedge material.

10.0 COUPLANT

Water shall be used as couplant

11.0 CALIBRATION STANDARD BLOCKS

IIW V1, V2 Blocks & step wedge.

12.0 INSTRUMENT CALIBRATION

12.1 SCREEN HEIGHT LINEARITY - Position an angle beam search unit on a calibration block (as shown in the below Figure A) such that indication from both the ½ T and ¾ T holes give a 2:1 ratio of amplitudes between the two indications. Adjust the sensitivity (gain) so that the larger indication is set at 80% of full screen height (FSH) without moving the search unit adjust the gain to successively set the larger of the indication from 100 % to 20% of FSH., in 10 % increment (or 2 dB steps if a fine control is not available) and read the smaller indication at each setting.

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BENDING PROCEDURE 24

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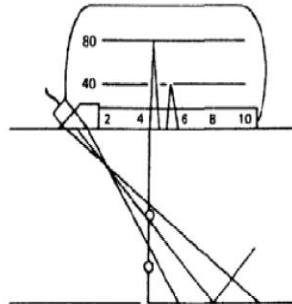


FIGURE A

12.2 The reading shall be 50% of the larger amplitude, within 5% of FSH. The settings and reading shall be estimated to the nearest 1% of full screen. Alternatively, a straight beam search unit may be used on any calibration block that provides amplitude differences, with sufficient signal separation to prevent overlapping of the two signals.

12.3 AMPLITUDE CONTROL LINEARITY - Position an angle beam or Normal beam transducer (as shown in Figure A) such that indication obtained from the calibration block is peaked on the screen Increase /decrease the dB as shown in the below Table 1.

TABLE 1

S. NO.	INDICATION SET AT % OF FSH	Db control change	Indication limits % of FSH
1	80		
2	80		
3	40		
4	20		

The procedure for evaluating the amplitude control linearity shall be performed at the beginning each period of extended use or every 3 month whichever is less.

12.4 HORIZONTAL LINEARITY

Horizontal linearity has significance when determination of the depth of a discontinuity is required. A block having good ultrasonic transmittivity, flat and a thickness of about one tenth of the specified sweep range will usually be adequate.

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Adjust the instrument gain, sweep- delay and sweep length control to display eleven Non-interfering back reflection back reflection at the 20% and 80% scale divisions respectively. After the third and ninth back reflections are positioned

accurately on the 20% and 80% scale divisions as described, and record the scale position of each other multiple Echo division should be with in $\pm 5\%$ FSW as shown in the Fig B. The procedure for evaluating the Horizontal linearity shall be performed at the beginning each period of extended use or every 3 month whichever is less.

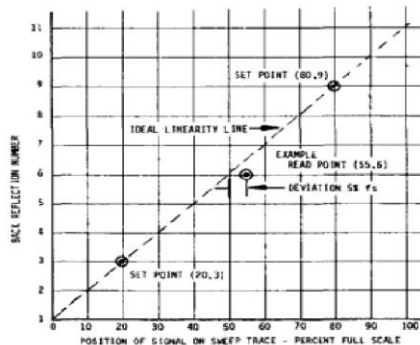


FIG. 2 Example of Data Plot for Determination of Horizontal Linearity

FIGURE B

13.0 REFERENCE STANDARD

For straight beam - The block is made up of same material, nominal thickness, geometry & of same grades with $\varnothing 6.00$ mm FBH with depth half of the wall thickness.

14.0 CALIBRATION FREQUENCY

Frequency of calibration - The calibration and shall be performed after sensitivity check at:

- The beginning of each normal inspection shift.
- Every four hours of the running system.
- When system is under idle condition for more than 2 hrs. continuously.
- When operator will be change.
- The equipment shall be recalibrated if any of the parameters which were used during the initial calibration are changed.
- End of the production run.
- Before any planned shutdown of the ultrasonic equipment during production,
- And every time the running of the system gives raise to doubt about in its efficiency
- Repeatability check - Repeatability Shall be checked during every calibration (4 hrs. interval).

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15.0 CALIBRATION PROCEDURE

Calibration shall be done for instrument setting the first echo from the flat bottom hole at 80% of FSH. Set the alarm gate at the required Threshold height from defect echo and the reference sensitivity. The scanning sensitivity shall be reference sensitivity +6 dB.

16.0 SCANNING SPEED

16.1 The scanning speed shall not exceed the 6 Inch / second.

17.0 TESTING PROCEDURE

The scanning shall be done in V shape (zigzag) with 10% overlapping and the scanning to be done through the entire circumference over a length of 50mm from both ends

18.0 ACCEPTANCE CRITERIA

Laminar imperfections ≥ 6.4 mm (0.25 in) in the circumferential direction is not acceptable as per API 5L 45th edition 2012.

19.0 DISPOSITION OF BEND CONTAINING DEFECTS

19.1 Pipes containing defects shall be given one or more of the following dispositions –

- The sections of pipe containing defects shall be cut off within the applicable limits for length.
- If the pipe is rejected, the same pipe is documented in NCR format

20.0 DOCUMENTATION

Examination results shall be recorded in standard report formats No. WCL/PBM/QC/F/08 A for SAP

- report & WCL/PBM/QC/F/08 for manual report
- Performance of ultrasonic pulse echo testing for linearity check shall be recorded in to format

21 SAFETY PRECAUTION

DO'S:-

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- Only authorized personal is authorized to operate the machine.
- Precaution should be taken during pipe movement.
- Always instruct the panel operator for your position.
- Maintain good housekeeping.
- Use recommended PPE's.

DON'TS:-

- Do not climb on the pipe to perform inspection.
- Do not throw the generated waste here & there.

ANNEXURE- I

SCANNING PATTERN FOR BEND END (CIRCUMFERENTIAL)

<INSERT PHOTO HERE>

REFERENCE STANDARD BLOCK

<INSERT PHOTO HERE>

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Note: Type and dimensions of the reflectors shall be physically verified
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