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Adhesives for ceramic tiles

陶瓷砖胶粘剂

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Adhesives for ceramic tiles

1 Scope

This standard specifies the terms and definitions, classification, code and marking, general requirements, technical requirements, test methods, inspection rules, marking, packaging, transportation and storage of adhesives for ceramic tile (hereinafter referred to as adhesives).

This standard applies to adhesives for internal and external wall and floor ceramic tiles.

This standard does not include technical requirements for guiding the design and installation of ceramic tiles.

This standard does not include the evaluation or recommendation of the design and use of ceramic tiles.

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) is applicable to this standard.

GB 175 Common Portland cement

GB/T 4100-2015 Ceramic tiles

JC/T 681 Planetary cement mortar mixer

JC/T 958-2005 Flow table for determine mortar fluidity

3 Terms and definitions

The following terms and definitions apply to this document.

3.1

Fixing surface

Fixing surface for ceramic tiles.

allowed to mature as required. If not, mature for 15 minutes and then continue to stir for 15 seconds.

7.4.2 Dispersion adhesive (D) and reactive resin adhesive (R)

The use of dispersion adhesive and reactive resin adhesive shall be carried out in accordance with the manufacturer's requirements.

7.5 Test substrate

7.5.1 Test concrete slab substrate

The test concrete slab adopts two sizes: 400 mm × 400 mm × 40 mm and 400 mm × 200 mm × 40 mm. If the test results are controversial, the 400 mm × 400 mm × 40 mm concrete slab shall be used. The moisture content of the concrete slab shall be less than 3% (mass percentage); the surface water absorption in 4h shall be controlled between 0.5 cm^3 and 1.5 cm^3. The preparation and requirements of concrete slabs are shown in Appendix A. The test concrete slab shall be placed under standard test conditions for 3 months before testing. The slab can also be placed at 105 °C for 5h and then placed under standard test conditions for 24h before use. Where there is a dispute between the two test results, the result of the concrete slab substrate that has been placed for more than 3 months shall prevail.

7.5.2 Other substrates

The use of other substrates (when the adhesive manufacturer recommends the use of ceramic tiles on the substrate) shall be permitted. To prove the compatibility with other optional substrates, the adhesive shall be selected based on the tensile adhesion strength test. When the test result is greater than the strength requirement of the adhesive of that grade or the substrate undergoes cohesive failure, the requirement is considered to be met.

7.6 Failure mode

7.6.1 Adhesive failure - AF-S or AF-T

The test value is equal to the adhesion strength when the failure occurs at the interface between the adhesive and the substrate (AF-S) or the interface between the adhesive and the ceramic tile (AF-T) (see Figures 1a) and 1b)). In some cases, the failure may occur in the bonding layer (BF) between the ceramic tile and the pull head (see Figure 1c)). In this case, the adhesion strength is greater than the test value, the test data is invalid, the test shall be repeated.

7.6.2 Cohesive failure of adhesive - CF-A

The test report shall include the following:

a) The standard implemented;

b) The test date;

c) The type of adhesive, brand, manufacturer's name;

d) The source of specimen, the date of sampling, complete specimen information;

e) The specimen handling and storage method before the test;

f) Test conditions;

g) The amount of water or liquid used to prepare the adhesive;

h) Other factors that may affect the test results;

i) Test results (if necessary, single values, average values and failure modes shall be included).

7.7.2 Test results of cementitious adhesives and dispersion adhesives

The test report shall report the following information:

a) Open time;

b) Slip;

c) Shear adhesion strength;

d) Tensile adhesion strength;

e) Transverse deformation.

7.8 Determination of open time

7.8.1 General

The open time test shall be carried out according to the standard test conditions and steps specified in 7.2 and the following provisions.

7.8.2 Test materials

7.8.2.1 Ceramic tiles: Category BIII dry-pressed ceramic tiles that meet the requirements of Appendix L of GB/T 4100-2015 [water absorption rate is (15 ± 3)% when measured by boiling method], with surface dimensions of (50 ± 1) mm × (50 ± 1) mm, thickness of 7 mm ~ 10 mm, depth of back contour pattern less than 0.25 mm.

A - bonding area, 2500 mm².

The tensile adhesion strength is calculated as follows:

a) Calculate the arithmetic mean of 10 data;

b) Discard values that exceed ±20% of the mean value;

c) If the retained data is greater than or equal to 5 values, re-calculate the average value;

d) If there are less than 5 values, retest;

e) Report the failure mode of each sample (see 7.6).

The unit of the open time is minutes (min).

7.8.6 Test report

The test report shall include 7.7.1 (a ~ i) and 7.7.2 a. The open time is in minutes (min).

