AEROSPACE STANDARD	AS6279	
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Standard Practice for Production, Distribution, and Procurement of Metal Stock

RATIONALE

This is a new document to establish requirements for production, distribution, and procurement of metal stock.

1. SCOPE

This SAE Aerospace Standard (AS) establishes requirements applicable to metal stock that is ordered and produced in accordance with an Aerospace Material Specification (AMS). Topics include producer requirements, distributor requirements, size and grain orientation nomenclature, and purchaser ordering information to distributors. Requirements of this document have been developed to address titanium and titanium alloys.

2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

ARP1917 Clarification of Terms Used in Aerospace Metals Specifications

AS9100 Quality Management Systems - Requirements for Aviation, Space and Defense Organizations

AS9120 Quality Management Systems - Requirements for Aviation, Space and Defense Distributors

2.2 MMPDS – Metallic Materials Properties Development and Standardization Handbook

Available from Battelle 505 King Avenue Columbus, OH 43201, Tel. 614-424-6496, http://projects.battelle.org/mmpds/

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: http://www.sae.org

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AS6279

3. REQUIREMENTS

3.1 Definitions

3.1.1 Bar, Rod, and Wire

A solid shape of material (other than sheet, strip, or plate) whose longitudinal orientation is the largest as-produced dimension and has been reduced in at least two axes perpendicular to the longitudinal direction by pressing, extruding, forging, rolling, or drawing and finished in accordance with standard industry practices to the producer-certified size and shape. Some shapes such as flat rounds may be finished by sizing in a single direction.

3.1.2 Billet (Reforging Stock, Rerolling Stock, or Extrusion Stock)

A solid metal product that is intended for subsequent hot working into finished or semi-finished products.

3.1.3 Cognizant Engineering Organization (CEO)

The engineering organization responsible for the design of the part, or the designee of this engineering organization.

3.1.4 Die Forging

Forging shaped by working stock in a closed die.

3.1.5 Distributor

For purposes of this standard, a Distributor is a business that sells metal stock. The same business operates as a “Producer” when it performs the functions of a “Producer.”

3.1.6 Drawn Shape

Shape produced by deformation of metal drawn through a die.

3.1.7 Extruded Shape

Shape produced by deformation of metal pressed through a die.

3.1.8 Forging

Product formed by heating and working stock between dies.

3.1.9 Gauge

The nominal thickness, diameter, hexagonal flat, or other applicable short transverse (ST) dimension of the material.

3.1.10 Hand Forging (aka, Open Die Forging)

Forging shaped by working stock between open dies.

3.1.11 Ingot

Cast metal intended and suitable for remelting or forming by hot or cold working.

3.1.12 Longitudinal (L)

Parallel to the principal direction of grain flow in a worked metal.

3.1.13 Long-Transverse (LT)

The direction of transverse grain orientation having the lesser amount of thermomechanical reduction (generally having the largest dimension, often called the “width”).

3.1.14 Mechanical Tube

Heavy-walled typically cylindrical tube, intended primarily for the machining of circular rings, flanges, shafts, etc., having a wall thickness that is a substantial proportion of the outer diameter. Such tube is not normally used for the transmission of fluids, and parts made from it are usually machined all over. This product is sometimes known as "hollow bar."

3.1.15 Metal Stock

For purposes of this standard, the term “metal stock” includes the following wrought product forms: bar, rod, wire, plate, sheet, strip, hand forgings, billet, extruded shapes, drawn shapes, and mechanical tube. It does not include castings, sintered powder metal parts, die forgings, seamless tubing, or welded tubing.

3.1.16 Plate

Reduced in at least one axis (the ST axis) by rolling and finishing in accordance with standard industry practices to the producer-certified size. Cross-rolled plate is reduced in the ST direction by rolling in both the LT and L axes. Plate is further distinguished from sheet and other product forms by differences in thickness and/or ratio of width to thickness; refer to ARP1917.

3.1.17 Produced Size

The nominal dimensions of the metal stock produced by mechanical working and finishing in accordance with industry standard practices.

3.1.18 Producer

The entity that takes responsibility for all processing and testing that results in certification to the AMS material specification.

