Procedure For The Magnetic Particle Testing Of Welded Joints In Steel Plate And Pipe in accordance with BS EN ISO 17638

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1. Scope

This procedure describes the method of magnetic particle inspection of welded joints in steel plate and pipe sections and must be adhered to as applicable to ensure customer requirements are met and that compliance with orders received is achieved.

This specification is only applicable to the testing of weldments using portable AC yoke MPI equipment, using black MPI inks on a white background and the continuous wet method.

This procedure covers the testing of, 1) newly fabricated products, 2) any required repairs to newly fabricated products, 3) in-service welds 4) repair work to in-service welds.

2. References

This procedure makes reference to or is derived from the following documents:-

BS EN ISO 9712:2022 Non-destructive Testing. Qualification and certification of NDT personnel.

BS EN ISO 9934-1:2016 Non-destructive testing. Magnetic particle testing. Part 1: General principles

BS EN ISO 9934-2:2015 Non-destructive testing. Magnetic particle testing. Part 2: Detection media

BS EN ISO 9934-3:2015 Non-destructive testing. Magnetic particle testing. Part 3: Equipment

BS EN ISO 17638:2016 Non-destructive testing of welds. Magnetic particle testing

BS EN ISO 3059:2012 Non-destructive testing. Penetrant testing and magnetic particle testing. Viewing conditions.

BS EN 1330-1:2014 Non-destructive testing. Terminology. List of general terms

BS EN ISO 12707:2016 Non-destructive testing. Magnetic particle testing. Vocabulary

BS EN ISO 5817:2023 Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections

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3. Safety

Personnel working to this procedure shall work in such a manner as to comply with the Health and Safety at Work etc. Act 1974.

All consumables used shall have accompanying COSHH data sheets and shall be disposed of in a way that is non-injurious to site personnel or to the environment.

Personnel working to this procedure shall at all times wear mandatory PPE; overalls, safety boots, hard hat, high visibility clothing, etc.

Mains powered equipment i.e. 110V yokes shall be in good working order and have been PAT tested within the last 12 months.

Caution: AC yokes produce magnetic fields which are capable of disrupting and or stopping the normal operation of watches, credit cards, pacemakers and other items sensitive to strong magnetic fields.

4. Personnel qualification

All personnel operating to this procedure shall hold a minimum of Level 2 certification in accordance with BS EN ISO 9712, covering the MPI testing of welds. e.g. MPI PCN Level 2 Welds or General (pre and in-service inspection)

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

Documentation relating to operators certification shall be kept on file at the administration offices for review purposes.

5. Description of method

Magnetic particle inspection is a method used to detect cracks, cold laps, inclusions and other discontinuities on or close to the surface of ferromagnetic materials. Magnetic particle examination is not applicable to non-ferromagnetic materials such as austenitic stainless steels.

The magnetic particle inspection method described in this procedure consists of locally magnetising the area to be examined, applying suitably prepared magnetic particles while the area is magnetised and subsequently interpreting and evaluating any resulting particle accumulations. Maximum detectability occurs when the discontinuity is positioned on the surface and perpendicular to the magnetic flux.

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6. Testing Materials

The following magnetic particle inspection materials shall be used.

Hydrocarbon based black magnetic ink.
The ink shall have a solid content within the manufacturer's specification for the product, as stated on the product data sheet.
White contrast aid paint.

All consumables shall comply with the requirements of BS EN ISO 9934-2.

7. Method of Testing

7.1 Surface preparation

All accessible surfaces of each finished part shall be inspected after final heat treatment and after all machining operations.

The surface subject to be inspected, will be free from scale, grease, oil, dirt or any other substance which may interfere with the effectiveness of the testing materials. Loose scale and other contaminants may be removed using a wire brush.

Acetone, cleaning solvent or a water based degreasing wash will be used as the cleaning and degreasing agents if necessary. The part shall be thoroughly dried before being subject to MPI testing.

The temperature of the part under test shall be between 5˚C and 50˚C

7.2 Extent of Testing

The area under inspection shall be tested so that all accessible surfaces are tested by applying the magnetic field in two perpendicular directions to ensure that full testing coverage is achieved.

The test basically contains three steps.

1) Magnetise
2) Apply ink over part
3) Inspect

If specified, after the test is complete the part shall be demagnetised to a residual field strength of H < 0.4 kA/m (approximately 5 gauss); however, when using AC yokes this is generally not necessary.

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