



# AEROSPACE MATERIAL SPECIFICATION

**AMS4178™****REV. H**

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Superseding AMS4178G

Core, Flexible Honeycomb, Aluminum Alloy, Treated  
for Sandwich Construction,  
5052, 350 Fahrenheit (177 Celsius)

## RATIONALE

AMS4178H results from a Five-Year Review and update of this specification with changes to update wording to prohibit unauthorized exceptions (see 4.6.1 and 8.4), relocate Definitions (see 2.3), and update Applicable Documents (see Section 2) and section headings (see 4.3.5.1 and 4.3.5.2).

### 1. SCOPE

#### 1.1 Form

This specification covers an aluminum alloy in the form of honeycomb core in a non-hexagonal, flexible cell configuration with the core being treated for increased corrosion resistance and furnished only in the expanded form (see 8.5).

#### 1.2 Application

This honeycomb core has been used typically in contoured sandwich construction for short-term exposure up to 350 °F (177 °C) or for long-term exposure up to 200 °F (93 °C), 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 that 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 issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

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## 2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 1-877-606-7323 (U.S. and Canada only) or 1-724-776-4970 (outside U.S. and Canada), [www.sae.org](http://www.sae.org).

AMS-A-81596 Aluminum Foil for Sandwich Construction

AMS-STD-595 Colors Used in Government Procurement

AS7766 Terms Used in Aerospace Metals Specifications

## 2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, [www.astm.org](http://www.astm.org).

ASTM B117 Operating Salt Spray (Fog) Apparatus

ASTM C273/C273M Shear Properties of Sandwich Core Materials

ASTM C365/C365M Flatwise Compressive Properties of Sandwich Cores

ASTM C393/C393M Core Shear Properties of Sandwich Constructions by Beam Flexure

## 2.3 Definitions

Terms used in AMS are defined in AS7766.

## 3. TECHNICAL REQUIREMENTS

### 3.1 Material

#### 3.1.1 Metal

Shall be AMS-A-81596, alloy 5052 aluminum alloy foil of the thickness specified on the part drawing or purchase order (see 8.5).

#### 3.1.2 Adhesive

The adhesive system used for node-to-node attachment shall be such that the resultant core meets the specified requirements.

### 3.2 Configuration

The core material shall consist of strips of aluminum alloy foil, treated for corrosion protection, bonded together to form cells of approximately uniform shape as shown in Figure 1.

#### 3.2.1 Designation

Core shall be designated in accordance with the following numbering system:

- Nominal density, pounds per cubic foot (kilograms per cubic meter)
- Cell count per linear foot (meter) of transverse direction
- Foil thickness in inches (micrometers)

- “N” for nonperforated, “P” for perforated, or “HP” for highly perforated (see 3.2.2)
- “F” for flexible
- “T” for treated for corrosion protection
- Adhesive, option of supplier

Example in inch/pound units: Core with a nominal density of 2.1 lb/ft<sup>3</sup> with a cell count of 40, 0.0013-inch foil thickness, nonperforated, flexible, treated, produced from AMS-A-81596 (5052) alloy, and bonded with required adhesive shall be numbered as follows:

- 2.1-40-13 NFT5052 (XXXX)

Example in SI units: Core with a nominal density of 34 kg/m<sup>3</sup> with a cell count of 131, 33-μm foil thickness, nonperforated, flexible, treated, produced from AMS-A-81596 (5052) alloy, and bonded with required adhesive shall be numbered as follows:

- 34-131-33 NFT5052 (XXXX)

### 3.2.2 Perforations

When perforation is specified, the perforations shall be of such size and location that all cells are vented at least once for each 0.250 inch (6.35 mm) of core thickness. When Type HP is specified, there shall be no fewer than 6000 perforations per square foot of foil, uniformly spaced and staggered.

### 3.3 Condition

The core shall be supplied in the expanded form.

