

### III. Basic Technical Criteria\* for Countermeasures Regarding Sick House Issues

\* These criteria are stipulated in the Building Standard Law Enforcement Order and Notifications.

#### 1. Chemical substances subjected to regulations

The chemical substances stipulated in the Order are chlorpyrifos and formaldehyde.

#### 2. Regulations on building materials in relation to chlorpyrifos

The use of building materials containing chlorpyrifos in buildings is prohibited.

\* Building materials containing chlorpyrifos is exempted if they have been used as building parts for five years or more.

#### 3. Regulations concerning building materials and ventilation equipment in relation to formaldehyde

##### 3.1 Restrictions on interior finishing materials

(1) Categories of building materials

Building materials which are now subject to formaldehyde-emission controls are classified under four categories according to their formaldehyde emission rates.

Formaldehyde emission rate (*1)	Building materials stipulated in Notification		Building materials approved by the Minister	Restrictions on interior finishing materials
	Name	Relevant Standard		
Over 0.12 mg/m <sup>2</sup> h	Type 1 formaldehyde-emitting building materials	Equivalent to old E <sub>2</sub> , Fc <sub>2</sub> standards under JIS, JAS systems, unclassified	/	Use prohibited
Over 0.02 mg/m <sup>2</sup> h But not more than 0.12 mg/m <sup>2</sup> h	Type 2 formaldehyde-emitting building materials	F☆☆ under JIS, JAS systems	Approved under Article 20-5, paragraph 2 of the Order (deemed equivalent to type 2 formaldehyde-emitting building materials)	Limited area of use
Over 0.005 mg/m <sup>2</sup> h But not more than 0.02 mg/m <sup>2</sup> h	Type 3 formaldehyde-emitting building materials	F☆☆☆ under JIS, JAS systems	Approved under Article 20-5, paragraph 3 of the Order (deemed equivalent to type 3 formaldehyde-emitting building materials)	
Up to 0.005 mg/m <sup>2</sup> h		F☆☆☆☆ under JIS, JAS systems	Approved under Article 20-5, paragraph 4 of the Order	No restrictions

\*1 Measurement conditions

Temperature: 28°C, relative humidity: 50%, formaldehyde density: 0.1 mg/m<sup>3</sup>  
( = guideline value announced by Ministry of Health, Labour and Welfare)

\*2 There are no restrictions on materials which have been used as parts of buildings for five years or more.

## Formaldehyde-emitting Building Materials

Building materials which are now subject to formaldehyde-emission controls are listed exclusively in Notification No. 1113-1115. Materials not listed are not subject to such controls. Even building materials listed in the Notification are exempted from controls when they are F \*\*\*\* of JIS or JAS or equivalent to them.

The following is a table of the building materials mentioned above.

Category	Formaldehyde-emitting building materials (included those approved as equivalent)			
	Type 1	Type 2	Type 3	Exempt from regulations
(1) Plywood	Plywood *Excluding materials listed in the other three columns	- F☆☆ (JAS) - Approved by Minister	- F☆☆☆ (JAS) - Approved by Minister	- F☆☆☆☆ (JAS) - e.g. Non-formaldehyde adhesives used (JAS) - Approved by Minister
(2) Wooden flooring	Wooden flooring (excluding solid-wood flooring with end (longitudinal) joints, etc.) *Excluding materials listed in the other three columns	- F☆☆ (JAS) - Approved by Minister	- F☆☆☆ (JAS) - Approved by Minister	- F☆☆☆☆ (JAS) - e.g. No adhesives used (JAS) - Approved by Minister
(3) Structural panels	Structural panels *Excluding materials listed in the other three columns	- F☆☆ (JAS) - Approved by Minister	- F☆☆☆ (JAS) - Approved by Minister	- F☆☆☆☆ (JAS) - Non-formaldehyde adhesives used (JAS) - Approved by Minister
(4) Glued laminated lumber	Glued laminated lumber *Excluding materials listed in the other three columns	- F☆☆ (JAS) - Approved by Minister	- F☆☆☆ (JAS) - Approved by Minister	- F☆☆☆☆ (JAS) - Non-formaldehyde adhesives used (JAS) - Approved by Minister
(5) Laminated veneer lumber (LVL)	Laminated veneer lumber *Excluding materials listed in the other three columns	- F☆☆ (JAS) - Approved by Minister	- F☆☆☆ (JAS) - Approved by Minister	- F☆☆☆☆ (JAS) - Non-formaldehyde adhesives and non-formaldehyde-emitting paints used (JAS) - Approved by Minister

