AEROSPACE MATERIAL SPECIFICATION

AMS3714™	REV. D

Issued 1981-01
Revised 1995-04
Reaffirmed 2022-08

Superseding AMS3714C

Core, Overexpanded Honeycomb, Polyamide Paper Base, Phenolic Coated

RATIONALE

AMS3714D has been reaffirmed to comply with the SAE Five-Year Review policy.

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:

This honeycomb core has been used typically for bonded sandwich structures requiring high strength and corrosion resistance in the temperature range -67 to +180 °F (-55 to +82 °C), for use in single curvature parts, but usage is not limited to such applications.

1.3 Safety - Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

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.

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**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS3714D/

2.1 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or www.astm.org.

ASTM C 271	Density of Core Materials for Structural Sandwich Constructions
ASTM C 273	Shear Properties in Flatwise Plane of Flat Sandwich Constructions or Sandwich Cores
ASTM C 363	Delamination Strength of Honeycomb Type Core Material
ASTM C 365	Flatwise Compressive Strength of Sandwich Cores
ASTM F 501	Aerospace Materials Response to Flame, with Vertical Test Specimen (For Aerospace Vehicles Standard Conditions)

2.2 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-R-9299	Resin, Phenolic, Laminating
MIL-STD-2073-1	DOD Materiel, Procedures for Development and Application of Packaging Requirements

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:

"OX" for overexpanded in the "W" direction
Cell size (fraction of an inch) (mm)
Nominal density in pounds per cubic foot (kg/m^3) (See 3.3.2)

(1) Example in Inch/Pound Units: OX 3/16-3.0 - Overexpanded core of 3/16 inch cell size and a nominal density of 3.0 pounds per cubic foot.

(2) Example in Metric (SI) Units: OX 4.8-48 - Overexpanded core of 4.8 mm cell size and a nominal density of 48 kg/m^3.

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

3.1.5 Core Dimensions: Shall be as specified in Figure 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: Compressive strength, core shear strength, and core shear modulus shall be as specified in Table 1, determined in accordance with 4.5.1 and 4.5.2, respectively. Specimens shall be tested after exposure for not less than 30 minutes at the test temperature.

TABLE 1A - Properties, Inch/Pound Units

Nominal Core Dimensions Cell Size Inch	Nominal Core Dimensions Density lb per cu ft	Test Temp °F	Core Shear Strength psi, min Individual L	Core Shear Strength psi, min Individual W	Core Shear Modulus psi, min avg L	Core Shear Modulus psi, min avg W	Compressive Strength psi, min Unstabilize Individual Dry	Compressive Strength psi, min Unstabilized Individual Wet	Compressive Strength psi, min Stabilized Individual Dry
3/16	1.8	77	45	35	1000	1000	70	63	110
		180	40	31	900	900	63		100
3/16	3.0	77	95	95	2400	3600	250	225	270
		180	85	85	2200	3200	225		245
1/4	3.0	77	90	90	2000	3000	210	190	300
		180	80	80	1800	2700	190		270

TABLE 1B - Properties, SI Units

Nominal Core Dimensions Cell Size mm	Nominal Core Dimensions Density kg/m^3	Test Temp °C	Core Shear Strength MPa, min Individual L	Core Shear Strength MPa, min Individual W	Core Shear Modulus MPa, min avg L	Core Shear Modulus MPa, min avg W	Compressive Strength MPa, min Unstabilized Individual Dry	Compressive Strength MPa, min Unstabilized Individual Wet	Compressive Strength MPa, min Stabilized Individual Dry
4.8	29	25	0.31	0.24	6.9	6.9	0.48	0.43	0.76
		82	0.28	0.21	6.2	6.2	0.43		0.69
4.8	48	25	0.66	0.66	16.5	24.8	1.72	1.55	1.86
		82	0.59	0.59	15.2	22.1	1.55		1.69
6.4	48	25	0.62	0.62	13.8	20.7	1.45	1.31	2.07
		82	0.55	0.55	12.4	18.6	1.31		1.86

3.3.2 Density: The core density shall be within ±10% of the nominal density specified in Table 1, determined in accordance with ASTM C 271.

