AEC-2.1, Issue 0

PRACTICAL EXAMINATION EQUIPMENT REQUIREMENTS

AEC documents are governed by the ASNT Certification Management Council (CMC).
Approved: October 10, 2019

<table>
<thead>
<tr>
<th>CMC Chair</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ASNT Certification Group</td>
<td></td>
</tr>
</tbody>
</table>

The American Society for Nondestructive Testing, Inc.
1.0 PURPOSE
The purpose of this procedure is to provide guidance to Authorized Examination Centers (AEC’s) who are administering American Society for Nondestructive Testing (ASNT) NDT qualification examinations.

2.0 SCOPE
This document establishes the minimum equipment required to properly conduct ASNT practical examinations.

3.0 REFERENCES
3.1 AEC-2 AEC Practical Examination Requirements
3.2 AS5282 Tool Steel Ring for Magnetic Particle Inspection.
3.3 AS5371 Reference Standards Notched Shims for Magnetic Particle Inspection.
3.5 ASTM E1065 Standard Practice for Evaluating Characteristics of Ultrasonic Search Units.
3.6 ASTM E114 Standard Practice for Ultrasonic Pulse-Echo Straight-Beam Contact Testing.
3.7 ASTM E1316 Standard Terminology for Nondestructive Examinations
3.8 ASTM E164 Standard Practice for Contact Ultrasonic Testing of Weldments.
3.9 ASTM E1417 Standard Practice for Liquid Penetrant Testing.
3.10 ASTM E1444 Standard Practice for Magnetic Particle Testing.
3.11 ASTM E1742 Standard Practice for Radiographic Examination.
3.12 ASTM E3022 Standard Practice for Measurement of Emission Characteristics and Requirements for LED UV-A Lamps Used in Fluorescent Penetrant and Magnetic Particle Testing

4.0 DEFINITIONS
4.1 The definitions listed in ASTM E1316 apply to this document.

5.0 RESPONSIBILITIES
5.1 The Certification Management Council (CMC) is responsible for:
   5.1.1 Defining the equipment requirements necessary to administer practical examinations using ASNT certification test samples.
5.2 ASNT ISC Certification Department is responsible for:
   5.2.1 Ensuring the AEC has the required equipment to administer the applicable practical examinations.
5.3 The Authorized Examination Center is responsible for:
   5.3.1 Compliance to this procedure and any other contractual requirements.
   5.3.2 Administering the applicable examinations using approved Proctors.
   5.3.3 Ensuring the equipment is in full working order, calibrated and/or verified in accordance with applicable test standards.
6.0 PROCEDURE

6.1 The AEC shall develop their own documented procedures that address the requirements specified in this procedure and other associated documents. Simply referring to a procedure is not acceptable.

7.0 GENERAL

7.1 All equipment used for the practical examinations shall be in working order prior to and during the administration of a practical examination.

7.2 Equipment shall meet the quality control requirements as identified in the AEC’s quality procedures.

7.3 All calibrations shall be traceable to the National Institute of Standards and Technology (NIST) or other recognized national standards.

7.4 Any equipment that requires calibration shall be calibrated and operating correctly. Any equipment that is out of calibration shall not be used for the practical examination.

7.4.1 If equipment is out of calibration, the AEC shall take steps to seek alternative equipment that is calibrated.

7.4.2 Alternative equipment may be used, providing authorization has been granted from ASNT ISC.

7.5 System performance checks, verifications, etc. shall be conducted at the required frequency as defined by the referenced ASTM standard for each method.

8.0 STANDARD EQUIPMENT

8.1 The AEC shall have the following equipment as standard for candidates taking any of the practical examinations.

8.1.1 Flashlight/trouble-light.

8.1.2 Inspection mirror(s).

8.1.3 China Markers or equivalent.

8.1.4 Wipes, paper towels, clean rags.

8.1.5 Masking tape / duct tape / velcro tape, bungee cords, etc.

8.1.6 Sufficient number of electrical outlets to use the equipment.

8.1.7 Electrical extension cords.

8.1.8 Measuring Devices: Tape measure, Pi tape.

8.1.9 Measuring Devices: Rule-various transparent and flexible in 1/32” or tenths increments.

8.1.10 Measuring Devices: Rule- 6” and 12” in 1/32” or tenths increments (metal type).

8.1.11 5x-10x magnifier.

8.1.12 Optical loupe with graduated reticules.

8.1.13 Ultrasonic cleaner with capacity to clean all surfaces of any non-volumetric ASNT test specimen located at the AEC. Equipment shall have adequate medium and temperature control to render parts acceptable for intended NDT examination.