(6) MDF	MDF *Excluding materials listed in the other three columns	- F☆☆ (JIS) - Approved by Minister	- F☆☆☆ (JIS) - Approved by Minister	- F☆☆☆☆ (JIS) - Approved by Minister
(7) Particle board	Particle board *Excluding materials listed in the other three columns	- F☆☆ (JIS) - Approved by Minister	- F☆☆☆ (JIS) - Approved by Minister	- F☆☆☆☆ (JIS) - Approved by Minister
(8) Other wood materials	Laminates, solid wood, wood chips or similar materials formed into boards through the use of urea resin-based adhesives, etc. *Excluding materials listed in the other three columns	- Approved by Minister	- Approved by Minister	- Approved by Minister
(9) Urea resin board	Urea resin board *Excluding materials listed in the other three columns	- Approved by Minister	- Approved by Minister	- Approved by Minister
(10) Wallpaper	Wallpaper *Excluding materials listed in the other three columns	- Approved by Minister	- Approved by Minister	- F☆☆☆☆ (JIS) - Approved by Minister
(11) Adhesives (both on-site use and secondary processing in factories)	Starch adhesives for wallpaper *Excluding materials listed in the other three columns	- Approved by Minister	- Approved by Minister	- F☆☆☆☆ (JIS) - Approved by Minister
	Starch adhesives for fixtures containing formaldehyde solutions *Excluding materials listed in the other three columns	- Approved by Minister	- Approved by Minister	- F☆☆☆☆ (JIS) - Approved by Minister
	Adhesives based on urea resins, etc. (urea resins, melamine resins, phenol resins, resolcinol resins, formaldehyde-based preservatives) *Excluding materials listed in the other three columns	- Approved by Minister	- Approved by Minister	- Approved by Minister
(12) Heat retention materials	Rockwool heat retention panels Rockwool felt Rockwool heat retention blankets Rockwool heat retention tubes Glasswool heat retention panels Glasswool corrugated heat retention panels Glasswool heat retention blankets Glasswool heat retention tubes *Excluding materials listed in the other three columns	- F☆☆ (JIS) - Approved by Minister	- F☆☆☆ (JIS) - Approved by Minister	- F☆☆☆☆ (JIS) - Approved by Minister
	Phenol resin heat retention materials *Excluding materials listed in the other three columns	- Approved by Minister	- Approved by Minister	- Approved by Minister

(13) Shock absorbent materials	Glasswool shock-absorbers for floating floors Rockwool shock-absorbers for floating floors *Excluding materials listed in the other three columns	- Approved by Minister	- Approved by Minister	- Approved by Minister
(14) Thermal insulation materials	Rockwool thermal insulation materials Glasswool thermal insulation materials Sprayable glasswool thermal insulation materials *Excluding materials listed in the other three columns	- Approved by Minister	- F☆☆☆ (JIS) - Approved by Minister	- F☆☆☆☆ (JIS) - Approved by Minister
	Thermal insulation materials containing urea or melamine resins *Excluding materials listed in the other three columns	- Approved by Minister	- Approved by Minister	- Approved by Minister
(15) Paints (applied on site)	Aluminum paints Oil-based ready-mixed paints Synthetic resin ready-mixed paints Phthalic resin varnishes Phthalic resin enamels Oil-based undercoats General anti-rust paints Multicolor paints Indoor household wooden floor paints Wood and metal household paints Floor paints for buildings (Limited to urea resin products in all of the above cases) *Excluding paints listed in the other three columns	- F☆☆ (JIS) - Approved by Minister	- F☆☆☆ (JIS) - Approved by Minister	- F☆☆☆☆ (JIS) - Approved by Minister
(16) Finishing paint materials (applied on site)	Interior finish synthetic resin emulsion finishing paint materials (for thin coatings) Interior finish synthetic resin emulsion finishing paint materials (for thick coatings) Light aggregate finishing paint materials Synthetic resin emulsion multilayer finishing paint materials Waterproof synthetic resin emulsion multilayer finishing paint materials (Limited to urea resin products in all of the above cases) *Excluding finishing materials listed in the other three columns	- Approved by Minister	- Approved by Minister	- F☆☆☆☆ (JIS) - Approved by Minister
(17) Adhesives (applied on site)	Vinyl acetate resin solvent-based adhesives Rubber solvent-based adhesives Vinyl copolymer resin solvent-based adhesives Recycled rubber solvent-based adhesives (Limited to urea resin products in all of the above cases) *Excluding products listed in the other three columns	- F☆☆ (JIS) - Approved by Minister	- F☆☆☆ (JIS) - Approved by Minister	- F☆☆☆☆ (JIS) - Approved by Minister

(2) Prohibition on use of type 1 formaldehyde-emitting building materials

The use of type 1 formaldehyde-emitting building materials as interior finishing materials in habitable rooms is prohibited.

