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Performance Testing and Evaluation Manual for Emission Rate of Formaldehyde from Building Materials

The Building Center of Japan

Contents

1. Scope of Evaluation Services

These services relate to the evaluation for the purposes of approval under technical criteria pertaining to Article 20-5 paragraphs 2 through 4 of the Building Standard Law Enforcement Order (sanitary measures in relation to emissions of chemical substances).

2. Documents Required for Evaluation Application

The following documents are required when making an application for a performance evaluation. Formats and other requirements are stipulated elsewhere.

(1) Performance evaluation application form
(2) Description of building material and specifications for constituent materials
(3) Description of scope of specifications covered by the present application
(4) Date of manufacture of the building material (if multiple materials are combined, the date of manufacture for each material is also required.)
(5) Description of manufacturing processes for the building material (including descriptions of acceptance inspections for individual materials, if multiple materials are combined)
(6) Construction method
(7) Corporate profile of Applicant Company, etc.
(8) Other items

3. Evaluation Procedures

Evaluations are conducted according to the procedures stipulated below.

(1) The evaluator carries out performance evaluations on the basis of the testing and evaluation methods stipulated in Section 4 and the documents submitted, as described in Section 2.
(2) If necessary, the evaluator shall ask the applicant for additional explanations of the documents submitted as stipulated in Section 2.
(3) If evaluation methods need to be specified in detail for individual materials, Detailed Provisions may be established as stipulated elsewhere.

4. Methods for Checking the Emission Rate of Formaldehyde

4.1 General Rules

(1) To determine the emission rate of formaldehyde, a specimen as stipulated in Section 2 is tested with the condition stipulated in Section 4, in accordance with the provisions of JIS A 1901 (measurement of emissions of volatile organic compounds and formaldehyde and other carbonyl substances from building materials using the small chamber method) (hereinafter referred to simply as "JIS A 1901"), using the test specimen specified in Appendix 2 (an example of small chamber, 20 L) of JIS A 1901.

(2) Specimens of plywood, timber flooring, structural panels, MDF, particleboard, wallpaper, starch wallpaper adhesives, starch adhesives and paints for fixtures containing formaldehyde-water solutions can be measured by using the glass desicator method and evaluation criteria individually defined in Japanese Industrial Standards (JIS) or Japanese Agricultural Standards (JAS).
Materials for which the JAS stipulate testing and evaluation criteria based on the acrylic desicator method, such as glued laminated timber and laminated veneer lumber, can be measured by using the acrylic desicator method as defined in the JAS.
Board shape products, consisted mainly of the above-mentioned materials, can be measured by using the glass desicator method, if it is judged to be suitable for this method. (according to criteria defined in detail elsewhere) The glass desicator method is defined in the appendix.

(3) Significant figure for measurement results shall be determined in accordance with Detailed Provisions stipulated elsewhere.

4.2 Test Specimens

Test specimens are, in principle, subject to the requirements set down in JIS A 1901 Section 9 (preparing specimens), and should satisfy the following requirements.

(1) Equivalency of test specimens
The materials in test specimens and their composition must, in principle, fully conform to the specifications stated in the application.

(2) Sampling, preparation and storage of test specimens

The test specimen must, in principle, be sampled from the material (generally produced in a factory) stipulated in the application and prepared with the required dimensions. If it is not possible to cut out a test specimen from the material, the test specimen should be prepared according to the same specifications, including the composition of materials, as stated in the application, so that the performance of the product based on the specifications stated in the application can be evaluated.

The test specimens should be taken from the product within seven days of manufacture. However, wallpaper test specimens should be taken immediately after manufacture.

Test specimens of formaldehyde evaporative (external) diffusion control type, such as paints, adhesives and finishing materials, should be prepared by applying the materials to glass plates (about 3 mm thick), aluminum plates or stainless steel plates according to the standard application methods, and leaving the plates to stand for the required period at ambient temperature of 23 ± 2ºC. If the standard installation method stipulates an open time, the standing period should be based on this. In other cases, the standing period for test specimens should be seven days for paints, and 60 ± 10 minutes for adhesives.

Test specimens should be cured using the method appropriate for the type of material. Detailed information should be determined in accordance with Detailed Provisions stipulated elsewhere.

Care should be taken to ensure that test specimens prepared in accordance with the above procedures are not exposed to high ambient temperatures (35ºC or higher) during transportation.

Until they are submitted for testing, test specimens should be wrapped tightly in aluminum foil and sealed in polyethylene bags or similar containers. They should be stored away from sunlight in an indoor location with minimal temperature fluctuation, wherever possible. However, in the case of wallpaper, testing should be conducted within four weeks of the date of preparation of the test specimen.

(3) Number of test specimens

In principle, two test specimens should be prepared. However, a single test specimen is acceptable if it is clear that product quality has been maintained and controlled appropriately and in accordance with the detailed requirements, as stipulated elsewhere.

(4) Selection of test specimens

In the case of materials that are deemed to be of the same type, the test specimen based on the specifications that have the highest level of formaldehyde emissions shall be selected. The methods of determining the range of products in the same category of materials and of selecting test specimens shall vary, depending on the materials used. However, additional tests and other reasonable methods shall be used.

(5) Surface of test specimen used for measurement

The surface of the test specimen on which measurements are taken shall differ according to the material and its use. In principle, the surface from which formaldehyde shall be emitted into the interior of a room shall be used. Other surfaces shall be sealed appropriately to prevent formaldehyde emissions with JIS A 1901 method.