### 3.4 Properties

Core shall conform to the following requirements; tests shall be conducted on the core supplied:

#### 3.4.1 Stabilized Flatwise Compressive Strength

Shall be as specified in Tables 1 and 2, determined in accordance with ASTM C365/C365M on five specimens 0.625 inch (15.88 mm) in thickness.

##### 3.4.1.1 At 65 to 85 °F (18 to 29 °C)

**Table 1 - Compressive strength at 65 to 85 °F (18 to 29 °C)**

**Table 1A - Compressive strength, inch/pound units**

| Core Designation        | Minimum Individual<br>Compressive Strength<br>psi |
|-------------------------|---------------------------------------------------|
| 2.1-40-13 N or PFT5052  | 157                                               |
| 3.1-40-19 N or PFT5052  | 280                                               |
| 4.1-40-25 N or PFT5052  | 420                                               |
| 5.7-40-37 N or PFT5052  | 700                                               |
| 4.3-80-13 N or PFT5052  | 455                                               |
| 6.5-80-19 N or PFT5052  | 735                                               |
| 8.0-80-25 N or PFT5052  | 1120                                              |
| 12.0-80-37 N or PFT5052 | 2160                                              |



**Table 1B - Compressive strength, SI units**

| Core Designation        | Minimum Individual<br>Compressive Strength<br>MPa |
|-------------------------|---------------------------------------------------|
| 34-131-33 N or PFT5052  | 1.08                                              |
| 50-131-48 N or PFT5052  | 1.93                                              |
| 66-131-64 N or PFT5052  | 2.90                                              |
| 91-131-94 N or PFT5052  | 4.83                                              |
| 69-262-33 N or PFT5052  | 3.14                                              |
| 104-262-48 N or PFT5052 | 5.07                                              |
| 128-262-64 N or PFT5052 | 7.72                                              |
| 192-262-94 N or PFT5052 | 14.9                                              |

3.4.1.2 At 350 °F (177 °C)

**Table 2 - Compressive strength at 350 °F (177 °C)****Table 2A - Compressive strength, inch/pound units (see 8.2)**

| Core Designation        | Minimum Individual<br>Compressive Strength<br>psi |
|-------------------------|---------------------------------------------------|
| 2.1-40-13 N or PFT5052  | 102                                               |
| 3.1-40-19 N or PFT5052  | 182                                               |
| 4.1-40-25 N or PFT5052  | 274                                               |
| 5.7-40-37 N or PFT5052  | 455                                               |
| 4.3-80-13 N or PFT5052  | 296                                               |
| 6.5-80-19 N or PFT5052  | 478                                               |
| 8.0-80-25 N or PFT5052  | 730                                               |
| 12.0-80-37 N or PFT5052 | 1700                                              |

**Table 2B - Compressive strength, SI units (see 8.2)**

| Core Designation        | Minimum Individual<br>Compressive Strength<br>MPa |
|-------------------------|---------------------------------------------------|
| 34-131-33 N or PFT5052  | 0.70                                              |
| 50-131-48 N or PFT5052  | 1.25                                              |
| 66-131-64 N or PFT5052  | 1.89                                              |
| 91-131-94 N or PFT5052  | 3.14                                              |
| 69-262-33 N or PFT5052  | 2.04                                              |
| 104-262-48 N or PFT5052 | 3.30                                              |
| 128-262-64 N or PFT5052 | 5.03                                              |
| 192-262-94 N or PFT5052 | 11.7                                              |

**3.4.2 Shear Strength**

Shall be as specified in Tables 3 and 4. For core with nominal density up to and including 8.0 lb/ft<sup>3</sup>, shear strength shall be determined in accordance with ASTM C273/C73M using five specimens 0.625 inch (15.88 mm) in thickness. For core with a nominal density greater than 8.0 lb/ft<sup>3</sup>, shear strength shall be determined in accordance with ASTM C393/C393M using five specimens 0.625 inch (15.88 mm) in thickness.