AEROSPACE MATERIAL SPECIFICATION

AMS3713	REV. D

Issued 1982-01
Revised 1996-04
Reaffirmed 2013-07

Superseding AMS3713C

Core, Flexible Honeycomb, Polyamide Paper Base, Phenolic Coated

RATIONALE

AMS3713D 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 in a non-hexagonal, flexible cell configuration and supplied in the form of blocks, slices, and ordered shapes.

1.2 Application:

This honeycomb core has been used typically in sandwich structures in single or compound curvature parts requiring high strength and corrosion resistance in the temperature range -55 to +82 °C (-67 to +180 °F) 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 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.

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/AMS3713D

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

3. TECHNICAL REQUIREMENTS:

3.1 Material:

3.1.1 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 coating 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:

"F" for flexible
Cell count, per linear foot (meter) of transverse direction (See 3.5.3)
Nominal density, pounds per cubic foot (kg/m^3) (See 3.3.2)

Example in Inch/Pound Units: F35-2.5 - Flexible core with a cell count of 35 cells per foot and a nominal density of 2.5 pounds per cubic foot.

Example in SI Units: F115-40 - Flexible core with a cell count of 115 cells/m and a nominal density of 40 kg/m^3.

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

3.15 Core Dimensions:

Shall be as specified in Figure 1 where,

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

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

W = Width (transverse) dimension measured normal 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 minutes at the test temperature.

3.3.2 Density: Shall be within +10% of the nominal density specified in Table 1, determined in accordance with ASTM C 271.

3.3.3 Flexibility: A core slice shall lie flat without crimping, permanent distortion, or delamination after being flexed in accordance with 4.5.4.

3.3.4 Node Bond Strength: Shall be not less than 16 pounds force (71 N) at 25 °C ± 3 (77 °F ± 5) and not less than 8 pounds force (36 N) at 175 °C ± 3 (347 °F ± 5), determined in accordance with ASTM C 363.

3.3.5 Flame Resistance: Time 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 condition, and be sound 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-inches (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), incl, thick; ±0.010 inch (±0.25 mm) for machined slices over 1.5 inches (38 mm) up to 3 inches (76 mm) thick. The tolerance for raw blocks shall be +0.25 inch (+6.4 mm), -0.00.

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

3.5.3 Cell Count: Shall not vary more than ±10% from nominal dimensions, determined by taking an actual count of cells per linear foot (per 305 mm) measured in the transverse direction at six randomly selected locations.

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), flexibility (3.3.3), 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 initial 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 in accordance with the following:

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: 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 core.

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 core. 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 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 hours and tested immediately after removal.

4.5.2 Core Shear Strength and Shear Modulus: Shall be determined in the L and W directions, using a plate shear test in accordance with ASTM C 273 at 25 °C ± 3 (77 °F ± 5) and 82 °C ± 3 (180 °F ± 5). The test specimen shall be 0.500 inch ± 0.010 (12.70 mm ± 0.25) in thickness.

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-inches (356 mm) dimension in either the "W" or "L" direction, and the flame applied for 60 seconds ± 1.

4.5.4 Flexibility Test: A 10-inch (254 mm) square specimen of the as received thickness or a slice 0.500 inch ± 0.005 (12.70 mm ± 0.13) thick, whichever is thinner, shall be wrapped around a 4.0-inches (102-mm) diameter cylindrical mandrel at room temperature, first perpendicular and then parallel to the L direction of the core. Core material under 0.500 inch (12.70 mm) thick shall use a mandrel in the same diametric ratio as for 0.500-inch (12.70-mm) thick core material.

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, AMS 3713D, manufacturer's identification, core designation, quantity, block or lot number.

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 Identification: The core shall be packaged in small quantities and delivered under basic lot approval provided lot identification is maintained.

