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Replacing GB/T 13448-1992

Test Methods for Prepainted Steel Sheet

彩色涂层钢板及钢带试验方法

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Table of Contents

Foreword.....	4
1 Scope.....	5
2 Normative References	5
3 Terms and Definitions	5
4 Determination of Coating Thickness	6
5 Determination of Specular Gloss	10
6 Determination of Color Difference.....	12
7 Bending Test	14
8 Reverse Impact Test	16
9 Pencil Hardness Test	18
10 Organic Solvent Resistance Test	20
11 Abrasion Resistance Test.....	22
12 Scratch Resistance Test	24
13 Grid-Drawing Test	26
14 Cupping test.....	28
15 Boiling-Water Resistance Test	30
16 Acid-and-Alkali Resistance Test.....	31
17 Pollution Resistance Test.....	33
18 Neutral Salt Spray Resistance Test.....	36
19 Dry Heat Resistance Test	38
20 Damp Heat Resistance Test.....	41
21 Sulfur Dioxide Damp Heat Resistance Test	43

22 Xenon Lamp Accelerated Aging Test	46
23 UV Lamp Accelerated Aging Test.....	49
24 Atmospheric Exposure Test	52
Appendix A (Informative) Corresponding Relationship between Knoop	
Hardness Range of Specially-Used Pencil in Chinese Brand 505 Steel Coil	
Coating Hardness Test and Knoop Hardness of Chinese Brand 101 Painting	
Pencil	56

Foreword

This Standard replaced GB/T 13448-1992 *Test Methods for Color-Coated Steel Plates and Strips*.

Compared with GB/T 13448-1992, this Standard has the major changes as follows:

- Modify 8 test methods in GB/T 13448-1992, such as coating thickness determination, specular gloss determination, bending test, reverse impact test, pencil hardness test, grid-drawing test, neutral salt spray resistance test, damp heat resistance test, etc.;
- Modify the accelerated weathering test in GB/T 13448-1992 into xenon lamp accelerated aging test;
- Add terms and definitions, and 12 test methods like determination of color difference, organic solvent resistance test, abrasion resistance test, scratch resistance test, cupping test, boiling-water resistance test, acid-and-alkali resistance test, pollution resistance test, dry heat resistance test, sulfur dioxide damp heat resistance test, UV lamp accelerated aging test, atmospheric exposure test, etc.

The Appendix A of this Standard is informative.

This Standard was proposed by China Iron and Steel Industry Association.

This Standard shall be under the jurisdiction of National Technical Committee for Standardization of Steel.

Drafting organization of this Standard: Baoshan Iron & Steel Co., Ltd.

Chief drafting staffs of this Standard: Zhang Jiaqi, Li Lei, Yang Zhengye, Fang Chun, Shi Qiaoyun, Zhou Xing, and Li Heping.

This Standard was first-time published in April 1992.

Test Methods for Prepainted Steel Sheet

1 Scope

This Standard is applicable to the determination and evaluation of coating performance of color-coated steel plates and strips (hereinafter referred to as color-coated plate).

2 Normative References

The provisions in following documents become the provisions of this Standard through reference in this Standard. For dated references, the subsequent amendments (excluding corrigendum) or revisions do not apply to this Standard, however, parties who reach an agreement based on this Standard are encouraged to study if the latest versions of these documents are applicable. For undated references, the latest edition of the referenced document applies.

GB/T 1766-1995 Paints and Varnishes - Rating Schemes of Degradation of Coats

GB/T 12754 Colored Painted Coat Steel Plates and Strips

3 Terms and Definitions

The following terms and definitions and those ones stipulated in GB/T 12754 are applicable to this document.

3.1 Relative luminous reflectance factor

Under the same geometric conditions, the ratio between the luminous flux value reflected by the specimen and the luminous flux value reflected by the standard surface.

3.2 Specular gloss

The relative luminous reflectance factor of the specimen in the specular reflection direction.