7.9 Determination of slip

7.9.1 General

The slip test shall be carried out according to the standard test conditions and procedures specified in 7.2 and the following provisions.

7.9.2 Test materials

7.9.2.1 Ceramic tiles: Category AIa extruded ceramic tiles in accordance with the requirements of Appendix A of GB/T 4100-2015 [water absorption (0.1% ~ 0.5%) measured by boiling method], unglazed, surface size (100 ± 1) mm × (100 ± 1) mm, mass (200 ± 10) g, thickness 8 mm ~ 10 mm.

7.9.2.2 Test substrate: in accordance with the requirements of 7.5.1.

7.9.3 Instruments

7.9.3.1 Steel ruler.

7.9.3.2 Clamp.

7.9.3.3 Masking tape: 25 mm wide.

7.9.3.4 Spacers: Two stainless steel (25 ± 0.5) mm × (25 ± 0.5) mm × (10 ± 0.5) mm spacers.

7.9.3.5 Press block: Cross-sectional dimensions (100 ± 1) mm × (100 ± 1) mm, mass: (5.00 ± 0.015) kg.

7.9.3.6 Vernier caliper: Accuracy 0.01 mm.

7.9.4 Test steps

Ensure that the edge of the steel ruler is placed on the top of the concrete slab and is level with the bottom edge of the steel ruler, when the concrete slab is erected. Apply 25 mm wide masking tape close to the bottom edge of the steel ruler. Apply a thin layer of adhesive to the concrete slab with a straight-edged spatula.

Apply another thick layer of adhesive to the surface of the concrete slab to just cover the bottom of the masking tape. Comb with a 6 mm × 6 mm (center distance 12 mm) notched trowel.

When holding the notched trowel, it shall be about 60° to the concrete slab and applied parallel to the edge of the concrete slab.

Remove the masking tape immediately and place a 25 mm wide spacer (or spacer strip) close to the lower edge of the steel ruler. After 2 minutes, place a ceramic tile that meets the requirements of 7.9.1.1 close to the spacer; place a press block with a mass of (5.00 ± 0.015) kg on the ceramic tile for (30 ± 5) s.

After removing the spacer, use a vernier caliper to measure the distance between the edge of the ruler and the tile, accurate to ±0.1 mm. Immediately after the measurement, carefully stand the concrete slab vertically (see Figure 2). Remeasure the distance between the edge of the ruler and the tile after (20 ± 2) minutes. The difference between the two measurement readings is the maximum sliding distance of the tile under its own weight.

samples are required for each test.

7.10.4 Adhesion strength (D, R)

7.10.4.1 10 samples are cured under the conditions of 7.2; the reaction resin adhesive is cured for 7 days; the dispersion adhesive is cured for 14 days.

7.10.4.2 After curing under the conditions of 7.2, the samples are placed in a shear fixture and a shear force is applied to the sample at a speed of (5 ± 0.5) mm/min until they are broken.

Test results: Expressed in Newton (N).

7.10.5 Adhesion strength after immersion in water (D, R)

10 samples are cured under the conditions of 7.2; the enhanced adhesive (D2) is cured for 21 days or the accelerated drying adhesive and reaction resin adhesive (R) are cured for 7 days. Then they are immersed in (23 ± 2) °C water, reaction resin adhesive (R) for 21 days, dispersion adhesive (D2, D2A) for 7 days.

Remove the specimen and wipe the moisture with a cloth. Test according to 7.10.4.2.

Test results: Expressed in Newton (N).

Note: This test is only for dispersion ceramic tile adhesives used in indoor humid environments.

7.10.6 Adhesion strength after heat aging (D)

10 samples are cured for 14 days under the conditions of 7.2, then placed in an air circulation oven at (70 ± 2) °C for another 14 days. It shall be ensured that the air around each sample flows freely.

After the sample is taken out, it is cured for 24 hours under the conditions of 7.2 and tested according to 7.10.4.2.

Test results: Expressed in Newton (N).

7.10.7 Adhesion strength at high temperature (D)

According to the test steps specified in 7.10.6, the adhesion strength of the sample is tested 1 minute after the sample is taken out of the oven.

Test results: Expressed in Newton (N).

7.10.8 Adhesion strength after thermal shock (R)

After curing 10 samples under 7.2 for 7 days, immerse the specimens in (23 ± 2) °C water for 30 minutes; then heat them in a (100 ± 2) °C water bath for another 30 minutes.

of Appendix A of GB/T4100-2015 [water absorption of 0.1% ~ 0.5% as determined by boiling method], with surface dimensions of (50 ± 1) mm × (50 ± 1) mm, thickness of (5 ± 2) mm, and unglazed flat bonding surface.

