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(WACO/JSA)

Wallpaper and wallcoverings for decorative finish

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry, through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Wallcoverings Association of Japan (WACOA)/ Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS A 6921: 2003** is replaced with this Standard.

However, **JIS A 6921: 2003** may be applied in the **JIS** mark certification based on the relevant provisions of Article 19 Clause 1, etc. of the Industrial Standardization Law until July 21, 2015.

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Attention is drawn to the possibility that some parts of this Standard may conflict with patent rights, applications for a patent after opening to the public or utility model rights. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying any of such patent rights, applications for a patent after opening to the public or utility model rights.

Wallpaper and wallcoverings for decorative finish

Introduction

This Japanese Industrial Standard was established in 1976 and has gone through five revisions to this day. The last revision was made in 2003, and it has been revised this time for the purpose of alteration of the technical matters such as testing method.

The corresponding International Standard has not been established at this point. The comparison table between previous and current editions of this Standard on technically significant revisions is given in Annex C.

1 Scope

This Standard specifies the wallpaper and wallcoverings to be stuck mainly on the wall, ceiling, etc. of the building as interior finish.

The wallpaper and wallcoverings defined herein mean the wallcovering product of paper, fibre, inorganic material (including metallic foil), plastics (polyvinyl chloride resin, ethylene vinyl acetate copolymer resin, acrylic resin, etc.) and their combination.

Moreover, this Standard is applicable to materials coated previously with adhesives, pressure sensitive adhesives, etc.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

- JIS A 6922 *Adhesives for wallpaper and wallcoverings for decorative finish and TATEGU*
- JIS K 7362 *Plastics — Determination of changes in colour and variations in properties after exposure to daylight under glass, natural weathering or laboratory light sources*
- JIS K 8001 *General rule for test methods of reagents*
- JIS L 0805 *Grey scale for assessing staining*
- JIS L 0842 *Test methods for colour fastness to enclosed carbon arc lamp light*
- JIS L 0849 *Test methods for colour fastness to rubbing*
- JIS P 8113 *Paper and board — Determination of tensile properties — Part 2 : Constant rate of elongation method*
- JIS R 3503 *Glass apparatus for chemical analysis*
- JIS Z 8401 *Guide to the rounding of numbers*

JIS Z 8703 *Standard atmospheric conditions for testing*

JIS Z 8721 *Colour specification — Specification according to their three attributes*

JIS Z 8722 *Methods of colour measurement — Reflecting and transmitting objects*

Japanese Agricultural Standard (JAS) *Plywood*

3 Quality

3.1 Appearance

The wallpaper and wallcoverings shall be free from external irregular colour, flaw, wrinkle, bubble, ingress of foreign matters, bowing, pattern discrepancy and the like which will affect the practicality of use. However, those especially given for the purpose of decoration are excluded.

3.2 Performance

The wallpaper and wallcoverings shall meet the requirements in Table 1 when tested in accordance with clause 6.

Table 1 Quality

Item			Performance	Subclause to be applied
Colour fastness to light ^{a)} (grade)			4 min.	6.3.1
Colour fastness to rubbing ^{a)} (grade)	Colour fastness to dry rubbing	Length	4 min.	6.3.2
		Width		
	Colour fastness to wet rubbing	Length	4 min.	
		Width		
Hiding property (grade)			3 min.	6.3.3
Workability			No float and peeling	6.3.4
Wet strength N/1.5 cm		Length	5.0 min.	6.3.5
		Width		
Formaldehyde emission quantity ^{b)} mg/L			0.2 max.	6.3.6
NOTE : The longitudinal direction and the lateral direction of product are defined as the length and the width.				
Notes ^{a)} For the colour fastness to light and the colour fastness to rubbing, the test condition I-, I or II in Table 3 shall be selected according to the characteristics of the material.				
^{b)} When the formaldehyde emission quantity is not more than 0.2 mg/L, its grade shall be grade F☆☆☆☆ and its symbol shall be F☆☆☆☆.				

