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Aluminum-plastic composite panel for curtain wall

建筑幕墙用铝塑复合板

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Aluminum-plastic composite panel for curtain wall

1 Scope

This standard specifies the terms and definitions, classifications, specifications and markings, raw materials, requirements, test methods, inspection rules, signs, packaging, transportation, storage and accompanying documents for aluminum-plastic composite panels (hereinafter referred to as “panels for curtain wall”) for building curtain walls.

This standard is applicable to aluminum-plastic composite panels for building curtain walls. For aluminum-plastic composite panels for other purposes, they may make reference to this standard.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this standard.

GB/T 191 Packaging - Pictorial marking for handling of goods

GB/T 1457 Test method for climbing drum peel strength of sandwich constructions

GB/T 1634.2 Plastics - Determination of temperature of deflection under load - Part 2: Plastics, ebonite and long-fiber-reinforced composites

GB/T 1720 Method of test for adhesion of paint films

GB/T 1732 Determination of impact resistance of film

GB/T 1740 Determination of resistance to heat and humidity of paint films

GB/T 1766 Paints and varnishes - Rating schemes of degradation of coats

GB/T 1771 Paints and varnishes - Determination of resistance to neutral salt spray (fog)

GB/T 2918 Plastics - Standard atmospheres for conditioning and testing

GB/T 3880.2 Wrought aluminum and aluminum alloy plates，sheets and

3.2

Aluminum-plastic composite panel for curtain wall

The aluminum-plastic composite panel which uses the flame-retardancy-treated plastic as the core material, is used as the materials for curtain wall.

3.3

Wave

The non-decorative wavy lines or concave-convex on the decorative surface of the product.

3.4

Spot

Local defects in the decorative surface of the product.

3.5

Bubble

Local bulging of the aluminum or decorative finish of the product.

3.6

Adhesive film

A composite film formed by co-extruding a functional polymer material (referred to as a binder) and polyethylene in a production process of an aluminum-plastic composite panel, which is used for bonding between a core material and an aluminum material.

4 Classification, specifications and marking

4.1 Classification

It is divided as follows based on combustion performance:

- Flame-retardant type, codenamed FR;

- High-flame-retardant type, codenamed HFR.

4.2 Specifications

The common specifications of panels for curtain wall are as shown in Table 1. Other specifications may be agreed between the supplier and the purchaser.

7.3 Aluminum thickness

Peel the aluminum material off from the specimen as a test piece. Use the measuring instrument which has a minimum division value of 0.01 mm to measure the thickness of the aluminum (excluding the thickness of the coatings, etc.). The measuring point contains at least 5 places: four corners and the center. Use the arithmetic mean and minimum value of all the measured values as the test results.

7.4 Appearance

In the natural light that is not exposed to direct sunlight, erect the panels along the same production direction side by side to form one plane, the angle between the panel and the horizontal plane is 70° ± 10°, perform visual inspection at 3 m away from the center of the formed panel plane. For different defects which are visually observed, use the straight ruler which has a minimum division value of 1 mm to measure its maximum dimension. The personnel who takes and arranges the specimen shall not participate in the visual test.

When there is any dispute about the result of visually-observed color difference, it shall follow the provisions of GB/T 11942 to perform arbitration test of color difference. During the test, it shall maintain the consistency of the production direction of the test piece.

7.5 Allowable deviation of dimension

7.5.1 Length and width

Use a steel tape which has the minimum division value of 1 mm to measure the length or width. Use the maximum difference between all measured values and nominal values of length or width as the test result.

7.5.2 Thickness

Use a measuring instrument which has a minimum division value of 0.01 mm to measure the thickness at least 20 mm inward from the edge of the panel. The measuring point includes at least the four corners and the midpoints of four edges. Use the maximum difference between all measured values and the nominal value as the test result.

7.5.3 Diagonal difference

Use a steel tape which has the minimum division value of 1 mm to measure and calculate the difference between the lengths of the two diagonals on the same panel. Use the maximum value of all the measured differences as the test result.

7.5.4 Edge straightness

Place the panel flatly on the platform, use the side of the 1000 mm long steel ruler to lean against the edge of the panel. Then use the feeler gauge to measure the maximum gap between the edge of the panel and the side of the steel ruler. Use the maximum value of all the measured values on each side as the test result.

7.5.5 Warpage

Place the concave surface of the panel upwards on the horizontal platform flatly, use a 1000 long steel ruler to stand laterally on the panel. Then use the steel ruler which has the minimum division value of 0.5 mm to measure the maximum gap height between the steel ruler and the panel. Use the maximum value of all the measured values is used as the test result.