3.3.3 Node Bond Strength: Shall be not less than 16 pounds force (71 N) at 77 °F ± 5 (25 °C ± 3) and not less than 8 pounds force (36 N) at 350 °F ± 5 (177 °C ± 3), determined in accordance with ASTM C 363.

3.3.4 Flame Resistance: Ti me to extinguish, defined as the total of flame time and glow time, shall not exceed 5.0 seconds average, or 6.0 seconds individual. Burn length shall not exceed 6.0 inches (152 mm) average, or 7.2 inches (183 mm) individual. Specimens shall be tested, in the vertical position with 60 seconds ± 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 three node-bond breaks or separations per 12-inch (305-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 (929 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 inches (305 mm) in the "W" direction.

3.5 Tolerances:

Shall be as follows:

3.5.1 Core Thickness: ±0.006 inch (±0.15 mm) for machined slices up to 1.5 inches (38 mm), inclusive, thick; ±0.010 inch (±0.25 mm) for machined slices over 1.5 to 3 inches (38 to 76 mm), inclusive, thick; and ±0.25 inch (±6.4 m), -0.00 for raw block.

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

3.5.3 Cell Count:

3.5.3.1 The 1/4-inch (6.4-mm) hexagonal core overexpanded in the "W" direction shall have a cell count of 30 to 36 cells per linear foot (305 mm) in the "W" direction and 80 to 90 cells per linear foot (305 mm) in the "L" direction, for the average of six measurements.

3.5.3.2 The 3/16-inch (4.8-mm) hexagonal core overexpanded in the "W" direction shall have a cell count of 40 to 50 cells per linear foot (305 mm) in the "W" direction and 108 to 120 cells per linear foot (305 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 inches (305 mm) apart, and another line in the principal ribbon direction (See Figure 1).

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The manufacturer of core shall supply all samples and shall be responsible for all required tests. 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: Core shear strength (3.3.1), core density (3.3.2), quality (3.4), and tolerances (3.5) are acceptance tests and shall be performed on each lot.

4.2.2 Preproduction Tests: All technical requirements are preproduction tests and shall be performed prior to or on the first-article shipment of core by the manufacturer, when a change in ingredients and/or processing 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 and Testing:

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.

4.3.1.2 A statistical sampling plan, acceptable to purchaser, may be used in lieu of sampling as in 4.3.1.

4.3.2 For Preproduction Tests: Shall be acceptable to purchaser.

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 purchaser. Results of tests on production core shall be essentially equivalent to those on the approved sample.

4.4.2 Manufacturer 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. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, manufacturer shall submit for reapproval a statement of the proposed changes in ingredients and/or processing 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 C 365 at 77 °F ± 5 (25 °C ± 3) and at 180 °F ± 5 (82 °C ± 3) on core specimens. Specimens for wet testing shall be immersed in water at 77 °F + 5 (25 °C ± 3) for not less than 24 hours 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 C 273 at 77 °F ± 5 (25 °C ± 3) and at 180 °F ± 5 (82 °C ± 3). The test specimen shall be 0.500 inch ± 0.010 (12.70 mm ± 0.25) thick.

4.5.3 Flame Resistance: Shall be determined in accordance with ASTM F 501 using three bare core specimens, 0.500 inch (12.70 mm) thick x 3.0 x 14.0 inches (76 x 356 mm), with the 14-inch (356-mm) dimension in either the “W” or “L” direction, and the flame applied for 60 seconds ± 1.

4.6 Reports:

The supplier of core shall furnish with each shipment a report from the manufacturer showing the results of tests to determine conformance to the acceptance test requirements and stating that the core conforms to the other technical requirements. This report shall include the purchase order number, block or lot number, AMS 3714D, manufacturer’s identification, and quantity.

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. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Packaging and Identification:

5.1.1 A honeycomb lot may be packaged in small quantities and delivered under the basic lot approval provided lot identification is maintained.

5.1.2 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.

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

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

5.1.4 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.

5.1.5 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-2073-1, Level C, unless Level A is specified in the request for procurement.

6. ACKNOWLEDGMENT:

A supplier 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 The change bar (|) is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this specification. If the symbol is next to the specification title, it indicates a complete revision of the specification.

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