



American Welding Society®

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CERTIFICATION

**Magnetic Particle Testing
(MT Dry Powder Yoke Method)
Endorsement**

Book of Specifications

MT Book of Specifications

Scope and Purpose

This MT Qualification testing procedure shall govern the Visible Dry Powder Yoke Technique method of Magnetic Particle testing (MT) of welds in ferrous materials. It is intended use is only for the AWS Certified Welding Inspector (CWI) or Senior Certified Welding Inspector's (SCWI) Magnetic Particle testing examination. The procedures and acceptance criteria in this document apply only to the AWS MT Endorsement and its exams and are not applicable to actual MT examinations performed to industry codes or specifications.

1. Facilities and Test Administrator for AWS MT Certification

1.1. All AWS Approved Test Centers (ATCs) for this MT examination shall meet the requirements of the endorsement specification governing this program.

1.2. Test Administrators shall be a current CWI or SCWI and hold ASNT ACCP Level III MT credentials.

2. Records and Grading

2.1. All steps in the test process shall be observed directly by the Test Administrator. The examination results for both the processing steps and the inspections shall be documented by the Test Administrator in the Examination Checklist shown in Annex A of the exam booklet. This checklist will be used by the Test Administrator to enter the results onto the standard AWS Answer Sheet for computer grading.

2.2. The individual taking the exam shall be responsible for entering all inspection data for the examination in the Data Sheet TEMPLATE. A blank template is shown in Annex B of the exam booklet. Sufficient Data Sheet TEMPLATES shall be given to the test taker for each test sample used in the exam.

3. Extent of Examination

All welds and 1/2 in [13mm] of the part surfaces on either side of the weld shall be examined for the entire length of the sample, unless otherwise directed.

4. Approved Methods and Materials

4.1. The test taker shall be responsible for providing any required Personal Protective Equipment (PPE) including safety glasses and protective gloves that shall be worn during specimen process testing and evaluation.

4.2. Test procedures shall be conducted according to this document and ASTM E 709, *Guide for Magnetic Particle Testing*.

4.3. All consumables and test samples shall be supplied by the test facility and shall meet the requirements of this document.

MT Book of Specifications

- 4.4. Equipment:** An electromagnetic probe (Yoke) shall be used to induce in the part under test, a Magnetic Flux of suitable intensity in the desired direction by the longitudinal method. Either HWDC or AC may be used. Where slightly subsurface discontinuities are suspected HWDC will be more effective. Where fine surface discontinuities are suspected, AC should be used.
- 4.5. Yoke Field Strength:** The minimum Magnetizing field strength shall be such that with a pole (Yoke leg) spacing of six inches; the lifting power, as applied to a carbon or alloy steel weight block, shall be 50-pounds for HWDC. This shall be verified by using a calibrated dead weight test block check. When AC is used, a 10-pound dead weight test block shall be used.
- 4.6. Indicating Powder:** Indicating powder shall be of a nontoxic, finely divided ferromagnetic material of high permeability and low retentivity of such size, shape, and color as to provide adequate testing sensitivity. The SAE sensitivity level shall be a #8 unless otherwise specified. Magnaflux powder 8A Red, 1 Grey, 2 Yellow, 3A Black or equal shall be used. All particles shall meet the requirements of AMS 3040.
- 4.7. Applying Particles:** Indicating powder shall be applied by means of a shaker or powder blower; either of which shall be capable of distributing a fine and uniform dust-like cloud of indicating powder.
- 4.8. Excess Particle Remover:** Excess powder shall be removed by a means of a dry air current of sufficient force to remove the excess particles without disturbing relevant indications which are indicative of discontinuities.

4.9. Test Samples

- 4.9.1. Number.** A minimum number of two (2) samples shall be used for this examination.
- 4.9.2. Types.** All test samples used for this examination shall be prefabricated weldments with known discontinuities. All discontinuities shall be accurately mapped on the master data sheet of the samples.

5. Surface Preparation

- 5.1. Preparation.** The surface to be Magnetic Particle Inspected and all adjacent areas within 1" shall be clean and dry, free of oil, sand, loose scale or rust, or any other material which may interfere with the formation or interpretation of Magnetic Particle patterns or indications. With the exception of undercut which is within the specification allowances, the contour of welds shall blend smoothly and gradually into the base metal.
- 5.2.** As-welded surface conditions are satisfactory.

6. Test Environment and Lighting Conditions

The test shall take place in a well-lighted area (minimum: 1000 lux or 100 foot candles measured at the surface being tested). Lighting shall be verified with a light meter.

MT Book of Specifications

7. Method of Testing

- 7.1.** Pole (Yoke leg) Spacing: The pole (Yoke leg) spacing shall be 6" maximum and 2" minimum. Pole (Yoke leg) spacing of up to 8" may be used where required only if a dead weight lift test is performed immediately prior to the inspection of the item under test.
- 7.2.** Method Used: The continuous method shall be used. This requires that the indicating powder shall be applied and excess removed while the magnetizing current is on.
- 7.3.** Inspection: The inspection shall be performed in such a manner as to provide satisfactory detection of discontinuities having axis in any direction. Any detected indications should be evaluated by moving the poles to the optimum magnetizing position and re-applying the test.
- 7.3.1.** The area to be tested shall be centrally located between the middle 1/3 pole (Yoke leg) spacing, and oriented perpendicular to an imaginary line connecting them. To be considered a complete test, the Yoke shall be rotated 90° and the area retested in the second direction. An overlap of a minimum of 1" shall be used with respect to the previous placement.

8. Examination

- 8.1.** Final interpretation shall be made to all relevant powder indications greater than 1/32 in (0.8mm) that remain on the surface being examined after removal of all excess powder.
- 8.2.** The test administrator shall observe the area of interest as the final interpretation is completed and documented on data sheet.
- 8.3.** Final Cleaning: Magnetic particles shall be completely removed from all parts after all magnetic particle testing has been completed.
- 8.4.** Demagnetization: All parts will be demagnetized after testing if more than ± 2 gaussses are measured on the Field Indicator.

9. Acceptance criteria (only used for the purposes of this examination).

- 9.1.** All linear indications greater than 1/16 in [1.6 mm] are rejectable. Linear is defined as an indication whose length is greater than three times its width. Rounded is defined as an indication that is three times or less than its width.
- 9.2.** Four or more indications in a line, any of which is separated from the adjacent indication by less than 1/16 in [1.6 mm] or D, whichever is greater, where D is the major diameter of the larger of the adjacent indications, are rejectable.
- 9.3.** Any single rounded indication larger than 3/16 in [5 mm] in diameter is rejectable.
- 9.4.** Non-linear indications less than 1/32 in [0.8 mm] may be disregarded.



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