7.6 Coating performance

7.6.1 Coating thickness

It is performed in accordance with the provisions of GB/T 4957. The measuring point shall include at least 5 places: four corners and center. Use the minimum and arithmetic mean of all the measured values as the test results.

7.6.2 Surface pencil hardness

It is performed in accordance with the provisions of GB/T 6739. After the test, the surface of the test piece shall be free of furrows or scratches. Take the minimum of all measured values as the test result.

7.6.3 Gloss deviation

It is performed in accordance with the provisions of GB/T 9754. The measuring point shall include at least 5 places: four corners and center. During the test, it shall maintain the consistency of the production direction of the test piece. Use the difference between the maximum value and the minimum value of all measured values as the test result.

7.6.4 Flexibility

Use the coated aluminum material which is removed from the specimen as a test piece, leaving a clamping segment of 13 mm ~ 20 mm. Bend the aluminum material with the coated plane outwards for more than 90°, use the vise which is equipped with a smooth jaw jacket to make the aluminum material itself attached closely to 180°, which is called 0T. Use a 5x ~ 10x magnifying glass to observe the coating to see whether there is cracking or peeling off. If so, continue attach closely to the previous wrapping portion of the aluminum material to bend another 180°, which is called 1T. Observe the coating again to see whether there is cracking or peeling off. This is done 2T, 3T... until the

Where:

A - Resistance to abrasion, in liters per microns (L/μm);

V - Total amount of sand used, in liters (L);

T - Thickness of the coating in a circular region, in microns (μm).

Take the arithmetic mean of all the test values of the resistance to abrasion as the test result.

7.6.8 Resistance to hydrochloric acid

Use Vaseline to bond one end of the glass tube which has an inner diameter of not less than 50 mm to the center portion of the coating surface under test, so that it is tightly contacted. Pour in the hydrochloric acid solution which has a volume fraction of 5%, so that the reagent liquid's level is 20 mm ± 5 mm. Cover the upper end of the glass tube. Let it be standing for 24 h, remove the test piece, wash it clean and wipe it dry. The region under visual observation shall be free from abnormalities such as discoloration, bulging, bubbling, powdering, etc. Use the worst performance of all the test pieces as the test result.

7.6.9 Resistance to oil

In accordance with the test method of 7.6.8, the chemical reagent is 20# engine oil, use the worst performance of all the test pieces as the test result.

7.6.10 Resistance to alkali

In accordance with the test method of 7.6.8, the chemical reagent is the sodium hydroxide solution which has a mass fraction of 5%. Make visual observation to see whether the coating has abnormal phenomena such as bubbling, bulging, powdering, etc., use the worst performance of all the test pieces as the test results of appearance. In accordance with the provisions of GB/T 11942, measure the color difference value of the test piece before and after the alkali resistance test in the same direction at the same position. Take the maximum value of all the test values of color difference as the test result of color difference.

7.6.11 Resistance to nitric acid

Contain 100 mL of analytical pure nitric acid into a 200 mL wide-mouth bottle, cover the test piece (coating surface downwards) over the bottle mouth for 30 min, take off the test piece, rinse it in flowing water for 1 min, use gauze to absorb the moisture from the surface, place it for 1 h. Make visual observation to see whether it has abnormal phenomena such as bubbling, bulging, and chalking. Use the worst performance of all the test pieces as the test result. In accordance with the provisions of GB/T 11942, measure the color difference value of the test piece before and after the nitric acid resistance test in the same

direction at the same position, take the maximum value of all the test values of color difference as the test result of color difference.

7.6.12 Resistance to solvent

Wrap a four-layer medical gauze over a flexible wiper. After it is saturated with butanone solvent, use the pressure force of 1000 g ± 10 g to wipe the same place of the coating of the test piece back and forth 200 times. Make visual observation to see whether the wiped position is bottom exposed (that is, the inner coating or aluminum is exposed). The wiping travel is 100 mm, the frequency is 100 times/min, the area of contact between the wipe head and the test piece is 2 cm^2; in the process of wiping, keep the gauze be infiltrated with methyl ketone. Use the worst performance of all the test pieces as the test result.

7.6.13 Resistance to stain

It is performed in accordance with the provisions of 5.1 ~ 5.4 of GB/T 9780-2013. Take the arithmetic mean of the test values of all the test pieces as the test result.