3.1.19 Product Form

Terminology used to describe metal materials including, but not limited to: ingot, billet, forging stock, forging, bar, rod, wire, sheet, plate, strip, foil, casting, extrusion, and tubing.

3.1.20 Purchaser

For purposes of this standard, a Purchaser is a business that procures metal stock.

3.1.21 Rolled

Metal shaped by rolling on a mill.

3.1.22 Sheet, Strip, and Foil

Reduced in at least one direction (the ST axis) by rolling and finishing in accordance with standard industry practices to the producer-certified size. Cross-rolled sheet is reduced in the ST direction by rolling in both the LT and L axes. Sheet, strip, and foil are further distinguished by differences in thickness and/or width; refer to ARP1917.

3.1.23 Short-Transverse (ST)

The direction of transverse grain orientation having the highest amount of thermomechanical reduction (generally the smallest dimension, often called the “thickness”).

3.1.24 Transverse (T)

A direction of grain orientation that is perpendicular to longitudinal; applicable to round, square, hexagonal, and similar shapes. The transverse orientations of rectangular shapes are described as long transverse (LT) and short transverse (ST).

3.2 General Requirements

3.2.1 Traceability

3.2.1.1 Source of Production

Material shall be traceable to source of production (e.g., producer name and heat number). This traceability shall be maintained throughout the metal production process (including melting of ingot, conversion to billet, production of metal stock, warehousing, and distribution). Material, regardless of form, that cannot be traced back to its producer shall not be certified as compliant to this AS.

3.2.1.2 Product Size and Grain Orientation

Producers, distributors, and purchasers shall maintain traceability to producer's heat and lot, product size, and corresponding grain orientation (refer to 3.2.7).

3.2.2 Responsibility for Certification

The producer is the organization responsible for operations performed by the processing and testing entities, but it is not required that all or any processing and testing be performed in house by the producer. The producer takes responsibility that the material meets the specification. Whenever the material owner authorizes thermo-mechanical processing to change the certified material gauge/condition/specification, they become the "Producer" and are responsible for the testing and certification to that new dimension/condition/specification.

3.2.2.1 The requirements of 3.2.4 apply when heat treatment is the only subsequent process performed (see 3.2.4, 3.4.5, and 3.4.5.1).

3.2.3 Revision of Material Certification

Only the producer that created a material certification document can amend that document (e.g., amend a material certification to an alternate revision).

3.2.4 Additional Heat Treatment

After product is certified to comply with an AMS, it is permitted to perform heat treatment that results in compliance with a different AMS material specification. Heat treatment processes shall be in accordance with the applicable AMS. All acceptance tests of the applicable material specification shall be performed in the final heat treat condition, except that the following are not required to be re-tested: composition, macrostructure, and ultrasonic. A report shall document processes and test results and shall certify compliance with the different AMS. The material owner shall coordinate the heat treatment, generate a new material certification, and take responsibility for compliance. (Refer to 3.4.5.)

3.2.4.1 Hydrogen content for titanium and titanium alloys shall be tested in the final heat treat condition after chemical processing (e.g., pickling, etching, chemical milling), hot-working, or heat treatment of the product.

3.2.5 Material Substitution

3.2.5.1 Product form shall not be substituted, unless specifically authorized in writing by the cognizant engineering organization.

3.2.5.2 Altering the produced and certified short transverse (ST) gauge (e.g., thickness, diameter) is considered a material substitution and is prohibited unless specifically authorized in the material specification or flowed down as a requirement by the cognizant engineering organization.

3.2.5.3 Requirements applicable to produced size dimensions (3.1.17) versus supplied cut size dimensions are provided in 3.4.6.

3.2.6 Dimensional Limits

When product gauge (i.e., thickness, diameter, etc.) establishes the requirements for tensile properties or other properties required by technical requirements (e.g., Section 3) of the material specification, the size shall be determined by the nominal size certified by the producer.

3.2.7 Grain Orientation Requirements

3.2.7.1 Grain Nomenclature (e.g., ST, LT, and L) shall be assigned by the producer and maintained by distributors and subsequent purchasers to the applicable dimension (example: 2 inches ST x 3 inches LT x 120 inches L). For round, square, hexagonal, and similar shapes, T and L are the applicable grain orientations. Other designations such as DIA, SQ, HEX, or similar are acceptable as equivalent to T.