4 Dimensions

4.1 Effective width

The width of wallpaper and wallcoverings shall be indicated by the effective width ¹⁾. The effective width shall be 520 mm, 920 mm and 460 mm in principle.

Note ¹⁾ The effective width is defined as the width taken into account for executing works. Where the pattern match is necessary, it means the effective width in the case of executing pattern matching.

4.2 Effective length

The length of wallpaper and wall coverings shall be indicated by the effective length ²⁾.

Note ²⁾ The effective length is defined as the length taken into account for executing works.

5 Materials

When the wallpaper and wallcoverings are manufactured, materials shall be selected in consideration of the characteristics of product, the time of using and waste disposal.

6 Tests

6.1 General conditions of test

Unless especially specified, the tests shall be carried out at the ordinary temperature and ordinary humidity conditions [at the temperature of $20\text{ }^{\circ}\text{C} \pm 15\text{ }^{\circ}\text{C}$ and the relative humidity of $(65 \pm 20)\%$] specified in JIS Z 8703.

6.2 Sampling method

Take the test specimens having the sizes given in Table 2 (see Figure 1). Where the hue, the material compositions, etc. are different according to the parts of product, take the test specimen from each part.

Table 2 Size and number of test specimens

Test item			Symbol of test specimen	Size of test specimen cm	Number of test specimens
Test for colour fastness to light			A	6.5 × 12	2
Test for colour fastness to rubbing	Colour fastness to dry rubbing	Length	B ₁	3 × 22	3
		Width	B ₂	3 × 22	3
	Colour fastness to wet rubbing	Length	B ₁	3 × 22	3
		Width	B ₂	3 × 22	3
Hiding property test			C	20 × 20	2
Workability test	Length		D ₁	20 × 50	2
	Width		D ₂	20 × 50	2
Wet strength test	Length		E ₁	1.5 × 20	10 min. a)
	Width		E ₂	1.5 × 20	10 min. a)
Formaldehyde emission quantity test			F ₁	15 × 20	2
			F ₂	15 × 40	2
Note a) The test specimens shall be taken in accordance with clause 6 of JIS P 8113.					

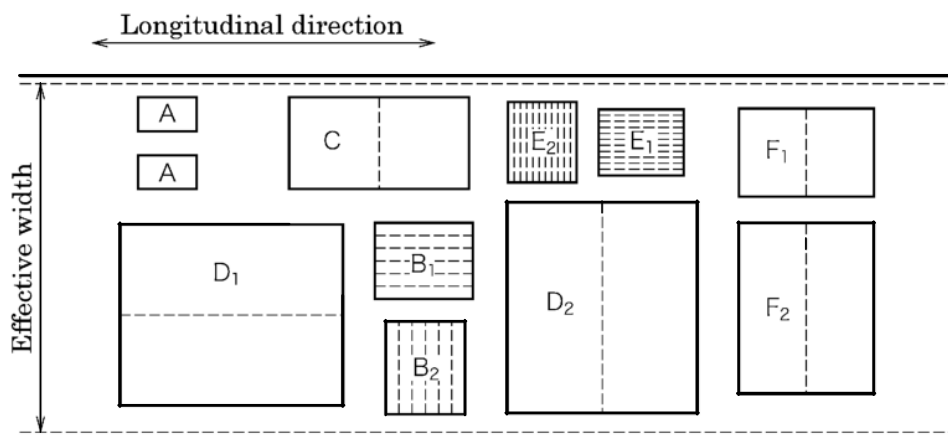


Figure 1 Example of sampling position and symbols (informative)

6.3 Test methods

6.3.1 Test for colour fastness to light

For the test for colour fastness to light, use the testing machine specified in **JIS L 0842** and mount the test specimen according to the operations specified in **7.1, a)** and **b)** of **JIS L 0842**. After irradiating the surface under the conditions specified in **7.1 d)** and **8 b)** of **JIS L 0842** for the time specified in Table 3, take out the test specimen and allow to stand at a cool and dark place for at least 2 h. Evaluate the colour fastness in accordance with **4.1.4.2** or **4.1.4.3** of **JIS K 7362**.

