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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 2635D

Issued AUG 1958
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Cancelled MAY 1999

Submitted for recognition as an American National Standard

Superseding AMS 2635C

Radiographic Inspection

CANCELLATION NOTICE

This specification has been declared "CANCELLED" by the Aerospace Materials Division, SAE, as of May 1999, and has been superseded by ASTM E 1742. The requirements of the latest issue of ASTM E 1742 shall be fulfilled whenever reference is made to the cancelled AMS 2635D. By this action, this document will remain listed in the Numerical Section of the Index of Aerospace Material Specifications noting that it is superseded by ASTM E 1742.

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1. SCOPE:

1.1 Purpose:

This specification covers the procedures for radiographic inspection.

1.2 Application:

Primarily for determining the presence of cracks, porosity, blowholes, inclusions, and other imperfections which may or may not be exposed to the surface and which may be detrimental to usage of the parts.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications shall apply.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 7295 Radiographic Film and Paper, Industrial

3. TECHNICAL REQUIREMENTS:

3.1 Equipment:

3.1.1 General: The radiographic equipment and procedures shall have qualification approval, unless otherwise specified.

3.1.2 Film: Shall be high-contrast, fine-grained safety film except when wide subject latitude or excessively long exposures prohibit its use. Film shall conform to AMS 7295 or equivalent.

3.1.2.1 Film Quantity: Only one film need be exposed at each location; however, multiple film techniques are permitted.

3.1.2.2 Film Density: Where the single film technique is used, the density of individual films shall be between 1.5 and 4.0 in the area being examined. Where the multiple film technique is used, the density of the superimposed films shall be between 2.0 and 4.0 in the area being examined. When the thickness of the part varies considerably in the area under examination, two films, either of equal or of different speeds, may be exposed simultaneously in the same film holder and the resultant radiograph submitted for interpretation either as single or superimposed film, whichever is better suited for the interpretation of any small portion of the area covered by the exposure. For the small portion of the area under immediate examination, the density of either the single or the superimposed film shall be in accordance with the above requirements.

3.1.3 Penetrameters: 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 3.1.3.1.1. Dimensions of standard penetrameters shall be as shown in Fig. 1.

3.1.3.1 Penetrameter thickness shall be not greater than 2% of the thickness of the section to be radiographed, except as specified in 3.1.3.1.1.

3.1.3.1.1 If the section to be radiographed is less than 0.25 in. (6.4 mm) thick, either penetrameters specifically designed for the application or the standard 0.005 in. (0.13 mm) thick penetrameter shall be used unless purchaser waives the use of penetrameters. The material and design of penetrameters prepared for specific applications shall be as agreed upon by purchaser and vendor. The use of specifically designed penetrameters is recommended, particularly in radiographing sections less than 0.125 in. (3.2 mm) thick.

3.1.3.2 Standard rectangular penetrameters shall be identified with a number made of lead alloy attached thereto or by punching or maching out the number. This number shall be equal to the thickness, in inches (millimetres), of the metal to which the penetrameter is normally applicable and shall have a value equal to 50 times the thickness of the penetrameter. When standard circular penetrameters are used, the lead alloy numbers shall be placed adjacent to the penetrameter to provide identification of the penetrameter on the film. Nonstandard penetrameters shall be identified as agreed upon by purchaser and vendor.

3.1.3.2.1 If standard 0.005 in. (0.13 mm) thick penetrameters are used in radiographing sections less than 0.25 in. (6.4 mm) thick, a series of such penetrameters may be prepared which shall be identical in all respects to the standard 0.005 in. (0.13 mm) penetrameter except that each shall be marked as in 3.1.3.2 with the thickness to which it is normally applicable and the resulting sensitivity.

3.1.3.2.2 Penetrameters shall have suitable, permanent, identification markings so as to be distinguishable with respect to material.

3.1.4 Screens and filters may be used to give better definition and sensitivity.

3.2 Procedure:

3.2.1 All radiographic examinations shall be performed with a technique capable of indicating the presence of imperfections having dimensions equal to 2% or more of the thickness of the section radiographed, unless otherwise specified.

3.2.2 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 shall be subject to approval by purchaser.

3.2.3 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 case, a single penetrameter placed upon the surface of a part at the outer edge of the cone of radiation will suffice, unless otherwise specified. 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 at the same distance from the film as it would be if placed on the source side of the item being radiographed.

3.2.4 Radiographic procedure shall be adjudged correct when at least two holes and the outer edges 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 shall be subject to approval by the purchaser.

3.2.5 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. QUALITY ASSURANCE PROVISIONS:

4.1 Acceptance Standards:

Shall be established between purchaser and vendor for disposition of inspected parts.

4.2 Responsibility for Inspection:

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.

4.3 Approval:

4.3.1 Equipment, procedure, acceptance standards, and qualification of operators shall be approved by purchaser before parts are supplied, unless such approval be waived.

4.3.2 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.

4.4 Reports:

4.4.1 Each radiograph shall carry a radiographic inspection number or code letters of test to positively identify the part or parts to which it pertains.

4.4.2 When requested by purchaser, parts as supplied shall be accompanied by one or more of the following: radiographs of the specific parts, reports of film interpretation, and disposition made on the parts.

4.4.3 Radiographs shall be kept on file for reference purposes for not less than 6 months from date of exposure, unless otherwise specified by purchaser.

4.5 Reports:

If marking or dyeing of inspected parts is impracticable, or when permitted by purchaser in lieu of dyeing or tagging, vendor shall report on an appropriate form 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 standards specified by purchaser.

5. PREPARATION FOR DELIVERY:

5.1 Identification:

5.1.1 Acceptable parts shall be identified with the authorized "(X)" mark together with such other characters as shall be necessary to complete inspection records, except as specified by 5.1.2. 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.

5.1.1.1 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.

5.1.2 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 purchaser.

6. ACKNOWLEDGMENT:

A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS:

Parts inspected in accordance with, and not conforming to, this specification or to modifications authorized by purchaser will be subject to rejection.

8. NOTES:

8.1 The change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this specification. An (R) symbol to the left of the document title indicates a complete revision of the specification.

8.2 Similar Specifications:

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.

PREPARED UNDER THE JURISDICTION OF AMS COMMITTEE "K"