3.3 Tristimulus values

The amount of three primary stimuli required to the color match with the to-be-measured light in the three-color system.

3.4 Color space

4.5.1.1.3 During the measuring period, the instrument shall be zeroed and calibrated constantly.

4.5.1.2 Determination

4.5.1.2.1 When the baseplate of color-coated plate is cold-rolled plate, select 3 different positions with the distance from the specimen edges greater than 25mm, use magnetic thickness tester to measure the coating thickness, and record the thickness value.

4.5.1.2.2 When the baseplate of color-coated plate is galvanized plate, select 3 different positions with distance from the specimen edges greater than 25mm, use magnetic thickness tester to measure the total thickness of galvanized layer and coating. Remove the coating with paint remover that has no corrosion effect against the galvanized layer; measure the galvanized layer thickness at the same position (or use the known galvanized layer weight per unit to convert into the galvanized layer thickness), the difference between the total thickness and the galvanized layer thickness is the thickness of coating.

4.5.2 Micrometer method

4.5.2.1 Mark the 3 different positions in the area about no less than 10mm away from the specimen edges, use micrometer to measure the thickness on the mark positions, and record them. When operating, pay attention that the coating shall not have the visible deformation, otherwise, it may influence the measurement results.

4.5.2.2 Use appropriate solvent or paint remover to remove the coating on the marking positions, then use micrometer to measure the thickness of baseplates removing the coatings, and record the thickness values.

4.5.3 Metallographic microscope method

4.5.3.1 Fix the specimen with appropriate materials, the specimen shall be perpendicular to the viewing surface during the specimen-preparing period.

4.5.3.2 Grind and polish the prepared specimen, so that it is smooth enough to observe its coating section under the microscope. Pay attention to maintain the specimen perpendicular to the sandpaper during the operation process.

4.5.3.3 Measure the coating thickness at 5 different positions in the specimen section by the scale on the microscope, and record the values.

4.5.4 Drilling damage microscope observation method

4.5.4.1 Place the specimen on the drilling table and adjust the drilling depth control wheel of the automatic drilling device, so that the drill bit just penetrates the baseplate, drill a circular shallow angle shrinkage hole.

The arithmetic mean of coating specular gloss of the 3 different measurement positions is the gloss of such specimen.

5.7 Test report

The test report shall contain the following contents:

- a) The adopted test standard and negotiated terms;
- b) Instrument model, selected incident angle;
- c) Specimen information;
- d) Test results;
- e) Test date and test personnel.

6 Determination of Color Difference

6.1 General

This Method is applicable to the quantitative determination of the color difference of color-coated plate.

6.2 Principle

Use colorimeter to measure the specular tristimulus values of reference sample and specimen, respectively; then the color difference between specimen and reference sample can be quantitatively measured.

6.3 Test device and materials

6.3.1 Colorimeter

6.3.1.1 The colorimeter generally-adopted geometric structure can be divided into directional type and integrating sphere type. Thereof, the directional geometric structure can be divided into $45^\circ/0^\circ$ and $0^\circ/45^\circ$; while integrating sphere geometric structure can be divided into $d/8^\circ$ and $8^\circ/d$.

6.3.1.2 The colorimeter can satisfy, in the conditions of standard light source and standard chromaticity observer, to determine the chromaticity coordinates in different color space at the same time. Generally-used color space includes CIELAB and HunterLab, etc. If different colorimeter, standard light source, standard chromaticity observer, color space, and observation area are selected, then the obtained color difference values can also be different.

6.3.2 Colorimeter calibration board

L_1^* , a_1^* and b_1^* or L_1 , a_1 and b_1 – chromaticity coordinates of specimen;

L_0^* , a_0^* and b_0^* or L_0 , a_0 and b_0 – chromaticity coordinates of reference sample.