6.3.2 Test for colour fastness to rubbing

For the test for colour fastness to rubbing, use the Type II rubbing tester (Gakushin type) specified in **JIS L 0849**, and carry out the operations specified in **9.2 a)** and **9.2 b)**. The number of frictions shall be that specified in Table 3. By reference to clause **10** of **JIS L 0849**, evaluate in accordance with Table 4 using the grey scale for assessing staining specified in **JIS L 0805**.

For “wallpaper and wallcoverings coated previously with adhesives, pressure sensitive adhesives, etc.”, peel off the release paper and stick it on the test board of friction testing machine so as not to be aerated.

Table 3 Test conditions

Item			Test conditions (irradiation time or number of rubbing)		
			I — a)	I a)	II
			Paper, fibre and inorganic material		Plastics
Test for colour fastness to light			10 h	20 h	40 h
Test for colour fastness to rubbing	Dry rubbing test	Length	Reciprocation 12 times	Reciprocation 25 times	Reciprocation 50 times
		Width	Reciprocation 12 times	Reciprocation 25 times	Reciprocation 50 times
	Wet rubbing test	Length	Reciprocation 3 times	Reciprocation 5 times	Reciprocation 25 times
		Width	Reciprocation 3 times	Reciprocation 5 times	Reciprocation 25 times
Note a) I — or I shall be selected according to the characteristics of wallpaper and wallcoverings.					

Table 4 Criteria of colour fastness to rubbing

Grade	Criteria	NBS unit of colour difference
Grade 1	Change in colour corresponding to grey scale for assessing staining rating 1 or that exceeding this degree.	32.0 ± 3.0
Grade 2	Change in colour corresponding to grey scale for assessing staining rating 2 or the equivalent.	16.0 ± 1.5
Grade 3	Change in colour corresponding to grey scale for assessing staining rating 3 or the equivalent.	8.0 ± 0.7
Grade 4	Change in colour corresponding to grey scale for assessing staining rating 4 or the equivalent.	4.0 ± 0.3
Grade 5	Change in colour corresponding to grey scale for assessing staining rating 5 or the equivalent.	0.2 max.

6.3.3 Hiding property test

For the hiding property test, contact the grey scale for hiding property test closely with the back surface of test specimen, move this grey scale to the right and left or back and forth, and carry out assessment of the degree to which it can be seen through the test specimen according to Table 5.

The grey scale for hiding property test consists of two kinds of achromatic colour chips on a board alternately, and the shape and dimensions shall be in accordance with Figure 2. The colour chip “a” in Figure 2 shall be of achromatic colour having a lightness of 9.4 ± 0.1 , and the colour chip “b” shall be of the achromatic colour having a lightness of 8.8 ± 0.1 . Further, the paper of the colour chip and its paint shall be free from fluorescence and have little aging, and its surface shall be uniform and nearly dull. The lightness of the colour chip is determined from Attached Table 2 in **JIS Z 8721** using the values of the chromaticity coordinates x , y and z obtained by the method specified in **JIS Z 8722**. The colour chip made of plastic film or the like may be used.

The test place shall be provided with at least 540 lx of illumination that corresponds to the daylight from the north-facing window avoiding direct sunlight. For “wallpaper and wallcoverings coated previously with adhesives, pressure sensitive adhesives”, after peeling off the release paper, stick it on the film with the physical properties of not more than 100 µm in thickness and not more than 10 % in haze [turbidity (cloudiness)] (see **JIS K 7136**) so as not to be aerated, take it as a test specimen and assess it.