8.2 Equipment using consumable materials for one-time use may not require the consumable to be verified at a defined frequency. This will be dependent on the consumable being used and the applicable industry standard documents being used.
9.0 MT – EQUIPMENT AND MATERIALS

9.1 The equipment for MT shall comply with the latest requirements of ASTM E3024.

9.2 The AEC shall have the following equipment available for the MT practical examinations.

9.2.1 AC yoke with articulating legs

9.2.2 Horizontal bench unit capable of 3000 Amps (contact) and 12,500 Amp-turns Full Wave Rectified (coil).

9.2.3 100 mL graduated centrifuge tube with a graduated stem in 0.05-mL increments.

9.2.4 10-pound weights for Yoke Dead Weight Check

9.2.5 Dry magnetic particles (yellow, black & red), shall meet the requirements of AMS 3040.

9.2.6 Hand-held squeeze bulbs (1 for application, 1 for removal).

9.2.7 Wet fluorescent magnetic particles (in a conditioned water or light petroleum suspension vehicle conforming to AMS 2641 type 1), shall meet the requirements of AMS 3041, 3042, 3043, 3044, 3045 or 3046 as applicable.

9.2.8 White light meter (Calibrated).

9.2.9 UV Light meter (Calibrated).

9.2.10 UV light (LED UV-A lamps shall meet ASTM E3022).

9.2.11 Timer

9.2.12 Hall-effect meter (calibrated) w/instruction manual or Magnetometer/gauss meter (mechanical) (calibrated).

9.2.13 Aluminum or copper central conductors at least 16 in. long, with a diameter range of 0.5” to 1.0”.

10.0 PT – EQUIPMENT AND MATERIALS

10.1 The equipment for PT shall comply with the latest requirements of ASTM-E1417.

10.2 The AEC shall have the following equipment available for the PT practical examinations.

10.2.1 Pre and post cleaning capability for the ASNT examination test samples.

10.2.2 Known defect standard for the system performance check. TAM Panel, cracked chrome panel or equivalent.

10.2.3 Type I (fluorescent), Method D- Post Emulsifiable; Sensitivity level 3; Form a Developer – Dry Powder or Form d Developer – Nonaqueous.

10.2.4 Type I (fluorescent), Method A- Water Washable; Sensitivity level 3; Form a Developer – Dry Powder or Form d Developer – Nonaqueous.

10.2.5 Type II (visible), Method C- Solvent Removable; liquid or spray type; Form d Developer - Nonaqueous.

10.2.6 Penetrant tanks: dip-type with drain surfaces provided; fixed or portable.

10.2.7 Emulsifier tanks: dip-type with drain surfaces provided; fixed or portable.

10.2.8 Dry developer tank or chamber, hand powder bulb or a conventional or electrostatic powder gun.

10.2.9 Rinse station with manual water rinse and UV light.

10.2.10 Calibrated pressure gauges.

10.2.11 Calibrated water temperature gauge.

10.2.12 Timer.

10.2.13 Forced air recirculating drying oven with capability to maintain the temp at +/- 10 degrees F (5.6 degrees C) and not exceed 160 degree F (71 degrees C).
10.2.14 Oven temperature indicator accurate to +/- 10 degrees F (5.6 degrees C).
10.2.15 White light meter (calibrated).
10.2.16 UV Light meter (calibrated).
10.2.17 Dark area compliant with ambient lighting requirements.
10.2.18 UV light (LED UV-A lamps shall meet ASTM E3022).
10.2.19 White light.
10.2.20 Penetrant application methods to allow for the entire surface of the part to be covered with penetrant. For example, spray systems, immersion, brushing, swabbing, etc.
10.2.21 Hydrophilic emulsifier concentration verification.

11.0 RT – EQUIPMENT AND MATERIALS

11.1 The equipment for RT shall comply with the latest requirements of ASTM E1742.

11.2 The AEC shall have the following equipment available for the RT practical examinations.

11.2.1 Simulated gamma ray tube (an actual guide tube with collimator is acceptable)
11.2.2 Dummy X-ray Tube Head (simulate with height and rotation capability)
11.2.3 An X-ray beam centering device. For example Plumb Bob, Laser device, etc.
11.2.4 Various sizes of film cassettes
11.2.5 Lead letter set (including numbers), Large lead "B"
11.2.6 Penetrameters (IQI's) in various ferrous and non-ferrous materials, both Hole and Wire types
11.2.7 Shims and blocks in various thicknesses up to 1 in. in both ferrous and nonferrous materials
11.2.8 Lead Back screen in 0.250 thickness
11.2.9 A subdued light viewing area
11.2.10 Film viewer(s) in both high intensity and fluorescent types
11.2.11 Densitometer
11.2.12 Calibrated film strip (step wedge or equivalent)
11.2.13 Exposure calculator

12.0 UT – EQUIPMENT AND MATERIALS

12.1 The ultrasonic instrument for UT shall comply with the latest requirements of ASTM E317. Transducers shall meet the requirements of ASTM E1065.