5.1.2 Packaging: The core shall be packaged to prevent physical damage during shipment and handling and shall be shipped flat unless contoured or formed, requiring special support are ordered. 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, FLEXIBLE HONEYCOMB, POLYAMIDE PAPER BASE, PHENOLIC COATED _____
AMS 3713D _____
CORE DESIGNATION _____
PURCHASE ORDER NUMBER _____
MANUFACTURER'S IDENTIFICATION _____
BLOCK OR LOT NUMBER _____
DATE OF MANUFACTURE _____
PART NUMBER OR SIZE (T x L x W) _____
QUANTITY _____

5.2 The 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.

5.3 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:

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 (R) symbol 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 this specification.

8.2 The flame resistance requirements of this specification meet the requirements of FAA FAR 25.853 (a) and Appendix F thereof. 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 For direct U.S. Military procurement, purchase documents should specify not less than the following:

Title, number, and date of this specification
Nominal cell count and core density required
Length, width, and thickness of blocks or slices required
Quantity of core desired
Level A packaging, if required (See 5.1.4).

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

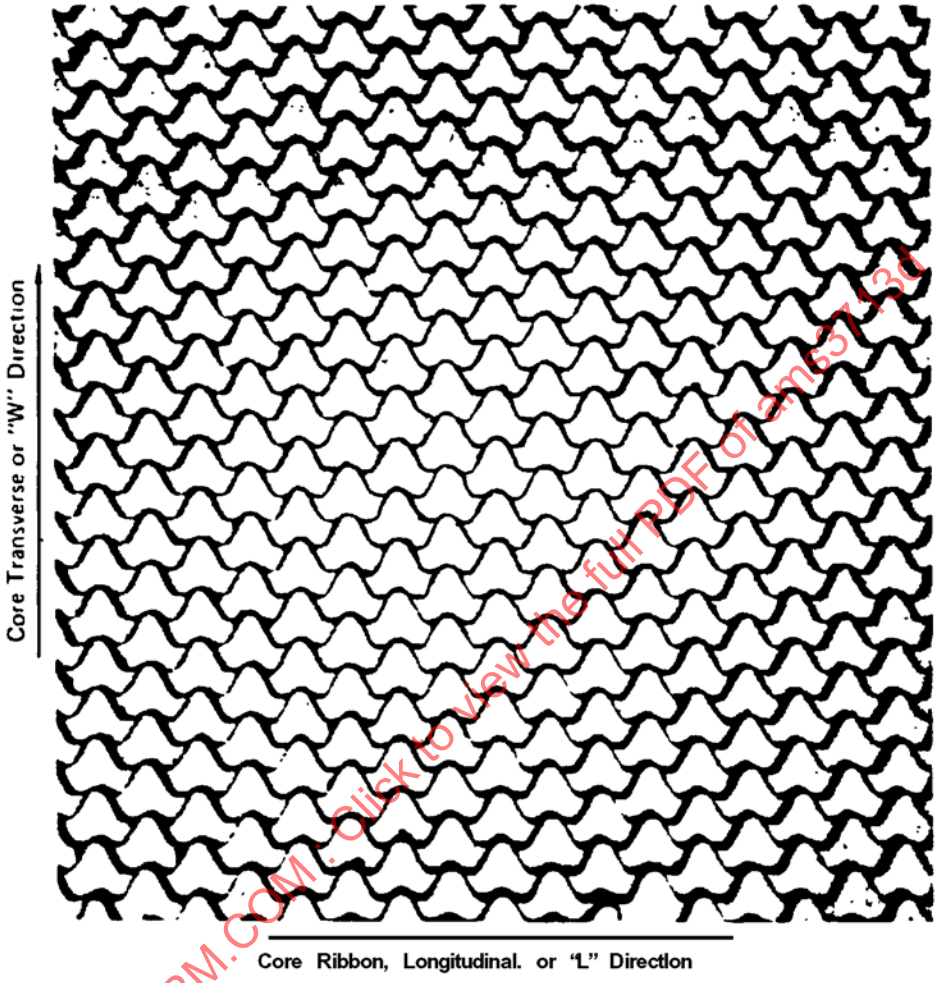

FIGURE 1 - Flexible Core Configuration