Table 5 Criteria of hiding property

Hiding property	Criteria
Grade 1	Clearly visible
Grade 2	Visible
Grade 3	Rarely visible
Grade 4	Invisible

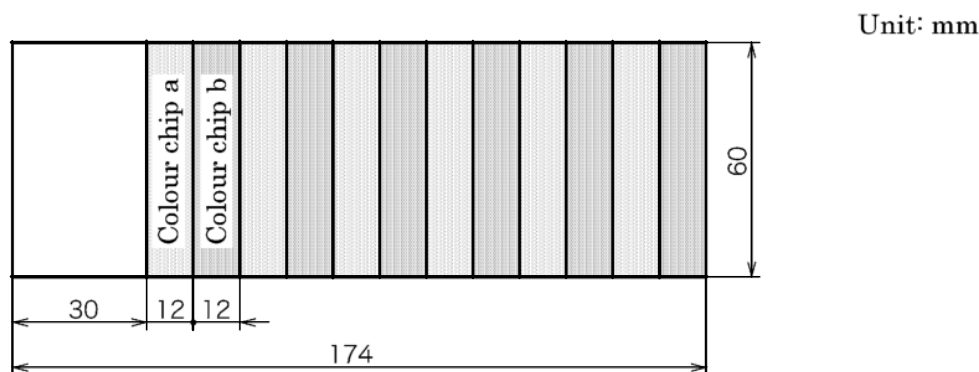


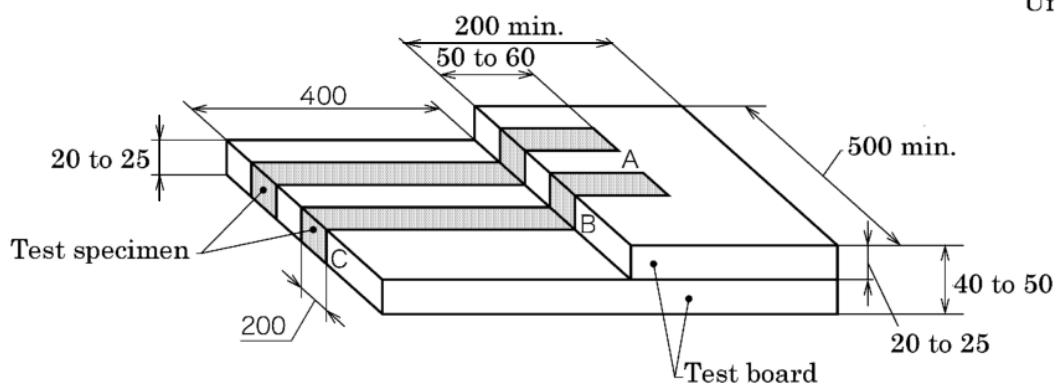
Figure 2 Grey scale for hiding property

6.3.4 Workability test

For the workability test, apply approximately 20 g of the adhesive of Type 2 Class 1 or Type 2 Class 2 specified in **JIS A 6922**, or that prepared by mixing at a rate of 80 % starch and 20 % vinyl acetate emulsion and adding water of 30 % of the mass to adjust the viscosity on the test specimen uniformly, and after allowing to stand for about 5 min, stick the test specimen to the test board as shown in Figure 3. Materials of the test board shall be any of lauan, magnolia obovata and cercidiphyllum japonicum, their parquet or plywood. In the case of plywood, plywood for general use specified in the Japanese Agricultural Standard (JAS) and free from knot, crack, gap and flaw shall be used. The moisture content shall be not more than 15 %. Observe the adhesion condition between the test specimen and the test board checking points A, B and C in Figure 3, 24 h after sticking.

For “wallpaper and wallcoverings coated previously with adhesives, pressure sensitive adhesives”, stick the test specimen to the test board in accordance with each usage and observe the adhesion condition according to the above-mentioned procedure without using the above-mentioned adhesive.