12.2 The AEC shall have the following equipment available for the UT practical examinations.

12.2.1 Ultrasonic Scope w/adjustable rep. rate and pulse length- Freq. 1-10MHz min.
12.2.2 IIW block (steel- type I or II).
12.2.3 ASME basic block (within thickness range)
12.2.4 Optional - ASME curved standard (matching diameter and thickness)
12.2.5 Optional - DSC or Mini-Angle beam block.
12.2.6 Optional - AWS DS block.
12.2.7 0 degree Transducer: 3/4” dia., 2-2.25 MHz.
12.2.8 0 degree Transducer: 1/2” dia., 4-5 MHz.
12.2.9 Transducers 1 each: 2-2.25, 45, 60 and 70 degrees (1/4” Dia.).
12.2.10 Transducers 1 each: 4-5 MHz, 45, 60 and 70 degrees (1/4” Dia.).
12.2.11 Transducers 1 each: 2-2.25, 45, 60 and 70 degrees (3/8" Dia.).
12.2.12 Transducers 1 each: 4-5 MHz, 45, 60 and 70 degrees (3/8” Dia.).
12.2.13 Transducers 1 each: 2-2.25, 45, 60 and 70 degrees (1/2” Dia.).
12.2.14 Transducers 1 each: 4-5 MHz, 45, 60 and 70 degrees (1/2” Dia.).
12.2.15 Transducers 1 each: 2-2.25 MHz, 45, 60 and 70 degrees (5/8-1” width x 5/8-13/16” height).
12.2.16 Coaxial cables (4-6’ length) – 1-2 spare cables per setup. Type to be determined by the transducer and scope connectors.
12.2.17 Commercial grade water-soluble couplant.
12.2.18 Rags or paper towels for cleaning.

13.0 VT – EQUIPMENT AND MATERIALS
13.1 The AEC shall have the following equipment available for the VT practical examinations.
   13.1.1 Fillet weld Gage.
   13.1.2 Cambridge Gage.
   13.1.3 Palmgren Gage (Automatic Weld Size Gage).
   13.1.4 Hi-Lo Gage (Gal or Dearman Gage).
   13.1.5 6” Calipers (Vernier, Digital, and/or Dial).
   13.1.6 0-1” Micrometer (round contact).
   13.1.7 6” Bevel Protractor.
   13.1.8 3” Depth Gage.
   13.1.9 Surface Finish Comparator Card.
   13.1.10 Rigid or Flexible Borescope.

14.0 USE OF PERSONAL NDT EQUIPMENT
In certain circumstances, a candidate taking a practical examination may wish to use their own equipment. This is acceptable practice, provided the equipment is capable of performing such inspections.

14.1 If the candidate’s equipment is not capable or functioning correctly, that will be the responsibility of the candidate and could jeopardize the end result of the practical examination.
14.2 If the candidate uses their own equipment, the AEC shall:
   14.2.1 Visually inspect the equipment to ensure that there is not anything that would compromise the integrity of the examination, e.g. scribing information on the equipment. Remove covers for inspection.
   14.2.2 Identify on the practical examination documentation, the equipment that was used and the calibration status of the equipment.
   14.2.3 Prior to the examination confirm any data on the equipment has been wiped and any memory cards or attachment have been removed or do not contain data that would compromise the integrity of the examination.
   14.2.4 Upon completion of the examination verify the equipment meets 14.2.1 and 14.2.3.
15.0 RESCHEDULING

15.1 If the practical examination cannot be completed due to missing, faulty or uncalibrated equipment owned by the AEC, then the AEC is responsible for all costs associated with re-scheduling the examination.

15.2 If the practical examination cannot be completed due to missing, faulty or uncalibrated equipment owned by the candidate, then the candidate is responsible for all costs associated with re-scheduling the examination.

16.0 DOCUMENT CHANGE HISTORY

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Summary of Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10/10/2019</td>
<td>Re-written based on procedure AEC-1 CD1, Issue 2, Rev. C</td>
</tr>
</tbody>
</table>