- \* Habitable rooms also include other areas of buildings, such as corridors, which have permanent openings (such as door undercuts) and which are ventilated together with the habitable rooms according to ventilation planning. (The same applies below.)
- \* Interior finishing materials are materials applied to the surfaces of walls, floors and ceilings (excluding picture rails, windowsills and similar parts). Pillars and other framing lumber, baseboards, handrails, head jambs, lintel joist, and other finishing trim, window/door trim and paints adhesives, etc used in small quantities are excluded. (The same applies below.)

(3) Restrictions on use of type 2 and type 3 formaldehyde-emitting building materials

The use of type 2 and type 3 formaldehyde-emitting building materials as interior finishing materials in habitable rooms is limited to area size which satisfy the following formula.

$$N_2 S_2 + N_3 S_3 \leq A$$

- $N_2$ : Value shown in column (1) in the table below
- $N_3$ : Value shown in column (2) in the table below
- $S_2$ : Area size type 2 formaldehyde-emitting building materials are used
- $S_3$ : Area size type 3 formaldehyde-emitting building materials are used
- $A$ : Floor area of habitable room

Type of habitable room	Ventilation	(1)	(2)
Habitable rooms in houses, etc. (*1)	At least 0.7 times/h (*2)	1.2	0.20
	Others (at least 0.5 times/h but less than 0.7 times/h) (*2)	2.8	0.50
Habitable rooms in buildings other than houses, etc.	At least 0.7 times/h (*2)	0.88	0.15
	At least 0.5 times/h but less than 0.7 times/h (*2)	1.4	0.25
	Others (at least 0.3 times/h but less than 0.5 times/h) (*2)	3.0	0.50

\*1 Habitable rooms in houses, etc., are habitable rooms in houses, bedrooms in boarding houses, bedrooms in dormitories, and sales areas in stores engaged in commodity sales such as furniture and similar items.

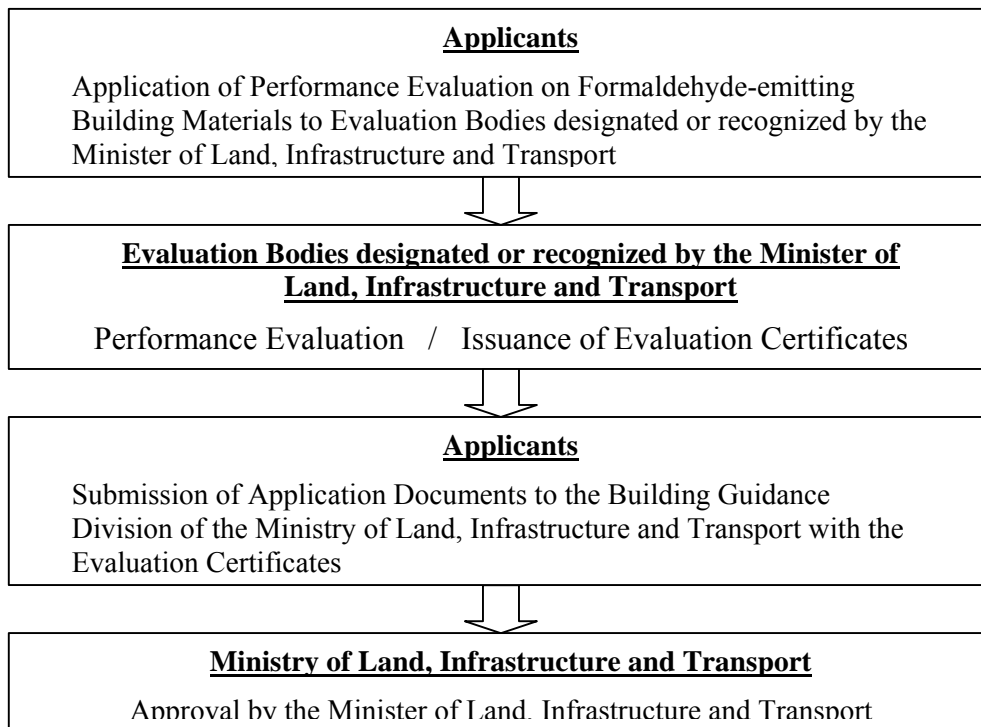
\*2 Ventilation includes ventilation achieved by using construction methods stipulated or approved by the Minister of Land, Infrastructure and Transport as providing a ventilation frequency equivalent or superior to mechanical ventilation equipment providing the ventilation frequency shown in the above table.