Unit: mm

**Figure 3 Test board**

6.3.5 Wet strength test

For the wet strength test, after immersing the test specimens into water for 5 min, take them out, place them on three sheets of blotting paper³⁾ laid one on top of another, cover them with a sheet of blotting paper, press them softly to remove the excessive moisture and carry out a tensile test quickly.

The pressurization at the time of removing the moisture shall be such extent that a small amount of adhered water is visible on the surface of the test specimen to avoid dispersion of test results.

For the tensile test in this case, use the testing machine specified in clause 5 of JIS P 8113, measure at least 10 test specimens in accordance with cause 9 of JIS P 8113 and obtain each average value of the length and width. Set the tensile speed at $20 \text{ mm} \pm 5 \text{ mm/min}$.

For “wallpaper and wallcoverings coated previously with adhesives, pressure sensitive adhesives”, after immersing the test specimens whose release papers have been peeled away in water for 5 min, take them out and place them on the release papers facing the surface to which adhesive or pressure sensitive adhesive is applied. Cover them with three sheets of blotting paper, press them softly to remove the excessive moisture contained between the release paper and the wallpaper and wallcoverings, peel them off from the release paper and carry out the tensile test quickly.

Note ³⁾ The blotting paper with a grammage of $250 \text{ g/m}^2 \pm 25 \text{ g/m}^2$ specified in 5.4 of JIS P 8222 or that at least equivalent thereto should be used.

6.3.6 Formaldehyde emission quantity test

The formaldehyde emission quantity test by desiccator method shall be carried out by using the glass desiccator shown in Figure 4. Pour distilled water into the desiccator, place the test specimens specified in Table 2, and obtain the emission quantity of formaldehyde from the concentration of formaldehyde absorbed in the distilled water after 24 h under the condition of $23 \text{ }^\circ\text{C} \pm 1 \text{ }^\circ\text{C}$. For “wallpaper and wallcoverings coated previously with adhesives, pressure sensitive adhesives”, peel away the release paper and carry out the test. The principle of concentration measurement of formaldehyde

absorbed in distilled water is based on Hantzsch reaction in which formaldehyde reacts with ammonium ion and acetylacetone to produce diacetyldihydrolutidine (DDL).

The storage of test specimens and collection of formaldehyde shall be as follows.

- a) **Storage of test specimen** The test specimens shall be covered with polyethylene bag immediately after manufacturing, and stored at the ordinary temperature ($20\text{ }^{\circ}\text{C} \pm 15\text{ }^{\circ}\text{C}$) until the testing time. However, the limit of storage period shall be four weeks.
- b) **Collection of formaldehyde** Place the glass crystallizing dish of 12 cm in diameter and 6 cm in height containing 300 ml of distilled water at the bottom part of the desiccator with the nominal size of 240 mm specified in **JIS R 3503**, lay a sheet of wire mesh on it, put the specified number of test specimens as shown in Figure 4, allow to stand under the condition of $23\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$ for 24 h and let the distilled water absorb formaldehyde to prepare the sample solution.

NOTE : It is recommended that the test specimens (F_1 and F_2) be rolled up in shape of cylinder and supported by the suitable metal fittings.