If: ΔL is positive value, the specimen is lighter than reference sample;

ΔL is negative value, the specimen is darker than reference sample;

Δa is positive value, the specimen is redder than reference sample;

Δa is negative value, the specimen is greener than reference sample;

Δb is positive value, the specimen is yellower than reference sample;

Δb is negative value, the specimen is bluer than reference sample.

The color difference shall be expressed by ΔE or ΔE , ΔL , Δa , Δb . The arithmetic mean of coating color difference on 3 different measuring positions shall be the color difference of such specimen.

6.7 Test report

The test report shall contain the following contents:

- a) The adopted test standard and negotiated terms;
- b) Instrument model, used geometric structure, selected instrument conditions (standard light source, standard chromaticity observer, color space, and observation aperture);
- c) Specimen information;
- d) Test results;
- e) Test date and test personnel.

7 Bending Test

7.1 General

This method is applicable to assess the ability of coating to resist the cracking and stripping phenomena when the color-coated plate is bent.

7.2 Principle

Perform the self-bending against the specimen for 180°; observe the coating cracking and stripping situation on the bending surface; ensure the multiple minimum thickness of specimen that make the coating generate no cracking or stripping situations.

8.4.1 The specimen size shall be no less than 75mm×150mm; the specimen surface shall be smooth, without oil stain or damage, the edges have no burr.

8.4.2 The test shall be performed under the test environment. In event of a dispute, place the to-be-measured specimen in the environment with temperature ($23^{\circ}\text{C}\pm 2^{\circ}\text{C}$) and relative humidity ($50\%\pm 5\%$) for 24h, and then carry out the test.

8.5 Test procedures

8.5.1 Specified impact energy test

8.5.1.1 Place the tested surface of the specimen downward (reverse impact) onto the punch die.

8.5.1.2 Raise the heavy hammer to certain height, and freely fall from such height; and the punch is hit onto the specimen and form a depression.

8.5.1.3 Paste the tape onto the post-impacted convex area, press it with finger; flatten the tape as remove the bubbles; then tear the tape quickly forming 60° angle with the specimen; check whether the tape has the stripping coating.

8.5.1.4 Visually observe whether the post-impacted convex area has the cracking situation. If the visual observation is difficult, the copper sulfate can be used to check. Paste the white flannel or filter paper dipped into the copper sulfate solution to the convex area, after 15min; remove the white flannel or filter paper, check the test area and flannel or filter paper, if there is copper precipitation, it indicates that the coating has cracking situation.

8.5.1.5 Repeat the above test on another 2 positions of the specimen. If both 2 tests at least generate no cracking or stripping situation, then the specimen pass the specified impact test.

8.5.2 Maximum impact energy determining the coating generates no cracking or stripping situation

8.5.2.1 Perform the test according to the test procedures 8.5.1.1~8.5.1.5.

8.5.2.2 If coating has no cracking or stripping situation, fix the weight of the heavy hammer; appropriately increase the fall height of heavy hammer; repeat the test procedures of 8.5.2.1 till find out the maximum fall height make coating generate no cracking or stripping situation; at this time, the product between such height and hammer weight shall be maximum impact energy, expressed by Joule (J).

8.5.2.3 If coating has no cracking or stripping situation, fix the fall height; appropriately increase the hammer weight; repeat the test procedures in 8.5.2.1 till find out the maximum hammer weight make coating generate no cracking or stripping situation; at this time, the product between such height and hammer weight shall be maximum

results inconsistent. It is recommended to use the Chinese Brand 505 of steel coil coating hardness to test the specially-used pencils and pencil lead cores (marks are 5H, 4H, 3H, 2H, H, F, HB, B). Other brands of pencils can also be used through the negotiation between the supplier and the purchaser. Various marks of Chinese Brand 505 steel coil coating hardness test the Knoop hardness of specially-used pencils and pencil lead cores, and its correspondence with the hardness of Chinese Brand 101 painting pencil can refer to Appendix A.