3.2.7.2 Product size and corresponding grain orientations shall be reported on certifications and reports; dimensions shall be in inches, unless specified otherwise.

3.3 Producer Requirements

3.3.1 Documented Practices

The producer shall ensure that each key operation is performed to a documented manufacturing plan in accordance with AS9100.

3.3.1.1 Process control parameters are considered proprietary and may be assigned a code designation. Each variation in such parameters shall be assigned a modified code designation. Evidence of the process control shall be available for purchaser's review/audit at the processor's facility.

3.3.2 Quality System Accreditation

Producers shall be accredited to AS9100 or otherwise approved by the cognizant engineering organization.

3.3.3 Inspection and Test Records

Producer shall maintain records of inspections and tests for material certified as compliant to this AS. This data shall be available for purchaser's review for a minimum of 5 years from date of shipment.

3.3.4 MMPDS Participation

Producers shall identify themselves to MMPDS at a frequency not to exceed 5 years (refer to Figure 4). A copy of the email sent to the MMPDS secretariat is acceptable record of compliance with this requirement.

3.4 Distributor Requirements

3.4.1 Quality System Accreditation

Distributors shall be accredited to AS9100 or AS9120 or otherwise approved by the cognizant engineering organization.

3.4.2 Each material certification received by a distributor shall be reviewed to verify that all required acceptance tests as specified in the material specification and any additional requirements flowed down from the cognizant engineering organization are acceptable prior to shipment to the purchaser. Review of material certifications shall include examination for conformance to traceability requirements (refer to 3.2.1).

3.4.3 Distributor Report

The distributor report shall include the items listed in Figure 1.

3.4.4 Ordering Information for Purchasers to Distributors

In addition to the details itemized in the applicable AMS material specification, the distributor shall request complete ordering information (refer to Figure 2) from the purchaser.

3.4.5 The material certification report that attests compliance to an AMS material specification shall not be altered and shall be created only by the producer (see 3.2.2). Distributors shall not create an AMS material certification report, unless the company is taking complete responsibility as the material producer.

3.4.5.1 Exception

The Distributor shall take responsibility as a producer when they coordinate heat treatment performed in accordance with 3.2.4.

3.4.6 Distributor is permitted to perform and separately certify the following operations to satisfy requirements specified by the purchaser of the material:

3.4.6.1 Distributor may straighten or level to produce straight or flat product from coil stock (i.e., produce straight rod from coiled stock, produce flat sheet from coil stock, et al.).

3.4.6.2 Cutting the ST dimension (perpendicular to the Short Transverse direction) to achieve the ordered thickness is not permitted, unless specifically authorized by the purchase order. (Refer to example in Figure 5C.) This restriction applies to all ST designations, including thickness, diameter, hex, and other similar designations.

3.4.6.3 Distributor may cut the L and LT dimensions (perpendicular to the Longitudinal and Long Transverse directions) to produce the as-ordered size, subject to restrictions in the following paragraphs. (Refer to examples in Figure 5.)

3.4.6.3.1 Grain orientation shall be marked on cut sizes of flat stock (e.g., plate, sheet, rectangular bar).

3.4.6.3.2 Product form shall not be substituted. Examples include, but are not limited to:

3.4.6.3.2.1 Cut plate shall not be supplied when bar is specified or required by the AMS specification.

3.4.6.3.2.2 Bar shall not be supplied when plate is specified or required by the AMS specification.

3.4.6.3.2.3 Cast material shall not be supplied when wrought product (i.e., bar, plate, rolled plate, hot finished plate, etc.) is specified or required by the AMS specification.

3.4.6.3.3 Requirements of the material specification apply to the mill-produced product cross section, not to the cross section dimensions of the distributor-supplied product.

3.4.6.3.4 Rectangular bar may be cut in the LT dimension (perpendicular to the Long Transverse direction) to supply smaller width bar unless it is restricted by material specification because of width or cross-sectional area. (Refer to example in Figure 5B.)

