The Engineering Society For Advancing Mobility Land Sea Air and Space

400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 3714A

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Superseding AMS 3714

CORE, OVEREXPANDED HONEYCOMB, POLYAMIDE PAPER BASE, PHENOLIC COATED

THIS REVISION CONTAINS ONLY EDITORIAL CHANGES.

1. SCOPE:

1.1 Form: This specification covers honeycomb core made of polyamide paper sheets and supplied in the form of blocks, slices, and ordered shapes, the cells of the core being in an overexpanded, rectangular configuration.

1.2 Application: Primarily for bonded sandwich structures requiring high strength and corrosion resistance in the temperature range -55° to +80°C (-65° to +180°F) for use in single curvature 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. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM C271 - Density of Core Materials for Structural Sandwich Constructions
ASTM C273 - Shear Test in Flatwise Plane of Flat Sandwich Constructions or Sandwich Cores
ASTM C363 - Delamination Strength of Honeycomb Type Core Material
ASTM C365 - Flatwise Compressive Strength of Sandwich Cores
ASTM F501 - Aerospace Materials Response to Flame, with Vertical Test Specimen (For Aerospace Vehicles Standard Conditions)

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Specifications:

MIL-R-9299 - Resin, Phenolic, Laminating

2.3.2 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

3. TECHNICAL REQUIREMENTS:

3.1 Material:

3.1.1 Paper Base: The paper base shall be composed of an aromatic polyamide polymer (nylon) in the form of short fibers (floc), bonded together with small fibrous binder particles (fibrids) of the same material, and shall contain no extraneous diluents. The sheet shall not be perforated.

3.1.2 Resin: The resin used for impregnating the paper and for any additional dip coatings shall conform to MIL-R-9299, Type II, Class I. The resin or adhesive used to bond the adjacent cells shall be sufficiently strong to meet the requirements of 3.3.

3.1.3 Designation: Core shall be designated according to the following numbering system:

a. "OX" for overexpanded in the "W" direction
b. Cell size (fraction of an in.) (mm)
c. Nominal density (lb per cu ft) (kg/m^3) (See 3.3.2)
d. Paper thickness in mils (mm)

Example: Overexpanded core of 3/16 in. (4.8 mm) cell size, a nominal density of 3.0 lb per cu ft (48 kg/m^3), and a paper thickness of 2 mils (0.05 mm) shall be designated as follows:

OX 3/16 - 3.0 (2) in Inch/Pound Units
OX 4.8 - 48 (0.05) in SI Units

3.1.4 Cell Configuration: Core shall consist of specified polyamide sheets bonded together to form cells of essentially rectangular shape as shown in Fig. 1.

3.1.5 Core Dimensions: Shall be as specified in Fig. 1 where,

T = Thickness, depth, or height dimension measured parallel to the core cell axis

L = Longitudinal or ribbon dimension measured along the direction of a ribbon

W = Transverse dimension perpendicular to the ribbon direction

3.2 Condition: Core shall be supplied completely cured and in the expanded form.

3.3 Properties: Core shall conform to the following requirements:

3.3.1 Core Properties: The compressive strength, core shear strength, and core shear modulus shall be as specified in Table I, determined in accordance with 4.5.1 and 4.5.2, respectively. Specimens shall be tested after exposure for not less than 30 min. at the test temperature.

3.3.2 Density: The core density shall be within ±10% of the nominal density specified in Table I, determined in accordance with ASTM C271.

3.3.3 Node Bond Strength: Shall be not less than 16 lb (70 N) at 25°C ± 3 (77°F ± 5) and not less than 8 lb (35 N) at 175°C ± 3 (350°F ± 5), determined in accordance with ASTM C363.

3.3.4 Flame Resistance: Time to extinguish, defined as the total of flame time and glow time, shall not exceed 5.0 sec average, or 6.0 sec individual. Burn length shall not exceed 6.0 in. (150 mm) average, or 7.2 in. (180 mm) individual. Specimens shall be tested in the vertical position with 60 sec ± 1 flame exposure in accordance with 4.5.3.

3.4 Quality: The core, as received by purchaser, shall be uniform in quality and free from foreign materials and from imperfections detrimental to usage of the core.

3.4.1 Visual Imperfections:

3.4.1.1 Node Bond Breaks: Not more than 3 node-bond breaks or separations per 12-in. (300-mm) diameter circle will be permitted with no two breaks being adjacent in the (L) ribbon direction.

3.4.1.2 Cell Walls: There shall be no more than one cell wall break per square foot (per 930 cm^2) of slice.

3.4.1.3 Double Layer: Expanded core blocks or slices which have double layers (two ribbons bonded together which cause uneven expansion in the "L" direction) shall be acceptable if the double layers are not more frequent than one in 12 in. (300 mm) in the "W" direction.

3.5 Tolerances: Shall be as follows:

3.5.1 Core Thickness: ±0.006 in. (±0.15 mm) for machined slices up to 1.5 in. (38 mm), incl, thick, ±0.010 in. (±0.25 mm) for machined slices over 1.5 in. (38 mm) up to 3 in. (76 mm) thick, and +0.25 in. (+6.4 mm), -0.00 for raw block.

3.5.2 Length and Width: +1.0 in. (+25 mm), -0.00.

3.5.3 Cell Count:

3.5.3.1 The 1/4-in. (6.4 mm) hexagonal core overexpanded in the "W" direction shall have a cell count of 30 - 36 cells per linear foot (300 mm) in the "W" direction and 80 - 90 cells per linear foot (300 mm) in the "L" direction.