9.3.2 For the small mechanical trolley for drawing pencil; its two sides have metal base with two pulleys that can move freely on the specimen; there is a 45° angle of round hole and a fixing clip for fixing the pencil in the middle of the base; the pencil can be fixed by 45° angle; such instrument's weight can ensure the force suffered by the pencil tip on the horizontal direction shall be (7.5 ± 0.1) N.

9.3.3 Pencil sharpener.

9.3.4 400# sandpaper.

9.4 Specimen preparation and test environment

9.4.1 The specimen size shall be 75mm×150mm; the specimen surface shall be smooth, without oil stain or damage.

9.4.2 The test shall be performed under the test environment. In event of a dispute, place the to-be-measured specimen in the environment with temperature $(23^{\circ}\text{C} \pm 2^{\circ}\text{C})$ and relative humidity $(50\% \pm 5\%)$ for 24h, and then carry out the test.

9.5 Test procedures

9.5.1 Manual pencil method

9.5.1.1 Cut the pencil with pencil sharpener till expose (4~6)mm column lead core (no loose or scratch the lead core); hold the pencil, make it perpendicular to 400# sandpaper; cross and grind on the sandpaper till the end is flat, and edges are sharp (the edges shall not be broken or notched).

9.5.1.2 Place the specimen onto the console horizontally; hold the cut and ground pencil, and make it form 45° angle against the coating; exert sufficient and uniform force downward and forward, the force strength shall be subject to the pencil edges broken or plow through the coating. The pencil promotes stroke shall be 6.5mm. After once usage, the pencil shall be turn 180° to use or grind to use.

9.5.1.3 From the hardest pencil, each hardness level of pencil shall draw 5 times, if there is twice among the 5 times to plow through the coating, then change the softer pencil till there are 4 times at least among the 5 times not to plow through the coating; then the hardness of such pencil shall be the pencil hardness of tested coating.

gravity load, the specified grinding and rotating times; the size of coating mass consumption shall be used to assess the coating abrasion resistance.

11.3 Test device and materials

11.3.1 Taber abrader consists of armed lever with counter poise and can mount grinding wheel, grinding wheel rotating speed counter, and vacuum cleaning device.

11.3.2 Grinding wheel: generally indicates the elastic rubber calibration wheel of CS-10 or CS-17; the grinding wheel shall be used within the valid date; stop using the grinding wheel when its diameter is less than 45mm.

11.3.3 Surface grinding tool: S-11 abrasive disc sandpaper used for trimming of grinding wheel surface.

11.3.4 Analytical balance: its accuracy shall be no less than 0.1g.

11.4 Specimen preparation and test environment

11.4.1 The specimen shall be disc with diameter of 100mm or square plate with edges of 100mm×100mm, and the center of which is drilled a round hole with diameter about 6.3mm. Make at least 2 parallel specimens; the specimen surface shall be smooth, without oil stain or damage.

11.4.2 The test shall be performed by placing the specimen under the test environment for at least 24h. In event of a dispute, place the to-be-measured specimen in the environment with temperature ($23^{\circ}\text{C}\pm 2^{\circ}\text{C}$) and relative humidity ($50\%\pm 5\%$) for 24h, and then carry out the test.

11.5 Test procedures

11.5.1 Use the analytical balance to accurately measure the mass of each specimen, accurate to 0.1mg.

11.5.2 Place the to-be-measured surface of the specimen onto the template holder upward, and use screw to fix it. Install a pair of ground grinding wheels onto the 2 armed levers of the abrader; the additional mass exerts total load of 500g or 1000g onto the armed lever. Place such armed lever on the specimen, and start abrader. The grinding wheel speed is 60r/min, and 100r/min maximum.

11.5.3 The test can be stopped till the specified grinding and rotating number is reached or the baseplate is exposed. During the abrader starting period, the cleaning device shall continuously remove the debris ground from the specimen surface.

11.5.4 Take off the specimen, after cleaning, use analytical balance to accurately measure the specimen mass after through the abrasion resistance test.

