AERONAUTICAL
MATERIAL SPECIFICATIONS

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AMS 2630

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Revised

ULTRASONIC INSPECTION

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

2. APPLICATION: Primarily for locating internal imperfections, such as cracks, spongy areas, structural segregation, and forging ruptures, which may or may not be exposed to the surface. Ultrasonic inspection may be performed by either the direct contact or the immersion procedure, unless otherwise specified.

3. CONTACT METHOD:

3.1 Equipment:

3.1.1 Electronic Apparatus: Shall be capable of producing, receiving, and displaying high frequency electrical pulses at the required frequencies and energy levels.

3.1.2 Transducers (Search Units): Shall be capable of reversibly transforming electrical energy to sound vibrations within themselves as well as transmitting and receiving ultrasonic vibrations in the material to be tested at the required frequencies and energy levels.

3.1.3 Couplant: Shall permit efficient transmission of ultrasonic vibrations from the transducer to the test surface.

3.1.4 Reference Blocks: Shall be of the same material as that under test and shall have equivalent ultrasonic response, shall have parallel surfaces, shall be machine finished as required for good contact, and shall contain one or more simulated imperfections in a face opposite the searching surface. The simulated imperfections shall consist of flat-bottomed holes drilled to a depth necessary to produce an indication well separated from the first back-face reflected pulse. Diameter of the holes shall be governed by usage of the part being inspected or as agreed upon by purchaser and vendor. Other types of reference blocks may be used for specific applications when agreed upon by purchaser and vendor.

3.2 Preparation of Parts: Surfaces of parts to be inspected may be machined to provide a series of flat parallel surfaces. These flat surfaces shall be as wide as possible consistent with part configuration or final processing requirements. A finish of 125 microinches or better is desirable. Surfaces shall be free from loose scale, machining or grinding particles, oil, grease, cutting compound, or other foreign materials.

3.3 Calibration of Apparatus: Prior to inspection of parts, the apparatus shall be adjusted using an appropriate reference block as necessary to produce a clearly defined indication, from the simulated imperfection, of sufficient height to ensure that the parts under test can be inspected as required to locate any imperfection of a detrimental size or nature in respect to usage of the part. Calibration for determination of loss in first back-face reflection shall be performed on the parallel surfaces of the part being inspected.

3.4 Procedure: The search unit shall be moved across the surface under test, each pass slightly overlapping the previous pass, until the entire surface being scanned has been covered. The speed of scanning shall be such as to permit detection of any imperfection equivalent to or larger than the simulated imperfections in the reference block.

4. IMMERSION METHOD:

4.1 Equipment:

4.1.1 Tank: Shall be of sufficient size to permit submersion of the part or portions of the part to be inspected as well as the scanning head of the search unit.

4.1.2 Couplant: The tank shall be filled with a water mixture containing a wetting agent in sufficient quantity to ensure complete wetting of the transducer face and of the surfaces of the part being inspected. A corrosion inhibitor may be added to the water mixture.

4.1.3 Rotating Unit: May be mounted in the tank and shall be capable of being rotated at predetermined speeds.

4.1.4 Electronic Apparatus: Shall be capable of producing, receiving, and displaying high frequency electrical pulses at the required frequencies and energy levels.

4.1.5 Scanning Head: Shall consist of a search unit conforming to 3.1.2 supported on a carriage so that this location with respect to the part being inspected is adjustable and which may be manually operated or motor driven along the scanning track.

4.1.6 Recorder: May be used for automatically recording the results of tests.

4.1.7 Reference Blocks: Shall be of similar material and configuration to the part under test, shall have been found free from detectable imperfections including loss of back-face reflections, when compared to previously approved samples as tested by the contact method, and shall contain one or more simulated imperfections. The simulated imperfections shall consist of flat-bottomed holes drilled to a depth necessary to produce an indication well separated from the first back-face reflection. Diameter of the hole shall be governed by usage of the part being inspected or as agreed upon by purchaser and vendor. Other types of reference blocks may be used for specific applications when agreed upon by purchaser and vendor.

4.2 Preparation of Parts:

4.2.1 Cleaning: Parts shall be cleaned to remove loose scale, chips, dirt, oil, and other foreign materials which might produce adverse results or contaminate the water in the test tank.

4.2.2 Fixturing: Parts to be tested shall be properly aligned on a fixture for the inspection operation.

4.3 Calibration of Apparatus: Prior to inspection of parts, the apparatus shall be adjusted using an appropriate reference block as necessary to produce a clearly defined indication, from the simulated imperfection, of sufficient height to ensure that the parts under test can be inspected as required to locate any imperfection of a detrimental size or nature in respect to usage of the part.

4.4 Procedure: Parts shall be immersed in the tank. The search unit shall be moved along the scanning track until the entire part has been inspected. Any reflection approximately equal to the amplitude of that received from the reference block simulated imperfection shall be investigated and the depth of imperfection in the part being tested shall be determined. A reference block with the appropriate depth of imperfection shall be selected and the apparatus recalibrated. The amplitude of imperfection in the part shall be compared with that from the simulated imperfection in the reference block. If reference blocks of varying thickness are not available, the apparatus shall be calibrated against that simulated imperfection in the reference block which most nearly approximates the depth of imperfection in the part under investigation.

5. PRECAUTIONS: It is essential that a thorough understanding be developed between the purchaser and vendor regarding the interpretation of the results of inspection and how they shall be reported and recorded. Ultrasonic testing is so comprehensive that it is necessary that all interested parties fully recognize that indications may appear which do not reflect conditions which are detrimental to actual service of the parts. Agreement between parties involved should be resolved in advance on the following:

(a) Surface finish.
(b) Internal structure.
(c) Location and extent of areas to be tested.
(d) Size of transducer and type of search unit.
(e) Test frequency.
(f) Type and grade of couplant.
(g) Method of calibration.
(h) Size, location, and frequency of indications considered acceptable and rejectable.
(i) Basis for acceptance or rejection of parts.

6. DISPOSITION:

6.1 Parts containing minor discontinuities not in excess of established standards may be approved for acceptance without remedial operations.

6.2 Parts containing discontinuities of such nature and location not considered detrimental to the parts under operating conditions or which will be removed during finish machining operations may be approved by authorized personnel for acceptance. Such discontinuities shall be reported.