(4) Ministerial Approval on Formaldehyde-emitting Building Materials

Type 1, 2 and 3 formaldehyde-emitting building materials stipulated in the Building Standard Law Enforcement Order (hereinafter referred to as the Order) Article 20-5 Paragraph 1-Item 3 and -Item 4 are specified in the Notifications quoting JIS and JAS product standards. As a general rule, building materials which do not comply with such JIS and JAS standards may become subject to Ministerial Approval and those approved by the Minister of Land, Infrastructure and Transport based on the Order Article 20-5 Paragraphs 2 through 4 are deemed to be equivalent to type 2, type 3 or non-classified as type-1, 2 or 3 (i.e. exempted from regulations) formaldehyde-emitting building materials according to classification of approval.

In order to obtain Ministerial Approval, applicants shall submit application documents with the evaluation certificate issued by the evaluation organizations designated or recognized by the Minister of Land, Infrastructure and Transport.

**Flowchart of the Ministerial Approval on Formaldehyde-emitting Building Materials**



(5) Exemptions

The following types of habitable rooms are covered by other criteria, etc., and are therefore exempted from the restrictions concerning interior finishing materials specified herein.

- Habitable rooms equipped with centrally controlled air conditioning equipment which complies with specific criteria (Article 20-6, paragraph 1 item (1) (c) of the Order)
- Habitable rooms approved by the Minister of Land, Infrastructure and Transport as rooms in which it is possible to maintain the concentration of formaldehyde at no more than 0.1 mg/m<sup>3</sup> throughout the year in areas where people can be expected to engage in normal activities. (Note: Such rooms are also exempted from the criteria concerning ventilation equipment.)

### 3.2 Mandatory installation of ventilation equipment

(1) Installation of one of the following types of ventilation equipment is mandatory.

A	b	c
Mechanical ventilation equipment (except b)	Mechanical ventilation equipment which cleans the air supply	Centrally controlled air conditioning equipment
<ul style="list-style-type: none"> <li>Equipment which complies with general technical criteria for mechanical ventilation equipment (Article 129-2-6 paragraph 2 of the Order)</li> </ul>		<ul style="list-style-type: none"> <li>Equipment which complies with general technical criteria for centrally controlled air conditioning equipment (Article 129-2-6 paragraph 3 of the Order)</li> </ul>
<ul style="list-style-type: none"> <li>Ventilation equipment must have the effective capacity to provide a ventilation frequency of at least 0.5 times/hour in habitable rooms in houses, etc., and at least 0.3 times/hour in other habitable rooms.</li> </ul>	<ul style="list-style-type: none"> <li>Ventilation equipment must either comply with the criteria stipulated in notifications or be approved by the Minister as having the equivalent effective ventilation capacity (calculated using the following formula) equivalent to providing a ventilation frequency of at least 0.5 times/hour in habitable rooms in houses, etc., and at least 0.3 times/hour in other habitable rooms.</li> </ul> $Vq = Q(C - C_p) / C + V$ <ul style="list-style-type: none"> <li>Vq: Equivalent effective ventilation capacity</li> <li>Q: Amount of air cleaned and supplied</li> <li>Cp: Amount of formaldehyde contained in cleaned air</li> <li>C: Amount of formaldehyde in air in habitable room</li> <li>V: Effective ventilation capacity</li> </ul>	<ul style="list-style-type: none"> <li>In principle, the equipment must have sufficient ventilation capacity to provide an effective ventilation capacity not less than the value calculated according to the following formula.</li> </ul> $V = 10(E + 0.02nA)$ <ul style="list-style-type: none"> <li>V: Effective ventilation capacity</li> <li>E: Formaldehyde emission from finishing of interior finish materials</li> <li>n: 3 for habitable rooms in houses, etc., 1 for other habitable rooms</li> <li>A: Floor area of habitable rooms</li> </ul>
<ul style="list-style-type: none"> <li>The air supply or exhaust system must, in principle, have the required capacity as confirmed from calculations which take into account the total pressure loss in the duct work.</li> </ul>		
<ul style="list-style-type: none"> <li>The ventilation equipment must be continuously operable when the habitable room is in normal use.</li> </ul>		

\*1 When one mechanical ventilation system is used to ventilate two or more habitable rooms, its effective ventilation capacity must be equal to or greater than the total required ventilation capacity for all of the rooms.