11.5.5 After grinding wheel continuously rotates for (500~1000) times and before new

12.3.2 Steel needle, the needle tip is hemisphere, diameter is 1mm, material is high-strength steel or tungsten carbon compounds.

12.4 Specimen preparation and test environment

12.4.1 The specimen shall meet the requirements of scratch tester; the specimen surface shall be smooth, without oil stain or damage.

12.4.2 The test shall be performed by placing the specimen under the test environment for at least 24h. In event of a dispute, place the to-be-measured specimen in the environment with temperature ($23^{\circ}\text{C}\pm 2^{\circ}\text{C}$) and relative humidity ($50\%\pm 5\%$) for 24h, and then carry out the test.

12.5 Test procedures

12.5.1 Judge passing/not passing the test under fixed load

12.5.1.1 Fix the to-be-measured surface of the specimen onto the scratch tester upward. Check the steel needle tip, ensure it has no damage. Fix the steel needle onto the bracket, ensure the steel needle is in contact with the specimen.

12.5.1.2 Set the weight-bearing counter poise to the test required weight, then the scratch tester can be started to test. The stroke of steel needle shall be no less than 50mm. If the steel needle plows through the coating, the scratch tester displays conductive, which indicates the specimen doesn't pass the scratch resistance test under the such weight-bearing; if the steel needle doesn't plow through the coating, the scratch tester displays nonconductive, which indicates that specimen passes the scratch resistance test under such load.

12.5.1.3 Measure on 3 different positions of the specimen surface, record the test results, respectively.

12.5.2 Test determining the maximum load for scratching the coating

12.5.2.1 Gradually increase the weight of load counter poise to repeat the test according to the procedure in 12.5.1. The starting counter poise weight shall be less than expected load of counter poise to scratch the coating, till find out the maximum counter poise weight not to scratch the coating.

12.5.2.2 Perform the test at 3 different positions on the specimen surface.

12.6 Result expression

12.6.1 Judge passing/not passing the test under fixed load

If there are at least twice among 3 times to pass the test, then the specimen pass the scratch resistance test under such fixed load.

When the test reaches the specified punching and deforming cup height (mm), observe whether the coating has cracks or stripped from the baseplate.

14.6.2 Post-grid-drawing cupping test

Report the grid-drawing test level of the specimen.

14.7 Test report

The test report shall contain the following contents:

- a) The adopted test standard and negotiated terms;
- b) The used grid-drawing tool, notch interval and grid knife model;
- c) Specimen information;
- d) Test results (indicate whether it is direct cupping test or post-grid-drawing cupping test);
- e) Test date and test personnel.

15 Boiling-Water Resistance Test

15.1 General

This method is applicable to assess the boiling-water resistance of color-coated plate.

15.2 Principle

After the edges are sealed, dip the specimen into the boiling water for several hours; take it out and check whether the coating has loss of gloss, discoloration, crack, bubble, and stripping phenomena.

15.3 Test device and materials

15.3.1 Water bath.

15.3.2 Distilled or deionized water: require the conductivity not exceeding 20 μ S/cm.

15.3.3 Gloss meter.

15.3.4 Color difference meter.

15.4 Specimen preparation and test environment

15.4.1 Generally, the specimen size shall be 70mm $\times$ 100mm; the specimen surface shall be smooth, without oil stain or damage, and edges have no burr; the quantity of

This method is applicable to assess the acid-and-alkali resistance of the color-coated plate coating.

16.2 Principle

Dip the specimen into the acid-alkali solution with certain concentration for a certain period of time, take it out and assess the changes of color difference and gloss, as well as whether the coating has bubbling and stripping phenomena.

