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ADOPTION NOTICE

QUALIFICATION SAMPLING AND TESTING OF STEELS - TRANSVERSE TENSILE PROPERTIES

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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 2310D

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Submitted for recognition as an American National Standard

QUALIFICATION SAMPLING AND TESTING OF STEELS
Transverse Tensile Properties

1. SCOPE:

This specification covers procedures for sampling and testing aircraft-quality, special aircraft-quality, and premium aircraft-quality steels requiring transverse tensile property testing.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The applicable issue of referenced publications shall be the issue in effect on the date of the purchase order.

2.1 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM A 370 Mechanical Testing of Steel Products

3. TECHNICAL REQUIREMENTS:

3.1 Sampling:

Samples shall be selected as in 3.1.1 through 3.1.6. Samples shall be full cross-sections not less than 3/4 inch (19 mm) thick taken from the largest size billet or bar for which the steel is to be qualified but before reduction to under 5 inches (127 mm) in diameter or least distance between parallel sides. Each sample, except those from individual billets or bars, shall be identified with its location in the ingot/remelt ingot and, when known, the ingot number and the ingot position in the heat. Specimens prepared as in 3.2 and tested as in 3.3 shall meet the specified requirements.

3.1.1 (R) Heat Qualification: When the product of an entire heat is to be qualified, samples shall be taken as follows; sampling is different for heats made from top poured ingots/electrodes and from bottom poured ingots/electrodes:

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3.1.1.1 (R) Pouring Sequence Known: When the pouring sequence is known and traceability of billets or bars to ingot/remelt ingot position has been maintained, samples shall be taken from one end of billets or bars representing the following positions:

3.1.1.2 (R) For Heats Produced From Top Poured Ingots/Electrodes:

3.1.1.2.1 (R) One or Two Ingot Electrodes: Top and bottom of each ingot/remelted ingot.

3.1.1.2.2 (R) Three to Nine Ingots/Electrodes: Top and bottom of the first and last ingot or electrode in the pouring sequence.

3.1.1.2.3 (R) Ten or More Ingots/Electrodes: Top and bottom of the first, middle, and last ingot or electrode in the pouring sequence.

3.1.1.3 (R) For Heats Produced From Bottom Poured Ingots/Electrodes: For each plate (cluster) poured, a top and a bottom of resulting ingots or remelted ingots.

3.1.2 (R) Partial Heat Qualification: When the product of only some ingots/electrodes from a heat is to be qualified, samples shall be taken from one end of billets or bars representing the positions in those ingots or remelted ingots specified in 3.1.1.1 when pouring sequence is known. When only a portion of an ingot or remelted ingot is to be qualified, samples shall be taken from one end of billets or bars representing the top and bottom of that portion of the ingot or remelted ingot.

3.1.3 Billet or Bar Qualification: If the product of an entire heat is not qualified as in 3.1.1, or the product of a portion of a heat is not qualified as in 3.1.2, or if traceability to ingot/remelt ingot position has not been maintained, samples shall be taken from both ends of each billet or bar to be qualified.

3.1.4 Multiple Size Qualifications: If the product of a heat or portion of a heat is qualified at one size, that heat or portion of a heat will be considered qualified for any size of smaller cross-sectional area without additional testing if the results of the original tests meet the requirements specified for the smaller size, unless purchaser specifies that each size be tested for qualification.

3.1.5 (R) Products from a heat qualified to the requirements of a specification requiring premium-aircraft-quality steel may be supplied, without retesting, to a specification requiring aircraft-quality or special aircraft-quality steel of the same basic composition.

3.1.6 When the material specification requires that samples be forged to specific size for qualification, or when specified by purchaser, the steel shall be forged to that size before cutting samples.

3.2 Specimen Preparation:

The samples obtained as in 3.1 shall be heat treated as specified. Tensile specimens shall be prepared from the heat treated samples as specified in 3.2.1 or 3.2.2 and tested as in 3.3.

3.2.1 (R) Aircraft-Quality and Special Aircraft-Quality Steels: From each sample from round or square product, two tensile specimens conforming to ASTM A 370 shall be taken from the locations shown in Figure 1. Specimens from rectangular product having a nominal thickness of 4.5 inches (114 mm) or over shall be taken at the 1/4 and 3/4 width locations at the midpoint of the thickness. For nominal thicknesses under 4.5 inches (114 mm), samples shall be similarly located in the long-transverse direction.

3.2.1.1 (R) Standard 0.500 inch (12.70 mm) diameter tensile specimens are preferred but sub-size specimens not less than 0.250 inch (6.35 mm) in diameter may be used. The 0.500 inch (12.70 mm) diameter specimen shall be used in any referee tests.

3.2.2 Premium Aircraft-Quality Steels: Specimens shall be prepared as in 3.2.1 except that the location of specimens from round or square product shall be as shown in Figure 2 and the location of specimens from rectangular product shall be adjacent to the mid-thickness or mid-width line.

3.3 (R) Sampling and Testing:

Each specimen prepared as in 3.2 shall be tested in accordance with ASTM A 370 to determine conformance to specified requirements.

3.3.1 Test Validity: If it can be shown that failure of any specimen to meet specified requirements is due to improper specimen preparation, heat treatment, or testing technique, an additional cross-section may be taken immediately adjacent to the section from which the failed specimen was taken. Results of tests of specimens from this section may be used in lieu of those from which the invalid specimens were obtained without resorting to the resampling and retesting provisions of 4.2.