7.6.14 Resistance to artificial weathering aging

The time of aging test is 4000 h. It is performed in accordance with the method A of GB/T 16259-2008, wherein the black standard temperature is 65 °C ± 3 °C, the relative humidity is 65% ± 5%. After the test, make visual observation to see whether the test piece is glue-opened. In accordance with GB/T 11942, GB/T 9754 and GB/T 1766, measure the color difference, grade of loss of light and other aging performance of the coating before and after aging in the same direction at the same position. The color difference and the grade of loss of light use the test results of the arithmetic mean of all the test pieces, the other aging performance uses the test result of the worst performance of all the test pieces.

7.6.15 Resistance to salt mist

The test time of resistance to salt mist is 4000 h. It is performed in accordance with the provisions of GB/T 1771. Make visual observation to see whether the test piece is glue-opened, follow the provisions of GB/T 1740 to rate it, use the worst value of performance of all the test pieces as the test result.

7.7 Physical and mechanical properties

7.7.1 Bending strength, flexural modulus of elasticity

7.7.1.1 Material testing machine

The testing machine applies load at a constant rate, the relative error of the indication is not more than ±1%, the maximum load of the test shall be between 15% and 90% of the value indicated by the testing machine.

R - Shear strength, in megapascal (MPa);

P - Maximum load, in Newtons (N);

h - Thickness of the test piece, in millimeters (mm);

d - Diameter of punch hole, in millimeters (mm).

Use the arithmetic mean of the measured values of all the test pieces as the test result.

7.7.3 Drum peel strength

It is performed in accordance with the provisions of GB/T 1457. Use 3 test pieces as a group, respectively measure the average peel strength and the minimum peel strength of each test piece of each group in the front-longitudinal direction, in the front-transverse direction, in the back-longitudinal direction, in the back-transverse direction. Respectively, use the arithmetic mean of the average peel strength of the 3 test pieces of each group as well as the minimum value of the minimum peel strength as the test results of this group.

7.7.4 Resistance to temperature resistance

Place the test piece at the constant temperature of -40 °C ± 2 °C for at least 2 h, take it out and place it at the constant temperature of 80 °C ± 2 °C for at least 2 h, which forms a cycle, totally 50 cycles are performed. Make visual observation to see whether the test piece has obvious deformation, bubbling, peeling, glue-opening, coating cracking, or other abnormal changes in appearance, perform the adhesion test in accordance with the provisions of 7.6.5. In accordance with the provisions of 7.7.3, measure and calculate the reduction rate of the average value of the drum peel strength before and after the test of resistance to temperature difference.

7.7.5 Thermal expansion coefficient

Use the vernier caliper which has an accuracy of 0.02 mm to respectively measure the lengths of the test pieces (as shown in Figure 5) at room temperature (23 °C), low-temperature (-30 °C) and high-temperature (70 °C). Before measuring the length, the test piece shall be kept at the corresponding constant temperature for at least 1 h.

8 Inspection rules

8.1 Inspection category

Product inspection is divided into two types: exit-factory inspection and type inspection.

8.2 Inspection conditions and inspection items

8.2.1 Each batch of products shall be subject to exit-factory inspection. The exit-factory inspection items include appearance, allowable deviation of dimension, coating thickness, surface pencil hardness, gloss deviation, flexibility, adhesion, resistance to impact, resistance to hydrochloric acid, resistance to alkali, resistance to nitric acid, resistance to solvent, drum peel strength, resistance to hot water.

8.2.2 Type inspection items shall include all the requirements as specified in clause 6. Type inspection shall be carried out in any of the following situations:

a) Identification of trial-type finalization of new products;

b) When there are major changes in the raw materials and processes of the product, which may affect the performance of the product;

c) When the production is restored after suspension for more than half a year;

d) When the exit-factory inspection result is significantly different from the previous type inspection;

e) Type inspection is carried out once a year during normal production. The test for resistance to artificial weathering aging, resistance to salt spray, and combustion performance can be carried out every two years.

8.3 Group-batch and sampling

8.3.1 Group-batch

Use 3000 m^2 continuously-produced products of the same variety, the same specification and the same color as a batch, those less than 3000 m^2 is considered as a batch.

8.3.2 Sampling

8.3.2.1 Exit-factory inspection

It is randomly selected in accordance with the dimension and quantity requirements of the items under inspection.

It is performed in accordance with the provisions of GB/T 6672.

A.3.5 Physical and mechanical properties

A.3.5.1 Tensile strength and elongation at break

It is performed in accordance with the provisions of GB/T 13022.

A.3.5.2 Right-angle tear strength

It is performed in accordance with the provisions of GB/T 11999.

