LAND SEA AIR SPACE

Society of Automotive Engineers, Inc.
TWO PENNSYLVANIA PLAZA, NEW YORK, N.Y. 1000

AEROSPACE MATERIAL SPECIFICATION

AMS 2646B
Superseding AMS 2646A

Issued 3-1-55
Revised 5-1-69

CONTRAST DYE PENETRANT INSPECTION

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

2. APPLICATION: Detection of surface discontinuities such as cracks, laps, porosity, cold shuts, lack of bond, and similar defects. Because inspection can be performed in normal light, this method can be used under conditions where use of fluorescent penetrant inspection is impracticable.

3. MATERIALS AND EQUIPMENT:

3.1 Penetrant: Shall be a strongly-colored liquid capable of penetrating fine discontinuities. The penetrant shall be removable by washing with water or with other common solvents, or by vapor degreasing; penetrant shall be noncorrosive.

3.2 Developer: The developer shall be of the type recommended by the manufacturer of the penetrant used.

3.3 Liquid vehicles of the penetrant and developer shall be noninjurious to the materials to be tested.

3.4 Equipment: For permanent installations where materials are applied by immersion of parts, equipment shall be so constructed and arranged as to permit uniform, controlled operation.

4. PREPARATION OF PARTS:

4.1 Parts shall normally be contrast dye penetrant inspected prior to all surface treatments such as plating, anodizing, dichromating, peening, or similar treatments which would tend to close or mask surface discontinuities. Contrast dye penetrant inspection may be performed after surface treatments provided it is demonstrated that the treatment is of such a nature that discontinuities are not obscured.

4.2 If machined surfaces are to be inspected, they shall be finished with a clean cut to prevent flowing or burnishing of the surface layer or shall be etched with a suitable etchant to remove flowed or burnished layers which might mask discontinuities. Parts shall not be etched indiscriminately because etching itself tends to mask surface discontinuities.

4.3 All parts shall be cleaned and dried in such a manner as to leave the surfaces free from grease, oil, soaps, alkalies, and other substances which would interfere with inspection. Vapor degreasing is generally suitable for this purpose.

4.4 This section shall not be interpreted as prohibiting additional contrast dye penetrant inspections after further processing or after use of parts.

5. PROCEDURE: After preparation, the parts shall immediately be subjected to the following operations:

5.1 The parts shall be immersed in the penetrant, or shall be sprayed or brushed with the penetrant, and shall be allowed to remain immersed in the penetrant or to stand for a sufficient length of time to allow satisfactory penetration into all discontinuities. This time shall be not less than 5 minutes. The time of immersion or standing will depend upon the character and fineness of the discontinuities, the effectiveness of penetration increasing with time.

5.2 Parts shall be removed from the penetrant and cleaned thoroughly using a medium which will remove penetrant from the surfaces of parts; washing with water shall be used when the penetrant is water washable. When other than water washable penetrants are used, the penetrant shall be removed with a suitable cleaner. Excessive cleaning which would remove the penetrant from discontinuities shall be avoided.

5.3 The parts shall be dried as thoroughly as possible. Drying of parts may be accomplished by evaporation at room temperature or by placing the parts in a circulating warm air oven or in the air stream of a hot air dryer. Excessive drying time or temperature above 75 C (167 F) should be avoided to prevent excessive evaporation of the penetrant. If heat is used for drying parts, parts shall be cooled to approximately 50 C (122 F) before proceeding to the operation of 5.4.

5.4 The developer shall be applied to the dry parts as lightly and as evenly as possible. Wet developer shall be thoroughly mixed by agitation immediately prior to its application. After the developer has been applied, care shall be taken that no indication is disturbed or obliterated in subsequent handling.

5.5 After sufficient time has been allowed to develop indications, parts shall be examined.

5.6 The parts shall be cleaned following the inspection to remove penetrant and developer.

6. DISPOSITION:

6.1 Parts containing minor discontinuities not considered detrimental to the part under operating conditions may be approved for acceptance without remedial operations at the discretion of authorized personnel.

6.2 Parts containing discontinuities of such nature and location that their removal would not adversely affect the serviceability of the part, although local sections might be outside drawing limits, may have such discontinuities removed with the approval of authorized personnel after due consideration of the stress distribution within the part together with the function of the part itself. If a discontinuity is removed, the spot shall be blended in such a manner as to minimize surface flow of the material and reinspected. Swab etching of the blended area before reinspection is recommended wherever practicable. Etched surface shall be polished after reinspection.

6.3 Parts having discontinuities which are considered detrimental to strength or serviceability shall be rejected.

6.4 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 contrast dye penetrant inspection. Procedure for qualification of personnel shall be acceptable to purchaser.

7. IDENTIFICATION: Parts which have satisfactorily passed the contrast dye penetrant inspection described herein shall be identified as follows: Ø

7.1 Wherever practicable, the character P shall be marked, by etching or impression stamping, on all parts actually inspected including those parts from a lot accepted on a sampling basis.

7.2 Parts accepted on a sampling basis but not actually inspected may be identified by the P character enclosed in a circle.

7.3 Where impression stamping or etching is not appropriate because of size, finish, or function of the part, identification may be by dyeing, unless parts are dyed for other reasons, or by tagging; when dyeing is used, a blue dye shall be used on all parts actually inspected and an orange dye on parts accepted on a sampling basis but not actually inspected.

7.4 Unless otherwise specified, fastener items and parts which are not individually marked shall be packaged and the package marked to indicate conformance. Ø