



# AEROSPACE MATERIAL SPECIFICATIONS

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc.

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## AMS 2635B

Superseding AMS 2635A

Issued 8-15-58

Revised 4-15-67

### RADIOGRAPHIC INSPECTION

1. **ACKNOWLEDGMENT:** A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.
2. **APPLICATION:** Primarily to determine the presence of cracks, porosity, blowholes, inclusions, and other imperfections considered detrimental to use of metals.
3. **EQUIPMENT:**
  - 3.1 **General:** Unless otherwise agreed upon, the radiographic equipment and procedures shall have qualification approval.
  - 3.2 **Film:** Shall be high-contrast, fine-grained safety film except when wide subject latitude or excessively long exposures prohibit its use.
  - 3.3 **Penetrators:** Shall be fabricated of material of the same base metal and of approximately the same radiographic density as the material to be radiographed, except as specified in 3.3.1.1. Dimensions of standard penetrators shall be as shown in Fig. 1.
    - 3.3.1 Penetrator thickness shall be not greater than 2% of the thickness of the section to be radiographed, except as specified in 3.3.1.1.
      - 3.3.1.1 If the section to be radiographed is less than 0.25 in. thick, either penetrators specifically designed for the application or the standard 0.005 in. thick penetrator shall be used unless purchaser waives the use of penetrators. The material and design of penetrators prepared for specific applications shall be as agreed upon by purchaser and vendor. The use of specifically designed penetrators is recommended, particularly in radiographing sections less than 0.125 in. thick.
      - 3.3.2 Standard rectangular penetrators shall be identified with a number made of lead alloy attached thereto or by punching or machining out the number. This number shall be equal to the thickness, in inches, of the metal to which the penetrator is normally applicable and shall have a value equal to 50 times the thickness of the penetrator. When standard circular penetrators are used, the lead alloy numbers shall be placed adjacent to the penetrator to provide identification of the penetrator on the film. Nonstandard penetrators shall be identified as agreed upon by purchaser and vendor.
        - 3.3.2.1 If standard 0.005 in. thick penetrators are used in radiographing sections less than 0.25 in. thick, a series of such penetrators may be prepared which shall be identical in all respects to the standard 0.005 in. penetrator except that each shall be marked as in 3.3.2 with the thickness to which it is normally applicable and the resulting sensitivity.
        - 3.3.2.2 Penetrators shall have suitable, permanent, identification markings so as to be distinguishable with respect to material.
    - 3.4 Screens and filters may be used to give better definition and sensitivity.

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#### 4. PROCEDURE:

- 4.1 Unless otherwise specified, all radiographic examinations shall be performed with a technique capable of indicating the presence of imperfections having a dimension equal to 2% of the thickness of the section radiographed.
- 4.2 All significant areas as specified shall be examined. Particular attention shall be given to highly stressed areas and a sufficient number of different views shall be taken to establish the nature and extent of any discontinuities in these areas. All views established for each part will be subject to approval by the purchaser.
- 4.3 Unless otherwise specified, one or more penetrameters shall be placed on the radiation source side of each part radiographed for the duration of the exposure, unless a number of identical parts are simultaneously exposed; in such a case, a single penetrameter placed upon the surface of a part at the outer edge of the cone of radiation will suffice. If variations in section thickness of the part are such that a single penetrameter will not adequately define radiographic sensitivity in all sections, additional penetrameters of appropriate thickness shall be used. One of the penetrameters, preferably that representing the thickest section, shall be placed at the outer edge of the cone of radiation. If it is impractical to place penetrameters upon the parts radiographed, they may be placed on the upper surface of blocks of metal of the same nominal composition and the same thickness as the sections of the part radiographed and located on films in areas at the outer edge of the cone of radiation.
- 4.4 Radiographic procedure shall be adjudged correct when at least two holes and the outer edge of the penetrameter or penetrameters are discernible on the radiographs, except when specifically designed penetrameters are used. Control settings shall then be determined and recorded on a radiographic control card for the individual part and material. This control card shall include the part number, x-ray equipment, accessories, type of film, kilovoltage, milliamperage, exposure time, focal spot to film distance, developer, developing time, diagram of exposure setup, and other pertinent data when applicable. When an identical procedure is used for a number of parts, a single record tabulating all identical features of the procedure will be sufficient for all such parts. The radiographic procedure will be subject to approval by the purchaser.
- 4.5 When specified, radiographs of permanently serialized parts shall be identified with the part serial number. Radiographs of non-serialized parts shall be suitably identified pending film interpretation and final disposition of such parts.
- 4.6 Standards for acceptance, as agreed upon by purchaser and vendor, shall be established for disposition of inspected parts.
- 4.7 Interpretation of the indications revealed by this inspection procedure and final disposition of the parts shall be the responsibility of only qualified personnel having experience with radiographic inspection. Procedure for qualification of personnel shall be acceptable to purchaser.

#### 5. IDENTIFICATION:

- 5.1 Unless otherwise specified, acceptable parts shall be identified with the authorized (X) mark together with such other characters as shall be necessary to complete inspection records. Identification of inspected parts shall be legible and so placed that it will not interfere with normal function of the part. Marking materials shall have no deleterious effect on the parts or their performance.
  - 5.1.1 Unless otherwise specified, rubber stamping of parts shall be considered an acceptable method of marking accepted parts. Methods other than rubber stamping may be used subject to agreement between purchaser and vendor.
- 5.2 Acceptable parts whose size or configuration does not permit marking with the authorized mark may be identified by dyeing, unless parts are dyed for other reasons, or by tagging when approved by the purchaser.

6. RECORDS:

- 6.1 Each radiograph shall carry a radiographic inspection number or code letters of test to positively identify the part or parts to which it pertains.
- 6.2 When so requested by the purchaser, parts shall be supplied accompanied by one or more of the following: radiographs of the specific parts, reports of film interpretation, and disposition made on the parts.
- 6.3 Unless otherwise specified, radiographs shall be kept on file for reference purposes for not less than 6 months from date of exposure.
- 7. REPORTS: If marking or dyeing is impracticable, or when permitted by purchaser in lieu of dyeing or tagging, vendor shall report on an appropriate form the details of the inspection technique used and the percentage of pieces inspected. This report shall also include a statement that all parts in the shipment conform to the standards specified by the purchaser.

8. APPROVAL:

- 8.1 To assure uniformity of radiographic inspection, the equipment, procedure, acceptance standards, and qualification of operators shall be approved by purchaser before parts are supplied, unless such approval be waived.
- 8.2 After approval of radiographic equipment and procedure as recorded on the radiographic control card, vendor shall make no change in equipment or procedure without written permission from purchaser prior to incorporating such change.

NOTE. SIMILAR SPECIFICATIONS: (a) This specification exceeds the minimum requirements of MIL-STD-453, Change Notice 1, dated 4 September 1963.

(b) MIL-STD-453 is listed for information only and shall not be construed as an acceptable alternate unless all requirements of this AMS are met.

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