16.3 Test device and materials

16.3.1 Glass beaker: 1000mL glass beaker with scale.

16.3.2 Distilled or deionized water: require the conductivity not exceeding 20 μ S/cm.

16.3.3 Concentrated hydrochloric acid: chemically pure or analytically pure.

16.3.4 Sodium hydroxide: chemically pure or analytically pure.

16.3.5 Hydrochloric acid (50mL/L) solution configuration: weigh 50mL of concentrated hydrochloric acid with graduated flask, pour it into 1000mL beaker containing appropriate amount of distilled water; use distilled water to dilute to 1000mL; mix evenly with glass bar. The concentration of hydrochloric acid can be determined through the negotiation between the supplier and the purchaser.

16.3.6 Sodium hydroxide (50g/L) solution configuration: weigh 50g of chemically pure and analytically pure sodium hydroxide, and put it into 1000mL beaker; use distilled water to dilute to 1000mL; mix and dissolve evenly with glass bar. The concentration of sodium hydroxide can be determined through the negotiation between the supplier and the purchaser.

16.3.7 Gloss meter.

16.3.8 Color difference meter.

16.4 Specimen preparation and test environment

16.4.1 Generally, the specimen size shall be 70mm $\times$ 100mm; the specimen surface shall be smooth, without oil stain or damage, and edges have no burr; the quantity of the same specimen shall be no less than 2 blocks; use tape (corrosion resistance is no less than that of the specimen coating) to seal its four edges.

16.4.2 The test shall be performed by placing the specimen under the test environment for at least 24h. In event of a dispute, place the to-be-measured specimen in the environment with temperature (23°C $\pm$ 2°C) and relative humidity (50% $\pm$ 5%) for 24h, and then carry out the test.

16.5 Test procedures

17.7 Test report

The test report shall contain the following contents:

- a) The adopted test standard and negotiated terms;
- b) The instrument model, test conditions;
- c) Specimen information;
- d) Test results;
- e) Test date and test personnel.

18 Neutral Salt Spray Resistance Test

18.1 General

This method is applicable to assess the corrosion resistance of color-coated plate coating in the neutral salt spray.

18.2 Principle

Expose the specimen to the neutral sodium chloride salt spray for the specified period of time, then assess the specimen surface bubbling and corrosion grade, as well as the corrosion spread distance, etc.

18.3 Test device and materials

18.3.1 Salt spray test chamber: equipped with one or more atomization nozzle, a salt solution storage tank, an air saturation device and an oil-free and dust-free air supply system.

18.3.2 Scribing tool: small knife used for drawing cutting line on the coating, the knife angle is 30°, or negotiated by the supplier and the purchaser.

18.3.3 pH meter or precise pH test paper (with precision of 0.3).

18.3.4 Sodium chloride: analytically pure.

18.3.5 Distilled or deionized water: require the conductivity not exceeding 20μS/cm.

18.3.6 Sodium chloride solution (50g/L): weigh 50g of sodium chloride reagent, use distilled water to dissolve and dilute to 1000mL, then make it even. The configured salt solution's pH value shall be 6.5~7.2. Use either the pH meter or precise pH test paper to measure the solution pH value. The solution's pH value can also be adjusted by hydrochloric acid or sodium hydroxide solution.

18.5.3 After the test chamber reaches the test conditions, perform the spraying continuously. Expose the specimen to the specified period of time or to the specified surface damage degree (test time shall be deducted from the time of the interruption of the spraying due to the specimen inspection).

18.5.4 After the completion of the test, take out the specimen from the salt spray box; clean with water, dry with cold-air, and assess it immediately.

18.6 Result expression

18.6.1 For the plate specimen, assess the level of the bubbling and rust as per GB/T 1766-1995; take the worst value among the parallel specimens as the test result.

18.6.2 For the crossing and notch specimen, select a representative area on the scribe; measure the maximum corrosion spread distance from the scribe to the bubbling or rust position on the at least six equidistant positions; take the arithmetic mean, which is the average corrosion spread distance; and record the maximum and minimum corrosion spread distance of the scribe.

18.7 Test report

The test report shall contain the following contents:

- a) The adopted test standard and negotiated terms;
- b) The instrument model, test conditions;
- c) Salt spray collecting amount, pH value of collecting liquid;
- d) Specimen information;
- e) Test results;
- f) Test date and test personnel.