(6) Other matters

Detailed provisions may be established separately with regard to matters that are essential to ensure objective and fair evaluations.

4.3 Test Conditions

The test conditions shall, in principle, comply with the conditions stipulated in Section 6 of JIS A 1901 (test conditions). The following conditions shall also apply.

(1) Test temperature	28ºC ± 1ºC
(2) Relative humidity	50% ± 5%
(3) Air exchange rate	0.5 l/h ± 0.05 l/h
(4) Loading factor	2.2 m^2/m^3 as a standard However, the loading factor can be adjusted whenever necessary to prevent the formaldehyde concentration in the chamber from exceeding 0.1 mg/m^3 during testing. As for the adhesives, the coating area should be determined, where the adhesives is coated evenly and quickly at a rate of 300 ± 15 g/m^2 so that the loading factor becomes 0.4 m^2/m^3.
(5) Sampling intervals	In principle, sampling shall be carried out one day, three days and seven days after the start of the tests. The emission rate shall be determined on the value on the seventh day. However, if the emission rate reaches the steady state before the seventh day, it shall be the value at that point.

4.4 Testing

Tests to determine the emission rate of formaldehyde shall, in principle, be carried out at the Tokyo Chemical Analysis Center or Osaka Chemical Analysis Center of the Japan Synthetic Textile Inspection Institute Foundation, a business partner of the Building Center of Japan. However, the emission rate may be ascertained using test results from organizations stipulated elsewhere as having the technical capabilities to conduct such tests fairly and independently according to detailed requirements stipulated elsewhere.

4.5 Judgment Criteria

The type of material shall be determined according to the following criteria, based on measurements obtained using the formaldehyde emission measurement method described in Section 4 (separate measurements if two test specimens are measured). If the glass desicator method described in the appendix is used, the classification shall be based on the criteria in the appendix.

(1) Building materials deemed to be Type 2 formaldehyde-emitting building materials as defined in Article 20-5 paragraph 2 of the Order
If the materials are checked according to JIS A 1901, the emission rate (or emission factor) of formaldehyde must be greater than 0.02 mg/m^2 h but not greater than 0.12 mg/m^2 h. If the materials are checked using a glass desicator method or acrylic desicator method stipulated in a particular JIS or JAS standard, the materials must conform with the F☆☆ formaldehyde emission criteria stipulated in each standard (excluding the criteria stated in (2)).

(2) Building materials deemed to be Type 3 formaldehyde-emitting building materials as defined in Article 20-5 paragraph 3 of the Order
If the materials are checked according to JIS A 1901, the emission rate (or emission factor) of formaldehyde must be greater than 0.005 mg/m^2 h but not greater than 0.02 mg/m^2 h. If the materials are checked using a glass desicator method or acrylic desicator method stipulated in a particular JIS or JAS standard, the materials must conform with the F☆☆☆ formaldehyde emission criteria stipulated in each standard (excluding the criteria stated in (3).

(3) Building materials as defined in Article 20-5 paragraph 4 of the Order

If the materials are checked according to JIS A 1901, the emission rate (or emission factor) of formaldehyde emission must not exceed 0.005 mg/m^2 h. If the materials are checked using a glass desicator method or acrylic desicator method stipulated in a particular JIS or JAS standard, the materials must conform with the F☆☆☆☆ formaldehyde emission criteria stipulated in each standard

5. Performance Evaluation Report

The performance evaluation report shall include the following items. The required format is stipulated elsewhere.

(1) Evaluation organization, evaluation number, evaluation completion date
(2) Performance evaluation category
(3) Evaluation report (outline of test results, discussion, summary of evaluation)
(4) Name of applicant (name of company and representative, address)
(5) Subject name (name of structural method or building material)
(6) Structural drawings (appendix)
(7) Specifications of component materials (appendix)
(8) Execution method (appendix)
(9) Test results (appendix)

Appendix: Determination of Formaldehyde Emission Using Glass Desicator Method

1. Testing Method

Testing with the glass desicator method is, in principle, carried out according to JIS A 1460 (Building boards Determination of formaldehyde emission – Desicator method) (hereinafter referred to as “JIS A 1460”).

2. Sampling and Curing of Test Specimens

Test specimens shall, in principle, be sampled and cured according to the procedures stipulated in JIS A 1460. However, if the principle material used is plywood, timber flooring, structural panels, glued laminated timber or laminated veneer lumber, test specimens shall be sampled and cured using the methods stipulated in the relevant JAS standards.

3. Treatment of Measurement Results

Results of formaldehyde concentration measurements are expressed numerically with two significant figures. The average of two sets of measurements shall be calculated, and the results shall be rounded down to one decimal place in accordance with JIS Z 8401 (Guide to the rounding of numbers).

4. Judgment Criteria

(1) Building materials deemed to be Type 2 formaldehyde-emitting building materials as defined in Article 20-5 paragraph 2 of the Order
The average emission of formaldehyde must be greater than 0.5 mg/L but not greater than 1.5 mg/L, and the maximum value must not exceed 2.1 mg/L.

(2) Building materials deemed to be Type 3 formaldehyde-emitting building materials as defined in Article 20-5 paragraph 3 of the Order
The average emission of formaldehyde must be greater than 0.3 mg/L but not greater than 0.5 mg/L and the maximum value must not exceed 0.7 mg/L.

(3) Building materials coming under Article 20-5 paragraph 4 of the Order

The average emission of formaldehyde emitted must not be greater than 0.3 mg/L and the maximum value must not exceed 0.4 mg/L.