4. QUALITY ASSURANCE PROVISIONS:

Shall be in accordance with requirements of the applicable material specification except as follows:

4.1 Reports:

The vendor of the product shall include in the report required by the material specification for each shipment the results of tests for transverse-tensile properties of each specimen; results shall be identified with the cross-section from which each specimen was obtained and, when known, the location in the ingot, the ingot number, and the ingot position in the heat. The tensile specimen size used shall be reported. If the material specification presents any options for heat treatment, the report shall detail the heat treatment used to qualify the stock.

4.2 Resampling and Retesting:

4.2.1 (R) Heat Consisting of Three or More Top Poured Ingots/Electrodes Where Pouring Sequence Is Known: If either specimen from any cross-section fails to meet the requirements of the applicable material specification, the heat may be resampled and retested as follows:

4.2.1.1 (R) An additional cross-section shall be cut from one end of billet or bar representing the two available ingots/remelted ingots most immediately adjacent in pouring sequence to the original nonconforming ingot/remelted ingot. Specimens shall be prepared from these cross-sections as in 3.2 and tested as in 3.3. If both specimens from each of these cross-sections meet specified requirements, all product of the heat, except billets and bars from the original nonconforming ingot/remelted ingot, shall be acceptable.

4.2.1.2 (R) The original nonconforming ingot/remelted ingot may be cropped and retested in accordance with provisions of 3.1.1 through 3.1.6 and 3.2. If both specimens from the retested test locations meet specified requirements, that product shall be acceptable.

4.2.1.3 (R) If retests of the original nonconforming ingot/remelt ingot as in 4.2.1.2 meet requirements of the applicable material specification, all ingots/remelt ingots in the heat shall be cropped the same amount unless tests of product from adjacent ingots/remelt ingots as in 4.2.1.1 conform to specified requirements.

4.2.1.4 (R) If any specimen from the cross-sections tested as in 4.2.1.1 fails to meet specified requirements, the billets or bars from those ingots/remelt ingots may be cropped and dealt with in accordance with provisions of 3.1.1 through 3.1.6 and 3.2. If both specimens from each end of any billet or bar meet specified requirements, that billet or bar shall be acceptable.

4.2.2 (R) Heat Consisting of Ingots/Remelted Ingots Produced From Bottom Poured Ingots/Electrodes: Shall be as follows:

4.2.2.1 (R) An additional cross-section shall be cut from the applicable end(s) of billet or bar representing a second ingot/electrode cast on the same plate as the original nonconforming ingot/remelted ingot. Specimens shall be prepared from respective test location(s) (top and/or bottom) as in 3.2 and tested as in 3.3. If both specimens from the cross section meet specified requirements, all product of the heat, except billets and bars from the original nonconforming ingot/remelt ingot, shall be acceptable.

4.2.2.2 (R) The original nonconforming ingot/remelt ingot may be cropped and retested in accordance with provisions of 3.1.1 through 3.1.6 and 3.2. If both specimens from the retested test location meet specified requirements, that product shall be acceptable.

4.2.2.3 (R) If retests of the original nonconforming test location as in 4.2.2.2 meet requirements of the applicable material specification, all ingots/remelt ingots in the heat shall be cropped the same amount unless tests of product from the second ingot as in 4.2.2.1 conform to specified requirements.

4.2.2.4 If any specimen from cross-sections tested as in 4.2.2.1 fails to meet specified requirements, the billets or bars from those ingots/remelt ingots may be cropped and dealt with in accordance with provisions of 3.1.1 through 3.1.6 and 3.2. If both specimens from the retested test location meet specified requirements, that product shall be acceptable.

4.2.3 (R) Heat Qualified in Part or Pouring Sequence Not Known: If either specimen from any cross-section of any ingot/remelt ingot fails to meet requirements of the applicable material specification, that ingot/remelt ingot may be resampled and retested as follows:

4.2.3.1 An additional cross-section shall be cut from the opposite end of the billet or bar previously tested. Specimens from this cross-section shall be prepared as in 3.2 and tested as in 3.3. If both specimens meet specified requirements, the remaining portion of that ingot/remelt ingot, excluding the retested billet or bar, shall be acceptable. The retested billet or bar may then be individually qualified as in 4.2.4 except that only the cropped end need be resampled and retested.

4.2.3.2 If one or both specimens from the additional cross-section of 4.2.3.1 fails to meet specified requirements, the billet or bar from which that cross-section was taken shall be rejected. The remaining billets or bars from that ingot/remelt ingot may be cropped if desired and retested as in 3.1.3.

4.2.4 Billets or Bars Individually Qualified: If one or both specimens from only one end of the billet or bar fails to meet specified requirements, that billet or bar may be cropped, resampled as in 3.2, and retested as in 3.3. If one or both specimens from both ends of the billet or bar fails to meet specified requirements, no additional resampling and retesting will be permitted.

5. PREPARATION FOR DELIVERY:

Not applicable.

6. ACKNOWLEDGMENT:

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

7. REJECTIONS:

Steel not conforming to this specification, or to modifications authorized by purchaser, will be subject to rejection.

8. NOTES:

8.1 Marginal Indicia:

The (R) symbol is used to indicate technical changes from the previous issue of this specification.

8.2 Procedures meeting the requirements of this specification have been classified under Federal Supply Classification (FSC) 95GP.

8.3 Key Words:

Qualification, sampling and testing of steel, transverse properties

PREPARED UNDER THE JURISDICTION OF AMS COMMITTEE "E".