

1.0 SCOPE

The purpose of this work instruction is to establish and maintain documented procedure to ensure that the magnetic particle inspection of bend body over extrados and intrados is carried out to get desired quality of hot pulled induction bend.

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 Magnetic Particle Examination shall be responsible for interpretation & evaluation of indications during the examination & preparation of examination 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 Magnetic Particle Examination shall be carried out on bend after beveling.

6.0 METHOD OF EXAMINATION

Magnetic Particle Examination shall be carried out using Continuous method, YOKE -type

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7.0 TECHNIQUE

Wet - Non-Fluorescent/ Fluorescent

8.0 APPARATUS

YOKE type, make - MAGNAFLUX /K-ELECTRONICS.

9.0 TYPE OF MAGNETIC PARTICLE:

Red/Black/Gray magnetic powder for Wet MPI.

10.0 SYSTEM PERFORMANCE / SENSITIVITY CHECK

11.0 MAGNETIC FIELD INDICATOR (PIE FIELD INDICATOR)

The Magnetic field indicator shall be used to verify the presence and approximate Direction of magnetic field. A suitable

field strength is indicated when a clearly defined lines of magnetic particles forms across the copper face of the indicator when the magnetic particles are applied simultaneously with the magnetizing force.

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BENDING PROCEDURE 16

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12.0 LIFTING CAPACITY OF YOKE

The lifting capacity of yoke shall be checked as mentioned below. In AC current, an electromagnetic yoke shall have a lifting power of 10 lb. (4.5 Kg.) at maximum pole spacing that will be used.



13.0 SYSTEM PERFORMANCE / SENSITIVITY CHECK FREQUENCY

The sensitivity shall be performed at:

- The beginning of each normal inspection shift,
- Every four hours of the running system.
- When there is malfunctioning of the inspection equipment found.
- The equipment shall be recalibrated if any of the parameters which were used during the initial calibration are changed.
- End of the production run.
- End of inspection
- Before any planned shutdown of the magnetic equipment during production and every time the running of the system gives raise to doubt about in its efficiency.

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14.0 EXAMINATION AREA

Light Intensity for examination

- Magnetic indications found using non fluorescent magnetic particles are examined under visible light. The intensity of visible light at the surface of the part
- Undergoing examination should be a minimum of 100 foot candles (1000 lux). The intensity of black (ultraviolet) light at the surface of the part undergoing examination should be a minimum of 1000 $\mu\text{W}/\text{cm}^2$.
- Test Surface Preparation: The examined surface shall be free of scale, dust, oil & dirt.

15.0 DETERMINING BATH CONCENTRATION

- A bath concentration is determined by measuring its settling volume through the use of a pear-shaped centrifuge tube. Take a 100 ml portion of the non
- Fluorescent suspension from the nozzle and allow it to settle for minimum 30 minutes with water based suspension before reading. The recommended settling volume is 1.2 to 2.4 ml per 100 ml of Suspension as per ASME Sec. V, Article 7.

For fluorescent particles-

- The required settling volume is from 0.1 to 0.4 ml in a 100 ml bath sample Concentration check shall be performed at the start of each shift.

16.0 EXAMINATION PROCEDURE

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- Place the pie field indicator between the legs of the yoke on test surface and apply the bath spray to confirm the magnetic field direction and strength of magnetic field. The examination shall be carried out in two direction way with simultaneous application of bath spray to test the bend body over an arc of 90° both sides from extrados of bend.

17.0 INTERPRETATION OF INDICATION

- All indications formed by magnetic particle examination are the result of magnetic leak fields. Indications may be relevant (16.1), non-relevant (16.2) or false indication (16.3).
- Relevant Indications – Relevant indications are produced by leakage fields, which are the result of discontinuities. Relevant indications required evaluation with regard to the acceptance standards.
- Non relevant Indications – Non relevant indications can occurred singly or in patterns as a result of leakage field created by conditions that require no evaluation such as changes in section, inherent material properties (like the edge of a bimetallic weld), magnetic writing etc.
- False Indication - False indications are not the result of magnetic forces, those may be particles held mechanically or by gravity in shallow depressions or particles held by rust, scale on the surface

19.0 DEMAGNETIZATION

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- Measurement shall be made on test surface of the bend. The residual magnetism at the test surface shall not exceed 30 gauss & no single reading shall exceed 35 gauss. The residual magnetism is measured by using calibrated Gauss Meter/Hall effect gauss meter.
- If residual magnetism found more specified above, demagnetization shall be carried out. After demagnetization the residual magnetization shall be measured again.

19.0 ACCEPTANCE CRITERIA

- Laminar imperfections 6,4 mm (0.25 in) in the circumferential direction shall be classified as defects
- If any relevant linear indications are found (i.e. crack, Lamination etc.) during MPI, the bend end shall be re beveled, and again the re beveled end shall be retested

20.0 DISPOSITION OF BEND CONTAINING DEFECTS

- The section of bend containing defect shall be cut off with in the applicable for length. If bend length is not in length tolerance, bend shall be rejected /degraded.

21.0 DOCUMENTATION

Test results shall be recorded on Bendco Form:

22.0 SAFETY PRECAUTION

DO'S

- Only authorized personal is authorized to operate the machine.
- Precaution should be taken during pipe movement to ensure that nobody is standing in front of pipe.
- Always use spray gun/bottle for spraying wet particle on the pipe.
- While using fluorescent method, check UV filter frequently for any damage.
- Maintain good housekeeping.
- Use recommended PPE's.

DON'TS

- Do not cross the barricading.

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- Do not touch the pipe with bare hands.

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