

# **Specification for TAX honeycomb core material of aramid paper**

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Yantai Taxent New Material Co., LTD.

## Foreword

This standard is prepared with reference to the rules given in GB/T1.1-2020 "Standardization Work Guidelines Part 1:Structure and Preparation of Standards".

This standard is proposed by Yantai Taxent New Material Co., LTD.

This standard is drafted by Yantai Taxent New Material Co., LTD.

The main draftsman of this standard: Jiang Qu.

This standard shall be valid for three years from the date of promulgation and shall be reviewed at expiration.

The company has formulated this enterprise specification as the basis for the company to organize production and sales.

# Specification for honeycomb core material of aramid paper

## 1 Scope

This specification specifies the requirements, quality assurance, delivery preparation and instructions of intermediate aramid paper honeycomb core materials.

This specification is applicable to a variety of metal materials or composite materials bonded sandwich structure with intermediate aramid paper honeycomb core (hereinafter referred to as the core), the use of the core temperature range of  $-55^{\circ}\text{C} \sim 180^{\circ}\text{C}$ .

## 2 Normative reference documents

The terms in the following documents become terms of this Standard by reference to this Standard. For dated references, all subsequent amendments (excluding errata) or revisions shall not apply to this Specification. However, parties advocating the use of this Specification shall explore the possibility of using the most recent version, and the most recent version of any referenced document without a date or edition shall apply to this specification.

GB/T 1453-2005 Test method for flat compression performance of sandwich structures or core materials

GB/T 1455-2005 Test method for shear properties of sandwich structures or core materials

GB/T 1464-2005 Sandwich structure or core material density test method

GB/T 5597-1999 Test method for microwave complex dielectric constant of solid dielectrics

GJB 179 Counting Sampling Inspection Procedures and Tables

GJB 1874-1994 Specification for aramid paper-based honeycomb core materials for aircraft structures

HB 5469-2014 Test method for combustion of non-metallic materials in civil aircraft cabins

HB 5470-2014 Requirements for combustion performance of non-metallic materials in civil aircraft cabins

## 3 Term and definition

The following terms and definitions apply to this specification.

### 3.1 Adhesive node

The bonding surface between honeycomb holes (shown by N in Figure 1).

### 3.2 Cell size

The sides of a regular hexagon (shown by A in Figure 1).

### 3.3 Transverse direction

The direction of the honeycomb cell expansion (shown by W in Figure 1).

### 3.4 Ribbon direction

Perpendicular to the direction of the honeycomb cell expansion (shown by L in Figure 1).

### 3.5 Thickness

The distance between the head face to the end face of the honeycomb core material (shown by T in Figure 1).

### 3.6 Internal tangential diameter

The diameter of the inner tangent circle of the honeycomb hole (shown by D in Figure 1).

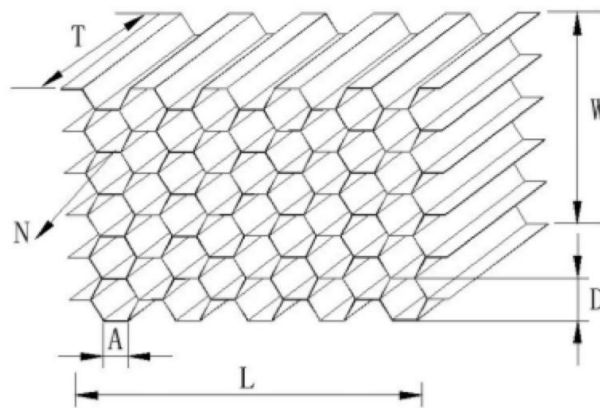


Figure 1 Honeycomb core schematic diagram

### 3.7 White honeycomb block

Honeycomb pellets unimpregnated with resin.

### 3.8 Honeycomb cured block

Honeycomb pellets impregnated with resin and cured.

### 3.9 Honeycomb slices cut into pieces

The honeycomb solidified block is cut into thin blocks of a certain thickness by a slicing machine.