3.5.3.2 The 3/16-in. (4.8 mm) hexagonal core overexpanded in the "W" direction shall have a cell count of 40 - 50 cells per linear foot (300 mm) in the "W" direction and 108 - 120 cells per linear foot (300 mm) in the "L" direction, for the average of six measurements.

3.5.4 Ribbon Direction: All ribbons shall be parallel to each other within 10 degrees. The ribbon direction shall be determined by measuring the angle between one line through two nodes on the same ribbon ("L") direction 12 in. (300 mm) apart, and another line in the principal ribbon direction (See Fig. 1).

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the core shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.6. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the core conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for core shear strength (3.3.1), core density (3.3.2), quality (3.4), and tolerances (3.5) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests and shall be performed prior to or on the first-article shipment of core to a purchaser, when a change in material, processing, or both requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.2.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, contracting officer, or request for procurement.

4.3 Sampling: Shall be as follows:

4.3.1 For Acceptance Tests: Each block or 2% of the slices from each lot shall be sampled at random to provide sufficient core to perform all required tests. The number of determinations for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three.

4.3.1.1 A lot shall be each block or all slices cut from a single block. A lot shall not exceed 250 lb (115 kg) and may be packaged in smaller quantities and delivered under the basic lot approval provided lot identification is maintained.

4.3.1.2 When a statistical sampling plan and acceptance quality level (AQL) have been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1 and the report of 4.6.1 shall state that such plan was used.

4.3.2 For Preproduction Tests: As agreed upon by purchaser and vendor.

4.4 Approval:

4.4.1 Sample core shall be approved by purchaser before core for production use is supplied, unless such approval be waived by purchaer. Results of tests on production core shall be essentially equivalent to those on the approved sample.

4.4.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection on production core which are essentially the same as those used on the approved sample core. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in material, processing, or both and, when requested, sample core. Production core made by the revised procedures shall not be shipped prior to receipt of reapproval.

4.5 Test Methods: Shall be as follows:

4.5.1 Compressive Strength: Shall be determined in accordance with ASTM C365 at 25°C ± 3 (77°F ± 5) and 82°C ± 3 (180°F ± 5) on core specimens. Specimens for wet testing shall be immersed in water at 25°C ± 3 (77°F ± 5) for not less than 24 hr and tested immediately after removal.

4.5.2 Core Shear Strength and Shear Modulus: Shall be determined in two directions, using a plate shear test in accordance with ASTM C273 at 25°C ± 3 (77°F ± 5) and 82°C ± 3 (180°F ± 5). The test specimen shall be 0.500 in. ± 0.010 (12.50 mm ± 0.25) thick with 0.06 lb per sq ft (0.30 kg/m^2) adhesive to bond plates to core.

4.5.3 Flame Resistance: Shall be determined in accordance with ASTM F501 using three bare core specimens, 0.500 in. (12.50 mm) thick x 3.0 x 14.0 in. (75 x 350 mm), with the 14 in. (350 mm) dimension in either the "W" or "L" direction, and the flame applied for 60 sec ± 1.

4.6 Reports:

4.6.1 The vendor of core shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the product conforms to the other technical requirements of this specification. This report shall include the purchase order number, AMS 3714A, core designation, quantity, and block or lot number.

4.6.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 3714A, contractor or other direct supplier of core, supplier's material designation, part number, and quantity. When core for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of core to determine conformance to the requirements of this specification and shall include in the report either a statement that the core conforms or copies of laboratory reports showing the results of tests to determine conformance.

4.7 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the core may be based on the results of testing three additional specimens, cut from the same block, for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the core represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Packaging and Identification:

5.1.1 The core shall be packaged to prevent physical damage, during shipment and handling, and shall be shipped flat unless contoured or formed shapes, requiring special support, are ordered.

5.1.2 Each piece of core and each interior and exterior package shall be marked with not less than the following information applied to a durable tag, using characters of such size as to be legible and which will not be obliterated by normal handling:

CORE, OVEREXPANDED HONEYCOMB, POLYAMIDE PAPER BASE, PHENOLIC COATED
AMS 3714A
CORE CLASSIFICATION _____
T x L x W _____
MANUFACTURER'S IDENTIFICATION _____
BLOCK OR LOT NUMBER _____
PURCHASE ORDER NUMBER _____
DATE OF MANUFACTURE _____

5.1.3 Packages of core shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the core to ensure carrier acceptance and safe delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

5.1.4 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-794, Level A or Level C, as specified in the request for procurement. Commercial packaging as in 5.1.1 and 5.1.3 will be acceptable if it meets the requirements of Level C.

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

7. REJECTIONS: Core not conforming to this specification or to modifications authorized by purchaser will be subject to rejection.

8. NOTES:

8.1 Marginal Indicia: This revision contains only editorial changes from the previous issue of this specification and, therefore, no phi (Ø) symbols indicating technical changes are required.

8.2 The flame resistance requirements of this specification meet the requirements of FAA FAR 25.853 (a) and Appendix F thereto. The flame resistance test is intended only for comparative evaluation of materials and is not to be construed as an indication of characteristics of the product under actual fire conditions.

8.3 Dimensions and properties in inch/pound units and the Celsius temperatures are primary; dimensions and properties in SI units and the Fahrenheit temperatures are shown as the approximate equivalents of the primary units and are presented only for information.

8.4 For direct U.S. Military procurement, purchase documents should specify not less than the following:

Title, number, and date of this specification
Nominal cell size and density required
Length, width, and thickness of blocks or slices required
Quantity of core desired
Applicable level of packaging (See 5.1.4).

8.5 Core meeting the requirements of this specification has been classified under Federal Supply Classification (FSC) 9330.