3.4.6.4 Cutting processes that result in a heat affected zone (i.e., EDM, laser cutting, flame cutting, plasma cutting, or other thermal cutting processes) are permitted only when it is confirmed that subsequent metal removal will exceed 0.100 inches or is otherwise approved by the CEO.

3.4.6.5 Chemical milling, etching, or pickling shall not be used for applications other than alpha case removal or for pre-penetrant etch, unless approved by the CEO.

3.4.6.5.1 Final hydrogen test requirement applies after chemical processing (see 3.2.4.1).

3.5 Purchaser Requirements

3.5.1 Flowdown of Requirements

Purchasers shall flow down any applicable requirements received from their upper tier customer(s).

3.5.2 Requests for quotation and purchase orders shall contain complete ordering information. (Refer to 5.1 and 5.2.)

3.5.3 Each material certification received by a purchaser shall be reviewed to verify that all requirements of the purchase order and any additional requirements flowed down from the cognizant engineering organization are acceptable. Review of material certifications shall include examination for conformance to traceability requirements (refer to 3.2.1).

4. CERTIFICATIONS AND REPORTS

4.1 Producer Certifications

4.1.1 Certification Responsibility

The producer is the entity that certifies compliance to an AMS material specification. No other organization has the authority to create or alter the producer certification report.

4.1.2 AMS producer certifications shall clearly distinguish “supplied-condition” data from “response to heat treat” data.

4.1.3 Producer Certification: Producer shall certify: “Business Name has complied with all producer requirements of AS6279.”

4.2 Distributor Reports

The distributor shall provide a report that contains the information listed in Figure 1.

4.3 Purchaser Report

Purchasers, including parts fabricators, that are required to comply with this document shall certify: “Purchaser Business Name has complied with all purchaser requirements of AS6279.”

5. PURCHASER ORDERING INFORMATION

5.1 Orders from purchasers to producers shall contain the ordering information listed in the applicable AMS.

5.2 Orders from purchasers to distributors shall contain the ordering information listed in Figure 2.

1. AMS material specification number (or other material specification) and revision identifier
2. Alloy
3. Temper or heat treat condition, as supplied
4. Data that establishes traceability to producer certification (producer name, lot number, etc.)
5. Product form (i.e., bar, plate, etc.).
6. Produced size, as stated on producer certification
7. Distributor supplied size, quantity and unit of measure (i.e., linear feet, square feet, number of pieces for cut sizes, etc.), and grain orientation nomenclature, as applicable, and the process used to produce this size.
8. Purchaser name and address.
9. Statement that material complies with the purchaser's as-ordered requirements.
10. Statement that material is traceable to heat/lot and grain direction through receipt from producer through delivery to purchaser.
11. Copy of the original unaltered AMS material certification report from the producer.
12. Certification of the following processes, if performed (or subcontracted) by the distributor:
    a. When heat treatment is performed, a copy of the heat treat process certification and a copy of the test report for heat treated material shall be provided.
    b. When nondestructive inspection or materials testing is performed, a copy of the test results shall be provided.
    c. Other special processes performed, when specified.
13. Statement: "Distributor Business Name has complied with all distributor requirements of AS6279."

FIGURE 1 - INFORMATION ON DISTRIBUTOR REPORTS

1. Material specification, including revision identifier when a compliance with a specific revision is required.
2. Alloy.
3. Temper or Heat Treat Condition.
4. Product Form.
5. Quantity and unit of measure (i.e., linear feet, square feet, number of pieces for cut sizes, etc.).
6. Purchaser shall flowdown any applicable requirements received from the CEO, including any applicable engineering definition requirements.
7. Size to be supplied and grain orientation. When grain orientation is not applicable, the order shall state “No grain orientation requirements apply”, or similar words.
8. Maximum allowable gauge per CEO requirements. When maximum allowable gauge is not specified, the material supplied shall be the mill-produced gauge.
9. When the specified size exceeds the size range covered by the AMS, the order shall include the following:
    a. Mechanical property requirements
    b. All other supplemental test requirements applicable to the order, or the statement “No other tests are required”.
10. Other services to be provided by the distributor.

FIGURE 2 - PURCHASER ORDERING INFORMATION TO DISTRIBUTOR