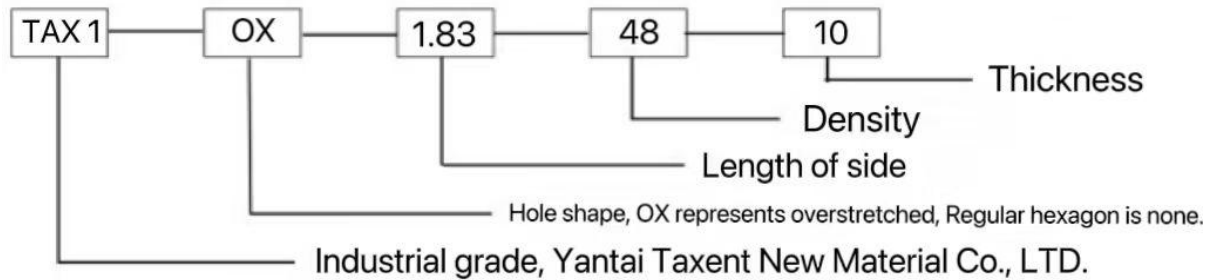
## 4 Core material classification

### 4.1 Core material categories

Core materials are divided into two categories: Tax 1 and Tax 2 corresponding to industrial grade and aviation grade respectively.

### 4.2 Core material code.

The core material shall be denoted by the following code:



Example: TAX 1-OX-1.83-48-10 indicates that the products produced by Yantai Taxent New Material Co., LTD. is industrial grade, 1.83mm overstretched honeycomb sheet, and the thickness is 10mm.

#### 4.3 Core material specifications.

See Table 1 for conventional core material specifications. Other specifications shall be agreed upon by both parties.

Table 1 Tax 1, Tax 2 core material specifications

Core material specifications	
Cell diameter (cell side length), mm	Nominal density, kg/m <sup>3</sup>
3.2(1.83)	29-144
4.5(2.5)	29-144
4.8(2.75)	29-96
6.4(3.67)	24-80
8.0(4.5)	24-64
9.6(5.5)	24-64
4.8-OX	29-144

#### 4.4 Core material dimensions and tolerances

It should comply with the provisions of Table 2, or be agreed upon by both parties.

Table 2 Honeycomb core material dimensions and tolerances

Project	Tolerance range
Length, Width	Positive tolerance
Cutting thickness	(1-50)mm, tolerance $\pm 0.15$ mm
	(50-100)mm, tolerance $\pm 0.25$ mm
	Above 100mm, tolerance $\pm 1.6$ mm
Standard curing block size:	(L)1300mm $\times$ (W)2600mm $\times$ (T)880mm/460mm
	(L)1220mm $\times$ (W)2440mm $\times$ (T)880mm/460mm
	(L)1050mm $\times$ (W)2700mm $\times$ (T)880mm/460mm (OX)
	(L)1500mm $\times$ (W)3200mm $\times$ (T)880mm/460mm

#### 4.5 Combustion performance and hazardous substance limits

The performance requirements of the 60-second vertical burning test of the core material sample comply with the requirements of the 60-second vertical burning test of Part 1 (a)(1)(i) of CCAR-25-R4 Appendix F, see Table 4 (Civil Aviation Administration of China Test Center Report No.:TC-ZR-2014033). At the same time, in accordance with TB/T 3237, DIN 5510. Tested according to TB/T 3139, EN45545 and other standards and meet the requirements of relevant regulations.

Table 3 The results of Combustion performance

Pilot projects	CCAR-25-R4 requirement	Tax Core material sample test results
Average flame time after removing the fire source.	$\leq 15s$	0s
Average burn length	$\leq 152mm$	49mm
Average drip flame time	$\leq 3s$	0s

Note: The specific test data in all test reports are only for the test samples and are not binding on the company's standards.

## 5 Requirement

### 5.1 Raw material

5.1.1 The materials composed of honeycomb core materials should comply the corresponding material specifications and the provisions of this Specification. If the materials have no corresponding provisions or are not specifically described in this Specification, they shall be approved by purchaser.

5.1.2 The paper is non-porous aramid (polyisophenyl-isophenylenediamine) fiber paper, and it is allowed to use imported aramid paper or domestic aramid paper.

5.1.3 The core adhesive for joint bonding and the impregnated curing resin system shall be mildew-resistant and non-corrosive to metals.

### 5.2 Appearance and defect

5.2.1 The hole shape of honeycomb core material should be approximately hexagonal, overstretched or specified shape. Honeycomb core material should have uniform appearance, no obvious excessive accumulation of resin, lean glue, glue layer separation, sticky, foaming and foreign matter.