A.3.5.3 Drum peel strength

A.3.5.3.1 Materials

Film to be inspected: The dimension is 350 mm × 350 mm, the quantity is 2 pieces;

Aluminum: The dimension is 350 mm × 350 mm, the thickness and material are the same as the aluminum material which is actually used in the production of aluminum-plastic composite panel. The quantity is 2 pieces, the surface is flat and there is no oxidized layer, use acetone to wash it clean;

Core material: The dimension is 350 mm × 350 mm × 3 mm, the quantity is 1 piece, it is manufactured by calendering method, the surface is flat, use acetone to wash it clean.

A.3.5.3.2 Sample preparation

Correctly stack and place the above materials in accordance with the structure of the aluminum-plastic composite panel, make it subjected to hot press for 3 min. Meanwhile, maintain the pressed thickness at 3 mm plus the thickness of two layers of aluminum material, then use the pressure of 50 N/cm^2 to shape it, cool it to room temperature.

A.3.5.3.3 Test

It is performed in accordance with the provisions of GB/T 1457.

attached face to the ultraviolet light source, to perform the aging test for 168 hours in accordance with the method of 7.6.14. Take it out and cool it naturally to room temperature. Observe whether the protective film within 10 mm to the edge of the panel to see whether there is abnormality such as bubbling or peeling off. In accordance with the provisions of GB/T 2790, measure the peel strength, during which the protective film shall not break. After tearing off the protective film, compare with the reference panel to measure the color difference and loss of adhesive of the aluminum-plastic composite panel before and after the aging test. The measurement of color difference is carried out in accordance with GB/T 11942; the measurement of the loss of adhesive is carried out in accordance with the method of B.3.5.

B.3.7 Resistance to low-temperature

Take 4 pieces of 300 mm × 300 mm aluminum-plastic composite panel which actually requires protection. Retain one piece as the reference panel, attach the protective films onto the remaining three pieces in accordance with the method of B.3.2, place them at the constant temperature of -35 °C ± 2 °C for 168 h. Take it out and let it cool naturally to room temperature. Observe whether the protective film within 10 mm from the edge of the panel has such abnormality as bubbling, peeling off, and so on. Follow the provisions of GB/T 2790 to measure the peel strength, during which the protective film shall not break; after tearing off the protective film, use the method of B.3.5 to measure the loss of adhesive.

B.3.8 Resistance to high-temperature

Take 4 pieces of 300 mm × 300 mm aluminum-plastic composite panel which actually requires protection. Retain one piece as the reference panel, attach the protective films onto the remaining three pieces in accordance with the method of B.3.2, place them at the constant temperature of 70 °C ± 2 °C for 168 h. Take it out and let it cool naturally to room temperature. Observe whether the protective film within 10 mm from the edge of the panel has such abnormality as bubbling, peeling off, and so on. Follow the provisions of GB/T 2790 to measure the peel strength, during which the protective film shall not break; after tearing off the protective film, use the method of B.3.5 to measure the loss of adhesive.

C.2 Tearing of film

After the aluminum-plastic composite panel is installed, it shall tear off the protective film in time, to reduce the possibility of difficulty in tearing-off film due to the aging of protective film, serious loss of adhesive, or serious contamination of the surface of aluminum-plastic composite panel.

C.3 Protection of surface paint film

It shall avoid damaging to the surface paint film.

C.4 Installation direction

Since the paint film on the surface of the aluminum-plastic composite panel is produced by the roll-coating process, the color of the coating may have a certain directionality (especially metallic color). When viewed from different angles, the sensory color of the aluminum-plastic composite panel may be different. In order to avoid this difference, the aluminum-plastic composite panels shall be installed in the same production direction.

C.5 Cleaning maintenance

The aluminum-plastic composite panel shall be cleaned and maintained at least once a year, to remove surface stains and harmful substances, so as to keep the panel surface clean and tidy and to ensure the normal service life of the product. It should select the neutral cleaning agent for flexible cleaning. Before cleaning, it shall consider whether the cleaning agent has adverse effects on the coating of aluminum-plastic composite panel.

C.6 Storage conditions

The aluminum-plastic composite panel shall be stored in a dry, cool, ventilated and flat place, the storage temperature shall not exceed 70 °C.

C.7 Edge-folding and bending

For aluminum-plastic composite panels that need to be slotted and edge-folded, it shall consider the folding procedure in advance. It shall not perform repeated edge-folding. For the aluminum-plastic composite panels that need to be directly bent without slotting, the minimum bending radius shall not be less than 35 cm.

C.8 Matched sealing material

The sealing material used for the aluminum-plastic composite panel shall have good resistance to weathering and good compatibility with the aluminum-plastic composite panel. Sealing materials shall also meet the requirements of the corresponding national or industry standards. Since the inferior sealing material

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