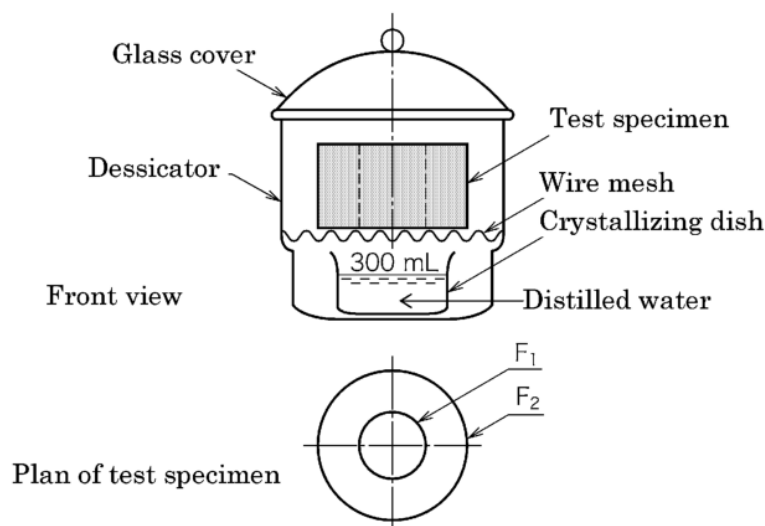


Figure 4 Collection method of formaldehyde

- a) **Determination method of formaldehyde** The concentration of formaldehyde in the sample solution shall be determined by acetylacetone method using photoelectric spectrophotometer.
 - 1) **Acetyl acetone-ammonium acetate solution** Dissolve 150 g of ammonium acetate in 800 ml of distilled water, add 3 ml of glacial acetic acid and 2 ml of acetylacetone to this solution. After shaking thoroughly, add the distilled water to make the solution 1 L and store it in the brown bottle. All the reagents used for the test shall be of guaranteed grade.
 - 2) **Determination procedure** Pour 25 ml of the sample solution into 100-ml Erlenmeyer flask with ground stopper, and add 25 ml of acetylacetone-ammonium ace-

tate solution (within several days after preparation) to this and shake thoroughly. After putting the stopper, warm this flask in the hot water bath at a temperature of $65\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ for 10 min. In parallel with this procedure, use the distilled water in place of the sample solution and perform the similar procedure to make the reference solution. After cooling the solution to be tested and the reference solution to room temperature, transfer these into the absorption cell. Adjust the absorbance to 0 using the reference solution at the wavelength near 412 nm. Measure the absorbance of the solution to be tested and obtain the concentration (mg/L) of formaldehyde from the working curve prepared previously.

NOTE : When the maximum absorbance appears at other wavelength than 412 nm, all measurement including the preparation of working curve may be carried out at this wavelength.

3) Preparation of working curve

- 3.1) **The formaldehyde standard stock solution and its verification** Dilute 1 ml of formaldehyde solution (36.0 % to 38.0 % formaldehyde) with distilled water to make 1 L of the standard stock solution and verify according to the following method.

Take 5 ml of the standard stock solution into 50-ml to 100-ml Erlenmeyer flask with ground stopper, add 20 ml of 0.01 mol/L iodine solution and 1 ml of 5 mol/L potassium hydroxide solution and put the stopper, and allow to stand at ordinary temperature for 15 min. In parallel with this, operate using 5 ml of distilled water similarly as a blank test. Add 2 ml of 2.5 mol/L sulphuric acid little by little, put the stopper, allow to stand at ordinary temperature for 5 min, and titrate by 0.01 mol/L sodium thiosulfate solution by using the microburette. Obtain the quantity of formaldehyde in 1 ml of the standard stock solution according to formula (1).

$$C = \frac{0.1501 \times (B - S) \times f}{5} \dots\dots\dots (1)$$

where, C : quantity of formaldehyde (mg/ml)
 B : quantity of titration of blank (ml)
 S : quantity of titration of the formaldehyde standard stock solution (ml)
 f : factor of sodium thiosulfate solution

The 0.01 mol/L sodium thiosulfate solution shall be in accordance with **JA.5.2 t) 3) of JIS K 8001**.

- 3.2) **Preparation of working curve** Take the calculated quantity of the standard stock solution verified in 3.1) into a volumetric flask, dilute with distilled water so that 0.1 mg of formaldehyde is contained in 1 ml of this solution. Take 0.5 ml, 1.0 ml and 1.5 ml of the same solution, dilute them with distilled water respectively to make 50 ml and take them as the standard solutions.

Take 25 ml of these solutions into 100-ml Erlenmeyer flask with ground stopper respectively, add 25 ml of acetylacetone-ammonium acetate solution to