\*2 The control and the monitoring of operational status of centrally controlled air conditioning equipment or mechanical ventilation equipment installed in buildings, etc., in which an emergency elevator is required to be installed (except equipment used to ventilate individual habitable rooms) must be possible from a central control room.

(2) Cases in which general mechanical ventilation equipment is not required

The following types of habitable rooms do not require ventilation equipment which complies with the requirements in 1).

a. Habitable rooms in which ventilation is provided through openings and gaps (equivalent to a ventilation frequency of 0.5 times/hour)

- Habitable rooms in which the total area of openings and gaps which are always open to the outside air and which are effective for ventilation is at least 15 cm<sup>2</sup> per square meter of floor area
- Habitable rooms other than those used for sleeping (e.g. habitable rooms in houses, bedrooms in hotels, inns and boarding houses) in which the total area of openings and gaps which are open to the outside air and which are effective for ventilation when the room is in use is at least 15 cm<sup>2</sup> per square meter of floor area
- Habitable rooms in buildings of “shinkabe” construction in which no plywood or similar panel-like building material is used for exterior walls, ceilings and floors
- Habitable rooms in buildings of “shinkabe” construction in which no plywood or similar panel-like building material is used for exterior walls, and in which the fixture fittings on openings in exterior walls are wooden frames and have gaps through which ventilation can be provided

b. Easing of ventilation frequency requirements for habitable rooms with high ceilings

- Habitable rooms in which the ceiling is above a certain height, and in which there is mechanical ventilation equipment providing effective ventilation capacity or equivalent effective ventilation capacity as stipulated in the following tables according to ceiling height

Habitable rooms (ceiling height 2.7 m or higher) with ventilation provided at the equivalent of 0.7 times/h

Ceiling height (m)	At least 2.7 but less than 3.3	At least 3.3 but less than 4.1	At least 4.1 but less than 5.4	At least 5.4 but less than 8.1	At least 8.1 but less than 16.1	16.1 or higher
Ventilation frequency (times/hour)	0.6	0.5	0.4	0.3	0.2	0.1

Habitable rooms (ceiling height 2.9 m or higher) with ventilation provided at the equivalent of 0.5 times/h

Ceiling height (m)	At least 2.9 but less than 3.9	At least 3.9 but less than 5.8	At least 5.8 but less than 11.5	11.5 or higher
Ventilation frequency (times/hour)	0.4	0.3	0.2	0.1



Habitable rooms (ceiling height 3.5 m or higher) with ventilation provided at the equivalent of 0.3 times/h

Ceiling height (m)	At least 3.5 but less than 6.9	At least 6.9 but less than 13.8	13.8 or higher
Ventilation frequency (times/hour)	0.2	0.1	0.05

- c. Habitable rooms approved by the Minister of Land, Infrastructure and Transport as rooms in which it is possible to maintain the concentration of formaldehyde at no more than 0.1 mg/m<sup>3</sup> throughout the year in areas where people can be expected to engage in normal activities. (Note: Such rooms are also exempted from restrictions concerning the use of building materials.)

### 3.3 Restrictions concerning ceiling cavities, etc.

Where mechanical ventilation equipment or centrally controlled air conditioning equipment has been installed, one of the following measures must be implemented to prevent formaldehyde entering habitable rooms from ceiling cavities, etc. (ceiling cavities, attics, cavities underneath floors, wall, storerooms and other similar locations):