5.2.2 The honeycomb core material is allowed to have one hole overlap defect every 300mm distance in the W direction (transverse). Each 300mm\*300mm range allows two node degumming defects with spacing not less than 150mm. Each 300mm\*300mm range is allowed to have a depth of no more than 1mm hole fracture type defect. Allow honeycomb core material to have a certain color difference. After the sheet cutting, there can be fiber burr on the honeycomb surface.

### 5.3 Physical properties

### 5.3.1 Size

The honeycomb core material shall be supplied in a state after tensile shaping and shall be within  $\pm 5\%$  of the nominal size.

### 5.3.2 Density

The density of the honeycomb core material shall comply with the provisions of Table 1 and the deviation of its nominal density shall not exceed 10%.

### 5.3.3 Flammability

The combustion performance of the honeycomb core material shall comply the requirements of EN45545, the 60-second vertical burning test of Part 1 (a) of CCAR-25-R Appendix F and if other relevant provisions are to be met, it shall be stated in the order contract. See Table 3.

### 5.3.4 Dielectric properties

The dielectric constant of the core material should not be greater than 1.5, and if there are special requirements for electrical properties, it should be specified in the order contract.

### 5.3.5 Water migration

The number of water migrations in the core cell does not exceed 6 consecutive holes.

## 5.4 Mechanical property

### 5.4.1 Mechanical properties at room temperature of industrial grade

The plane compression and shear properties (ribbon and transverse) of the core material shall comply the performance requirements of Table 4.

### 5.4.2 Mechanical properties at high temperature of industrial grade

When the core material is tested at 180°C, its compression and shear properties should maintain at least 65% of the minimum values in Table 4.

### 5.4.3 Mechanical properties at low temperature of industrial grade

When the core material is tested at -55°C, its compression performance should maintain at least 80% of the minimum value in Table 4.

### 5.4.4 Wet mechanical properties of industrial grade

The compression properties of the core material in the wet condition state should maintain at least 90% of the minimum values in Table 4.

**Table 4 Mechanical properties of industrial grade aramid paper honeycomb**

Unit: MPa

Cellular Type	Density Kg/m <sup>3</sup>	Bare honey compressive strength		L direction shear performance		W direction shear performance	
		ave	min	strength	modulus	strength	modulus

				ave	min	ave	ave	min	ave
TAX1-1.83	29	0.57	0.50	0.48	0.36	24	0.25	0.20	13
	48	1.94	1.56	1.26	0.91	42	0.64	0.47	23
	56	2.53	1.96	1.52	1.24	43	0.79	0.58	25
	64	3.35	2.29	1.72	1.40	56	0.94	0.70	32
	80	4.60	3.52	2.15	1.73	72	1.39	0.83	40
	96	6.40	4.59	2.33	2.04	83	1.56	0.99	46
	128	11.3	8.39	3.07	2.56	103	1.73	1.21	69
TAX1-2.75	32	0.80	0.61	0.62	0.46	32	0.34	0.24	16
	48	2.00	1.58	1.21	0.91	42	0.64	0.45	26
	56	2.45	1.86	1.43	1.26	47	0.80	0.66	30
	64	3.25	2.20	1.48	1.39	50	1.06	0.73	34
	72	4.19	3.24	2.31	1.48	58	1.30	0.71	39
	128	8.67	8.00	3.79	2.72	80	2.20	1.34	60
TAX1-OX-2.75	29	0.59	0.48	0.27	0.16	12	0.30	0.20	17
	40	1.40	1.17	0.60	0.39	19	0.71	0.33	25
	48	2.06	1.64	0.76	0.47	23	0.90	0.51	42
	64	3.39	2.40	0.95	0.67	27	1.02	0.81	59
TAX1-3.67	32	0.80	0.69	0.59	0.43	25	0.41	0.17	17

#### 5.4.5 Mechanical properties at room temperature of aviation grade

The plane compression and shear properties (ribbon and transverse) of the core material shall comply the performance requirements of Table 5.

#### 5.4.6 Mechanical properties at high temperature of aviation grade

When the core material is tested at 180°C, its compression and shear properties should maintain at least 65% of the minimum values in Table 5.

#### 5.4.7 Mechanical properties at low temperature of aviation grade

When the core material is tested at -55°C, its compression performance should maintain at least 80% of the minimum value in Table 5.

