GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

ICS 83.120

CCS Q 23

GB/T 1457-2022

Replacing GB/T 1457-2005

Test Method for Climbing Drum Peel Strength of Sandwich Constructions

夹层结构滚筒剥离强度试验方法

Issued on: April 15, 2022 **Implemented on: November 1, 2022**

Issued by: State Administration for Market Regulation;

Standardization Administration of the People's Republic of China.

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Test Method for Climbing Drum Peel Strength of Sandwich Constructions

1 Scope

This document specifies the test principle, test equipment, specimens, test conditions and state adjustment, test procedures, test results and processing, and test report of climbing drum peel strength of sandwich constructions.

This document is applicable to the determination of climbing drum peel strength of flexible faceplate sandwich constructions, and the determination of climbing drum peel strength of other assemblies with optional adhesives.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in this text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 1446 Fiber-reinforced Plastics Composites - The Generals for Determination of Properties

GB/T 3961 Terms for Fiber Reinforced Plastics

3 Terms and Definitions

What is defined in GB/T 3961, and the following terms and definitions are applicable to this document.

3.1 Climbing Drum Peel Strength

Climbing drum peel strength refers to the moment of resistance to peeling per unit breadth when the faceplate is separated from the core.

3.2 Nominal Climbing Drum Peel Strength

Nominal climbing drum peel strength refers to the climbing drum peel strength without compensating for faceplate resistance force load.

3.3 Resistance Force

Resistance force refers to the load required to overcome the bending of the faceplate and the

Figure 2 -- Shape and Size of Specimen

6.2 For the orthotropic sandwich constructions, the specimens shall be divided into two types: longitudinal and transverse.

6.3 For wet-formed sandwich construction products, the specimens shall be divided into two types: peeling the upper faceplate and peeling the lower faceplate.

6.4 When the specimen thickness is less than 10 mm or when the bending stiffness of the sandwich construction specimen is relatively small, on the non-peeling faceplate, stick a reinforcing material, for example, wood, with a thickness of greater than 10 mm, as it is shown in Figure 3. The bonding curing temperature shall be room temperature or at least 30 °C lower than the bonding curing temperature of the sandwich construction.

6.5 The non-peeling faceplates and cores at both ends of the specimen shall respectively be cut by 30 mm, leaving the peeled faceplates (see Figure 2 and Figure 3) for connection with the drum and the clamp (see Figure 1).

6.6 For the faceplate specimen used for the resistance force test, the material, thickness and breadth shall be the same as those of the peeled faceplate. Or after the peeling test, determine them in accordance with the condition of peeling. When the faceplate with the adhesive layer is separated from the sandwich construction, the faceplate with the adhesive layer shall be cut from the sandwich construction for the resistance force test.

NOTE 1: the resistance force test adopts the ascending-type drum to test a single faceplate, so as to obtain the resistance force load required to overcome the bending of the faceplate and the rise of the drum.

NOTE 2: the resistance force load of partial sandwich construction peeling (for example, low-density core sandwich) is not only from the faceplate and the drum, but also from the adhesive layer and other factors.

6.7 The quantity of the specimens shall comply with the stipulations of GB/T 1446.

7 Test Conditions and State Adjustment

Comply with the stipulations of GB/T 1446.

8 Test Procedures

8.1 The appearance inspection of the specimens shall comply with the stipulations of GB/T 1446.

8.2 Number the qualified specimens; measure the breadth at any 3 points of the specimens and take the arithmetic mean; the thickness of the peeled faceplate shall take the nominal thickness of the faceplate, or measure the thickness at 10 points of the peeled faceplate of the same batch of specimens and take the arithmetic mean; the measurement accuracy shall comply with the stipulations of GB/T 1446. For the sandwich construction specimens with a lattice core, record the number of lattice walls in the breadth direction.

8.3 Respectively connect both ends of the peeled faceplate of the specimen to the upper clamp and the drum, so that the axis of the specimen is perpendicular to the axis of the drum. Then, connect the upper clamp to the testing machine and adjust the zero-load point of the testing machine; connect the lower clamp to the testing machine.

8.4 In accordance with the specified loading speed, carry out the test. The loading speed is generally 20 mm/min ~ 30 mm/min. During the arbitration test, the loading speed is 25 mm/min. Select one of the following methods to record the peel load:

a) Use an automatic recording device to record the load - peeling distance curve;

b) When there is no automatic recording device, about 5 s after the start of applying the load, at a certain time interval, read and record the load; the number of readings shall not be less than 10.

8.5 When the specimen is peeled to 150 mm ~ 180 mm, it may be unloaded.

8.6 In accordance with the following conditions, determine whether the resistance force test shall be carried out:

a) If there is no failure, for example, delamination or breakage, on the faceplate after peeling, then, choose a blank faceplate (or a faceplate with an adhesive layer) and carry out the resistance force test in accordance with the steps 8.3 ~ 8.5;

b) If there is a failure, for example, delamination or breakage, on the faceplate after peeling, or the faceplate compensation is not considered, no resistance force test is required, and the test shall be terminated.

8.7 Record the failure patterns. Table 1 manifests the designation of typical failure patterns. The failure patterns not listed in the table shall be described and recorded in appropriate words.

9.2 If there is resistance force test, in accordance with the value-taking method of average peel load in 9.1, obtain the average resistance force load.

9.3 The average climbing drum peel strength shall be calculated in accordance with Formula (1):

$$M = \frac{(P_b - P_0)(D + t_b - d - t_f)}{2b} \quad \cdots\cdots (1)$$

Where,

M---the average climbing drum peel strength, expressed in [(N • mm)/mm];

P_b---the average peel load, expressed in (N);

P_0---the resistance force load, expressed in (N);

D---the diameter of the drum flange, expressed in (mm);

d---the diameter of the drum, expressed in (mm);

t_f---the thickness of the peeled faceplate, expressed in (mm);

t_b---the thickness of the loading belt, expressed in (mm);

b---the breadth of the specimen, expressed in (mm).

9.4 The minimum climbing drum peel strength shall be calculated in accordance with Formula (2):

$$M_m = \frac{(P_m - P_0)(D + t_b - d - t_f)}{2b} \quad \cdots\cdots (2)$$

Where,

M_m---the minimum climbing drum peel strength, expressed in [(N • mm)/mm];

P_m---the minimum peel load, expressed in (N).

9.5 If the resistance force test is not performed, in accordance with Formula (3), calculate the average nominal climbing drum peel strength:

$$M_n = \frac{P_b(D + t_b - d - t_f) - W(D + t_b)}{2b} \quad \cdots\cdots (3)$$

Where,

M_n---the average nominal climbing drum peel strength, expressed in [(N • mm)/mm];

W---the dead weight of the drum, expressed in (N).

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