- (1) Controlling the emission of formaldehyde which might flow into habitable rooms through non-use of the following materials as base materials, thermal insulation materials or other similar surface materials, in ceiling cavities, etc.:
  - Type 1 formaldehyde-emitting building materials
  - Type 2 formaldehyde-emitting building materials
  - Building materials approved by the Minister of Land, Infrastructure and Transport under the provisions of Article 20-5 paragraph 2 of the Order (building materials deemed to be equivalent to type 2 formaldehyde-emitting building materials)
- (2) Controlling the flow of formaldehyde into habitable rooms through use of airtight layers or seals. The locations in which countermeasures are implemented are as follows:
  - Areas facing the outside, other than separation walls which are separated from a habitable room with a continuous airtight layer, using airtight materials as stipulated in the “Design and Construction Guidelines for the Rationalization of Energy Use in Houses,” based on Ministry of Construction Notification No. 998 of 1999, under the Law Concerning the Rationalization of Energy Use (Law No. 49 of 1979, known as the “Energy Conservation Law”) (referred to below as “airtight materials”)
  - Parts of walls, etc, in which air seals are applied to all necessary locations to prevent the passage of air between habitable rooms and other areas using airtight materials or materials with airtightness equivalent or superior to that of airtight materials (e.g. plasterboard) to control the flow of formaldehyde into habitable rooms.

(3) For ceiling cavities, etc., where the countermeasures described in 1) or 2) have not been implemented limiting formaldehyde flowing into habitable rooms due to air pressure differentials by measures based on the use of mechanical ventilation equipment, etc., to maintain the air pressure in habitable rooms at a higher level than in ceiling cavities, etc.. Depending on the type of mechanical ventilation equipment, etc., the following specific measures might be used for this purpose:

- Type 1 ventilation equipment (equipment with air supply and exhaust systems)  
The air pressure in the habitable rooms shall be maintained above the pressure in the ceiling cavities, etc., by adjusting the capacities of the air supply and exhaust systems. Alternatively, an exhaust system installed in a habitable room or another exhaust system may be used to exhaust air from the ceiling cavities, etc.
- Type 2 ventilation equipment (equipment with an air supply system and an air outlet)  
Since air supply is provided mechanically, no other special measures are required.
- Type 3 ventilation equipment (equipment with an air inlet and an exhaust system)  
An exhaust system installed in a habitable room or another exhaust system may be used to exhaust air from the ceiling cavities, etc.

June 6, 2003

**List of Designated Performance Evaluation Organizations  
Engaged in the Performance Evaluation of Formaldehyde-emitting Building Materials**

Organization	Service areas	Telephone number	Address	Designation* date
Hokkaido Northern Regional Building Research Institute	Japan	0166-66-4217	1-20 Higashi 1-jo 3-chome, Midorigaoka, Asahikawa, Hokkaido 078-8801	June 3, 2003
Japan Testing Center for Construction Materials	Japan	03-3664-9216	Yusenkyabacho Building 10F, 2-9-8 Nihonbashi kayabacho, Chuo-ku, Tokyo 103-0025	March 14, 2003
Japan Spinners Inspecting Foundation	Japan	03-3661-7179	Shiga Buildinug, 12-9 Nihonbashi-kodenmacho, Chuo-ku, Tokyo 103-0001	April 4, 2003
The Building Center of Japan	Japan and overseas	03-3434-7169	30 Mori Building, 3-2-2, Toranomom, Minato-ku, Tokyo 105-8438	March 14, 2003
Japan Plywood Inspection	Japan	03-3591-7438	Meisan Building, 1-18-17 Nishi-shimbashi, Minato-ku, Tokyo 105-0003	March 14, 2003
Japan Housing and Wood Technology Center	Japan and overseas	03-3589-1796	Adoresu Building 4F, 2-2-19 Akasaka, Minato-Ku, Tokyo 107-0052	March 14, 2003
Japan Paint Inspection and testing Association	Japan	03-3443-3011	Tokyo Toryo kaikan 205, 2-2-19 Ebisu, Shibuya-ku, Tokyo 150-0013	March 14, 2003
Center for Better Living	Japan and overseas	03-5211-0599	Sogo Nibancho Building 6F, 4-5 Nibancho, Chiyoda-ku, Tokyo 102-0084	March 14, 2003
Tokai Technology Center	Japan	052-771-5161	710 Inokoshi, 2-chome, Meito-ku, Nagoya 465-0021	June 3, 2003
Chemicals Evaluation and Research Institute, Japan	Japan	06-6771-5157	1-6-5 Dogashiba, Tennoji-ku, Osaka 543-0033	April 4, 2003
General Building Research Corporation of Japan	Japan and overseas	06-6966-7600	TS Building 4F, 1-2-10 Minani-shinmachi, Chuo-ku, Osaka 540-0024	March 14, 2003

\* Designation as an entity qualified to carry out performance evaluations for approval under Article 20-5 Paragraphs 2 through 4 of the Order as stipulated in Article 59 Item (8)-3 of the Ministry Order Concerning Designated Qualified Inspection Organizations, etc., under the Building Standard Law.