#### 5.4.8 Wet mechanical properties of aviation grade

The compression properties of the core material in the wet condition state should maintain at least 90% of the minimum values in Table 5.

**Table 5 Mechanical properties of aviation grade aramid paper honeycomb**

Unit: MPa

Cellular Type	Density Kg/m <sup>3</sup>	Bare honey compressive strength		L direction shear performance			W direction shear performance		
		ave	min	strength		modulus	strength		modulus
				ave	min	ave	ave	min	ave



TAX2-1.83	29	0.59	0.52	0.52	0.39	26	0.31	0.22	13
	48	2.01	1.59	1.28	0.97	44	0.69	0.54	25
	56	2.57	2.01	1.55	1.28	50	0.83	0.62	28
	64	3.44	2.47	1.77	1.49	56	0.97	0.74	32
	80	4.80	3.74	2.25	1.84	72	1.22	0.98	39
	96	6.47	4.90	2.49	2.22	90	1.60	1.19	49
	128	11.60	8.11	2.95	2.77	110	1.81	1.38	70
	144	13.31	10.03	3.23	2.95	123	2.05	1.71	77
TAX2-2.75	32	0.86	0.66	0.62	0.51	32	0.45	0.28	16
	48	2.05	1.61	1.22	0.97	42	0.71	0.48	25
	56	2.45	1.86	1.43	1.26	47	0.80	0.66	32
	64	3.46	2.44	1.63	1.50	52	1.09	0.76	36
	72	4.27	3.48	2.40	1.66	61	1.39	0.83	40
	128	8.72	8.12	3.86	2.85	88	2.26	1.49	65
TAX2-0X-2.75	29	0.61	0.50	0.31	0.20	14	0.38	0.29	22
	40	1.48	1.22	0.61	0.44	20	0.78	0.44	34
	48	2.08	1.74	0.77	0.53	23	0.92	0.55	42
	64	3.59	2.49	0.97	0.72	29	1.04	0.83	55
TAX2-3.67	32	0.89	0.77	0.64	0.47	29	0.45	0.24	59

## 6 Experimental method

### 6.1 Exterior and defect

Inspect visually and measure with a measuring tool.

### 6.2 Physical properties

#### 6.2.1 Size

Measure the distance between 10 continuous core cells in the W direction with a measuring tool, accurate to 0.01mm, at least five random measurements and take the average value. The hole side length of the core material should be  $\sqrt{3}/30$  of the actual measured size.

#### 6.2.2 Density

According to GB/T 1464-2005 test method.

#### 6.2.3 Combustion performance

According to EN45545 test method.

#### 6.2.4 Dielectric properties

According to GB/T 5597-1999 test method.

#### 6.2.5 Water migration

The sample size should be greater than 76mm\*76mm, and the thickness should be (12.7±0.2)

mm. Take two plexiglass plates, drill a through hole in the center of one of them, and the hole area is slightly smaller than the area of a single hole. The honeycomb core material is bonded to the middle of the plexiglass plate with transparent resin, and the holes are aligned with the honeycomb holes. The glass tube connected with water injection above the hole is  $(914\pm 1)$  mm from the liquid surface to the sample height. After holding the liquid level for 24h, the sample was taken to record the number of pores for water migration.

## 6.3 Mechanical property

### 6.3.1 Plane compression property

#### 6.3.1.1 Plane compression property at room temperature

According to GB/T 1453-2005 test method.

#### 6.3.1.2 Plane compression property at high temperature

The sample prepared in accordance with 5.3.1.1 was heated to  $180\pm 5^{\circ}\text{C}$  for 15 minutes and tested at this temperature.

#### 6.3.1.3 Plane compression property at low temperature

The sample prepared in accordance with 5.3.1.1 was cooled to  $-55^{\circ}\text{C}$  for 15 minutes and tested at this temperature.

#### 6.3.1.4 Wet plane compression performance

The sample prepared in accordance with 5.3.1.1 was soaked in distilled water at  $23\pm 2^{\circ}\text{C}$  for 24 hours and tested immediately after removal.

### 6.3.2 Shear property

#### 6.3.2.1 Shear property at normal temperature

The sample was prepared and tested according to GB/T1455-2005.

#### 6.3.2.2 Shear property at high temperature

The sample prepared according to 5.3.2.1 was heated to  $180\pm 5^{\circ}\text{C}$  for 15 minutes and tested at this temperature.