19 Dry Heat Resistance Test

19.1 General

This method is applicable to assess the dry heat resistance of color-coated plate.

19.2 Principle

After the color-coated plate aging through specified temperature and time period baking, assess its changes in loss of gloss, discoloration, bubbling, cracking, T-bend performance, as well as the coating performance changes in resisting stripping phenomenon. The color-coated plated that has been preliminarily perform the T-bend

- a) Plate specimen: the edges of the specimen shall be sealed by appropriate materials (the corrosion resistance shall be no less than that of the specimen coating paint or tape);
- b) Crossing specimen: if measuring the corrosion spread situation of the scratch position of the specimen, before the test, use small knife to draw a single straight line parallel to the long edge of the specimen, the length shall be no less than 50mm; or draw two crossing straight lines along the diagonal line direction. The straight line must penetrate the coating (check by the magnifier), the straight line shall be no less than 30mm away from the edge.
- c) Notch specimen: If measuring the corrosion situation of the specimen notch, the edges of the specimen shall not be sealed.

20.4.3 If the specimen is required to suspend in the test chamber, the specimen top shall be drilled; the drilling notch shall be seal for protection, if necessary.

20.4.4 The test shall be performed by placing the specimen under the test environment for 24h at least. In event of a dispute, place the to-be-measured specimen in the environment with temperature ($23^{\circ}\text{C}\pm 2^{\circ}\text{C}$) and relative humidity ($50\%\pm 5\%$) for 24h, and then carry out the test.

20.5 Test procedures

20.5.1 Condensing damp heat method

20.5.1.1 Inject distilled or deionized water to the wet test chamber; start test chamber, adjust the instrument, so that the test chamber temperature can be maintained at ($38^{\circ}\text{C}\pm 2^{\circ}\text{C}$) or other specified temperature, the relative humidity shall be no less than 98%; then suspend the specimen into the test chamber and start test.

20.5.1.2 The specimen shall be placed on the upper and lower layers; the condensing water on the upper specimen and the bean suspending the specimen shall not drop onto the lower specimen. When suspending the specimen, the materials suspending the specimen shall be used those ones that don't influence the test results.

20.5.1.3 Perform the test continuously till the specified period of time or the specified surface damage degree.

20.5.1.4 After the completion of test, take out the specimen, dry it with cold-air or absorbent paper, then assess it.

20.5.2 Non-condensing damp heat method

20.5.2.1 Start the constant temperature and humidity test chamber, adjust the instrument, so that the test chamber temperature is maintained at ($40^{\circ}\text{C}\pm 2^{\circ}\text{C}$) or other specified temperature, the relative humidity is no less than 95%; then place the

21.3.2 Bottled SO₂ gas: purity is at least 99.9%, liquid phase.

21.3.3 Distilled or deionized water: require the conductivity not exceeding 20μS/cm.

21.3.4 Color difference meter.

21.3.5 Gloss meter.

21.4 Specimen preparation and test environment

21.4.1 The specimen size shall be 75mm × 150mm; the specimen shall be smooth, without oil stain or damage; the edges shall have no burr. The quantity of the same specimen shall be no less than 3 blocks.

21.4.2 The specimen can be prepared by the following 3 methods:

- a) Plate specimen: the edges of the specimen shall be sealed by appropriate materials (the corrosion resistance shall be no less than that of the specimen coating paint or tape);
- b) Crossing specimen: if measuring the corrosion spread situation of the scratch position of the specimen, before the test, use small knife to draw a single straight line parallel to the long edge of the specimen, the length shall be no less than 50mm; or draw two crossing straight lines along the diagonal line direction. The straight line must penetrate the coating (check by the magnifier), the straight line shall be no less than 30mm away from the edge.
- c) Notch specimen: If measuring the corrosion situation of the specimen notch, the edges of the specimen shall not be sealed.