7.11.2.2 Test substrate: In accordance with the requirements of 7.5.1.

7.11.3 Test instrument

7.11.3.1 Press block, cross-sectional dimensions of 50 mm × 50 mm, mass of (2.00 ± 0.015) kg.

7.11.3.2 Puller, a square metal block with dimensions of (50 ± 1) mm × (50 ± 1) mm and a minimum thickness of 10 mm, connected to the testing machine with an appropriate device.

7.11.3.3 The tensile testing machine shall have an appropriate range and an accuracy of 1%. The testing machine that directly applies tensile force shall apply a load of (250 ± 50) N/s to the puller through a suitable device that does not generate any bending force.

7.11.3.4 Blast drying oven, which has a temperature control accuracy of ±3 °C.

7.11.4 Test steps

7.11.4.1 Preparation of samples

Perform as specified in 7.8.4.

7.11.4.2 Tensile adhesion strength

After curing for 27 days under the conditions of 7.2, use a suitable high-strength adhesive (such as epoxy adhesive) to stick the puller to the tile. Continue to place it under the conditions of 7.2 for 24 hours; measure the tensile adhesion strength of the adhesive at a loading rate of (250 ± 50) N/s. If you want to test a fast-setting adhesive, stick the puller to the tile at least 2 hours before the test.

Test results: Expressed in Newton (N).

7.11.4.3 Tensile adhesion strength after immersion in water

After curing for 7 days under the conditions of 7.2, immerse the sample in water at standard temperature. After immersion in water for 20 days, remove the sample from the water; wipe off the surface moisture with a cloth; stick the puller to the tile. Continue to place it under the conditions of 7.2 for 7 hours; immerse the sample in water at standard temperature. After 17 hours, take the sample out of the water and immediately measure the tensile adhesion strength of the adhesive at a loading rate of (250 ± 50) N/s.

Test results: Expressed in Newton (N).

7.11.4.4 Tensile adhesion strength after heat aging

After curing for 14 days under the conditions of 7.2, place the sample in an oven at (70 ± 3) °C for 14 days. After removing the sample from the oven, stick the puller to the tile with a suitable high-strength adhesive (such as epoxy adhesive). Continue to cure for 24 hours under the conditions of 7.2; measure the tensile adhesion strength of the adhesive at a loading rate of (250 ± 50) N/s.

Test results: Expressed in Newton (N).

7.11.4.5 Tensile adhesion strength after freeze-thaw cycles

Prepare the sample according to 7.8.4. Before placing the tiles, apply about 1 mm thick adhesive on the back of the tiles with a straight-edged spatula. Before conducting 25 freeze-thaw cycle tests, the samples are cured for 7 days under the conditions of 7.2, then immersed in water for 21 days.

Each freeze-thaw cycle is as follows:

a) Remove the sample from the water; cool it to (-15 ± 3) °C within 2 h ± 20 min;

b) Keep the sample at (-15 ± 3) °C for 2 h ± 20 min;

c) Immerse the sample in (20 ± 3) °C water; raise the temperature to (15 ± 3) °C; maintain it at this temperature for at least 2 h before the next freeze-thaw cycle;

d) Repeat 25 cycles.

After completing 25 cycles, the sample is placed under standard test conditions and the puller is glued to the tile. The tensile adhesion strength of the adhesive is measured at a loading rate of (250 ± 50) N/s within 24h.

Test results: Expressed in Newton (N).

7.11.5 Evaluation and expression of test results

Calculated according to 7.8.5.

7.11.6 Test report

The test report includes 7.7.1 (a ~ i) and 7.7.2 d. The adhesion strength in each state is in megapascals (MPa).

7.12 Determination of lateral deformation

7.12.1 General

8.4 Judgment rules

If the product test results meet the basic performance of the corresponding category in Chapter 6 of the standard and the special performance provisions agreed upon in the contract between the supplier and the buyer, the batch of products is judged to be qualified. If two or more test results do not meet the standard requirements, the batch of products is judged to be unqualified. If only one of the test results does not meet the standard requirements, the retained sample can be used to re-test the item. If the retest results meet the requirements of the standard, the batch of products is qualified; if they still do not meet the requirements of the standard, the batch of products is unqualified.

9 Marking, packaging, transportation, storage

9.1 Marking

The outer packaging of the product shall include:

a) Product name and place of origin;

b) Manufacturer name and address;

c) Trademark;

d) Product mark, component name (multi-component);

e) Product ratio (multi-component) and net weight of the product;

f) Instructions for use;

g) Production date or batch number;

h) Storage period;

i) Storage and transportation precautions.

Note: When the adhesive may be used for special purposes, the product name may include information on its special characteristic.

This information shall be provided on the packaging or in the product's technical data list.

9.2 Packaging

Category C products should be packaged in composite packaging bags. Category D and

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