



American Welding Society®

www.aws.org

CERTIFICATION

Penetrant Testing (PT Type II-Method C) Endorsement

Book of Specifications

PT Book of Specifications

Scope and Purpose

This procedure shall govern the ASTM E165 Type II Method C form e (visible, color contrasting solvent removed, with non-wet aqueous developer) penetrant testing of welds in ferrous and non-ferrous materials manufactured from non-porous materials, for the purpose of an AWS Certified Welding Inspector's (CWI) or Senior Certified Welding Inspector's (SCWI) penetrant testing examination. The procedures and acceptance criteria in this document apply only to the AWS PT Endorsement and its exams and are not applicable to actual PT examinations performed to industry codes or specifications.

1. Facilities and Test Administrator for AWS PT Certification

- 1.1 All AWS Approved Test Centers (ATCs) for this liquid penetrant examination shall meet the requirements of the endorsement specification governing this program.
- 1.2 Test Administrators shall be a CWI or SCWI and hold ASNT or ACCP Level III PT 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 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 examiner to enter the results onto the standard AWS Answer Sheet for computer grading.
- 2.2 The test taker shall enter all inspection data for the examination in the Data Sheets. A blank template is shown in Annex B of the exam booklet. One Data Sheet shall be given the test taker for each sample used in the exam.

3. Extent of Examination

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

4. Approved Methods and Materials

- 4.1 The test taker shall wear safety glasses with side shields and protective gloves while handling PT materials and during test specimen testing.
- 4.2 Test procedures shall be conducted according to this document and ASTM E165, *Standard Test Method for Liquid Penetrant Examination*.
- 4.3 All consumables and test samples shall be supplied by the test facility and shall meet the requirements of this document.
- 4.4 **Cleaner, Penetrant, and Developer Type**
 - 4.4.1 **Penetrant.** ASTM E165 Type II Method C visible color contrast penetrants shall be used. The penetrant shall be solvent removable.
 - 4.4.2 **Cleaner.** The cleaner shall be solvent based.

PT Book of Specifications

4.4.3 Developer. The developer shall be wet non-aqueous applied by spraying.

4.4.4 Penetrant cleaner and developer must be compatible and from the same manufacturer.

4.4.5 Penetrant materials shall be certified that the total halogen content does not exceed one percent by weight.

4.5 Test Samples

4.5.1 Number. A minimum number of two (2) samples shall be used for this examination. All samples shall meet the requirements of Clause 4.

4.5.2 Types. All test samples used for this examination shall be prefabricated weldments (any metal type and grade) with known discontinuities. All discontinuities shall be accurately mapped on the master data sheets of the samples. Listed below are some suggested sample types which may contain cracks, porosity or other fusion discontinuities:

- fillet welds on plate or pipe
- groove welds on plate or pipe

5. Surface Preparation

5.1 As-welded surface conditions are satisfactory.

5.2 The surface shall be free of dirt, grease, lint, scale, or other extraneous matter that could obscure surface openings or otherwise interfere with the examination.

5.3 Weldments and any other examination surfaces shall not be subjected to sand or shot blasting prior to liquid penetrant examination.

5.4 The surfaces to be examined shall be thoroughly cleaned using organic solvents prior to application of the penetrant. The organic solvents shall meet the halogen requirements specified for the penetrant materials. Drying time after cleaning shall be a minimum of 5 minutes after cleaning.

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 test surface). Lighting shall be verified with a visible white light meter.

7. Procedure

7.1 Penetrant Application

7.1.1 The penetrant may be applied to the test specimen by brushing or spraying.

7.1.2 The surface temperature of the part being tested shall be between 60° F and 125° F [15° C and 52° C].

7.1.3 The penetrant dwell time shall be as recommended by the penetrant manufacture but shall not be less than 10 minutes nor more than 60 minutes.

PT Book of Specifications

7.2 Penetrant Removal

- 7.2.1 Removal of the excess penetrant residue from the surface is an essential activity and proper attention to detail is required to assure meaningful results are obtained by avoiding indications that are nonrelevant.
- 7.2.2 Excess penetrant shall be removed by wiping with a dry clean cloth or absorbent paper towel. After initial wiping, the cloth or paper towel may be moistened with the recommended solvent cleaner in order to remove all excess penetrant: however, care shall be taken to avoid using excess solvent cleaner such that penetrant could be removed from discontinuities.
- 7.2.3 Spraying or flooding the part with the solvent cleaner is strictly prohibited.

7.3 Drying

- 7.3.1 Sufficient time is required to allow the surface of the part being examined to dry after penetrant removal and before applying developer.
- 7.3.2 The minimum drying time is 5 minutes.
- 7.3.3 The maximum drying time is 10 minutes.

7.4 Developer Application

The developer shall be applied by spraying the test surface with non-aqueous wet developer.

7.5 Examination

- 7.5.1 Final interpretation shall be made after allowing a developer to completely dry on the surface, after which the dwell time shall not be less than 10 or more than 30 minutes.
- 7.5.2 The test administrator shall observe the area of interest after the developer dwell time has been completed.

8. Acceptance Criteria (only used for the purposes of this examination).

- 8.1 All linear indications longer 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 if an indication is three times or less its width.
- 8.2 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.
- 8.3 Any single rounded indication larger than 3/16 in [5 mm] in diameter is rejectable.
- 8.4 Non-linear indications less than 1/32 in [0.8 mm] may be disregarded.



American Welding Society®

CERTIFICATION

www.aws.org

**Penetrant Testing
(PT TYPE II - Method C)
Endorsement
Book of Specifications**