21.4.3 If the specimen is required to suspend in the test chamber, the specimen top shall be drilled; the drilling notch shall be seal for protection.

21.4.4 The total combined surface area of the specimen tested at any time shall be (0.5m²±0.1m²).

21.4.5 The test shall be performed by placing the specimen under the test environment for 24h at least. In event of a dispute, place the to-be-measured specimen in the environment with temperature (23°C±2°C) and relative humidity (50%±5%) for 24h, and then carry out the test.

21.5 Test procedures

21.5.1 Measure the gloss and chromaticity coordinates of specimen as per the test methods of 5 and 6.

21.5.2 Suspend the specimen in the test chamber, the specimen interval shall be no less than 20mm, the distance between specimen and chamber wall/top shall be no

1995; take the worst value of parallel specimens as the test result.

23.7 Test report

The test report shall contain the following contents:

- a) The adopted test standard and negotiated terms;
- b) The instrument model, test conditions;
- c) Specimen information;
- d) Test results;
- e) Test date and test personnel.

24 Atmospheric Exposure Test

24.1 General

This method is applicable to assess the durability of color-coated plate in the outdoor natural weather conditions.

24.2 Principle

After the color-coated plate is aging in the natural atmosphere, assess its coating aging performance like loss of gloss, discoloration, chalking, bubbling, rust, and cracking.

24.3 Test device and materials

24.3.1 Atmospheric exposure test site

24.3.1.1 According to the different use environment of color-coated plate, the atmospheric exposure test site shall select the most harsh areas that can represent various climate types; or select the actual use environment of the color-coated plate.

24.3.1.2 Recommend to use the typical atmospheric exposure test site given in GB/T 12754.

24.3.2 Atmospheric exposure test rack

According to different use requirements of color-coated plate, the atmospheric exposure test rack can be self-made, and establish atmospheric exposure test point to perform the test. The construction of atmospheric exposure test rack and the establishment of atmospheric exposure test point shall conform to the following conditions:

24.5 Test procedures

24.5.1 Measure the gloss and chromaticity coordinates of prepared specimen as per the test methods of 5, 6, 7 and 8; assess T-bend and impact performance; observe specimen surface's appearance performance on the crossing, drilling, riveting and bending positions; and keep the original record. The original record shall include the appearance performance on the crossing, drilling, riveting and bending positions, as well as date starting the atmospheric exposure test, etc.

24.5.2 Place the specimen onto the atmospheric exposure rack with tested surface upward.

24.5.3 The cycle of atmospheric exposure test shall be no less than 1 year.

24.5.4 Determine the assessment cycle of the specimen according to the cycle of atmospheric exposure test. If the cycle of atmospheric exposure test is less than 2 years, assess the specimen once every 3 months; if the cycle of atmospheric exposure test is greater than or equal to 2 years, assess the specimen once half a year. Before assessment, the specimen is recommended not to be cleaned; if it is required to clean, it shall be negotiated by the supplier and the purchaser.

24.5.5 According to test methods of 5 and 6, measure the gloss and chromaticity coordinates of plate specimen in the atmospheric exposure test.

24.6 Result expression

24.6.1 For plate specimen, assess the level of loss of gloss, discoloration, chalking, bubbling, rust, and cracking, etc. of specimen as per GB/T 1766-1995; take the worst value of the parallel specimens as the test result.

24.6.2 For damage specimen, assess the level of bubbling on T-bending, impacting, crossing, riveting, and bending positions, rust, cracking, etc. of specimen as per GB/T 1766-1995; take the worst value of the parallel specimens as the test result.

24.6.3 The assessment of atmospheric exposure specimen can also refer to the test report provide after the completion of various atmospheric exposure test sites.

27.4 Test report

The test report shall contain the following contents:

- a) The adopted test standard and negotiated terms;
- b) The instrument model, test conditions;
- c) Geographical positions, climate conditions, and environmental conditions of atmospheric exposure sites and atmospheric exposure points;

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