

PENECERT™ TESTING PROCEDURES

1. **Scope:** The purpose of this document is to specify test procedures used by the MAGNAFLUX PeneCert™ Testing Program to monitor the quality of penetrant materials in use.

2. **Applicable Documents:**
 - 2.1 MIL-STD-6866 Inspection, Liquid Penetrant
 - 2.2 ASTM E1417 Liquid Penetrant Examination
 - 2.3 MIL-I-25135E Inspection Materials, Penetrants
 - 2.4 AMS 2644 Inspection Material, Penetrant
 - 2.5 ASTM D95 Water in Petroleum Products and Bituminous Materials by Distillation, Test for
 - 2.6 ASTM D445 Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity), Test for
 - 2.7 ASTM E1135 Standard Test Method for Comparing the Brightness of Fluorescent Penetrant
 - 2.8 ASTM D1298 Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method
 - 2.9 Pratt & Whitney TAM 146040
 - 2.10 Where referenced specifications and this specification differ, this specification shall govern.

3. **Reference Materials:** Reference materials shall be the unused samples of materials being tested.

4. **Applicability of Tests:** Unless otherwise specified by the customer, PeneCert™ shall test materials as follows:
 - 4.1 All Penetrants shall be subjected to the tests specified by 4.1 above in addition to the tests described in the following paragraphs:
 - 5.1 Clarity and color
 - 5.2 Contamination or separation of constituents
 - 5.3 Viscosity
 - 5.4 Fluorescent Brightness

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- 4.2 Water Washable Penetrants shall be subjected to the tests specified by 4.1 above in addition to the tests described in the following paragraphs:
 - 5.5 Water Content
 - 5.6 Water Washable Penetrant Removability
 - 5.7 Water Washable Penetrant Sensitivity

- 4.3 All emulsifiers and removers shall be subjected to the tests described in the following paragraphs:
 - 6.1 Clarity and Color
 - 6.2 Contamination
 - 6.3 Water Content

- 4.4 All developers shall be subjected to the tests described in the following paragraphs:
 - 7.1 Appearance
 - 7.2 Contamination

- 4.5 Dry powder developers shall be subjected to the tests specified by 4.4 above in addition to the tests specified in Paragraph 7.3, Fluffiness.

- 4.6 Aqueous developers shall be subjected to the tests specified by 4.4 above in addition to the tests described in the following paragraphs:
 - 7.4 or 7.5 Concentration (whichever applies)
 - 7.6 Clarity and Color
 - 7.7 Wetting

- 4.7 All PE (lipophilic) and PR (hydrophilic) type systems shall be subjected to the tests specified in the following paragraphs:
 - 8.1 Removability
 - 8.2 Sensitivity

- 4.8 TAM panels (for example MAGNAFLUX Z5 or SHERWIN PSM-5 panels) shall be subjected to the procedures specified in paragraph 9.1.

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5. Penetrant Tests:

5.1 Clarity and Color

The test penetrant shall be observed for any evidence of cloudiness. The color of the test material shall be noted.

5.2 Contamination

The test penetrant shall be visually checked for any evidence of contamination by a foreign material or separation of constituents.

5.3 Viscosity

The viscosity of the test penetrant shall be determined in accordance with ASTM D445 at $38\pm 3^{\circ}\text{C}$ ($100\pm 5^{\circ}\text{F}$).

5.4 Fluorescent Brightness

Penetrant Types I and III as defined in MIL-I-25135E and/or AMS 2644 shall be tested in accordance with ASTM E1135 using the unused penetrant as reference per AMS 2644.

5.5 Water Content

The water content of the test water washable penetrant shall be determined in accordance with ASTM D95.

5.6 Water Washable Penetrant Removability

The Removability of the test water washable penetrant shall be determined as specified in MIL-I-25135E or AMS 2644. The test panels used shall be as described in MIL-I-25135E or AMS 2644 therein. Unless otherwise specified by the customer, the processing parameters are as stated in MIL-I-25135E or AMS 2644.

5.7 Water Washable Penetrant Sensitivity

The sensitivity of test water washable penetrant shall be tested as follows:

5.7.1 The test panels used shall be the TAM 146040 panels.

5.7.2 Panels shall be processed using both the test material and the appropriate reference material using the same developer for both.

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6. **Emulsifier/Remover Tests:**

6.1 Clarity and Color

The test emulsifier/remover shall be observed for any evidence of cloudiness. The color of the test material shall be noted.

6.2 Contamination

The test emulsifier/remover shall be visually checked for any evidence of contamination by a foreign material.

6.3 Water Content

The water content of the test emulsifier/remover shall be determined in accordance with ASTM D95.

7. **Developer Tests:**

7.1 Appearance

The test developer shall be observed for its overall appearance under visible light.

7.2 Contamination

The test developer shall be exposed to black light and visually checked for any signs of fluorescence.

7.3 Dry Developer Fluffiness

The test dry developer shall be examined for any caking.

7.4 Concentration of Aqueous Developer, Soluble (Form B)

The relative density of the soluble type aqueous developer sample shall be determined per ASTM D1298. The concentration is then obtained from a standard density vs. concentration chart as supplied by the manufacturer.

7.5 Concentration of Aqueous Developer, Suspendible (Form C)

The particle concentration of the suspendible developer shall be determined by evaporating a 50 ml sample in a petri dish. The concentration of the bath is calculated as: Weight of the remaining solids in g x 8.33, and reported in lbs./gal./50 ml

Note: Refer to Appendix A for Calculation of ZP-5B Concentration.

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7.6 Aqueous Developer Clarity and Color

The test aqueous-type developer shall be observed for any evidence of cloudiness. The color shall also be noted.

7.7 Aqueous Developer Wetting Ability

The test aqueous developer shall be applied to a test part and checked for a smooth and even coating.

8. PE and PR type Systems Tests:

8.1 Removability

8.1.1 The Removability of the PE (lipophilic) penetrant/emulsifier system shall be determined in accordance with MIL-I-25135E or AMS 2644.

8.1.2 The Removability of the PR (hydrophilic) penetrant/remover system shall be determined in accordance with MIL-I-25135E or AMS 2644.

8.2 Sensitivity

8.2.1 The test panels used shall be the TAM 146040 panels.

8.2.2 Panels shall be processed using both the test penetrant with the unused emulsifier and the appropriate reference system with the same developer.

8.2.3 For PE type (lipophilic) systems, processing shall consist of a 5 minute penetrant dwell, 2 minute emulsification, 1 minute post rinse, a wipe and a 2 minute 150±5°F oven dry, and a 10 minute developing time.

8.2.4 For PR type (hydrophilic) systems, processing shall consist of a 5 minute penetrant dwell, 60 second pre-rinse, 5 minute remover dip (no agitation), 2 minute post rinse, a wipe and a 2 minute 150±5°F oven dry, and a 10 minute developing time.

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9. TAM Panel Tests;

9.1 Cleaning and Calibrating

The panel shall be cleaned by detergent wash, tap water rinse, acetone rinse and 10 minutes in cleaning solution with ultrasonic agitation. The panel shall be dried and cooled before calibration. The panel shall be recalibrated in accordance with TAM 146040.

10. Non-Conforming Material:

10.1 When test results indicate that the material is not in conformance with specification requirements, a phone call reporting results is placed immediately and a certification of non-conformance is mailed to the customer. (It is then up to the customer to take corrective action or send a second sample for retest).