## 6.4 Combustion performance

Carry out according to CCAR-25-R4 Appendix F Part I (b) (4) 60-second vertical combustion test method.

## 7 Testing regulations

### 7.1 Inspection classification

The classification of tests specified in this Code is as follows:

a) type tests;

b) routine tests.

## 7.2 Type inspection

### 7.2.1 General rule

Type inspection shall be carried out under any of the following circumstances:

- a) Transfer factory production or product identification and shaping;
- b) Changes in raw materials or production processes;
- c) Suspension of production for more than one year or there is no a), b) situation occurs within three years.

### 7.2.2 Inspection item

Type inspection items are shown in Table 3.

Table 3 Inspection item

No.	Inspection item		Type test	Routine test	Requirement chapter number	Experimental method chapter number
1	Appearance and defect		●	●	5.2	6.1
2	Physical properties	Size	●	●	5.3.1	6.2.1
3		Density	●	●	5.3.2	6.2.2
4		Flammability	●	○	5.3.3	6.2.3
5		Dielectric properties	●	○	5.3.4	6.2.4
6		Water migration	●	○	5.3.5	6.2.5
7		Combustion performance	●	○	5.5	6.4
8	Mechanical property	Plane compression property at room temperature	●	●	5.4	6.3.1.1
9		Plane compression property at high temperature	●	○	5.4	6.3.1.2
10		Plane compression property at low temperature	●	○	5.4	6.3.1.3
11		Wet plane compression performance	●	○	5.4	6.3.1.4
12		“L” Shear property at normal temperature	●	●	5.4	6.3.2.1
13		“W” Shear property at normal temperature	●	●	5.4	6.3.2.1

14		“L”Shear property at high temperature	●	○	5.4	6.3.2.2
15		“W”Shear property at high temperature	●	○	5.4	6.3.2.2
Note: ● is required inspection item; ○ is unrequired inspection item.						

### 7.2.3 Number of samples

The core material should be taken with a height of 12mm and an area less than 1.5 m<sup>2</sup>.

### 7.2.4 Conformity criteria

All the test results conform to the requirements of this code.

## 7.3 Routine Inspection

### 7.3.1 Inspection items

The routine inspection items are shown in Table 3.

### 7.3.2 Sampling

#### 7.3.2.1 Batch Group Rules

A batch group is produced by the same batch of raw materials and the same process of continuous production.

#### 7.3.2.2 Sampling Scheme

Unless otherwise specified in the agreement or contract, the test sample shall be randomly selected in any area not less than 50mm from the edge of the core material; According to the inspection level of GJB 179, the acceptable quality level (AQL value) 2.5 determines the sampling quantity of the core material and makes a judgment on the acceptance or rejection of the inspection lot.

### 7.3.3 Decision Rules

#### 7.3.3.1 Qualification Determination

All the test results meet the requirements of this code.

#### 7.3.3.2 Failure Detection

The result of reinspection still does not meet the requirements of this code.

#### 7.3.3.3 Recheck Rules

When there are non-conforming items in the test results, double samples should be taken from the original batch to retest the non-conforming items.

## 8 Delivery preparation

## 8.1 Packaging

8.1.1 The core material shall be placed horizontally in a waterproof wood, cardboard or plywood packing box. The core material layer should be isolated by neutral kraft paper or plastic film without migration pollution.

8.1.2 The test report, certificate and packing list shall be attached in the packing box.

## 8.2 Flags

8.2.1 Each core material shall be labeled with the following information:

- a) Product name and code,
- b) The code number,
- c) Production batch,
- d) Production unit, production date and storage period.

8.2.2 There should be signs such as "Handle with care" and "Keep away from moisture" on the packing cases.

## 8.3 Transportation

Transport as non-dangerous goods, the transport should be moisture-proof measures and avoid bending, heavy pressure.

## 8.4 Storage

8.4.1 The core material should be stored in a clean, ventilated and pollution-free environment with a temperature below 30 ° C and a relative humidity below 75%. The core material should be flat, avoid bending or heavy pressure, and prevent oil, acid, alkali, sun and fire.

8.4.2 The storage period shall be two years from the date of production. If the storage period exceeds two years, it can be rechecked according to the requirements of this specification before use, and the qualified ones can still be used.

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